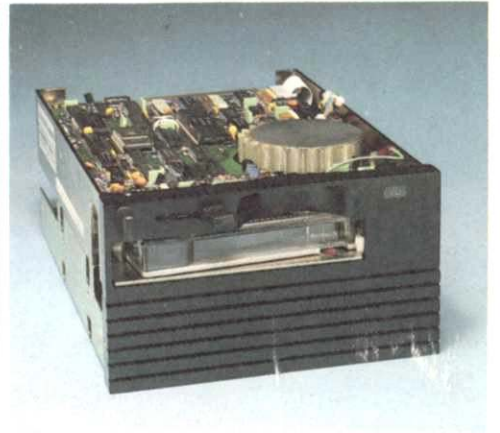
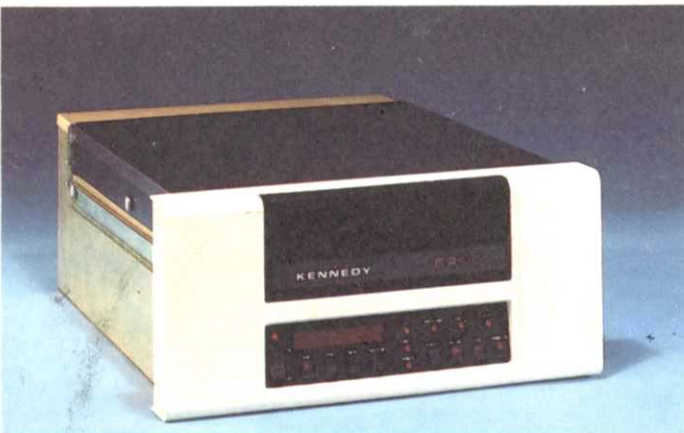


Model 9600A



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.

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SECTION I
APPLICATION DATA

SECTION I

GENERAL DESCRIPTION AND APPLICATION DATA

1.1 GENERAL DESCRIPTION

The Kennedy Model 9600A (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, PE 3200 BPI and NRZ1 800 BPI tapes. The drive can operate in streaming or start/stop mode and can read in either forward or reverse direction.

1.1.1 FEATURES

The Kennedy Model 9600A features:

1. Two independent microprocessors: one for the drive servo electronics: one for the Formatter.
2. Tru 50-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. Modular configuration that allows for future expansion.
6. Self diagnostic capability.
7. Front-panel eight-character LED readout that displays operational status, errors, abnormalities, and diagnostic parameters.

1.1.2 HOST INTERFACE

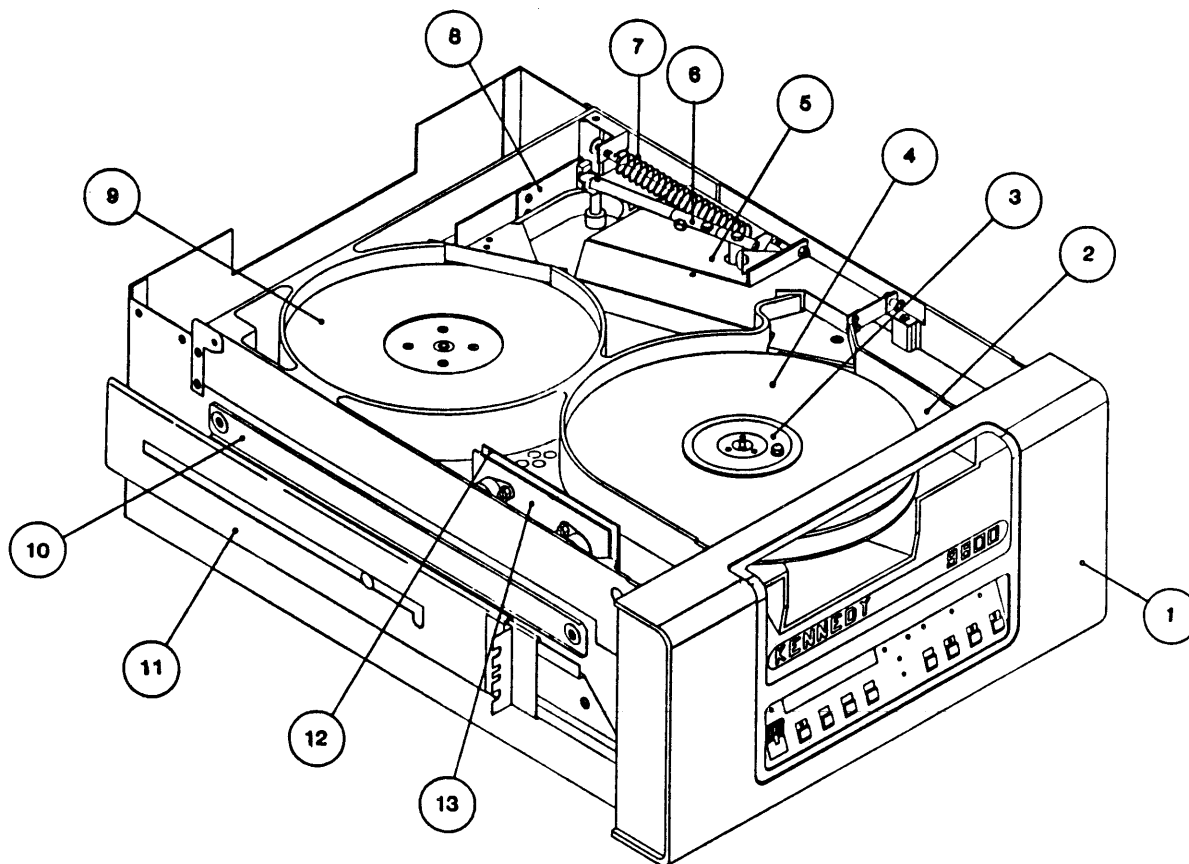
The 9600A Drive has the Industry Standard Interface for Formatted 1/2-inch Tape Drives.

1.1.3 MICROCOMPUTER BASED DESIGN

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



Parts List

Item	Part Name	Item	Part Name
1	Panel Assembly	7	Spring, Extension
2	Supply Arm Assembly (bottom, hid)	8	Take-up Arm Limmit Sensor PCBA
3	Supply Hub Assembly	9	Vacuum Hub Assembly
4	Supply Reel Tape	10	Support Bar
5	Magnetic Head Assembly (hidden)	11	Slide Set
6	Take-up Arm Assembly (top)	12	12VDC Regulator PCBA
		13	+/-12VDC Regulator Assembly

Figure 1-1. Model 9600A Auto-load Tape Drive

1.2 SPECIFICATIONS

1.2.1 OPERATIONAL SPECIFICATIONS

Table 1-1. Operational Specifications

TAPE	
Width	0.498 (+/- .002) inch
Thickness	1.9 or 1.3 mil (0.038 or 0.0226 mm)
Tension	8.75 +/-0.5 ounces
Reel Size	6.0, 7.0, 8.5, or 10.5 inch open reels
Tape Capacity	
1.9 mil tape	200, 600, 1200, or 2400 feet
1.0 mil tape	300, 900, 1800, or 3600 feet
PERFORMANCE	
Data Density	800 BPI (NRZ1) 1600 BPI (PE) 3200 BPI (PE)
Format	NRZ1, ANSI and IBM compatible PE, ANSI and IBM compatible 3200 ANSI compatible
Tape Speed:	
Start/Stop	50 ips
Streaming	100 ips
Rewind, nominal	200 ips
Gap Length	NRZ1/PE 0.6" (nominal - Read/Write)
Data Access Time (nominal):	
Streaming (100 ips):	
Read	12 ms
Write	12 ms
Start/Stop (50 ips)	7.5 ms
Command Reissue Time (streaming mode):	
Write command	45 ms
Write command, long gap	105 ms
Read command	60 ms
Repositioning Time (streaming mode):	
Same Direction	50 ms
Opposite Direction	200 ms
Speed Variation:	
Instantaneous	+/-3%
Long Term	+/-1%
Data Transfer Rate	
50 ips	PE - 80 KB/sec, 2XPE - 160KB/sec, NRZ1 - 40 KB/sec
100 ips	PE - 160 KB/sec, 2XPE - 320KB/sec, NRZ1 - 80 KB/sec

Table 1-1. Operational Specifications (Continued)

MAGNETIC HEAD ASSEMBLY	
Surface	Hard coated
Number of tracks	9 tracks, read after write
Tape cleaners (2)	Sapphire
BOT/EOT detection	infrared
Broken tape detection	infrared
Motion Control	Microprocessor controlled capstan and reel servo with tension arm tape buffering
Tape Threading	Automatic
MAINTENANCE STATISTICS	
MTBF	7000 hours
MTTR	30 minutes
POWER REQUIREMENTS	
Input Voltage	90-132 vac 190-256 vac
Input current	4.5 amp (nominal) at 120 vac 2.5 amps (nominal) at 220 vac
Power	500 watts (nominal)

1.2.2 PHYSICAL/ENVIRONMENTAL SPECIFICATIONS (Table 1-2)

Table 1-2. 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	60o to 90o F (15o to 32o C)
Temperature, nonoperating	36o to 122o F (2o to 50o 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 9600A Tape Drive is capable of reading and writing ANSI and IBM Standard Tapes in 9-Track NRZI, 9-Track PE, and 9-Track 3200 Formats (See Table 1-1 Performance Specifications).

1.4 INTERFACE DESCRIPTION

The interface connectors on the 9600A 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 9600A Tape Drive and the Host/Controller.

1.5.1 LOGIC STATE DEFINITIONS

Signals from the Host to the Model 9600A 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 9600A 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.

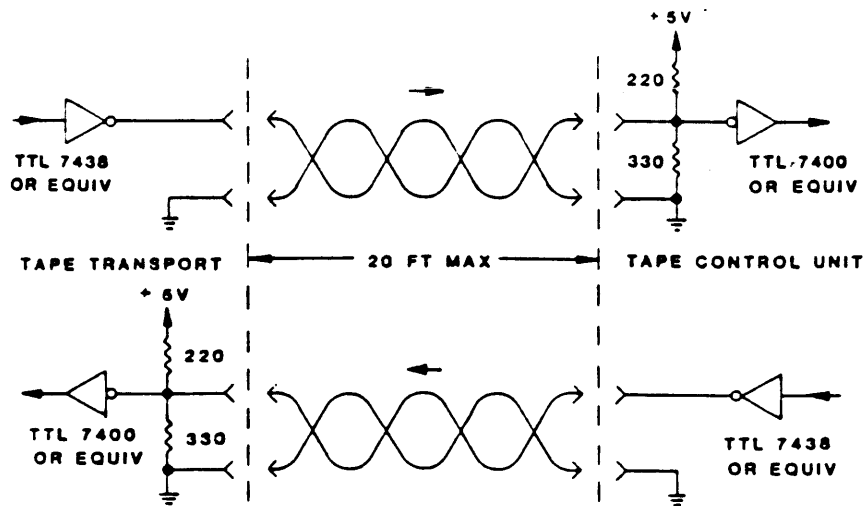


Figure 1-2. Receiver/Driver Interface Configuration

1.6 INTERFACE SIGNALS

The following paragraphs describe the specifications and functions for each signal required between the Host/controller and the 9600A 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 1-3, which follows, is a complete summary of Drive interface signals.

Table 1-3. Interface Summary (Sheet 1 of 2)

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

Table 1-3. Interface Summary (Sheet 2 of 2)

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

1.6.1 INTERFACE INPUT SIGNALS (HOST TO DRIVE)

1.6.1.1 DRIVE ADDRESS ITAD0, ITAD1, IFAD 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. The following Table 1-4 defines the tape drive addresses produced as a result of ITAD0, ITAD1, and IFAD.

Table 1-4. Drive Address Selection

ITAD0	ITAD1	IFAD	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** **(Table 1-3)**

Write Data lines are used in all densities.

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 check the parity bit specified by the customer. 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.

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, but was not in Rewind, the tape retensions and positions past the point when ILOL was asserted. If the tape is installed but not yet loaded when ILOL is asserted, the tape loads and rewinds 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.
5. Read After Write Compare Error.
6. Write Data Parity Error (optional).

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 (1600 and 3200 BPI):

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 1-5. IHER/ICER Signal Combinations

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

1.6.2.5 CHECK CHARACTER GATE AND IDENTIFICATION BURST

ICCG/ID Level P2-16

Check Character Gate: In NRZ1 Read Mode, the Formatter sets ICCG true (low) when the Formatter sends to the Host a Cyclic Redundancy Check Character (CRCC) or a Longitudinal Redundancy Check Character (LRCC). When the Formatter sends data to the Host, it resets ICCG false (high). After the tape leaves load point, the ICCG/ID line should be used only when the Drive is in NRZ1 mode.

ID Burst: In PE 1600 and 3200 Read Mode, the Formatter sets ID true (low), indicating the ID Burst has been detected and identifying the tape in the Drive as a PE 1600 or 3200 Tape.

1.6.2.6 FILE MARK IFMK Pulse P2-14

IFMK is pulsed when a file mark is detected on the tape during a read operation or during a write file mark operation in a read-after-write operation. The IFMK line will be pulsed after a complete file mark record has been read. Error conditions should be ignored when a file mark is detected.

1.6.2.7 ON-LINE IONL Level P2-44

IONL is true (low) when the on-line flip-flop is set, indicating the Drive is under remote control. IONL false (high) indicates the Drive is under local control.

1.6.2.8 READY IRDY Level P2-28

IRDY is true (low) only when the Drive is ready to receive external commands; the following conditions must exist:

1. All interlocks are made.
2. Initial load or rewind sequence is complete.
3. Drive is on-line.

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 ILDP Level P2-4

ILDP 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** **(Table 1-3)**

The read data lines transmit the read data for NRZ1, and PE 1600 and 3200 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 1600 or 3200 mode.

1.6.3 COMMAND LINE CONFIGURATIONS

Host Commands are conveyed on some of the Interface Lines listed in Table 1-3. The following Table 1-6 lists these commands and shows the configurations that control the various modes of operation, which are described in detail in the following subparagraphs.

Table 1-6. 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
SECURITY ERASE		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
SET 3200 BPI (2XPE)		L	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 a file mark to be written on tape.

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).

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. A File Mark Search started at a point past EOT will stop in 5 feet if no File Mark is found sooner and if the Timeout is not disabled.

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-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-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. Set 3200 BPI sets the Drive for PE Mode at 3200 BPI. These commands will be accepted only when the tape is at BOT.

SECTION II
INSTALLATION AND OPERATION

SECTION II - INSTALLATION AND OPERATION

2.0 INTRODUCTION

Section II describes unpacking, inspecting, installing, cabling, adjusting, and operating the Model 9600A Tape Drive.

2.1 UNPACKING

WARNING

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

The Model 9600A is cushioned by styrofoam supports and shipped in a heavy-weight cardboard container. Place the shipping container on a flat, dry, non-slip surface. Carefully open the shipping container. Fold back the polyethylene wrap, remove the Drive from the shipping container, and set it on a flat surface. Remove from the carton, and save, the following items: Slide Rails, AC Power Cord, 220/240-volt Fuse Kit, Hardware (two Shipping Retainer Brackets, Rack-Latch Angle Bracket, screws, etc) and 9600A Manual. Retain the shipping container, polyethylene wrap, and styrofoam supports for possible future shipment.

Tape Drives shipped in racks are held in place by the two Shipping Retainer Brackets mentioned above (Figure 2-1). These Brackets should be removed after the Rack is put in its final location at the installation site, and the Rack-Latch Angle Bracket (also mentioned above) must be installed in place of the left Retainer Bracket. This Bracket comprises the Catch (Figure 21) for the Retainer Latch located just inside the Front Panel.

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

The user must provide Host-to-Drive interconnect cables. Up to eight Drives can be daisy chained, but combined cable length must not exceed 20 feet. Resistor Packs IC3, IC4, and IC11 must be removed from all Drive Formatter Boards except from the last Formatter on the daisy chain. To remove the Resistor Packs:

1. Remove Top Cover at rear top of the Drive.
2. As applicable, disconnect two cables from the Formatter Board (Figure 2-4).
3. Grasp the PCB Ejectors firmly, and pull Ejectors toward the side of the unit. Board should pop partly out if the slot.
4. Locate Resistor Packs IC3, IC4, and IC11 (Figure 2-4), and remove them.
5. Replace the Formatter Board and Top Cover.

Recommended connectors and cables are as follows: - Daisy chains may optionally require a Cable Connector Adapter (See Figures 2-3 and 2-5).

<u>Item</u>	<u>Vendor</u>	<u>Part Number</u>	<u>Specifications</u>	<u>Other Vendor</u>
Connectors:	Kennedy	23-000162	50-pin, card edge	3M 3415-0001
Adapter	Kennedy	90-08018-001	50-pin, 3-port	none
Cables:	Kennedy	60-00056-001	50-wire, 28-gauge,	3M 3365/50
			UL Style 2651	Winchester 55-5038-10

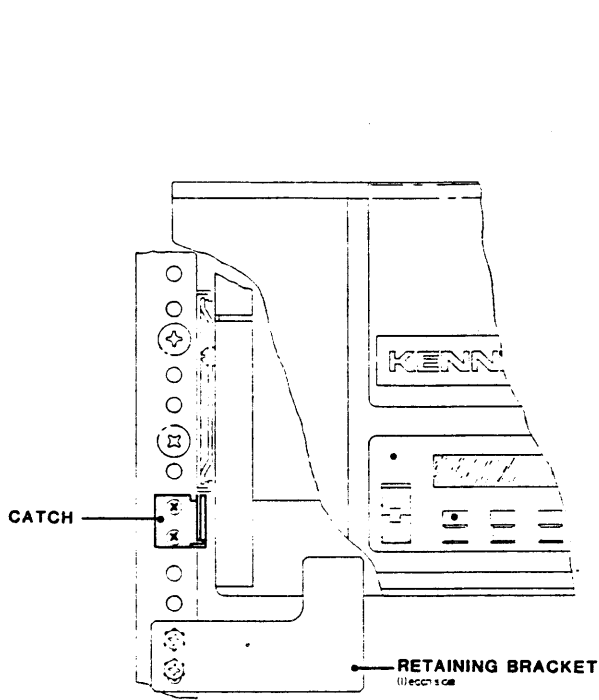


Figure 2-1. Shipping Retainer Bracket and Catch

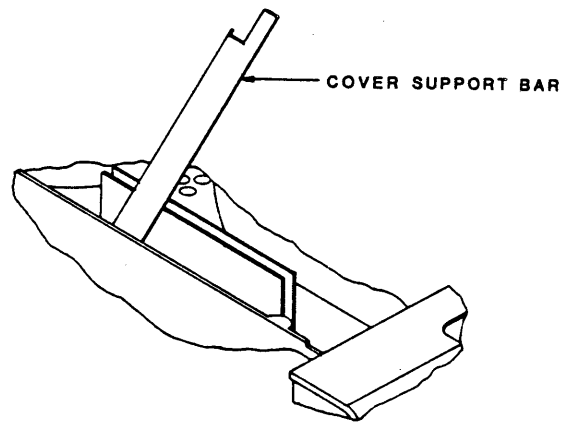


Figure 2-2
Dust Cover Support Bar

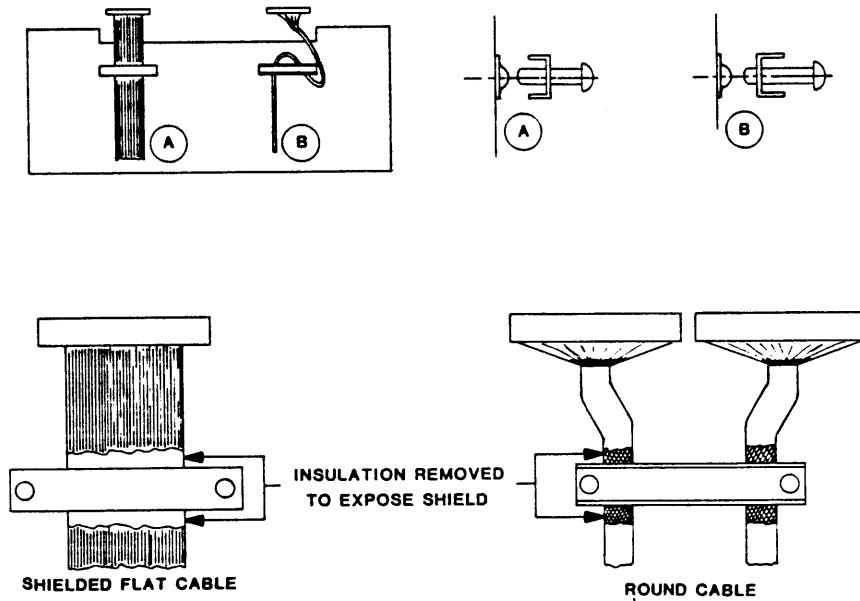


Figure 2-3. Grounding Cable Clamp Details

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

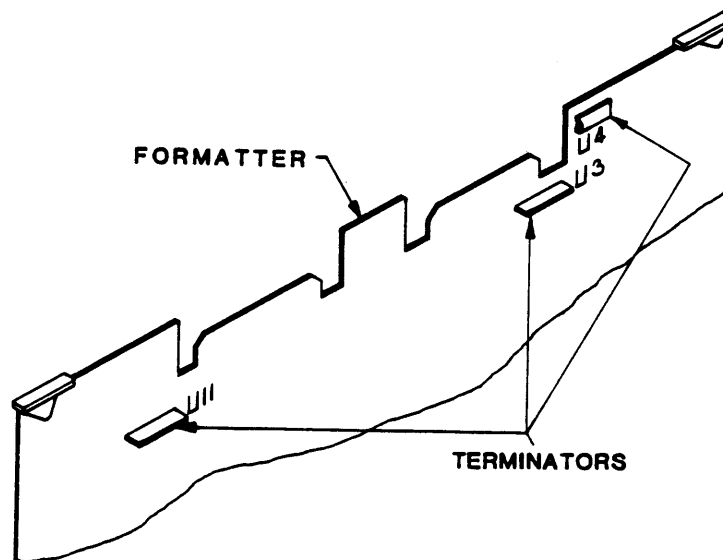
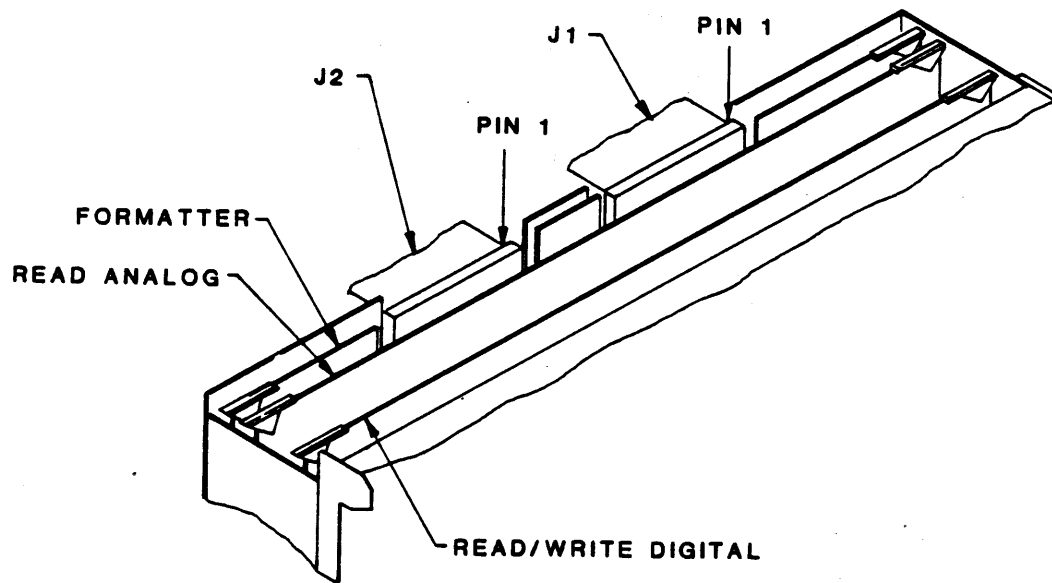
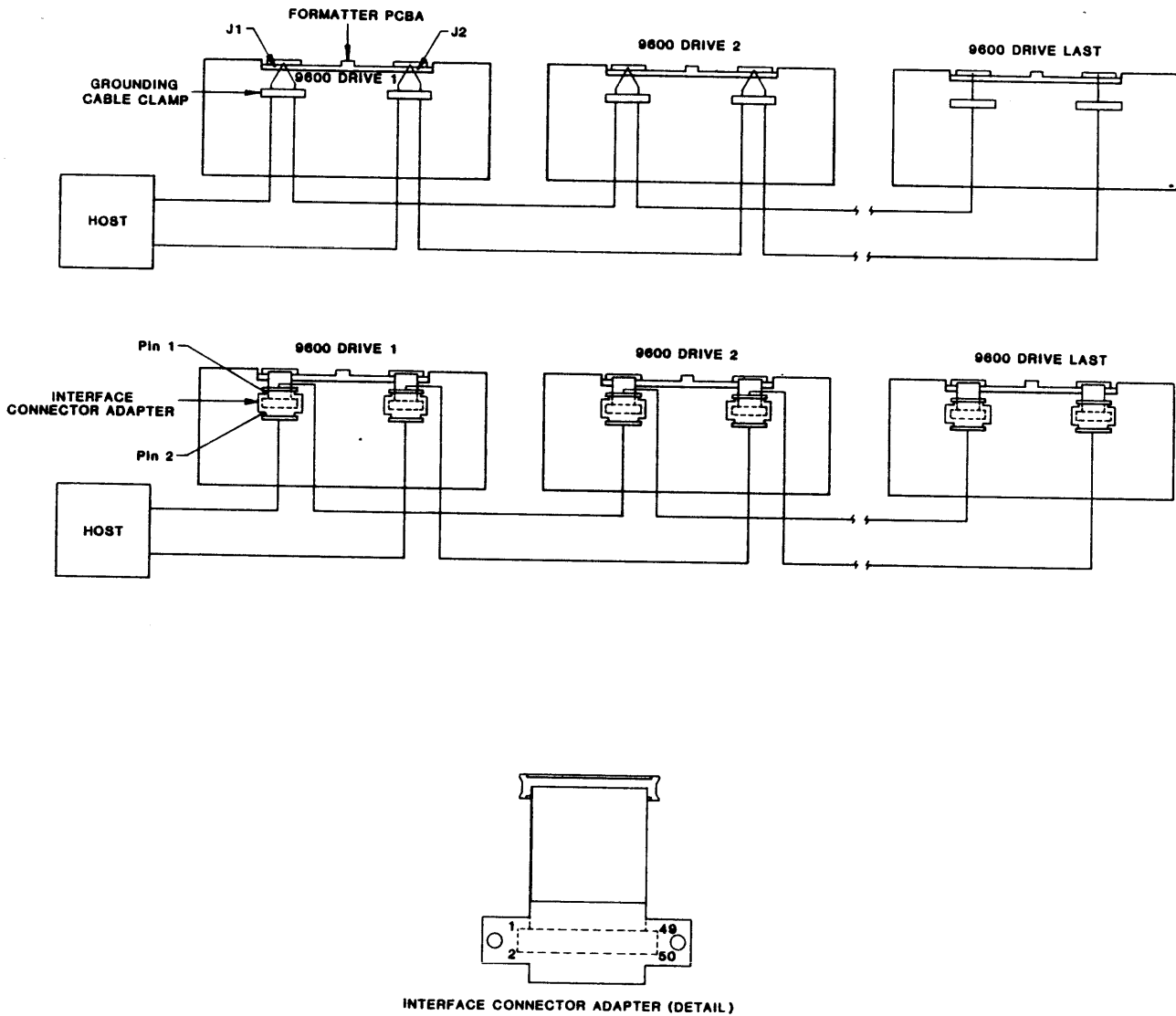


Figure 2-4. Card Cage, Cables, And Terminators



NOTE:

1. Terminators removed from all but last Drive.
2. Shielded Cables are recommended. If used, ground the shields as illustrated. For Interface Connector Adapter, remove some insulation from the cable and connect cable shield under an Adapter Mounting Screw.

Figure 2-5. Daisy Chaining

2.4 INSTALLATION

2.4.1 TABLE-TOP INSTALLATION

Place the Drive on a flat table top with dimensions to accommodate the Drive (Figure 2-6) and of sufficient strength to support the weight of the Drive. Do Steps E and F in paragraph 2.4.2.2.

2.4.2 RACK-MOUNT 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 2.4.2.1.

*This dimension allows 1-inch (min) clearance for opening the Tape Access Door.

2.4.2.1 RAIL ASSEMBLY COMPONENT CHECKOUT

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

<u>ITEM</u>	<u>Outer/Center Track Assembly</u>	<u>ITEM</u>	<u>Outer/Center Track Assembly</u>
1	Center Track	5	One Adjustable Mounting Bracket
2	Outer Track	6	Three Nut Plates
3	Fixed Mounting Bracket	7	Six 10-32 by 1/2-inch Panhead Screws
4	One Chassis Rail	8	Retention Latch Bracket

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.

2.4.2.2 MOUNTING PROCEDURE

- A. Referring to Figure 2-7, 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. Remove about an inch of insulation from each Interface Cable at a point where the Cable will pass under the Grounding Cable Clamp(s). This will expose the cable shield. Run the Interface Cables under the Cable Clamp(s) as illustrated in Figure 2-3. Tighten the Clamp(s).
- F. Connect AC Power.
- G. Locate mounting holes on the front of the rack that align with Retention Latch on the Drive, located just within the front plastic access door to the left. Mount the Retention Latch Bracket (Item 8) so that it meshes with the Retention Latch Armature when the Drive is slid all the way into the rack.

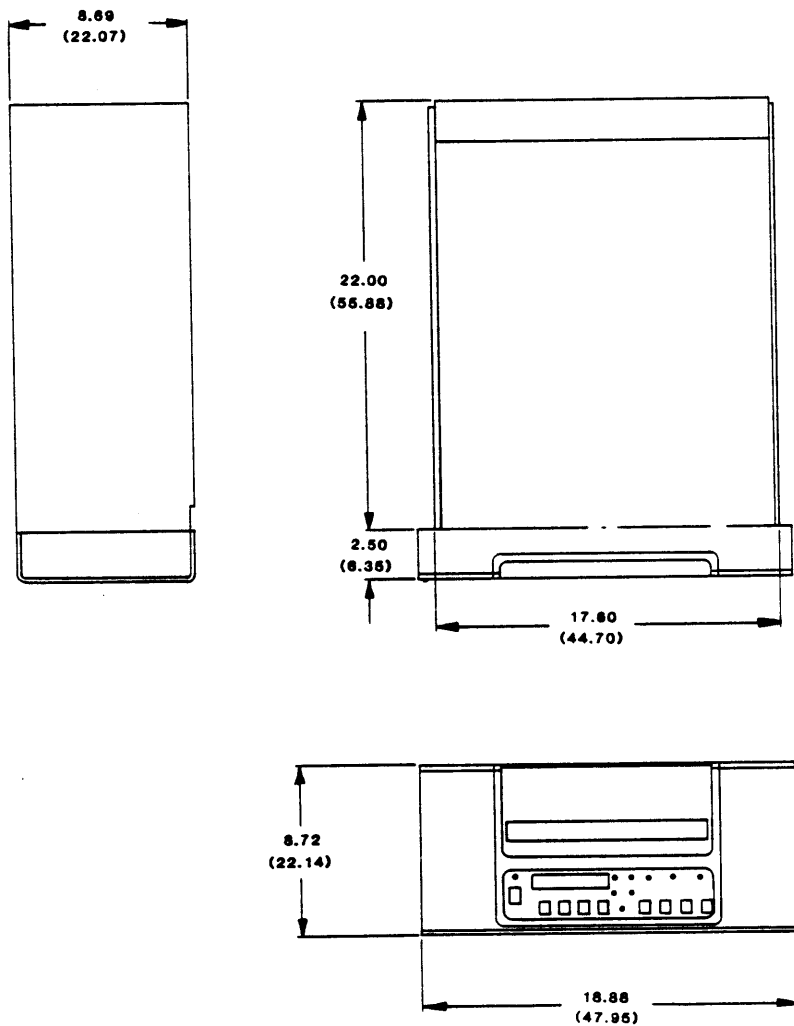
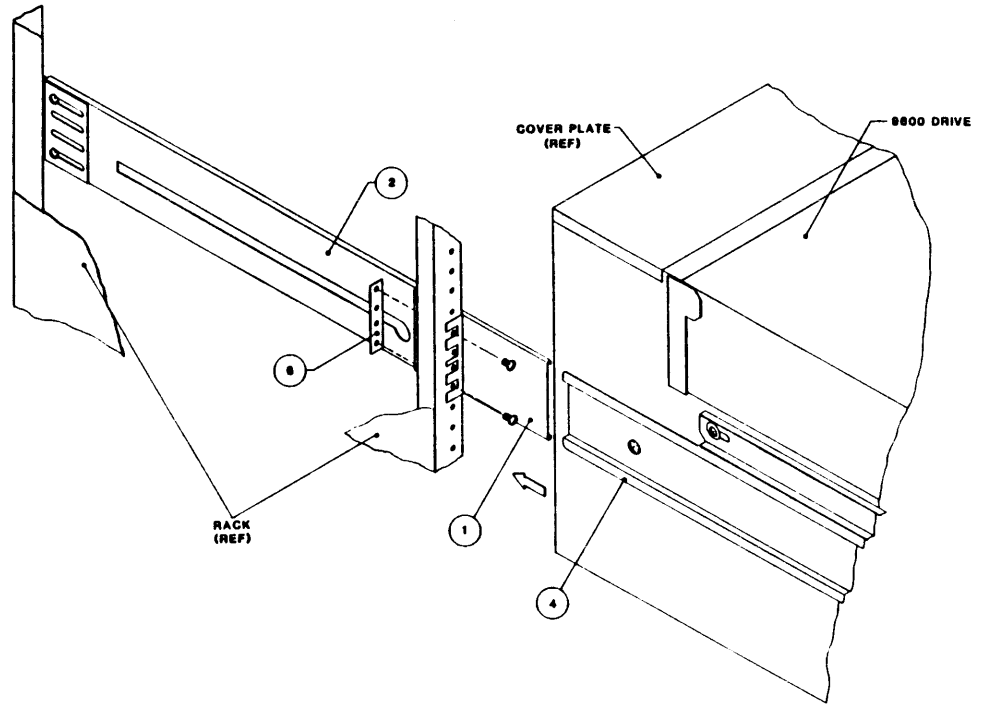


Figure 2-6 Outline And Installation Drawing

Track Subassembly



Track Subassembly
Detail

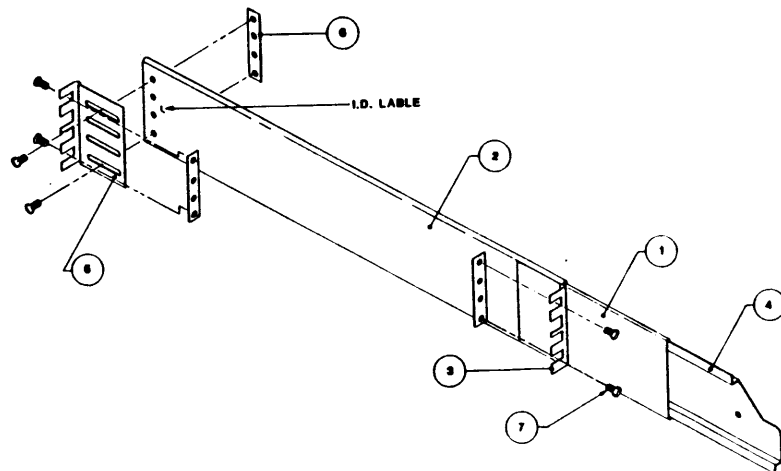


Figure 2-7. Track Subassembly

2.5 POWER UP AND INITIAL CHECKOUT

2.5.1 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 2-8) 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).

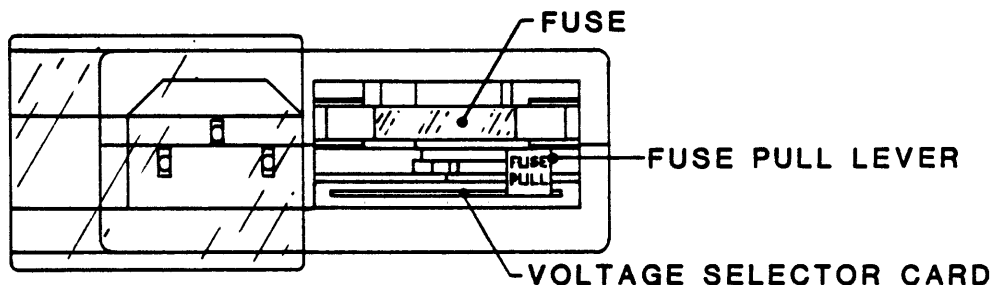


Figure 2-8 Power-In Assembly

2.5.1.1 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 2-8), 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 at the entrance to the card slot so that the correct voltage (100, 120, 220, or 240) is legible (facing upward), 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 is approved for 220/240 VAC. The 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.

2.5.2 POWER UP

- A. Check that the Voltage-Selector Card is set for the line voltage of the installation site per paragraph 2.5.1.
- B. Turn Power ON-OFF switch ON (Figure 2-9).
- C. Check that the following panel indicators light: the Power-On LED (unmarked, located above the Power switch), the Power ON-OFF switch, the 1600 and REMOTE LEDs. The Character Display Readout indicates "TESTING" for a short time followed by "9600A".

2.5.3 CHECKOUT

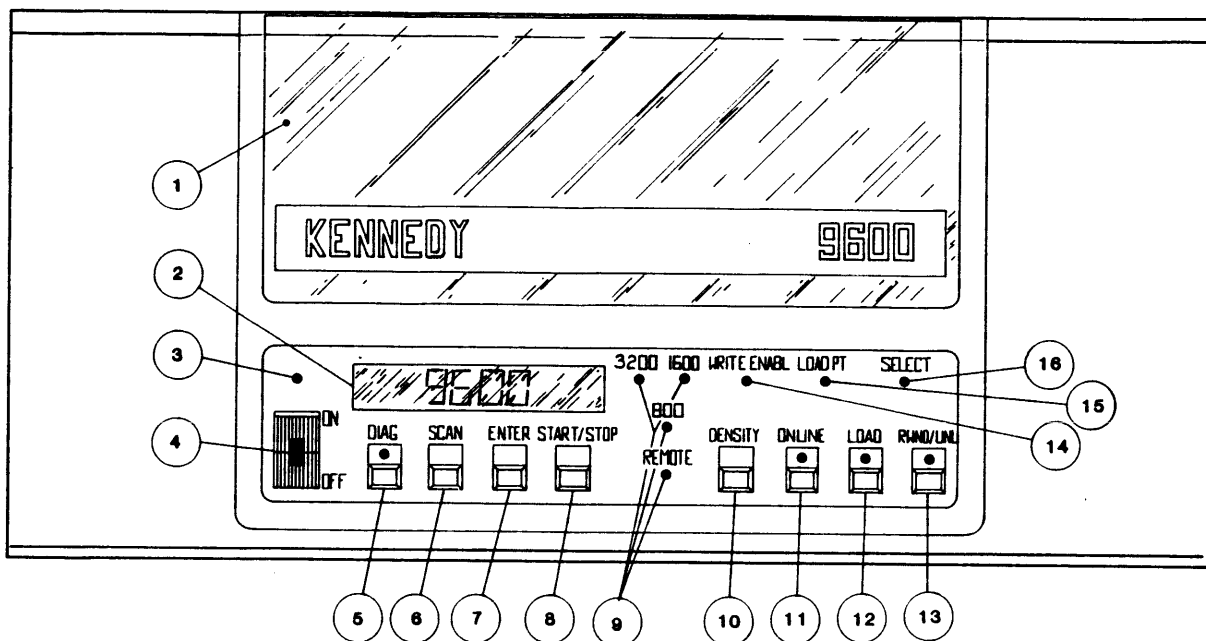
- A. Swing open the Tape Access Door as shown in Figure 2-10, and mount a 10-1 /2 inch reel onto the Hub. The reel must be properly seated with write enable ring side facing downward toward the Deck Plate. If reel is installed upside down, the RWND/UNLD LED blinks, tape will not load, and the Readout 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 "9600A". 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. When the Drive selected, the SELECT LED lights.
- E. Depress ON-LINE. ON-LINE LED goes out and the Readout displays "9600A".
- F. Depress DIAG. DIAG LED lights and the Readout displays "DIAG".
- G. Depress ENTER. Readout displays "MOTION". Depress SCAN. Readout displays "DRV ADJ". Depress SCAN. Readout displays "SET UP". Depress SCAN. Readout displays "CAL". Depress SCAN. Readout displays "DATADIAG". Depress SCAN. Readout displays "MOTION".
- H. Depress ENTER. Readout displays "50 FWD" (50 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 (50 FWD), Step 3 (50 FSS), Step 5 (50 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 (50 REV), Step 4 (50 RSS), etc., the Display reads "BOT" and the Command cannot be entered.
- P. Depress DIAG. DIAG LED goes out, and Readout displays "9600A".
- Q. Depress RWND/UNL. Tape rewinds to the supply reel, and Readout displays "UNLDNG" until tape is unloaded (stops motion), then the readout displays "9600A".
- R. Open the Tape Access Door, remove the tape, and turn off power.

TABLE 2-1 MOTION CONTROL SEQUENCE

STEP	DISPLAY			MOTION
	NORMAL *	AT EOT	AT BOT	
1	50 FWD	EOT		50 ips Forward
2	50 REV		BOT	50 ips Reverse
3	50 FSS	EOT		50 ips Forward Start/Stop
4	50 RSS		BOT	50 ips Reverse Start/Stop
5	50 FRF	EOT	BOT	50 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	50/100 F	EOT		50 ips / 100 ips Forward
12	50/100 R		BOT	50 ips / 100 ips Reverse
13	BURN IN			50 ips / 100 ips /50 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



- (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 DEN LED** - Lights when density is selectable by Host.
800/1600/3200 LEDs - Indicates selected density.
- (10) **DENSITY Pushbutton** - Selects data density (800, 1600, or 3200) and REMOTE.
- (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 ENBL 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 2-9. Panel Controls and Indicators

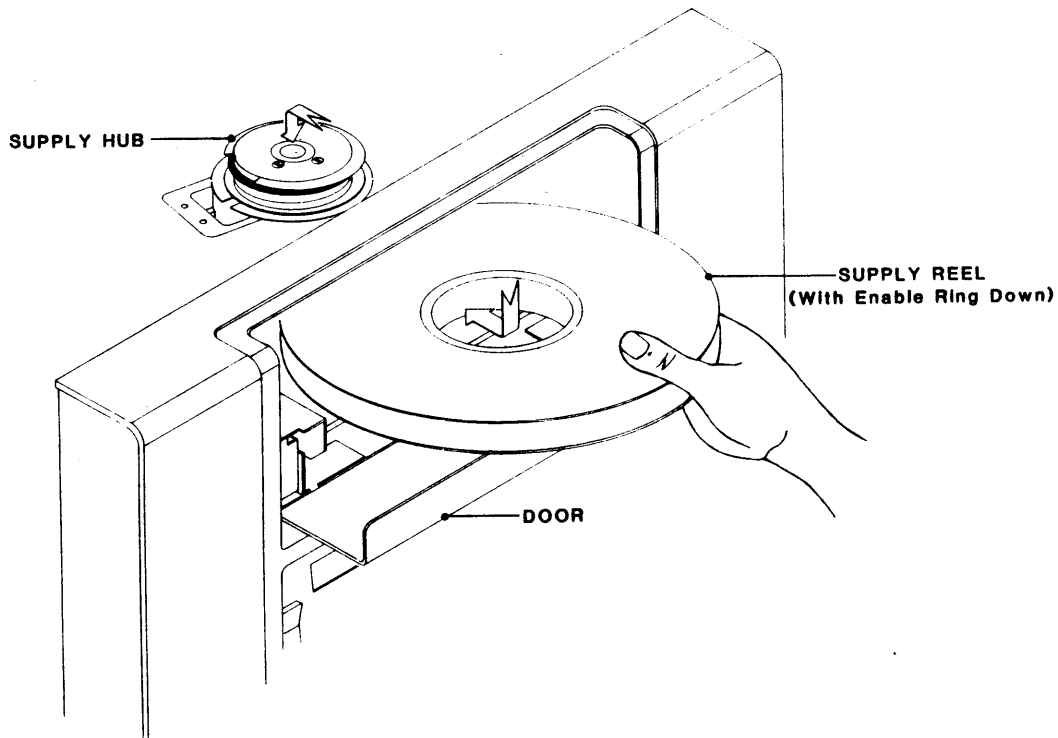


Figure 2-10. Installing Supply Reel

2.5.3.1 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 100/50/100 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 100/50/100 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.

2.5.4 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.
- B. In turn, depress DIAG, ENTER, SCAN, SCAN. Readout displays in sequence: "DIAG", "MOTION", "DRV ADJ", SET UP".
- C. Depress ENTER. Drive enters SET UP Mode; Readout displays "UNIT NUM"
- D. Depress ENTER. Readout displays "UNIT 0".
- E. Repeatedly depress SCAN until the Readout displays the desired Unit Number.
- F. Depress ENTER. Readout displays "LOAD?".
- G. Depress LOAD to save new Unit Number. Drive displays "DEFL DEN" (the next parameter).
- H. The Drive will now respond to the new Unit Number (address) sent from the Host.
- I. Depress DIAG twice to return the Drive to Off Line status. The Readout displays the new Unit Number.

2.5.5 DATA DENSITY - INTRODUCTION

The Model 9600A can operate at 800 BPI density in Non-Return-to-Zero (NRZ1) format, at 1600 BPI density in Phase-Encoded (PE) format, and at 3200 BPI Density in Double Density PE (2XPE) format. When powered up, the Drive automatically defaults* to REMOTE/PE (1600 BPI), in which the Host controls density selection for Write Operation.** The operator can override the default operating density by operating the Front Panel DENSITY Switch as described under A below:

* Default Density is factory-set, but can be changed as described below under C. Changing Default Density.

** In Remote Density Mode, when reading tape, the Drive automatically selects the density of the tape currently loaded.

A. Changing Operating Density:

1. If tape is loaded, rewind tape to BOT and set the Drive to off-line. The Readout displays UNIT 0 (typ) and the 1600 and REMOTE LEDs light. The Drive is in Remote PE Mode.
2. Repeatedly, as necessary, press DENSITY. The Indicators will light in the following sequence, putting the Drive in the corresponding Density Mode. Leave the Drive in the desired Mode.

<u>Mode</u>	<u>LEDs Lit</u>		<u>Mode</u>	<u>LEDs Lit</u>	
	<u>Dens</u>	<u>Control</u>		<u>Dens</u>	<u>Control</u>
a. Local NRZ1	800		d. Remote PE	1600	REMOTE DEN
b. Remote NRZ1	800	REMOTE DEN	e. Local 2XPE	3200	
c. Local PE	1600		f. Remote 2XPE	3200	REMOTE DEN

B. Operation:

1. In Read operations, if the Drive is in Remote Mode, the Drive reads automatically in the density in which the tape was written.
2. In Write operations, the Drive writes in the density indicated by the Density LEDs.

C. Changing Default Density:

1. Starting with the Readout displaying "UNIT 0", do Steps B and C in paragraph 2.5.4.
2. Depress SCAN. Readout displays "DEFL DEN".
3. Depress ENTER. Readout displays "1600/REM" (the factory-set Density).
4. Repeatedly press SCAN until the desired Density displays. The sequence of displays is:

a. 800	c. 1600	e. 3200
b. 800/REM	d. 1600/REM	f. 3200/REM
5. Press ENTER. The Readout displays "LOAD?".
6. Press LOAD. The Readout displays "SPEED" (the next parameter): the Density just displayed is now the Default Density. Whenever power is turned ON, the Default Density will be active.
7. Press DIAG twice to return to the Unit Number display.
8. Turn AC Power OFF.

2.6 OPERATING INSTRUCTIONS

2.6.1 OPERATING PROCEDURE

A. Turn Power On. Readout displays "TESTING" and if the Drive passes all tests, the Readout displays "UNIT (X)". Fault Conditions that could occur during power up, and possible related failures, are listed and described in Section IV.

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 "UNIT X" 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 (ILOL) 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 Failure Code Readout per Section IV, and depress LOAD to repeat the load operation.

D. Depress ON-LINE. ON-LINE LED lights and the Readout continues to display 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 OPERATION NOTES

A. On-line Operations

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

B. Load Operations

1. 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.
 - a. Pressing LOAD will start another Load attempt.
 - b. Pressing RWND/UNL will initiate an Unload.
 - c. If nothing is done, the Drive will time out in one minute and display "9600A".
2. 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.

C. Rewind Operations

1. Pressing RWND/UNLD once causes the Drive to rewind tape to BOT.
2. 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.

D. Recover From Tape Running Off Reel. The Drive has a built-in feature to prevent tape runaway: If a new command is not received from the Host within 25 feet of tape motion before EOT, or 5 feet of tape motion after EOT, the Drive will normally stop tape motion. However, the 25-foot/5-foot limit feature can be defeated in the Setup Mode, or by continued Read Commands being received from the Host after EOT has been passed. Either of these conditions could result in tape being run completely off the Supply Reel. The following procedure is recommended to recover from this predicament.

1. Manually thread tape backwards through the tape path from the Take-Up Reel to the Supply Reel.
2. Wrap tape around the Supply Reel in a counterclockwise direction.
3. Manually rotate the Supply Reel counterclockwise until the EOT Tab is on the Supply Reel.
4. Press LOAD. Tension Arms will tension tape and tape will rewind back to Load Point.

SECTION III
THEORY OF OPERATION

SECTION III DIAGNOSTICS

3.0 GENERAL

The Model 9600A Tape Drive incorporates extensive built-in Self-Test and Front-Panel Diagnostics providing tests for maintenance and troubleshooting aids. Self-Test Diagnostics occur automatically during Power Up, displaying appropriate failure codes if failure occurs. Front Panel Diagnostics are manually-controlled operations that exercise the Tape Drive, displaying appropriate readouts to indicate Drive condition.

3.1 CONTROLS AND INDICATORS

Controls and Indicators used in Diagnostics and Calibration Modes are listed and described in Section II, Table 2-9.

3.2 POWER-UP

Upon Power Up, and without a reel of tape inserted, the Readout normally displays: TESTING, for about 7 seconds. If TESTING continues to be displayed, this indicates that communication between Formatter and Drive is disrupted and no further testing can be accomplished. There is a problem in the Formatter or the interface between Formatter and Drive. Assuming that communication between Formatter and Drive is obtained, the Drive performs the Self Tests described below. In addition to the Failure Codes, The Drive can display Failures in the form of words or abbreviations. - Tables 3-1 and 3-2 list and describes the Failures represented by this type of display, and also indicates the possible causes of failure. If a failure should occur during Power Up, press REWIND/UNLOAD. This clears the error and permits loading tape to continue diagnostics.

Each Power-Up Self-Test exercises the following areas of the Drive:

- A. Drive Electronics:
 - 1. Power Supply
 - 2. Drive Electronics PCBA
 - 3. Front Panel
 - 4. Servo System including Reel and Capstan Motors.

Formatter and Read/Write Electronics:

- 1. Formatter Board
- 2. Write/Read Board
- 3. Read Analog Board

3.2.1 DRIVE ELECTRONICS FAILURE DISPLAYS

Table 3-1 lists failure displays

Table 3-1. Drive Electronics Failure Displays

DISPLAY	FAULT CONDITION/POSSIBLE FAILURE
TESTING	<u>Formatter not communicating with the Drive:</u> Diagnostics hangup: Formatter Board 8951, Drive Electronics Board 7952.
FMT ERR? and flash REW	<u>Formatter Error (Formatter Timeout):</u> Formatter Section has failed to interrogate Drive Electronics; or the Formatter has failed to send its Identification (ID) after request from the Drive Electronics. Check Formatter Board 8951.
TAK ARM?	Takeup Arm fails to calibrate.
SUP ARM?	Supply Arm fails to calibrate.
CAPSTAN?	No Tachometer Voltage. Check Capstan Motor, Capstan Power Amplifier, and Tachometer.
T MOTOR?	<u>Takeup Reel Motor not running:</u> Servo Preamplifier 7147, Servo Amplifier 7111, Drive Electronics Board 7952, Takeup Reel Motor.
S MOTOR?	<u>Supply Reel Motor not running:</u> Servo Preamplifier 7147, Servo Amplifier 7111, Drive Electronics Board 7952, Supply Reel Motor.
ROM ?	<u>Drive Electronics Program PROM Checksum Error:</u> Non-zero checksum detected.
EEPROM ? and Flash REW	<u>Checksum Error:</u> Non-zero checksum detected. Press RWND/UNL. The Drive will compute a new checksum and attempt to write it into the EEPROM. Check Drive Electronics Board 7952
+12V ?	Voltage below +10V
+40V ?	Voltage below +30V
-12V ?	Voltage above -7V
-40V ?	Voltage above -29V
FAIL XXX	(XXX refers to Failure Code - See Table 3-2)

3.2.2 FORMATTER FAILURE CODES

Table 3-2 lists the Failure Codes that could display during Power Up, indicating probable causes of failure. Note that Failure Codes 150 thru 159 include the option of obtaining a second Failure Code which indicates specific problems. If a Failure Code between 150 and 159 occurs, to obtain the second Failure Code, press DENSITY. **NOTE:** the Failure Code is preceded by the word: FAIL.

Table 3-2. Power-Up Failure Codes

CODE	DESCRIPTION	PROBABLE FAILURE																																	
128	External RAM Data Error	Compare RAM Formatter 7951																																	
129	External RAM Addressing Error																																		
130	No WBSY for Deskew Values	Digital R?W Board 7960																																	
131	No RBSY for Amp Values	Read Analog Board 9017																																	
140	Auto Adjust Ranging Error	Read Analog Board 7917																																	
141	Dead Track found in Auto Adjust																																		
142	Over Range Signal in Auto Adjust																																		
150	No RBSY in Loop RAW Test	Press DENSITY Pushbutton for Second Code listed below:																																	
151	No WBSY in Loop RAW Test																																		
152	Time-out on WBSY in Loop RAW Test																																		
153	Time-out on RBSY in Loop RAW Test																																		
154	WBSY ended too soon in Loop Test																																		
155	Hard Error in Loop Test																																		
156	Corrected Error in Loop Test																																		
157	Compare Error in Loop Test																																		
158	Filemark during Loop Test																																		
159	Block Size Error in Loop Test																																		
<table border="0"> <thead> <tr> <th><u>SECOND CODE</u></th> <th><u>DESCRIPTION</u></th> <th></th> </tr> </thead> <tbody> <tr> <td>D-50 NRZ</td> <td>Loop Write to Read Digital, 50 ips NRZ1</td> <td rowspan="2"></td> </tr> <tr> <td>D-100 NRZ</td> <td>Loop Write to Read Digital, 100 ips NRZ1</td> </tr> <tr> <td>D-50 PE</td> <td>Loop Write to Read Digital, 50 ips PE</td> <td rowspan="6">Read/Write Digital Board 7960</td> </tr> <tr> <td>D-100 PE</td> <td>Loop Write to Read Digital, 100 ips PE</td> </tr> <tr> <td>D-50 DDPE</td> <td>Loop Write to Read Digital, 50 ips DDPE</td> </tr> <tr> <td>D-100DDPE</td> <td>Loop Write to Read Digital, 100 ips DDPE</td> </tr> <tr> <td>A-50 NRZ</td> <td>Loop Write to Read Digital, 50 ips NRZ1</td> <td rowspan="6">Read/Write Digital Board 7917</td> </tr> <tr> <td>A-100 NRZ</td> <td>Loop Write to Read Digital, 100 ips NRZ1</td> </tr> <tr> <td>A-50 PE</td> <td>Loop Write to Read Digital, 50 ips PE</td> </tr> <tr> <td>A-100 PE</td> <td>Loop Write to Read Digital, 100 ips PE</td> </tr> <tr> <td>A-50 DDPE</td> <td>Loop Write to Read Digital, 50 ips DDPE</td> </tr> <tr> <td>A-100DDPE</td> <td>Loop Write to Read Digital, 100 ips DDPE</td> </tr> <tr> <td>CHECK X</td> <td colspan="2">Indicates Channel (X) where Auto Adjust had a problem.</td> </tr> </tbody> </table>			<u>SECOND CODE</u>	<u>DESCRIPTION</u>		D-50 NRZ	Loop Write to Read Digital, 50 ips NRZ1		D-100 NRZ	Loop Write to Read Digital, 100 ips NRZ1	D-50 PE	Loop Write to Read Digital, 50 ips PE	Read/Write Digital Board 7960	D-100 PE	Loop Write to Read Digital, 100 ips PE	D-50 DDPE	Loop Write to Read Digital, 50 ips DDPE	D-100DDPE	Loop Write to Read Digital, 100 ips DDPE	A-50 NRZ	Loop Write to Read Digital, 50 ips NRZ1	Read/Write Digital Board 7917	A-100 NRZ	Loop Write to Read Digital, 100 ips NRZ1	A-50 PE	Loop Write to Read Digital, 50 ips PE	A-100 PE	Loop Write to Read Digital, 100 ips PE	A-50 DDPE	Loop Write to Read Digital, 50 ips DDPE	A-100DDPE	Loop Write to Read Digital, 100 ips DDPE	CHECK X	Indicates Channel (X) where Auto Adjust had a problem.	
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A-100DDPE	Loop Write to Read Digital, 100 ips DDPE																																		
CHECK X	Indicates Channel (X) where Auto Adjust had a problem.																																		

3.2.3 FORMATTER POWER-UP SELF-TEST DESCRIPTIONS

The Drive displays TESTING during the Power Up Tests, and UNIT X when the testing is complete. If the Drive fails to power up, it displays either the failed module or a failure code. Power-Up Self-Tests are described as follows:

a. Micro-processor Sanity Check:

Verify operation of the Microprocessor.

b. Microprocessor RAM Check:

Verify operation of 8031 internal RAM

c. External RAM Check, Data Pattern 55H: Failure Code 128.

Verify operation of External RAM with Data Pattern 55H.

d. External RAM Check, Data Pattern AAH: Failure Code 128

Verify operation of External RAM with Data Pattern AAH.

e. External RAM Check, Addressing: Failure Code 129

Verify addressing capability of External RAM.

f. ID The Formatter: Failure Codes 132, 133, 134

Verify that the Formatter, Read Analog, and Write/Read Boards are the proper type for 9600A operation.

g. Send Test Amp Gain Values to Analog Board: Failure Code 131

Verify operation of Read Analog Board.

h. Send Default Deskew Values to Write Module: Failure Code 130

Verify operation of Write/Read Digital Board.

i. Loop Write to Read Digital: Failure Codes 150-159

Run data through the Write/Read Digital Board, looping it from the output of the Write Section back into the Read Section, and verify proper operation at all speeds and densities.

i. Loop Write to Read Analog: Failure Code 150-159

Loop data, in turn, at 50 ips and 100 ips and, in turn, at each densities, from the output of the Write Section of the Write/Read Digital Board to the input of the Read Analog Board, and verify proper operation.

3.3 LOADING FAILURE CODES

The 9600A also includes automatic diagnostics that can detect loading failures, giving appropriate displays to indicate failures and their possible causes. Table 3-3 lists and describes the displays and related Fault Condition, and Possible Failures that could occur during Loading. After successfully completing Power Up, load a reel of tape into the Drive. If there is a loading failure, one of the displays listed in Table 3-3 will appear.

Table 3-3. Loading Failures

DISPLAY	FAULT CONDITION/POSSIBLE FAILURE
1. CLOSE/DOOR	<u>Door Interlock Circuit: (Drive cannot load)</u> Tape Access Door open, Door Switch, Drive Electronics Board 7952, Interconnect Board 7228.
2. BOT	<u>No BOT Marker detected:</u> Tape Marker missing from tape, Tape Leader too short, Faulty BOT Sensor, Drive Electronics Board 7952, Interconnect Board 7228.
3. ABORTED	<u>Automatic Load aborted:</u> No vacuum, Air leak in tape path, Drive Electronics Board 7952, Servo Boards 7111, 7147, Position Sensors.
4. REV REEL	<u>Reverse Reel - Reel upside down.</u>
6. CHK SLND	<u>Check Solenoid - Hub Lock Solenoid not locking:</u> Hub Lock Solenoid defective or needs adjustment, Drive Electronics Board 7952, Interconnect Board 7228.
6. CHK HUB	<u>Check Hub - Supply Reel not detected:</u> Reel-In-Place Tab Adjustment, Reel-In-Place Sensor, Drive Electronics Board 7952, Interconnect Board 7228.
7. BKN TAPE	<u>Broken Tape - Tape not detected:</u> Broken Tape, No EOT Marker, EOT Sensor, Interconnect Board 7228, Drive Electronics Board 7952.
8. TAK ARM?	<u>Takeup Arm not operating correctly:</u> Takeup Arm Position Sensors (Check with Arm relaxed), Drive Electronics Board 7710, Interconnect Board 7228.
9. SUP ARM?	<u>Supply Arm not operating correctly:</u> Supply Arm Position Sensors (Check with Arm relaxed), Drive Electronics Board 7710, Interconnect Board 7228.

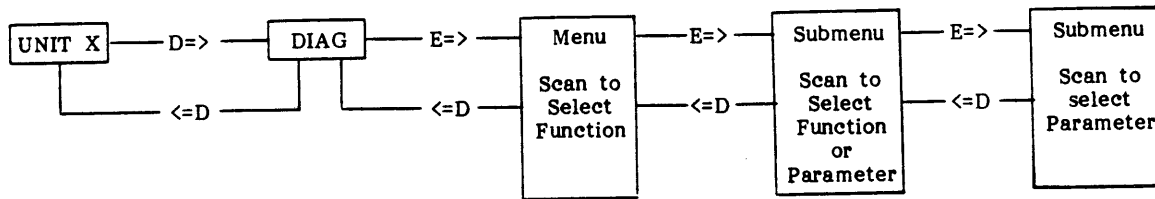
3.4 FRONT PANEL DIAGNOSTICS

Diagnostics are divided into six major sections represented by Displays as indicated below:

<u>Chart</u>	<u>Section</u>	<u>Display</u>	<u>Chart</u>	<u>Section</u>	<u>Display</u>
A	Motion	MOTION	D	Calibration	CAL
B	Drive Adjustment	DRV ADJ	E	Data diagnostics	DATADIAG
C	Set Up	SET UP			

Each section, when accessed, displays its own Menu which further divides into submenus. Figure 3-1 illustrates, and the following subparagraphs describe accessing the major diagnostic sections, their Menus and Submenus.

Note that although Set Up and Calibration are contained in the Diagnostics Menu, they are not Diagnostic Functions. They are for setting up the Drive for operation and for calibrating as required.



NOTE: D=> indicates press DIAG and proceed to the right.
 <=D indicates press DIAG and proceed to the left.
 E=> indicates press ENTER and proceed to the right.

Figure 3-1. Diagnostics Menu Dynamics (Simplified)

3.4.1 DIAGNOSTICS MENU

Table 3-4 illustrates the overall Diagnostics Menu structure. Each indent represents a Submenu accessible from the Main Menu, by pressing ENTER. Pressing SCAN presents the next lower item in any Menu or Submenu.

3.4.2 OPERATING PROCEDURE

Running the diagnostics consists essentially of pressing specified pushbuttons on the front panel and following the direction provided by messages on the front panel display.

After a successful power-up self test, begin diagnostics by pressing the DIAG pushbutton. The Readout displays DIAG, and the Drive is ready to enter the Diagnostic Mode of operation. Subsequently, pressing the ENTER pushbutton accesses the Main Menu.

Generally, as illustrated in Figure 3-1, (proceeding from left to right) the Operator accesses a particular Menu or Submenu by pressing the ENTER pushbutton. He returns to a previous Menu or Submenu by pressing the DIAG pushbutton. Repeatedly pressing DIAG exits from the Diagnostics Mode.

In any Menu, repeatedly pressing the SCAN pushbutton scrolls through functions or parameters in that Menu. Generally, pressing ENTER activates that function or parameter. In certain Submenus, activating the parameter is done by pressing START/STOP or LOAD/ONLINE - these variations are described as applicable in the following subparagraphs.

Table 3-4. Diagnostics Menu Structure

- | | |
|---|--|
| <p>A. MOTION Parameters (1)</p> <ul style="list-style-type: none"> 1. 50 FWD 2. 50 REV 3. 50 FSS 4. 50 RSS 5. 50 FRF 6. 100 FWD 7. 100 REV <p>B. DRV ADJ Functions: (2)</p> <ul style="list-style-type: none"> 1. Buffer Arms <ul style="list-style-type: none"> a. Takeup b. Supply 2. Hub Sensor <ul style="list-style-type: none"> a. Not In b. In Place (Monitor) <p>C. SET UP Functions/Parameters (2)</p> <ul style="list-style-type: none"> 1. Unit Number: <ul style="list-style-type: none"> a. Unit 0 thru Unit 7 2. Default Density: <ul style="list-style-type: none"> a. 800 b. 800 Remote c. 1600 d. 1600 Remote e. 3200 f. 3200 Remote 3. Speed: <ul style="list-style-type: none"> a. Host Select b. Auto c. 50 ips d. 100 ips 4. Timeout: <ul style="list-style-type: none"> a. 25 Ft ON b. 25 Ft Off 5. Security: <ul style="list-style-type: none"> a. Enabled b. Disabled 6. Parity: <ul style="list-style-type: none"> a. Check b. Ignore 7. Long Gap: <ul style="list-style-type: none"> a. 0.6 INCH b. 1.2 INCH c. 2.5 INCH d. 3.5 INCH <p>D. CALIBRATE Functions/Parameters (2)</p> <ul style="list-style-type: none"> 1. Auto <ul style="list-style-type: none"> a. All <ul style="list-style-type: none"> 1) Confirm? (3) b. 800 c. 1600 50 ips d. 3200 100 ips (4) 2. Manual <ul style="list-style-type: none"> a. 800 50 ips b. 1600 100 ips (4) c. 3200 | <p>E. DATA DIAGNOSTICS (2)</p> <ul style="list-style-type: none"> 1. Mode (Test Options) <ul style="list-style-type: none"> a. On Error: <ul style="list-style-type: none"> 1) Continue 2) Stop b. At EOT: <ul style="list-style-type: none"> 1) Rewind 2) Stop c. Block Size: <ul style="list-style-type: none"> 1) 4 2) 256 3) 513 4) 1024 d. Data: <ul style="list-style-type: none"> 1) All Ones 2) All zeros 3) Increment 4) Random 5) Alternate 00 - FF e. Speed: <ul style="list-style-type: none"> 1) 50 ips 2) 100 ips f. Re-Instruct: <ul style="list-style-type: none"> 1) Stream 2) Start/Stop 3) Single 2. Commands (5) <ul style="list-style-type: none"> a. Loop Dig b. Loop Alg c. Write d. Wrt W/RE e. Read f. Read Reverse g. Read/RR h. FMK Test i. WR/RR/RD 3. Errors (Display) (6) <ul style="list-style-type: none"> a. EIC(0-7,P) xxx (7) b. WPAR xxx (Write Parity Error) c. HER xxx (Hard Error) d. CER xxx (Correctable Error) e. FMK xxx (Fmk Flag) f. CMP xxx (Comp Errors) <p>Note:</p> <ul style="list-style-type: none"> (1) Press ENTER to start motion. (2) Press ENTER to enter parameter. (3) Press ONLINE for yes, DIAG for no. (4) Pressing ENTER displays LOAD?. Press LOAD for yes, DIAG for no. (5) Press START/STOP to start and end. (6) xxx = Error Code (7) Error In Channel |
|---|--|

3.4.2.1 ENTERING THE DIAGNOSTICS MODE

In Diagnostic Mode, repeatedly pressing SCAN displays the Diagnostic Functions. Pressing ENTER enables the function displayed. This sequence is illustrated by the following chart:

General Chart: Entering the Diagnostics Mode

Step	ACTION (Press:)	DISPLAY	ACTION (Press:)	DISPLAY	ACTION
0		UNIT X			
1	DIAG	DIAG			Press ENTER to activate selected operation.
2			ENTER	MOTION	
4			SCAN	DRV ADJ	
5			SCAN	SET UP	
6			SCAN	CAL	Press DIAG to exit from Menu.
7			SCAN	DATADIAG	

Having selected a diagnostics function by pressing ENTER, repeatedly pressing SCAN scrolls through the selected Functions Menus illustrated by the following charts.

3.4.2.2 MOTION DIAGNOSTICS TESTS

In Motion Mode, the operator can check and adjust the tape path, and Check Motors and Servos. Perform Motion Diagnostics Tests as follows:

After autoloading a tape, press the DIAG pushbutton. The Readout will display DIAG. Pressing the ENTER pushbutton will cause the Readout to display SELFTEST. Press SCAN and the Readout displays MOTION. Again pressing ENTER accesses the Motion Parameters Submenu. This sequence of events is illustrated in Chart A. Table 3-5 defines abbreviations displayed in the Motion Tests.

Chart A. Selection of Motion Parameters

Step	ACTION (Press:)	DISPLAY	ACTION (Press:)	DISPLAY	ACTION
0		MOTION			
1	ENTER			50 FWD	
2			SCAN	50 REV	
3			SCAN	50 FSS	Press START/STOP to select and initiate the displayed Test.
4			SCAN	50 RSS	
5			SCAN	50 FRF	
6			SCAN	100 FWD	
7			SCAN	100 REV	Press START/STOP again to stop motion
8			SCAN	100 FSS	
9			SCAN	100 RSS	
10			SCAN	100 FRF	Press DIAG to exit from Menu.
11			SCAN	100 50/100 F	
12			SCAN	100 50/100 R	
13			SCAN	BURN IN	

Table 3-5. Motion Test Definitions

DISPLAY	DEFINITION	DISPLAY	DEFINITION
50 FWD	50 ips Forward	100 FSS	100 ips Forward Start/Stop
50 REV	50 ips Reverse	100 RSS	100 ips Reverse Start/stop
50 FSS	50 ips Start/Stop	100 FRF	100 ips Fwd/Rev/Fwd
50 RSS	50 ips Reverse Start/Stop	50/100 F	50/100 ips Alternate Forward
50 FRF	50 ips Fwd/Rev/Fwd	50/100 R	50/100 ips Alternate Reverse
100 FWD	100 ips Forward	BURN IN	Continuous testing in Forward direction with Rewind at EOT.
100 REV	100 ips Reverse		

3.4.2.3 DRIVE ADJUSTMENT TESTS

Enter the Drive Adjustment Diagnostic Mode by repeatedly, as necessary, pressing DIAG until the Readout displays DIAG. Then press ENTER and SCAN until the Readout displays DRV ADJ. Chart B illustrates accessing the Submenus of the Drive Adjustment Mode.

Buffer Arm Test. Use the Buffer Arm Tests to verify if the two calibration positions of each Buffer Arm are adjusted correctly per adjustment procedure in Section V.

Hub Sensor Test. The Hub Sensor Tests enable testing the operation of the Reel-In-Place Sensor and the File Protect Sensor. The digital display indicates the status of the tape reel (NOT IN = Not inserted; IN PLACE = Tape inserted). The WRITE ENBL light indicates the status of the Write Protect Sensor.

Chart B. Drive Adjustment Tests

Step	DISPLAY	ACTION (Press:)	DISPLAY	ACTION (Press:)	DISPLAY
0	DRV ADJ				
1		ENTER	BUF ARMS	ENTER SCAN	RELAXING * TAKE X.X SUPP X.X
2		SCAN	HUB SENS	ENTER	NOT IN ** IN PLACE **

NOTE: * Arm relaxes then Display changes to TAKE X.X. Pressing DIAG causes Display to indicate: RETRACT, as Arm retracts.

** These displays indicate the state of the tape reel.

3.4.2.4 SET UP

In the Set Up Mode, the operator sets the basic operating parameters of the Drive. Except for UNIT NUM and DEFL DENS, the Calibration Jumper* (S10) must be placed in ENABLE Position (EN) for the Set Up Procedures. Set up can be done with or without tape loaded. The basic parameters displayed and set up in this Mode are:

NOTE: * In most procedures of Setup Mode, and all of Calibration Mode, the Calibration Jumper must be installed in the ENABLE Position to store the selected parameters. If the jumper is not installed, and a store (LOAD) operation is attempted, the Readout displays, "JUMPER?" and the RWND/UNL LED flashes. Pressing RWND/UNL aborts the Setup or Calibration attempt. (See Section V - Calibration and Setup, Electronic - for Calibration Jumper installation.)

When Setup or Calibration is complete, replace the Calibration Jumper to its original position. **CAUTION: DO NOT TURN POWER OFF UNTIL CALIBRATION JUMPER IS RETURNED TO ITS ORIGINAL POSITION.** To do so could destroy vital data in the Calibration EEPROM.

- a. **UNIT NUM:** Unit Number. The Drive Unit Number (Address). This can be set to any logical number from 0 thru 7. (Cal Jumper can be in either position.)
- b. **DEFL DEN:** Default Density. The Density to which the Drive will default to on Power Up. Default Density can be set to 800 bpi, 1600 bpi, 3200 bpi, and 6250 bpi, and can be set for Local or Remote (Host) Control. (Cal Jumper can be in either position.)
- c. **SPEED:** The Speed to which the Drive will default to on Power Up. Speed can be set to 50 or 100 ips, Host Select; or Automatic Select wherein the Drive automatically selects the speed for optimum performance, based on the Host Re-Instruct Time. In Host Select, if the Host does not designate, the speed is 50 ips.
- d. **TIMEOUT:** 25-foot Timeout. The 25-foot Timeout Parameter, when set to ON, causes the Drive to stop tape motion and report a Hard Error if no data is detected within 25 feet of tape. This feature prevents tape from running off the reel at the end of tape.
- e. **SECURITY:** Security Erase. Security Erase, when enabled, allows the Drive to accept a Security Erase Command from the Host which will cause the Drive to erase tape from its present position to 3 feet past EOT.
- f. **PARITY:** For Hosts that provide Parity, the Drive can be set either to check or ignore parity of Write Data from the Host.
- g. **LONG GAP:** Interrecord Gap. To accommodate certain Host requirements, the interrecord gap that occurs when the Host issues a Long Gap Command can be set to any one of the values: 0.45, 0.6, 1.2, or 2.5 inches.

As required, install the Calibration Jumper in ENABLE Position; and set Up the Drive by accessing the Set Up Mode as illustrated in Chart C. With the Readout displaying SET UP, press ENTER. Repeatedly press SCAN to access the desired Feature; then press ENTER to display the first of the available parameters. Repeatedly, as necessary, press SCAN to display and select the desired parameter. Now Press ENTER once more. The Readout displays LOAD?. Press LOAD to enter and save the parameter.

Chart C. Set Up

Step	DISPLAY	ACTION (Press:)	DISPLAY	ACTION (Press:)	DISPLAY *
0	SET UP	***		***	
1		ENTER	UNIT NUM	ENTER SCAN	UNIT X **
2		SCAN	DEFL DEN	ENTER SCAN SCAN SCAN SCAN SCAN	800 800 REM 1600 1600 REM 3200 3200 REM
3		SCAN	SPEED	ENTER SCAN SCAN SCAN	HOST SEL AUTO 50 IPS 100 IPS
4		SCAN	TIME OUT	ENTER SCAN	25FT ON 25FT OFF
5		SCAN	SECURITY	ENTER SCAN	ENABLED DISABLED
6		SCAN	PARITY	ENTER SCAN	CHECK IGNORE
7		SCAN	LONG GAP	ENTER SCAN SCAN SCAN	0.45INCH 0.6 INCH 1.2 INCH 2.5 INCH

NOTE: * The last parameter selected (in a previous Set Up) displays when ENTER is pressed. Repeatedly press SCAN to select a new parameter. Then press LOAD to store the new parameter.

** XX = Unit Number 0 thru 7.

*** Press DIAG to exit from any Menu or Submenu.

3.4.2.5 CALIBRATION

NOTE 1: See NOTE under par. 3.4.2.4.

NOTE 2: A reel of tape must be loaded to accommodate the Calibration Tests.

NOTE 3: After completing the Calibration sequence and, with Drive AC power still ON, replace the Calibration Jumper to Operate Position.

Using this menu, the operator can manually or automatically calibrate Read Analog Amplifiers for all the densities. Chart D illustrates the operating procedure using the ENTER-SCAN sequence. Completing the procedure (storing the parameters) is done by pressing ONLINE in response to the Readout display, CONFIRM?. To exit from any Menu or Submenu, press DIAG.

Chart D. Calibration

Step	DISPLAY	ACTION (Press:)	DISPLAY	ACTION (Press:)	DISPLAY *	
0	CAL	***		***		
1		ENTER	AUTO	ENTER SCAN SCAN SCAN SCAN SCAN	ALL NRZI PE DDPE GCR WRT CURR	
2		ENTER	MANUAL	ENTER SCAN SCAN SCAN SCAN	NRZI PE DDPE GCR WRT CURR	
Step-->	DISPLAY	1 ACTION (Press:)	DISPLAY	2 ACTION (Press)	3 DISPLAY	3 ACTION
AUTO: SCAN	ALL NRZI	ENTER ENTER SCAN	50 IPS 100 IPS	ENTER ENTER	CONFIRM? CONFIRM?	Press ONLINE to confirm.
SCAN	PE	ENTER SCAN	50 IPS 100 IPS	ENTER ENTER	CONFIRM? CONFIRM?	Press SCAN to go to next item.
SCAN	DDPE	ENTER SCAN	50 IPS 100 IPS	ENTER ENTER	CONFIRM? CONFIRM?	
MANUAL:	NRZI	ENTER SCAN	50 IPS 100 IPS	ENTER ENTER	CONFIRM? CONFIRM?	Press ONLINE to confirm.
SCAN	PE	ENTER SCAN	50 IPS 100 IPS	ENTER ENTER	CONFIRM? CONFIRM?	Press SCAN to go to next item.
SCAN	DDPE	ENTER SCAN	50 IPS 100 IPS	ENTER ENTER	CONFIRM? CONFIRM?	
<p>NOTE: Pressing ONLINE displays: RANGE X (Calibration Range) Then pressing SCAN displays: AMP N X (Read Amp Channel N Gain)</p>						

3.4.2.6 DATA DIAGNOSTICS

Data Diagnostics allows offline testing of the data path one module at a time. In this mode, to prevent the possibility of disturbing the calibration settings, the Calibration Jumper must be installed in Operate Position. There are three Submenus in Data Diagnostics:

- a. MODE Functions set up Drive Parameters for testing.
- b. COMMANDS select and initiate the test to be run
- c. ERRORS display accumulated errors of various types in the error log.

Chart E illustrates entering Data Diagnostics. The following subparagraphs describe the three major categories of Diagnostics Tests. Load a reel of tape before starting Data Diagnostics Tests.

Chart E. Entering Data Diagnostics

Step	DISPLAY	ACTION (Press:)	DISPLAY	ACTION
1	DATADIAG	ENTER	MODE	Press ENTER to access selected Submenu
2		SCAN	COMMANDS	
3		SCAN	ERRORS	

MODE (Test Options). In this category, the Operator sets up the Drive to operate with specific parameters. He repeatedly presses SCAN to display the desired categories (listed above); then uses the ENTER-SCAN sequence to select the various Submenu Parameters. Submenu Parameters are defined as follows: NOTE: The first parameter listed for each Option is the default parameter. Chart F illustrates operating the Modes Menu.

<u>Option</u>	<u>Parameters</u>	<u>Description</u>
ON ERROR	CONTINUE STOP	Drive continues motion on detecting error. Drive stops on error.
AT EOT	REWIND STOP	Drive rewinds when detecting EOT. Drive stops at EOT.
BLK SIZE	4, 256, 513, or 1024	Drive generates data blocks of selected size.
DATA	ALL ONES, ALL ZERO, INCREMENT, RANDOM, ALT (00-FF)	Drive generates data pattern selected.
SPEED	50 IPS, 100 IPS	Drive operates at speed selected.
RE-INST	STREAM STRT/STP SINGLE	Drive operates in streaming Mode. Drive operates in Start/Stop Mode. Drive reads or writes one block.

Chart F. Accessing the Modes Submenu

Step	DISPLAY	ACTION (Press:)	DISPLAY	ACTION (Press:)	DISPLAY *
1	MODE	ENTER	ON ERROR	ENTER SCAN	STOP CONTINUE
2		SCAN	AT EOT	ENTER SCAN	REWIND STOP
3		SCAN	BLK SIZE	ENTER SCAN SCAN SCAN	4 256 513 1024
4		SCAN	DATA	ENTER SCAN SCAN SCAN SCAN	ALL ONES ALL ZEROS INCREMENT RANDOM ALT (00-FF)
5		SCAN	SPEED	ENTER SCAN	50 IPS 100 IPS
6		SCAN	RE-INST	ENTER SCAN SCAN	STREAM TRT/STP SINGLE

NOTE: * When ENTER is pressed, the option displayed is the last one selected (during a previous diagnostics session).

COMMANDS: Under the Commands Category, ENTER accesses the Submenu, and SCAN selects the test to be run, and START/STOP starts and ends the test. If a runaway occurs, due to module failure, pressing DIAG will force a hard stop but lose tape position. Commands are defined as follows: **NOTE:** Commands are executed using parameters set in the Mode Menu.

LOOP DIG Data loops from the Write Digital to the Read Digital Sections without going through the Read Analog Section or the Head. Tape not required.

LOOP ALG Data loops from the Write Section to the Read Digital Section through the Read Analog Module without going through the Head or the Pre-Amp. Tape not required. Command executes only in GCR at 50 ips.

- WRITE** Drive writes Data to tape per selected Mode Parameters (listed above). No retry on error. If tape is write protected, display is: "CAN'T WRITE".
- WRT W/RE** Drive writes Data to tape using Retry Sequence for Blocks In Error. Retry consists of: Backspace, Erase, Write.
- READ** Drive reads Data from tape in forward direction, comparing it to pattern selected in Mode Menu.
- READ REV** Drive Reads Data from tape in the reverse direction. No compare made.
- READ/RR** If last command caused a forward motion, the Drive alternately and repeatedly reads reverse and forward over the **previous** data block. If the last command caused a reverse motion, the Drive alternately and repeatedly reads forward and reverse over the **next** data block. To stop this test, press START/STOP. **NOTE:** Compare is made only in Read Forward Operations.
- FMK TEST** Drive continually writes Filemarks and confirms Filemark Status.
- WR/RR/RD** Drive writes a block, reads it in reverse, then reads it forward.

NOTE: These tests can be stopped by Pressing START/STOP; but, If in MODE Category, ON ERROR, STOP was selected, the Drive will stop whenever an error is detected.

Chart G. Accessing the Commands Submenu

Step	DISPLAY	ACTION (Press:)	DISPLAY	ACTION
1	COMMANDS	ENTER	LOOP DIG	Press ENTER to enable parameter and advance to the next parameter. Press SCAN to advance to the next parameter without enabling the current parameter.
2		SCAN	LOOP ALG	
3		SCAN	WRITE	
4		SCAN	WRT W/RE	
5		SCAN	READ	
6		SCAN	READ REV	
7		SCAN	READ/RR	
8		SCAN	FMK	
9		SCAN	WR/RR/RD	

NOTE: Commands take effect using the parameters set up in Modes Menu.

ERRORS Display. The Errors Function displays selectable types of errors. Repeatedly pressing SCAN in turn causes each type of error to be **displayed**. Pressing ENTER resets the currently displayed error reading and scans to the next display. Errors are defined as follows: Chart H illustrates using the Errors Submenu

- EIC(0-7,P) Error in Channel 0 thru 7 and P. Accumulation of Hard Errors and Corrected Errors.
- WPAR Write Parity Errors. Hard Errors flagged because of a detected Parity Error of the Write Data Bus from the Host.
- CMP Compare Errors. Data returned by Read Section does not match Data sent to the Write Section during a Write Command; or Data read does not match the pattern selected on Diagnostic Read Command.
- HER Hard Error (Non-Recoverable) flagged by the Read Section. See Section I for detailed description of Hard Errors.
- FMK Filemark Error. Filemark Status Report was not returned following a Write Filemark Command.

NOTE: Each Error display is followed by a number (xxx) or "OVR". This represents the number of errors detected (xxx) or a Counter Overflow (OVR = over 255).

Chart H. Accessing the Errors Submenu

Step	DISPLAY	ACTION (Press:)	DISPLAY	ACTION
1	ERRORS	ENTER	EIC (0-7,P) XXX	Press ENTER to clear the error count and advance to the next parameter. Press SCAN to advance to the next parameter without clearing error count.
2		SCAN	WPAR XXX	
3		SCAN	HER XXX	
4		SCAN	CER XXX	
5		SCAN	FMK XXX	
6		SCAN	CMP XXX	

SECTION IV
MAINTENANCE INSTRUCTIONS

SECTION IV MAINTENANCE

4.0 GENERAL

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

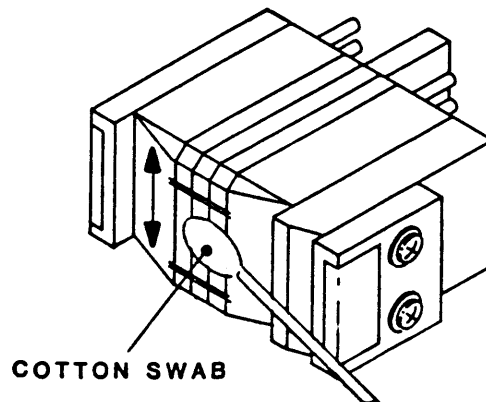


Figure 4-1 Erase/Write/Read Head Cleaning

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**.

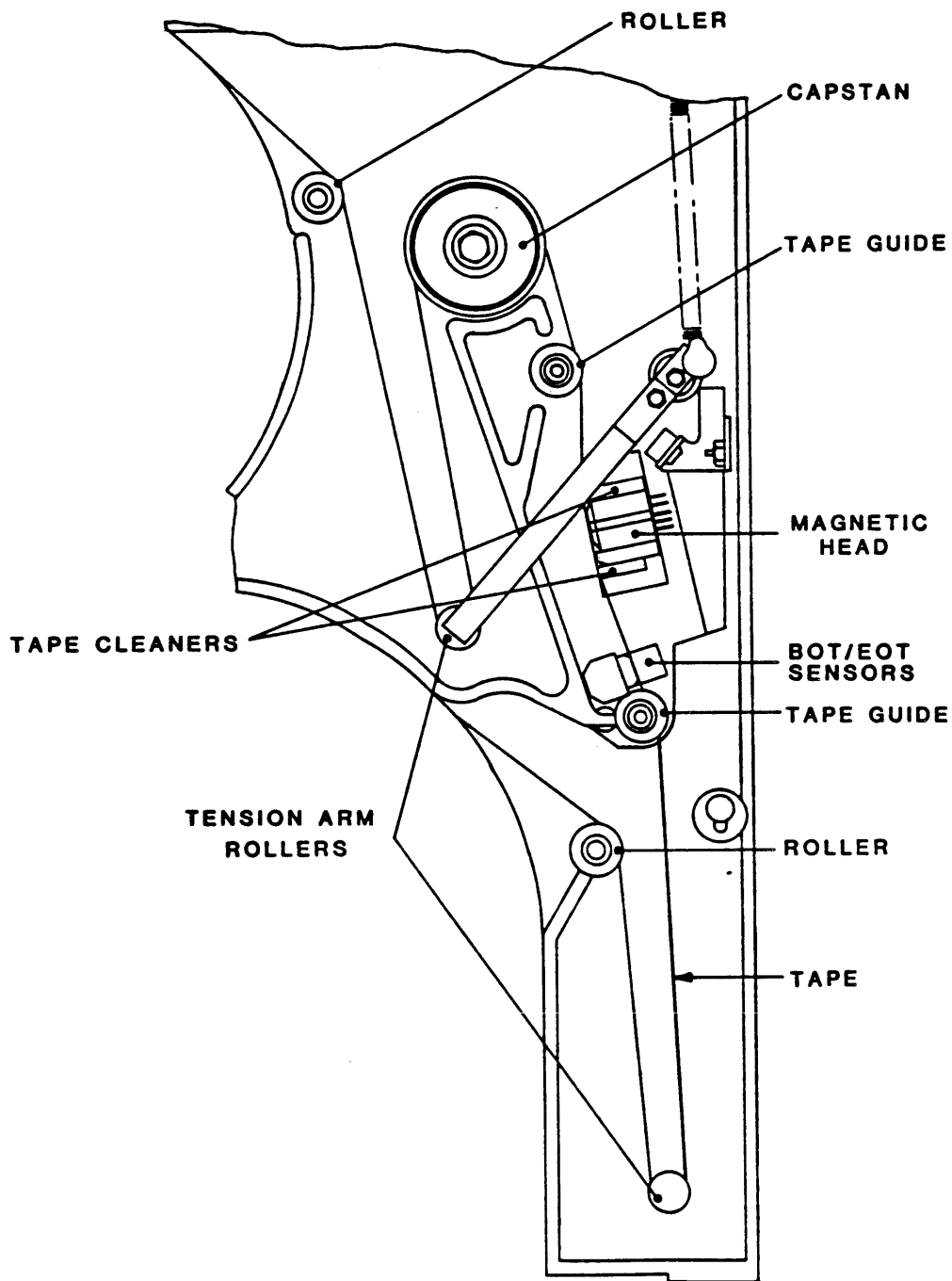


Figure 4-2 Tape Path Cleaning

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). Normal output voltage is 3.0 volts +/-10% p-p. 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 (Section V, Table 5-1).

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.
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. Tape compatibility problem, or blank tape.

4.2.3 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, paragraph 4.5.

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. 4-3)

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.

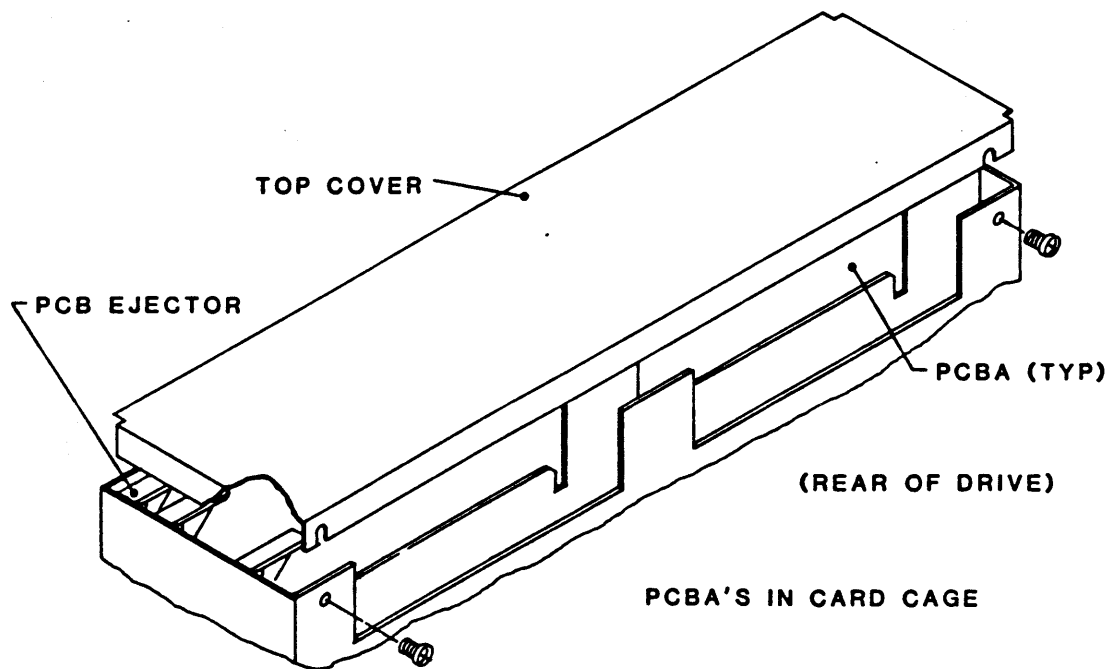


Figure 4-3 Card Cage

4.3.3 HUB LOCK SOLENOID (Fig. 4-4)

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 Pin from end of Plunger.

To replace: Reverse removal procedure. Align per paragraph 4.4.2.6 -2. Torque screws to 13 +/-1 inch-pounds.

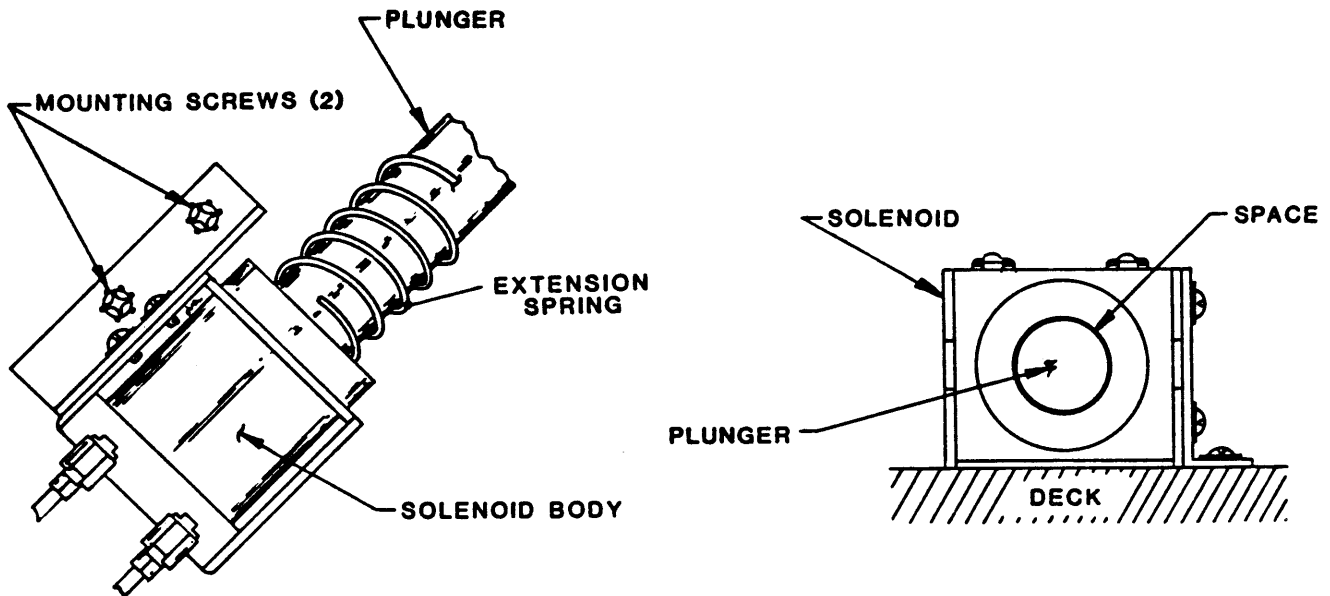


Figure 4-4 Hub Lock Solenoid

4.3.4 SPRING, EXTENSION (Fig. 4-5)

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

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

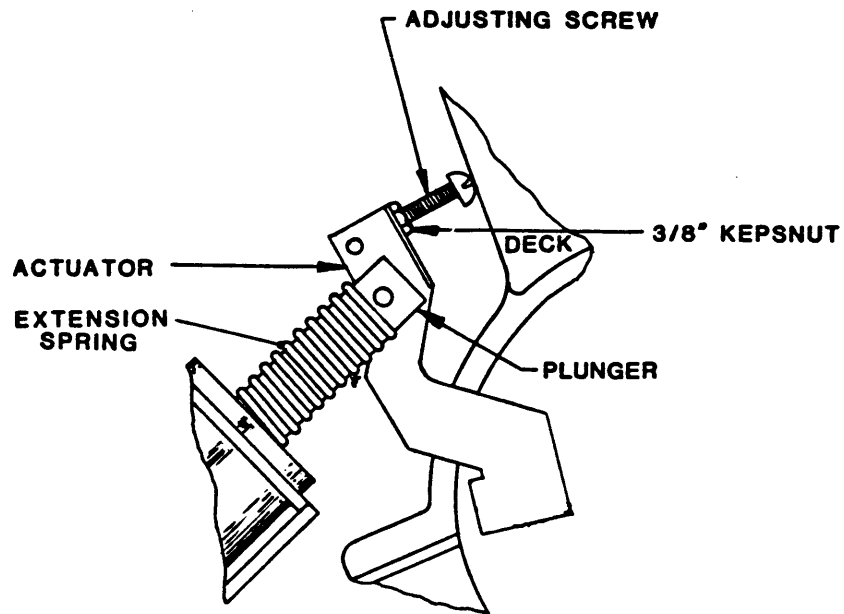


Figure 4-5 Hub Lock Solenoid Actuator

4.3.5 FAN (Fig. 4-6)

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. Note direction of air flow.

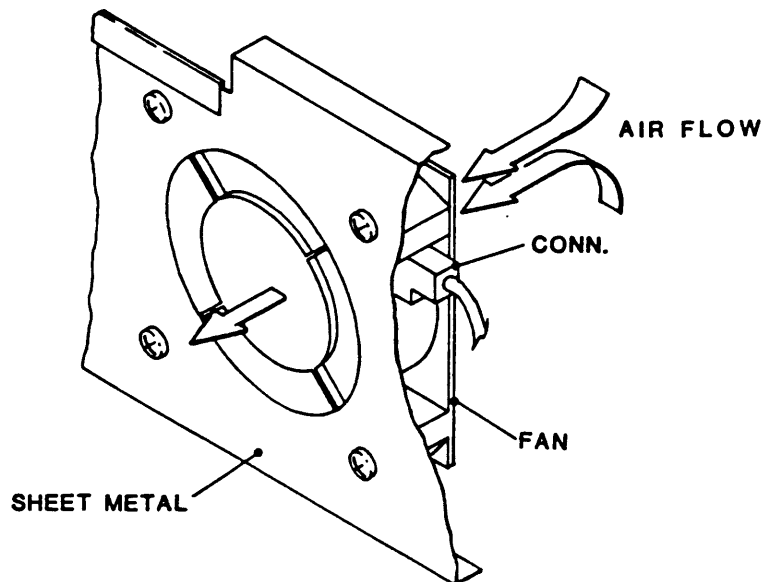


Figure 4-6 Fan

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. 4-7)

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.

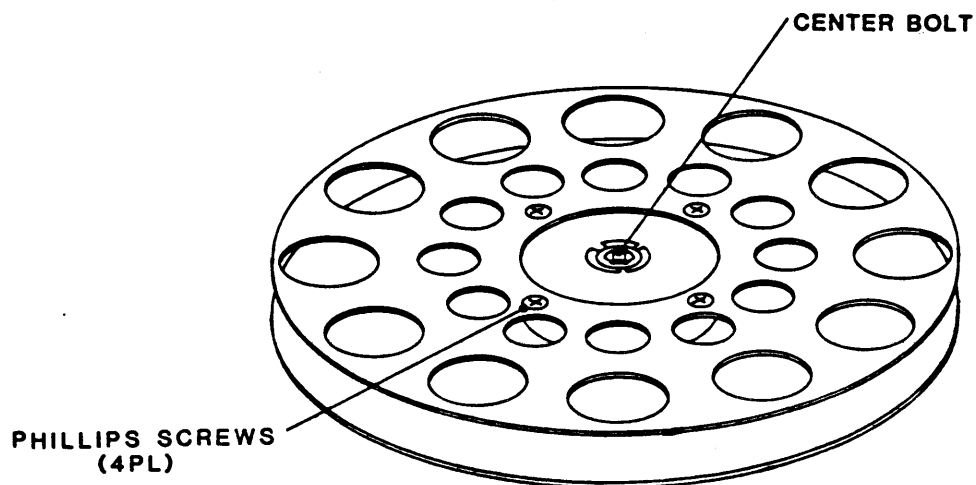


Figure 4-7 Vacuum Hub Assembly

4.3.8 TAKEUP-ARM RETRACT AND PIVOT SENSOR ASSEMBLY (Fig. 4-8)

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.

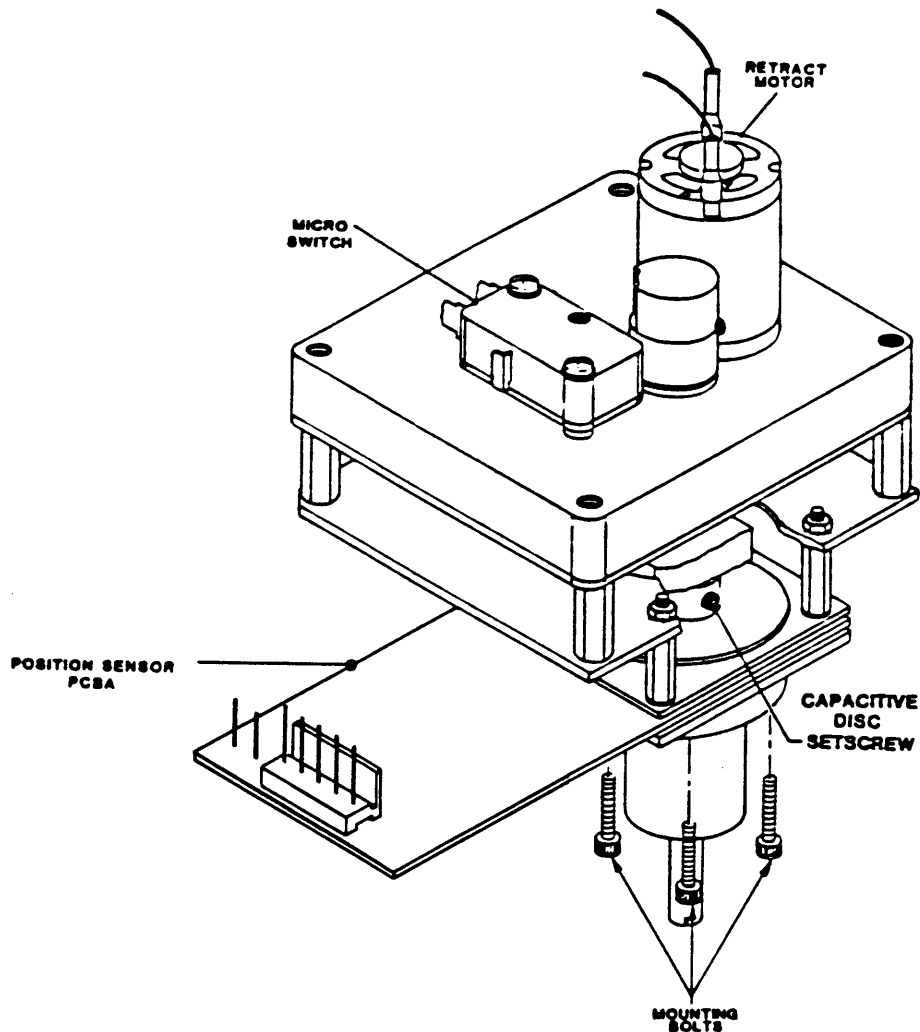


Figure 4-8 Takeup Arm Retract and Pivot Sensor Assembly

4.3.9 MOTHER BOARD PCBA (Fig. 4-9)

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.

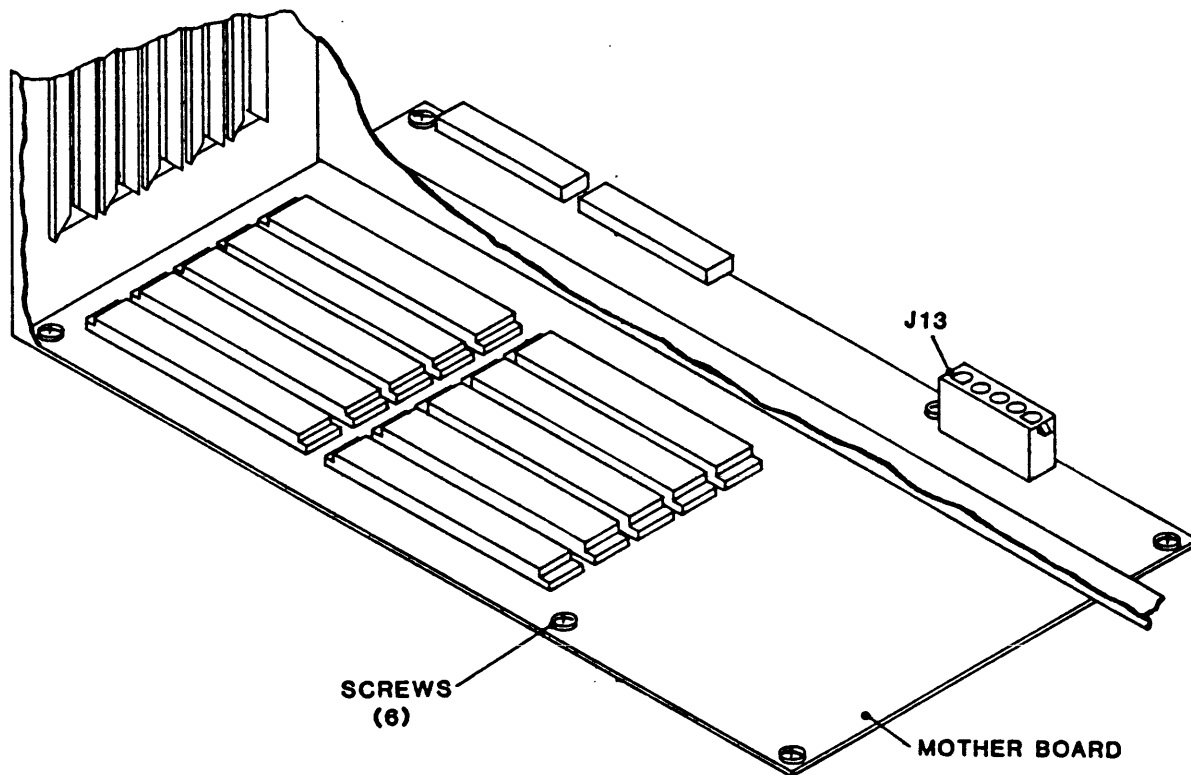


Figure 4-9 Mother Board

4.3.10 OPERATOR CONTROL PANEL PCBA (Fig. 4-10)

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.

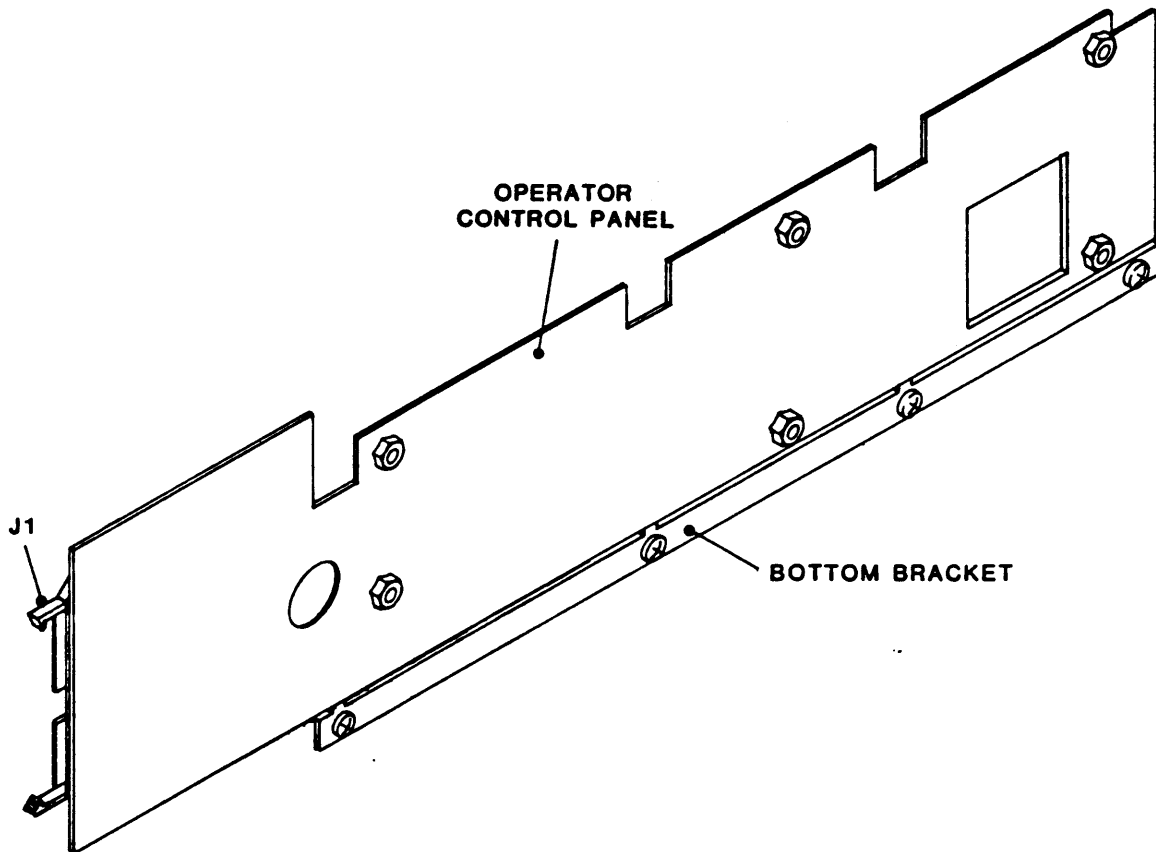


Figure 4-10 Operator Control Panel PCBA

4.3.11 REEL-IN-PLACE SENSOR ASSEMBLY (Fig. 4-11)

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. Torque screws to 7 +/-1 inch-pounds.

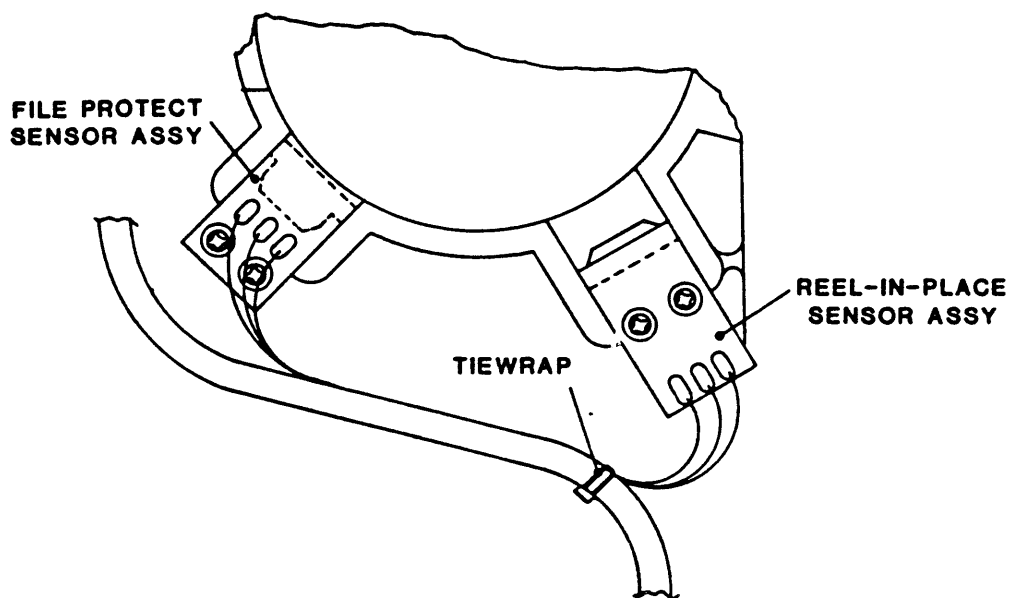


Figure 4-11 File-Protection and Reel-In-Place Sensor Assemblies

4.3.12 FILE PROTECT SENSOR ASSEMBLY (Fig. 4-11)

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

To Replace: Reverse removal procedure. Torque screws to 7 +/-1 inch-pounds

4.3.13 TAKEUP ARM LIMIT SENSOR PCBA (Fig. 4-12)

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.

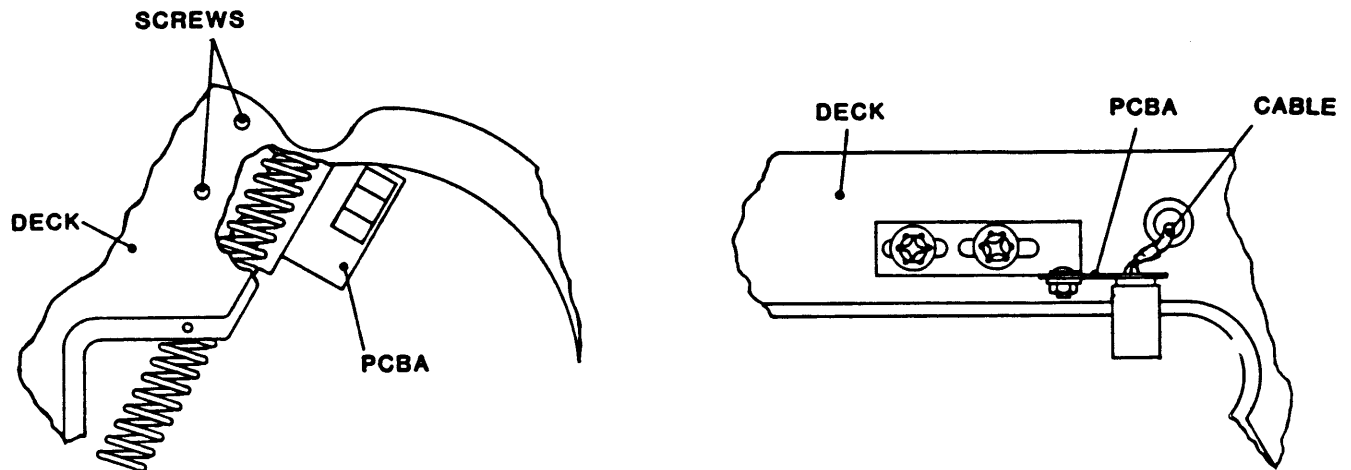


Figure 4-12 Supply-Arm and Takeup-Arm Limit Sensor PCBA's

4.3.14 SUPPLY ARM LIMIT SENSOR PCBA (Fig. 4-12)

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. 4-13)

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.

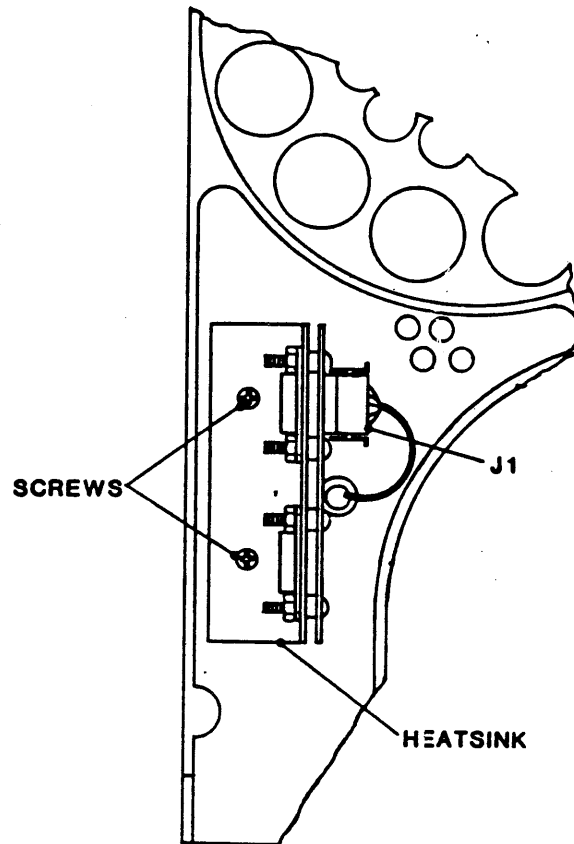


Figure 4-13 12 VDC Regulator Power Supply

4.3.16 5 VDC REGULATOR POWER SUPPLY (Fig. 4-14)

1. Unplug the five connectors shown in Figure 4-14 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. 4-15)

1. Remove eight Phillips screws at bottom of blower box, and remove the Cover.
2. Remove the Vacuum Hub Assembly per paragraph 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.

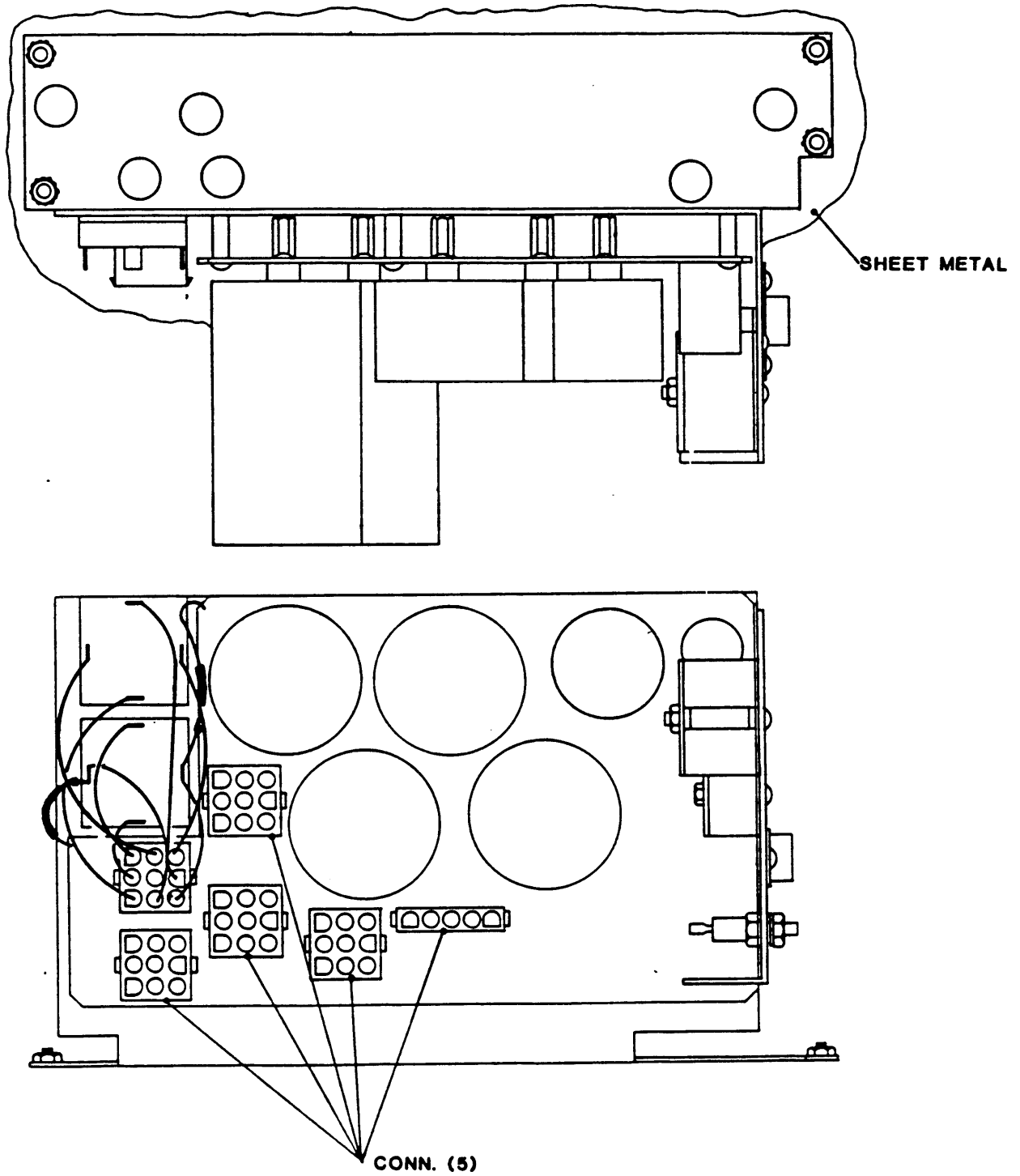


Figure 4-14 5 VDC Regulator Power Supply

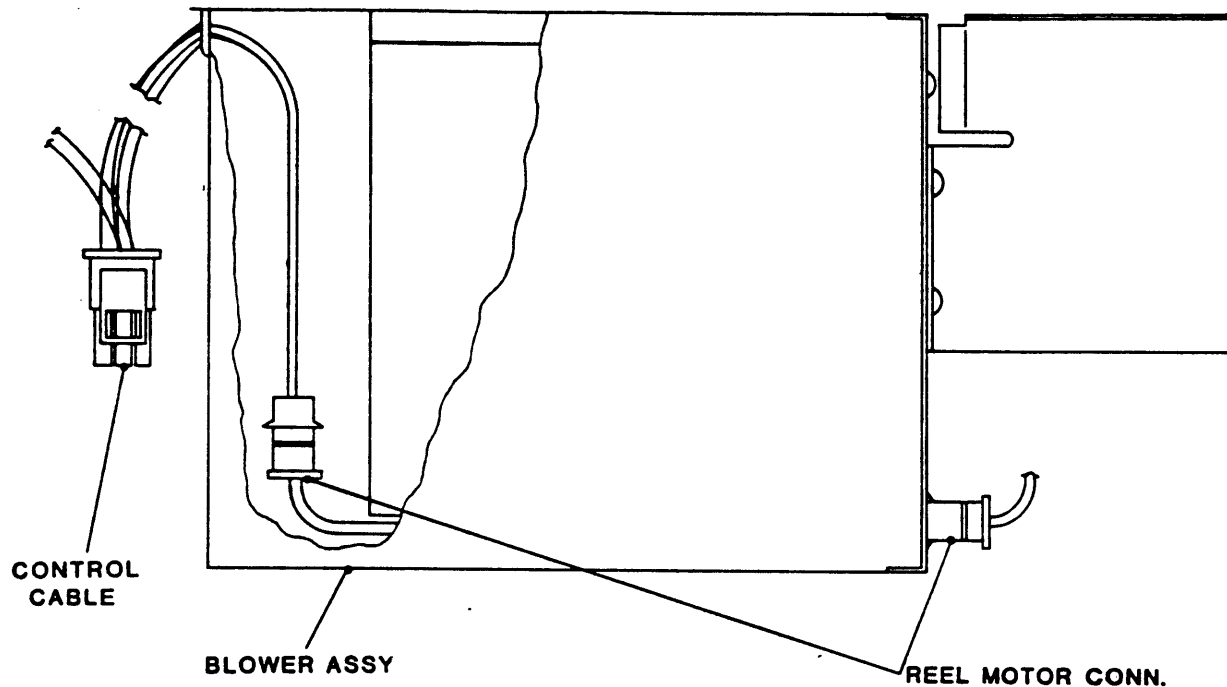


Figure 4-15 Blower Assembly

4.3.18 TAKEUP ARM ASSEMBLY (TOP) (Fig. 4-16)

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. 4-16)

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

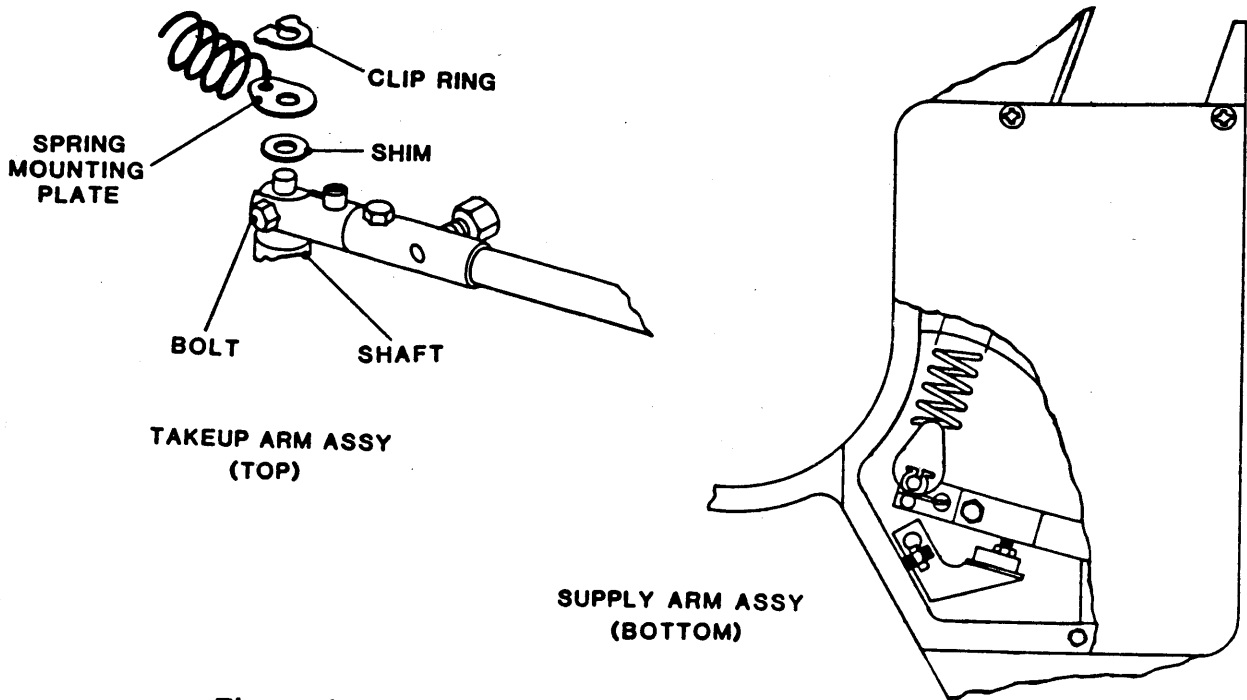


Figure 4-16 Takeup-Arm and Supply-Arm Assemblies

4.3.20 RETRACT AND PIVOT SENSOR (TAKEUP) (Fig. 4-8)

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 4-17)

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

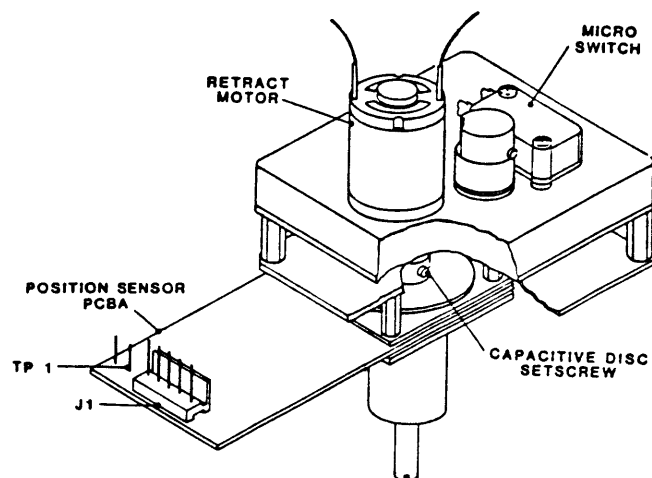


Figure 4-17 Supply-Arm Retract and Pivot Sensor Assembly

4.3.22 PANEL ASSEMBLY (Figure 4-18)

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..

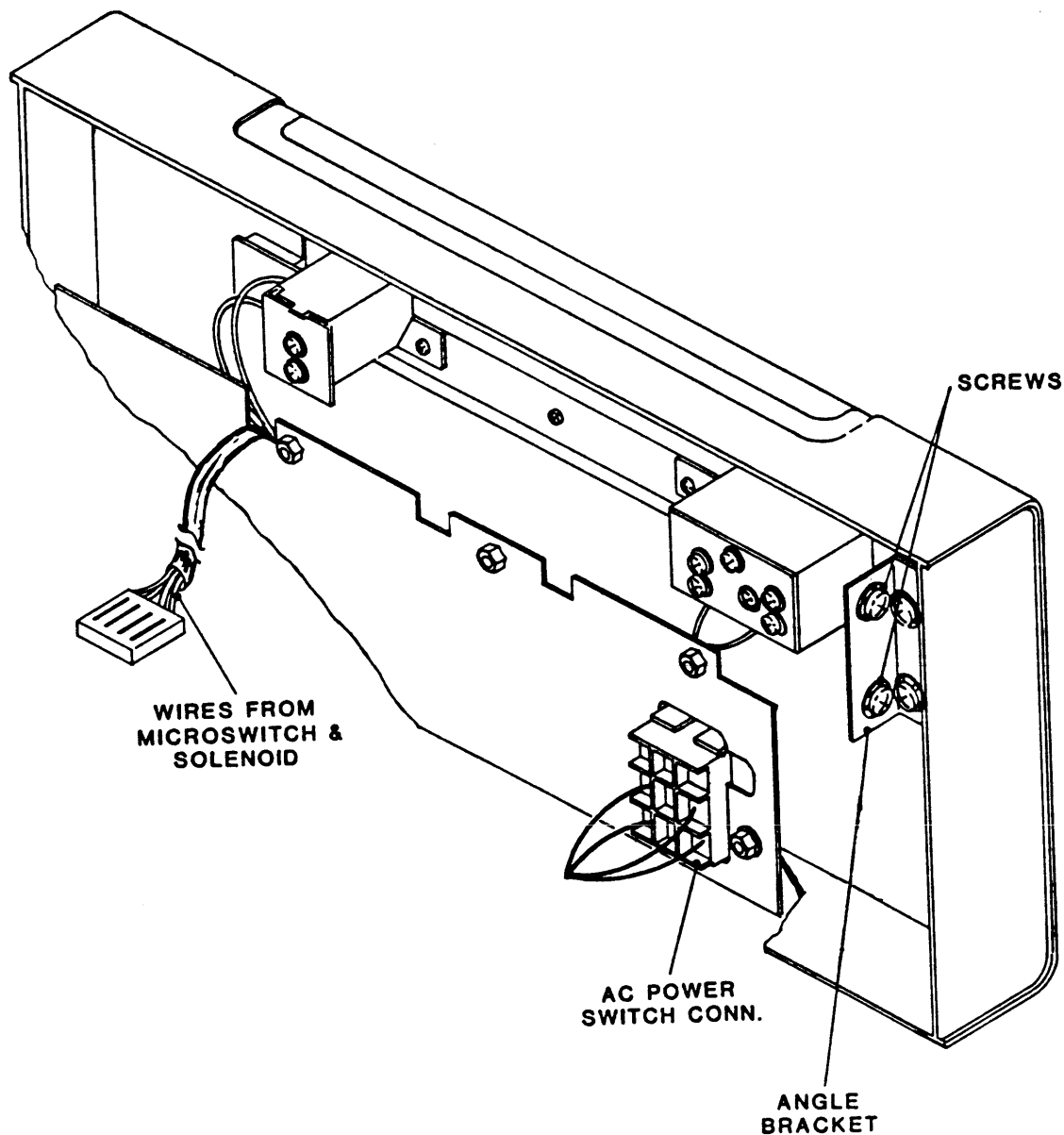


Figure 4-18 Panel Assembly

4.3.23 SUPPLY HUB ASSEMBLY (Figure 4-19)

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.

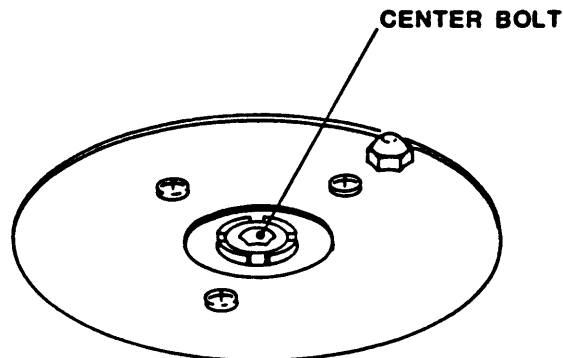


Figure 4-19 Supply Hub Assembly

4.3.24 CAPSTAN MOTOR ASSEMBLY (Figure 4-20)

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 4-21)

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.

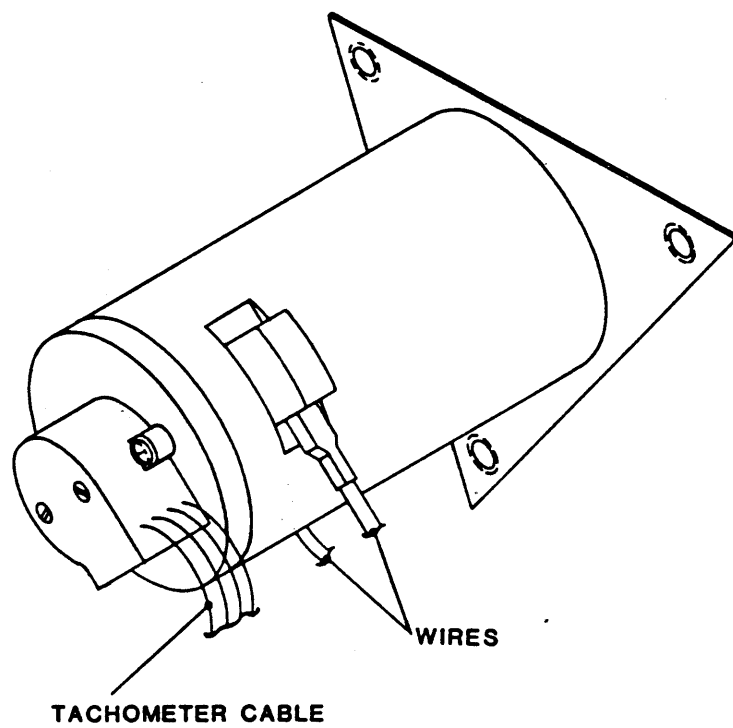


Figure 4-20 Capstan Motor Assembly

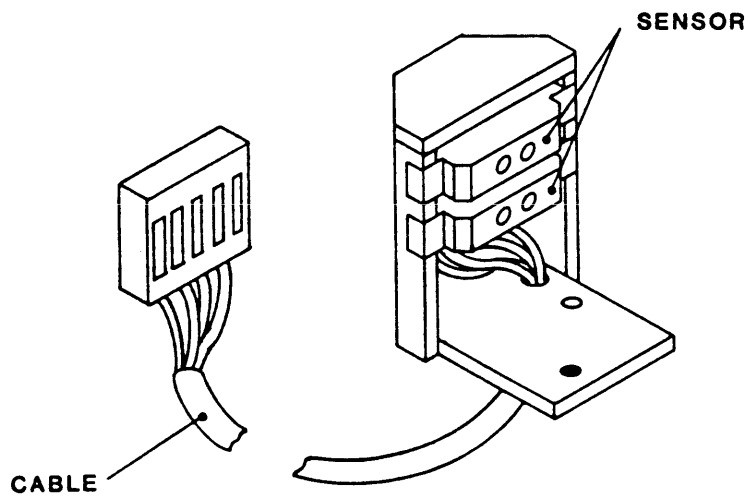
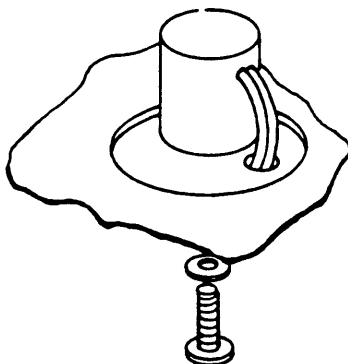


Figure 4-21 BOT/EOT Sensor Assembly

4.3.26 TAPE-IN-CHANNEL EMITTER ASSEMBLY (Figure 4-22)

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 offset 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. Torque Mounting Screw to 3.5 +/-0.5 inch-pounds.



**Figure 4-22 Tape-In-Channel Emitter Assembly and
Tape-In-Channel Sensor Assembly**

4.3.27 TAPE-IN-CHANNEL SENSOR ASSEMBLY (Figure 4-22)

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. Torque Mounting Screw to 3.5 +/-0.5 inch-pounds.

4.3.28 VACUUM MOTOR ASSEMBLY (Figure 4-23)

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.

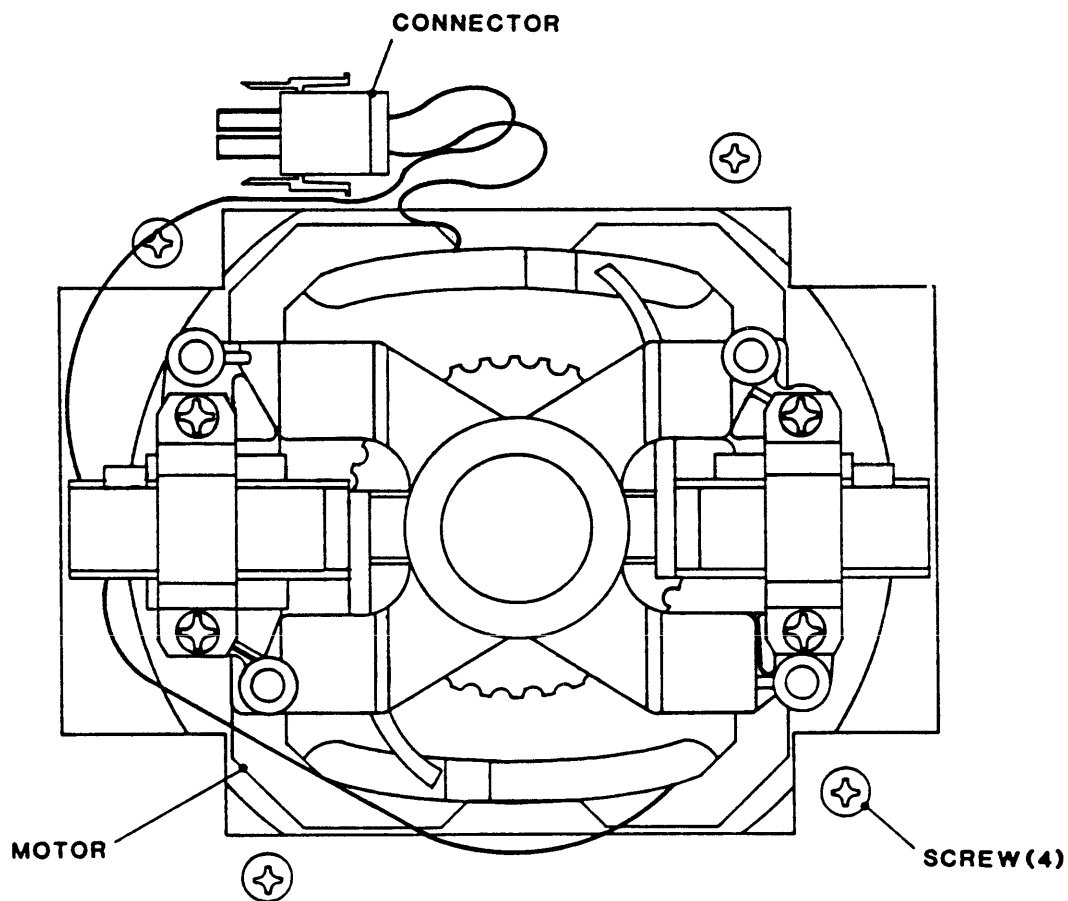


Figure 4-23 Vacuum Motor Assembly

4.3.29 REEL MOTOR ASSEMBLY (Figure 4-24)

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.

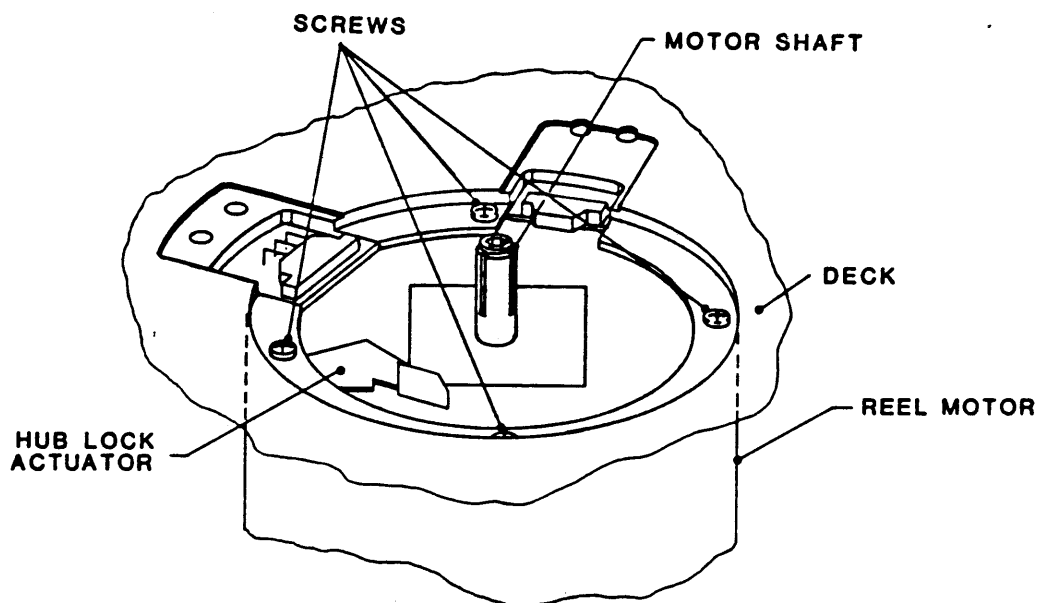


Figure 4-24 Supply Reel Motor Assembly

4.3.30 MAGNETIC HEAD ASSEMBLY (Figure 4-25)

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 Head Plate. Realign and adjust the Magnetic Head Assembly per paragraph 4.4.2.7 -5).

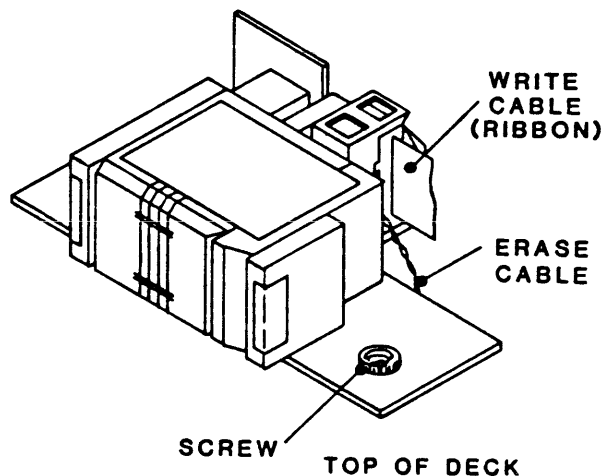


Figure 4-25 Magnetic Head Assembly

4.3.31 CAPSTAN (Figure 4-26)

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.

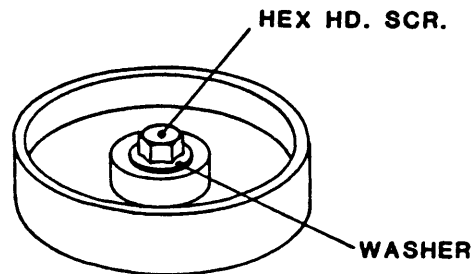


Figure 4-26 Capstan

4.3.33 ROLLER (Figure 4-27)

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.

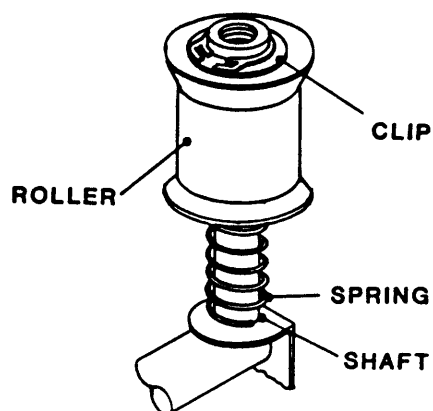


Figure 4-27 Roller

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	+/-7.5V
2	+12	+/-0.5	8	+50	+/-7.5V
3	-12	+/-0.5	9	+24	+/-4.0V

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: 9600A.

4.4.2.2 POSITION SENSOR CALIBRATION

1. Open Tape Path Covers.
2. Unlatch and lift the Deck Plate, and set the support to lock the Deck Plate in Maintenance Position.
3. Turn on ac power.
4. Takeup and Supply Arms Calibration:
 - a. Press DIAG, then ENTER, and repeatedly Press SCAN until Display indicates: DRV ADJ. Then Press ENTER again. Display indicates: BUF ARMS. Press ENTER again. Display indicates: RELAXING until Arms reach mechanical stops.
 - b. Adjust the mechanical stops for each arm so that associated Tape Guide rests at position indicated in Figure 4-28:

Takeup Arm	4.8 +/-0.2 inches from Deck Side Wall
Supply Arm	1.4 +/-0.2 inches from Deck Front Wall.

Torque the Locking Kepsnut to 13 +/-1 inch-pounds.

- c. Adjust the Plastic Cam on the Arm Shaft so that the Microswitch engages the notch on the Cam at 20 +/-10° after the Arm contacts the Stop (This corresponds to the gap dimension indicated in Figure 4-28). Torque the Cam Lock Screw to 3.5 +/-0.5 inch-pounds.
- d. For each Buffer Arm, using a loop of string (or rubber band, etc) adhesive tape, attach a static tension-measuring device to the Tape Guide Roller, and move the Arm to Zero Point. Then, using an end wrench, loosen the Lock Nut on the Spring Tension Adjusting Screw, and turn the Spring Adjustment Screw until the tension at the Tape Guide Roller is 17.5 +/-1.0 ounces.
 1. The Display should now indicate: TAKE 0.0V (Tolerance = +/-0.3V).
 2. Press SCAN. The Display should now indicate: SUPP 0.0V (Tolerance = +/-0.3V)
- e. In turn, move each Arm to the Mechanical Stop.
 - 1 The Display should now indicate : SUPP-2.2V. (Tolerance = +/-0.3V)
 2. Press SCAN. The Display should now indicate: TAKE-2.6V (Tolerance = +/-0.3V).
- f. If voltage at the Mechanical Stop or Zero Point is out of tolerance, loosen the respective locking bolt on the Arm Shaft and, holding the Arm at its appropriate position, rotate the rotor until the voltage is within specification. Torque the Locking Bolt on the Arm Shaft to 13.0 +/-1.0 inch-pounds.
- g. In Turn, move each Arm to the Optical Limit Switch. Press SCAN to display the appropriate parameter. The Display should indicate: TAKE+4.8V (Tolerance = +/-0.3V) for Takeup Arm, and SUPP+4.2V (Tolerance = +/-0.3V) for Supply Arm..
- h. Power down; then power up.
- i. Do Step 4a and, manually moving each Arm throughout its range, press SCAN as necessary to verify displayed voltages for each point of Arm rotation. If any voltage is out of tolerance, repeat the adjustment procedure. The following is a summary of these voltages:

	<u>Takeup Arm</u>	<u>Supply Arm</u>
Mechanical Limit Stop	-2.6V +/-0.3V	-2.2V +/-0.3V
Zero Point	0.0V +/-0.3V	0.0V +/-0.3V
Optical Limit Switch	+4.8V +/-0.3V	+4.2V +/-0.3V

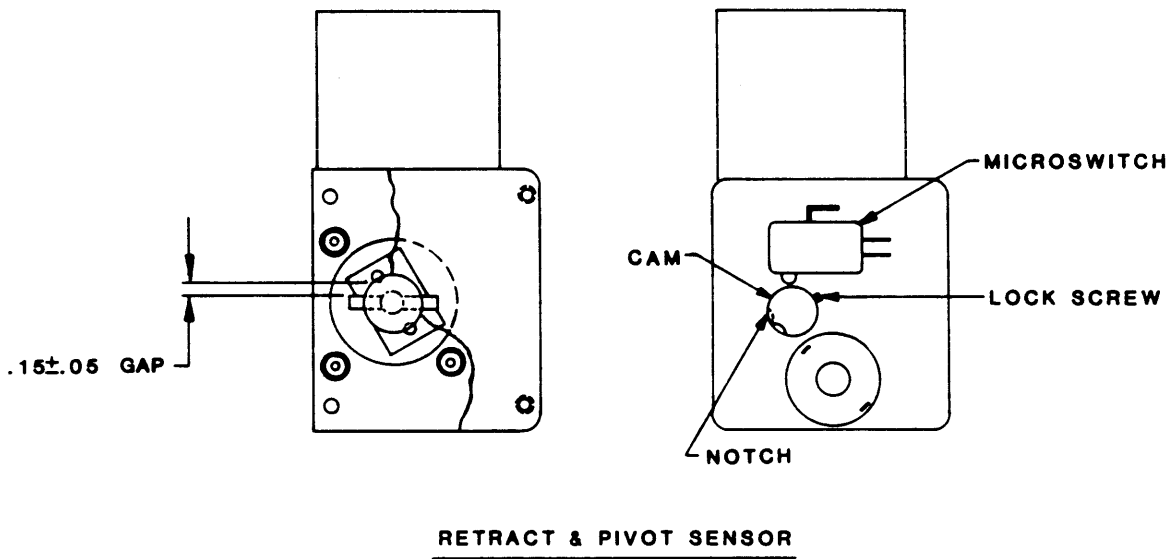
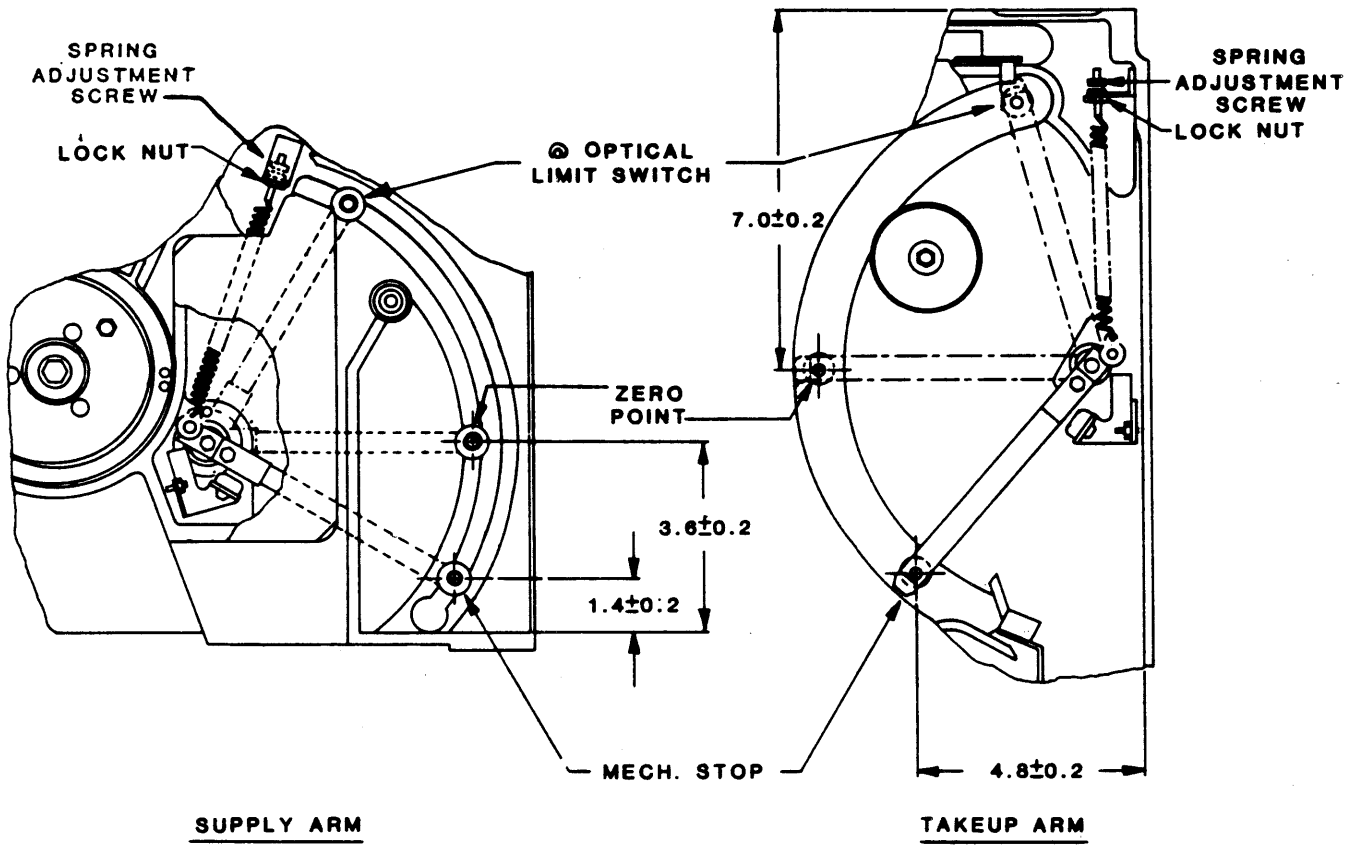
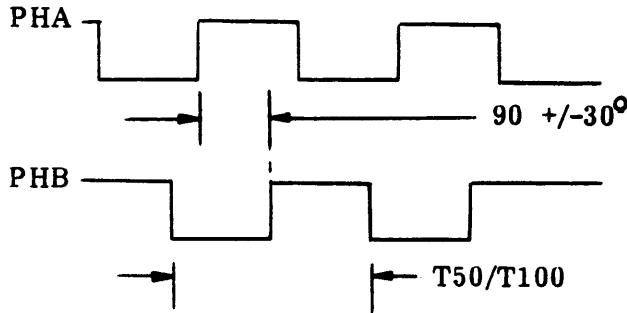


Figure 4-28 Buffer Arms Calibration

4.4.2.3 CAPSTAN CHECK

- 1) Turn on ac power.
- 2) Press DIAG. Display indicates: DIAG.
- 3) Press SCAN. Display indicates: MOTION.
- 4) Press ENTER. Display indicates: 50 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 approximate squarewaves 90 \pm 30° out of phase with one another, as illustrated below:



Note:
 Waveforms can be asymmetrical by \pm 30°
 Vp-p = TTL Levels.
 T50 = 126 \pm 0.75 us
 T100 = 63 \pm 0.75 us

Capstan Drive Voltages Phase Relationship

- 6) Check time period, T50.
- 7) Press START/STOP. Capstan should stop motion.
- 8) Repeatedly press SCAN until Display indicates: 100 FWD.
- 9) Check time period T100.

4.4.2.4 LOAD TEST

With the Drive in Diagnostic-Motion Mode per paragraph 4.4.2.3, Steps 1 thru 4:

1. Open the Tape Access Door and insert a 10-1/2 inch Test Reel.
2. Leaving the Access Door open, Press LOAD. 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 and locks the reel.
 - 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 (8.75 \pm 0.5 oz).
 - h. Drive searches for Load Point.
 - i. Drive stops at Load Point, and lights LOAD POINT indicator.
 - j. Displays indicates: 9600, and Tension Arms position 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 4.4.2.3, Steps 1 thru 4:

1. Repeatedly press SCAN and verify the sequence of displays:

<u>Step</u>	<u>Display</u>	<u>Step</u>	<u>Display</u>
a.	50 FWD	h.	100 FSS
b.	50 REV	i.	100 RSS
c.	50 FSS	j.	100 FRF
d.	50 RSS	k.	50/100 F
e.	50 FRF	l.	50/100 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 indicates: 9600A.
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**Hub Lock Solenoid Adjustment (Figure 4-5):**

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

- a. Loosen the two 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 centered in its channel and can be moved freely over its full range of travel.
- c. Holding the Solenoid Body firmly in its location on the Deck, tighten the two Solenoid Mounting Screws. Verify that the Solenoid Plunger does not bind in the Solenoid Bore. Repeat Steps a, b, and c if necessary. Torque Mounting Screws to 13.0 +/-1.0 inch-pounds.
- d. Loosen the 3/8-inch Kepsnut 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 Kepsnut. Verify that the Hub does not touch the Actuator by rotating the Hub several times. Torque the Kepsnut to 7 +/-1 inch-pounds.

4.4.2.7 CALIBRATION AND SETUP, ELECTRONIC

A. General

All Electronic Calibration procedures and most of the Electronic Setup procedures require that the Calibration Jumper on the Drive Electronics Board be placed in CALIBRATE position. The following Preparation Procedure describes installing the Calibration Jumper.

NOTE: The Setup Procedures for UNIT NUMBER and DEFAULT DENSITY do not require the Calibration Jumper to be placed in CALIBRATE Position. These procedures are described in Section II.

B. Preparation

1. Turn ac power on. The Readout displays "TESTING", then "9600A".

CAUTION

Turning ac power OFF or ON while the Calibration Jumper is in CALIBRATE position could cause loss of programmed parameters on the Drive Electronics Board. Such a loss could require reentry of parameters by Kennedy service personnel. Therefore, during the following calibration procedures, **DO NOT TURN AC POWER OFF UNTIL CALIBRATION JUMPER HAS BEEN REPLACED TO ITS ORIGINAL POSITION.**

2. 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.
3. On Drive Electronics Board (Figure 4-29), move the Calibration Jumper from IC Connector U75 pins 8 and 9 to pins 9 and 10.
4. Unlatch Support Bar and lower the Deck Assembly.
5. Install a reel of tape in the Drive, set the Drive to Diagnostic-Motion Mode, run tape to BOT by pressing LOAD.

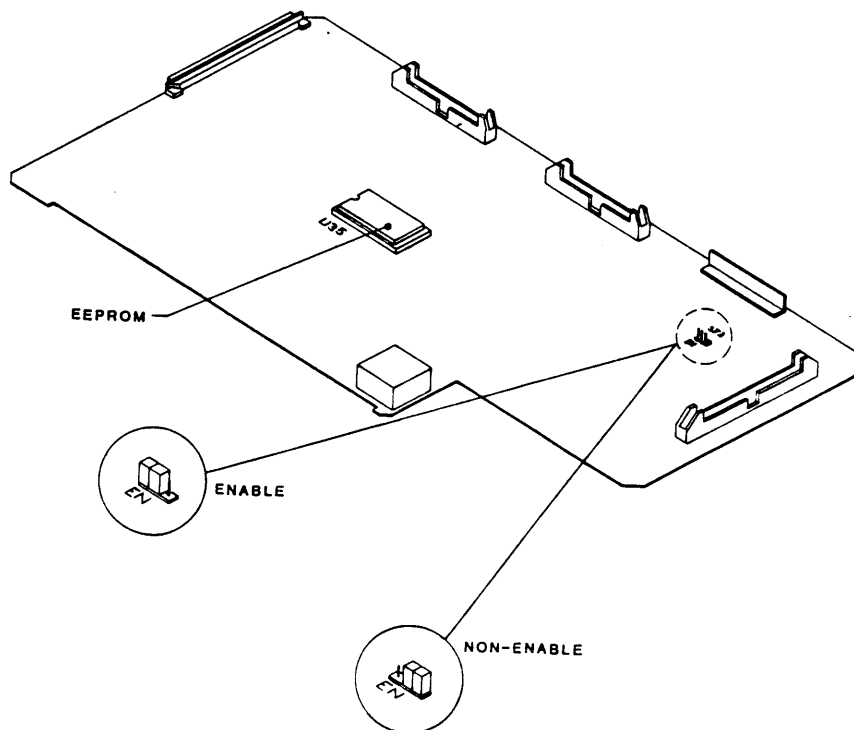


Figure 4-29. Calibration Jumper Location

4.4.2.7.1. DRIVE ELECTRONIC SETUP

- A. Press DIAG. Display indicates: DIAG.
- B. Press ENTER. Display indicates: MOTION (first Diagnostic parameter).
- C. Press SCAN twice. Display indicates: SET UP. Setup Parameters are:
 1. UNIT NUMBER (Factory-set to 0) - (Don't care about Calibrate Jumper)
 - a. Repeatedly pressing SCAN displays each of eight Numbers: 0 through 7.
 - b. Pressing ENTER prepares the displayed Number for storage. The Readout indicates: LOAD?.
 - c. Pressing LOAD stores the displayed Number as the new Unit Number.
 2. DEFAULT DENSITY (Factory set to 1600/REM)(Calibrate Jumper - Don't care)
 - a. Repeatedly pressing SCAN changes the Density Parameters and the corresponding Readout to each of the six Density Configurations: 800, 800 REM, 1600, 1600 REM, 3200, and 3200 REM.
 - b. Pressing ENTER prepares the displayed Density for storage. The Readout indicates: LOAD?.
 - c. Pressing LOAD stores the displayed Density as the new Default Density.

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

FOLLOWING ITEMS REQUIRE CALIBRATE JUMPER IN CALIBRATE POSITION.

3. SPEED (Factory set to HOST SEL) The 9600A Drive provides the following options to match a variety of Hosts.
 - a. HOST SEL Speed selection is made by Host.
 - b. AUTO SPD Drive automatically overrides Host-selected speed and goes to high speed if this will improve performance.
 - c. 50 IPS Drive performs at 50 IPS regardless of Host selection.
 - d. 100 IPS Drive performs at 100 IPS regardless of Host selection.
4. TIME OUT (Factory set to 25FT ON)
 - a. 25FT ON Drive stops motion and sets Hard Error Flag IHER if no data is detected within 25 feet after a Read or Read Space Command.
 - b. 25FT OFF Drive ignores no-data-detected information, if it occurs, and continues motion.
5. SECURITY (Factory set to ENABLE)
 - a. ENABLE Drive can do a Security Erase on command.
 - b. DISABLE Drive cannot do a Security Erase.
6. PARITY (Factory set to IGNORE)
 - a. CHECK Drive will check the parity of Write Data from the Host.
 - b. IGNORE Drive will ignore the parity of Write Data from the Host.
7. LONG GAP (Factory set to 1.2 INCH)

The length of the Long Gap will affect the Re-Instruct Window to maintain streaming when writing at 100 ips. By increasing the Gap, the Re-Instruct Window will also increase. This setting only has an affect on Write Commands at 100 ips with ILGP active on the Host Interface.

4.4.2.7.2 ELECTRONIC CALIBRATION

With the Calibration Jumper in CALIBRATE position, a reel of tape in the Drive, and the Drive set to DIAGNOSTIC-MOTION Mode, run tape to BOT by pressing LOAD.

A. Read Amplitude, Automatic Adjustment

1. Repeatedly press SCAN until Display indicates: CAL.
2. Press ENTER. Display indicates: WRT SKW (first Calibrate parameter)
3. Press SCAN. Display indicates: READ AMP.
4. Press ENTER. Display indicates: AUTO (Auto Amplifier-Adjust).
5. Press ENTER again. Display indicate: ALL (all Densities and all Speeds for all Channels).
 - a. To automatically adjust and store the Gain for all Densities and all Speeds for all Channels, Press ENTER.
 - b. To automatically adjust and store the Gain for a selected Density at a selected Speed for a selected Channel:
 - 1) Repeatedly press SCAN until the desired density is displayed.
 - 2) Press ENTER. The Display will indicate: 50 IPS (the current speed).
 - 3) As desired, to select High Speed, Press SCAN. The display will indicate: 100 IPS.
 - 4) Press ENTER. The Display will indicate: CONFIRM?
 - 5) Press ONLINE. The Drive will move tape forward for a few seconds, then stop. The adjustment is complete and values stored.

B. Read Amplitude, Manual Adjustment: With the Drive in Calibrate Mode and the Calibration Jumper in Calibrate Position, load a good reel of Write-enabled tape and do the following:

1. Using an Extender Card, extend the Read Analog Board above the chassis.
2. Connect oscilloscope probe to TP101 on the Read Analog Board.
3. Momentarily press ENTER. The Display will indicate: WRT SKEW.
4. Press SCAN. The Display will indicate: READ AMP (Amplifier Adjust Mode).
5. Press ENTER. The Display will indicate: AUTO (Auto Amplifier-Adjust).
6. Press SCAN. The Display will indicate: MANUAL (Manual Amplifier Adjustment).
7. Press ENTER. The Display will indicate: 800 (Current Density). If desired, press SCAN to select a different Density.
8. Press ENTER again. The Display will indicate: 50 IPS (Current Speed). If desired, press SCAN to select 100 IPS.
9. Press ENTER again. The Display will indicated: CONFIRM?.

10. Setting Adjustment Parameters:

- a. If you made a mistake when selecting the Density and Speed:
 - 1) Press DIAG to abort the adjustment. The Display indicates READ AMP.
 - 2) Repeat Steps 4 through 9.
- b. If you have correctly selected Density and Speed, press ONLINE. This stores the selected Density and Speed as adjustment parameters. The Display indicates: RANGE XX. XX represents the Course Gain of the system. The Front Panel pushbuttons will now perform the following functions:

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

11. Set the Course Gain by repeatedly pressing ENTER or START/STOP until voltage amplitude at TP101 is 3 volts p-p.
12. Press SCAN. The Display will indicate: AMP-5 XX. (XX = Channel-5 Gain).
13. In turn, connect an oscilloscope probe to the Test Point in each Read Channel of the Read Analog Board, press SCAN to display the Channel, and set Gain by repeatedly pressing ENTER or START/STOP until voltage amplitude at each Test Point is 3 volts p-p +/-0.3V. The following table shows Track, Test-Point, and Channel relationships.

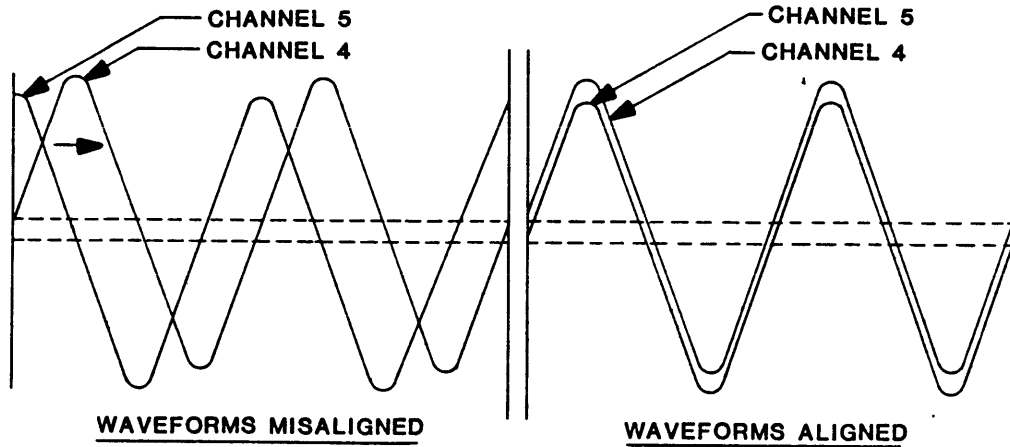
<u>Track</u>	<u>Test Point</u>	<u>Channel</u>	<u>Track</u>	<u>Test Point</u>	<u>Channel</u>
1	101	5	6	601	1
2	201	7	7	701	0
3	301	3	8	801	6
4	401	P	9	901	4
5	501	2			

14. Press RWND/UNL. This stops the operation, and the Display indicates: LOAD?.
- 15 Press LOAD. This stores the new adjustment values.

C. Read Skew Adjustment:

1. Load a Skew Tape into the Drive.
2. Connect a dual-trace oscilloscope to the Read Analog Board, one probe to TP101, the other to TP401. Trigger on TP401.
3. In Diagnostic Motion Mode, run the tape forward at 50 ips.

- Using a small-blade common 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.



- Leaving one probe on TP401, and triggering on TP401, 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	

- 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 4 and 5.
 - Run the tape in Read Reverse, and repeat Steps 5 and 6. The maximum scatter should be within specification per the chart above. If maximum scatter is out of specification, repeat Steps 5, 6, and 7. If scatter is out of tolerance replace Head.
 - Press DIAG to exit from the Motion Mode, and unload and remove the Skew Tape.
- D. Write Skew Adjustment: Adjust for Write Skew only if Head has been replaced. With the Drive in Calibrate Mode and the Calibration Jumper in Calibrate Position, load a good reel of Write-enabled tape and do the following:
- Select CAL WRT SKEW Mode. The Display will indicate: WRT SKEW.
 - Press ENTER. The Display will indicate: CONFIRM?
 - Press ONLINE. Tape will start moving forward and the Display will indicate, SKW-5 xx (xx = a number from 01 to 15). Panel Controls will now perform the functions listed under 4.k above except that ENTER and START/STOP will respectively increase and decrease timing delay of the waveforms.

4. Connect one oscilloscope probe to Read Analog Board, TP101, the other to TP401 and, triggering on TP401 note the waveforms displayed on the oscilloscope. The phase displacement of the waveforms should be within 2.2 us. of the corresponding values in the Read Chart (Step C.5. above).
5. In turn, connect the other input probe to each Channel Test Point and press SCAN. For each Channel Test Point, by repeatedly pressing ENTER or START/STOP adjust the phase relationship to be within 2.2 us. of the corresponding values in the Read Chart.
6. Press RWND/UNL. The Display will indicate: LOAD?, and the operation will stop.
7. Press LOAD. This stores the new Write Skew values.

4.5 DIAGNOSTICS

4.5.1 GENERAL

- A. In Diagnostic Mode, repeatedly pressing SCAN displays the Diagnostic Functions: MOTION, DRV ADJ, SET UP, CALIBRATE, and DATA DIAGNOSTICS. Pressing ENTER enables the function displayed.
- B. Having selected a diagnostic function per Step A, repeatedly pressing SCAN displays the functional categories or parameters of the selected function:
- C. In Diagnostic Mode, if tape has been installed but not Loaded, pressing LOAD will initiate a Tape Load Sequence. However, the tape will not go to Load Point, and the Drive will remain in Diagnostics Mode.

4.5.2 MOTION DIAGNOSTICS

In Motion Mode, the operator can check and adjust the tape path, and Check Motors and Servos:

- A. After selecting Motion Mode per Step A (par 4.5.1), repeatedly pressing SCAN displays the Motion Parameters listed in Paragraph 4.4.2.5.
- B. After selecting the Motion Parameter per Step A, pressing ENTER enters the Parameter.
- C. With the Motion Parameters entered, pressing START/STOP starts the motion selected. Pressing START/STOP again stops motion.
- D. When tape is in motion, the DIAG LED flashes at 0.5 Hz.

4.5.3 DRIVE ADJUST (DRV ADJ)

A. Buffer Arms (BUF ARMS)

The 9600A Drive automatically adjusts the gain of the Buffer Arms Sensors on power up. In Buffer Arms Mode, the Operator can check the gain of the Buffer Arms Sensors as indicated on the Readout display.

B. Hub Sense

In Hub Sense Mode, the operator can manually rotate the Hub to check the status of the Reel-In-Place Sensor as indicated on the Readout display. The operator can make necessary adjustments.

4.5.4 CALIBRATION SUMMARY

A. General

1. In Cal Mode, the Calibration Jumper must be installed in Calibration Position 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 attempt.
2. In Cal Mode, repeatedly pressing SCAN displays the Calibrate Functions: WRT SKEW, and READ AMP. Pressing ENTER enters the currently displayed Function and displays the first related Parameter.
3. Once a Function has been selected (by pressing ENTER), again repeatedly pressing SCAN displays the Parameters for that Function (For Write Skew, there is only one Parameter; for Read Amplifier, there is a set of Parameters).
4. Once a Parameter, or set of parameters, has been selected per Step 3 above, pressing ONLINE (for Write Skew) or LOAD (for Read Amplifier) enters the parameter.

B. Write Skew

1. With the Write Skew Function entered per Item A.4 above, the Display indicates: CONFIRM?. Pressing ONLINE prepares the Drive to receive new parameters. Refer to Paragraph 4.4.2.7.2-C for setting Read Skew Parameters.

C. Read Amp

1. With Read Amp Function entered per Item A.2. above, repeatedly pressing SCAN alternately displays: AUTO and MANUAL. Then, again pressing ENTER selects the displayed function.
2. AUTO Selection. Repeatedly pressing SCAN in turn displays the densities: ALL, 800, 1600, and 3200. Pressing ENTER selects the displayed density.
 - a. ALL. When ALL is selected, the Readout indicates: CONFIRM. Then, pressing ONLINE moves tape forward, and the Drive automatically calibrates for all densities at both 50 ips and 100 ips.
 - b. 800, 1600, and 3200.
 - 1- Pressing ENTER selects the displayed density, and displays: 50 IPS.
 - 2- Repeatedly pressing SCAN alternately displays 100 IPS and 50 IPS. Again pressing ENTER selects the displayed speed, and the Readout indicates: LOAD?.
 - 3- Pressing LOAD stores the selected parameters and starts the calibration procedure. See Paragraph 4.4.2.7.2.
3. Manual Selection
 - a. Repeatedly pressing SCAN in turn displays the three densities: 800, 1600, and 3200.
 - b. Pressing ENTER, selects the displayed density.
 - c. (Same as Step 2.b above.)

4.5.5 DATA DIAGNOSTICS

Data Diagnostics allows offline testing of the data path one module at a time. In this mode, to prevent the possibility of disturbing the calibration settings, the Calibration Jumper must be installed in Operate Position. MODE Functions set up Drive Parameters for testing; COMMANDS select and initiate the test to be run; and ERRORS select the type of Error Display desired.

- A. Mode (Test Options). In this mode, the Operator sets up the Drive to operate with specific parameters. Parameters are factory set to:
- a. CONTINUE ON ERROR
 - b. REWIND AT EOT
 - c. BLOCK SIZE = 4 Bytes
 - d. DATA Pattern = last Data Pattern
 - e. SPEED = 50 IPS
 - f. RE-INT (Re-instruct) is STREAM

Initial Readout is CONTINUE. Refer to Diagnostics Menu under DATA DIAGNOSTICS for parameter breakdown. To change parameters:

1. Repeatedly press SCAN to display the desired parameter category (listed above).
2. Press ENTER to enter the displayed parameter category.
3. Again press SCAN to display the desired parameter for the selected category..
4. Again press ENTER to store the selected parameter.
The Readout changes to the next parameter category.
5. Repeat the above Steps 1 thru 4 for each parameter category to be changed.

- B. Commands. Under the Commands Function, SCAN selects the test to be run, and START/STOP starts and ends the test. If a runaway occurs, due to module failure, pressing DIAG will force a hard stop but loose tape position. Commands are defined as follows:

LOOP DIG Data loops from the Write Digital to the Read Digital Sections without going through the Read Analog Section or the Head. There is no tape motion.

LOOP ALG Data loops from the Write Section to the Read Digital Section through the Read Analog Module without going through the Head or the Pre-Amp.

WRITE Drive writes Data to tape per selected Mode Parameters.

WRT W/RE Drive writes Data to tape using Retry Sequence for Blocks In Error.

READ Drive reads Data from tape.

READ REV Drive Reads Data from tape in the reverse direction.

READ/RR If last command caused a forward motion, the Drive alternately and repeatedly reads forward and reverse over the **previous** data block. If the last command caused a reverse motion, the Drive alternately and repeatedly reads forward and reverse over the **next** data block. To stop this test, press START/STOP.

FMK TEST Drive writes Filemarks and confirms Filemark Status on Read.

WR/RR/RD Drive writes a block, reads it in reverse, then reads it forward.

1. Repeatedly press SCAN until the desired Command is displayed.
2. Press START/STOP to start the test.
3. Press START/STOP to end the test. (If under ON ERROR: STOP was selected, the Drive will stop on error.)
4. Press DIAG to exit from the test. The Readout indicates: COMMAND.
5. Press SCAN to go to the Errors Display Function

C. Errors Display. The Errors Function displays selectable types of errors. Repeatedly pressing SCAN in turn causes each type of error to be **displayed**. Pressing ENTER **resets** the currently displayed error reading. See Item e.3) in Diagnostics Menu for definitions of errors.

4.5.7 DIAGNOSTICS MENU

The Diagnostics Menu below summarizes the functions, parameters, adjustments, calibration, and tests described above. The Menu is arranged with each successive indent representing a different and subordinate level of control. Pressing SCAN moves control to the next lower item on the Menu but at the same indent level. Pressing ENTER moves control to the next indent level.

SECTION V
PARTS IDENTIFICATION

SECTION V PARTS IDENTIFICATION

5.0 INTRODUCTION

This Manual contains parts ordering information and lists replacement and recommended spare parts. Figures 5-1 thru 5-5 include parts lists that identify each part illustrated. Parts Tables 5-1 and 5-2 list parts recommended as spares. Table 5-3 lists recommended Maintenance Tools.

Field-Repair and -Change Kits consist of parts assembled and adjusted at the factory. Repair Kits are for repair of Kennedy products. Change Kits are for adding standard or special options not originally included in the equipment. Kits include installation instructions.

5.1 PARTS WARRANTY

Parts are warranted to be free from defects in materials and workmanship for 90 days from the date shipped from Kennedy. This warranty does not apply to Kennedy parts that have been neglected, misused, improperly installed, poorly maintained, or damaged by accident. Liability under this Warranty is limited to replacement or repair of defective parts. The equipment user must obtain Return Authorization (RA) from Kennedy Company before shipping the defective parts. The customer must send the package postage paid.

5.2 OUT-OF WARRANTY EMERGENCY PARTS

Kennedy Company expedites shipment of emergency orders for out-of-warranty parts. The price of expedited orders includes the standard price for the part plus a \$75.00 Expediting Fee. Kennedy ships emergency orders within one week of receipt of the order.

5.3 PARTS ORDERING INFORMATION

Include the following information in all orders:

- a. Serial Number and Part Number of the equipment (printed on the Serial Number Tag located on the rear panel of the unit)
- b. Company Name, shipping and billing address
- c. Purchase Order Number
- d. Authorized person's name and phone number
- e. Preferred method of shipment (FOB Monrovia, California)
- f. Name, Part Number, and quantity (Ref par. 5.3.3.d) of parts being ordered
- g. Return Authorization Number
- h. For items returned for repair or replacement, include description of malfunction.

5.3.1 MINIMUM PARTS ORDERS

The minimum domestic order value is \$50.00. Minimum international order value is \$100.00. Refer to Parts Price List Manual for parts prices. For Emergency Orders, order value does not include the \$75.00 Expedite Fee (Ref par. 5.2).

5.3.2 RETURNING PARTS TO KENNEDY

If a part must be returned for repair or replacement, the customer must first notify the nearest Customer Service Office listed in Paragraph 5.3.4 to obtain a Return Authorization Number (RA Number). If the part is available at that Office, the Kennedy Agent will issue the RA Number and give further instruction for returning the part. If the part is not available at that local office, the customer must notify the Kennedy Main Office at Monrovia, California to obtain the RA Number. The part must be returned to the Office that issued the RA Number. Orders will be accepted via Telephone or Telex, but will not be shipped until a confirming Purchase Order is received from the customer.

NOTE 1: Parts sent to Kennedy Company that do not include a Return Authorization Number will be returned to the sender COD unopened. The RA Number must be written on the outside of the package in a conspicuous place.

NOTE 2: Send only the item(s) needing repair or replacement. Use standard good packaging procedures. Kennedy Company will not be responsible for any accessories to the repair item. **DO NOT SEND ACCESSORIES.**

5.3.3 PARTS ORDER LEADTIME

- a. Delivery of spare parts: 60-90 days After Receiving Order (ARO).
- b. Delivery of tools and special parts: 90 days ARO
- c. Delivery of parts for obsolete equipment: 120 days ARO
- d. For quantities of six or more of one item or for items not covered by these guidelines, consult your nearest Kennedy Company Customer Service Department (Ref par. 5.3.4).

5.3.4 KENNEDY COMPANY CUSTOMER SERVICE ADDRESSES

For service and general information, contact the nearest Kennedy Company Customer Service Office listed below:

United States:

Kennedy Company
Main Office
1600 Shamrock Avenue
Monrovia, California 91016
PHONE: (818) 357-8831
TELEX: 247019 KNDY UR

Kennedy Company
Eastern District
400 West Cummings Park
Suite 3650
Woburn, MA 01801
PHONE: (617) 935-9787

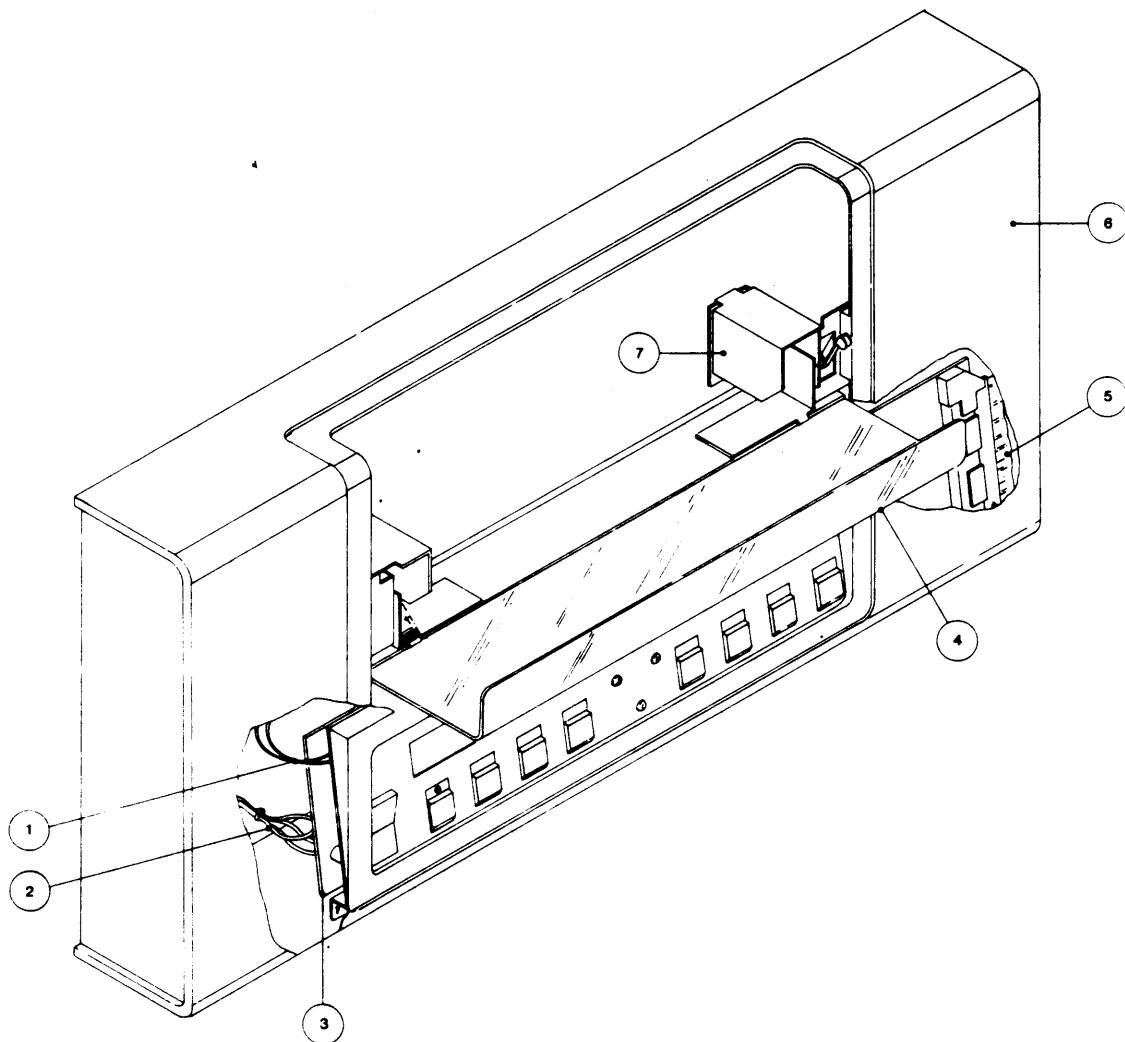
Kennedy Company
4364 L.B. McLeod
Orlando,
Florida 32811
PHONE: (305) 843-9335

United Kingdom

Kennedy International Inc.
Ashville Way
Workingham, Berkshire RG11 2PL
England,
PHONE: (734) 776033
TELEX: 847871 KENUKS G

Central Europe

Kennedy Holdings Inc.
Koningin Elisabethplein 8
B-2700 Sint-Niklaas
Belgium
PHONE: (3) 777.19.62
TELEX: 71870 KEN CO



Parts List:

Item	Part Number	Description
1	90-07578-001	Wire Assembly
2	90-07340-001	Power Switch Cable Assembly
3	90-07947-101	Operator Control Panel PCBA
4	91-07324-001	Tape Access Door
5	90-07486-001	Front Panel Cable Assembly
6	90-07321-001	Panel Assembly
7	22-00008-002	Solenoid, 24 VDC

Figure 5-1. Front Panel Assembly

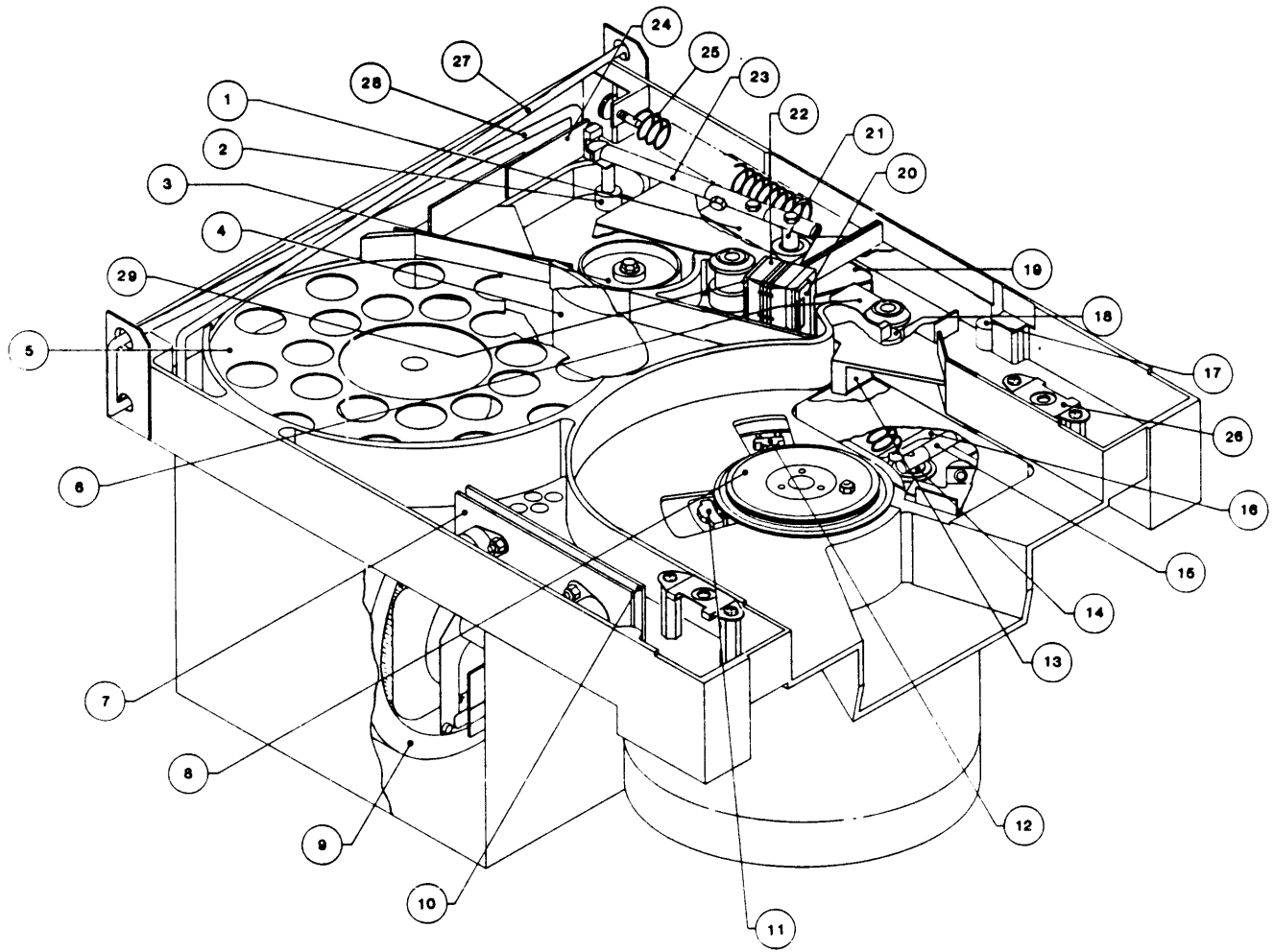
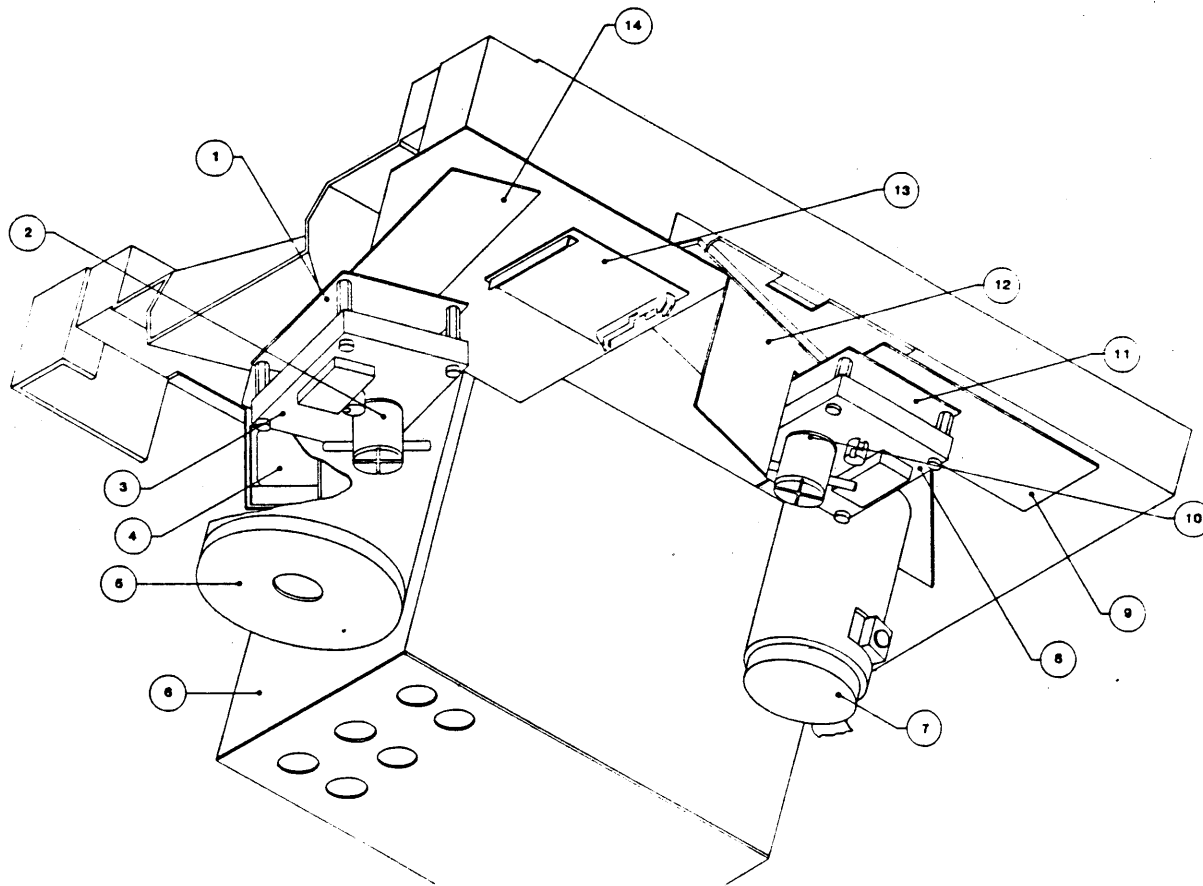


Figure 5-2. Deck Assembly, Top View (Sheet 1 of 2)

Parts List:

Item	Part Number	Description
1	90-07320-001	Retract & Pivot Sensor (Takeup)
2	91-07211-001	Roller
3	91-05699-001	Capstan
4	90-07333-001	Capstan Motor Assembly
5	90-06842-001	Vacuum Hub Assembly
6	90-05906-004	EOT/BOT Sensor Assembly
7	90-07295-001	+/- 12 VDC Regulator Assembly
8	90-07332-001	Supply Hub Assembly
9	90-07483-001	Vacuum Motor Assembly
10	90-07148-001	12VDC Regulator PCBA
11	90-07119-001	Read-in-Place Sensor Assembly
12	90-07144-001	File Protect Sensor Assembly
13	90-07235-001	Supply Arm Limit Sensor PCB
14	90-07216-002	Arm Pivot Assembly
15	90-07319-002	Supply Arm Assembly (Bottom)
16	90-07320-002	Retract & Pivot Sensor (Supply)
17	90-07334-002	Tape-in-Channel Emitter Assembly
18	90-07334-001	Tape-in-Channel Sensor Assembly
19	90-07524-001	Magnetic Head Assembly
20	90-07974-001	Tape Cleaner Assembly (Left)
21	90-07216-001	Arm Pivot Assembly
22	90-07335-001	Head/Guide-Plate Assembly
23	90-07319-001	Take-up Arm Assembly (Top)
24	90-07231-001	Take-up Arm Limit Sensor PCBA
25	25-00073-006	Spring, Extension
26	28-00259-001	Fastener, 1/4-turn, Receptacle, Clip-On
27	91-07731-201	Torsion Bar
28	91-07731-101	Torsion Bar
29	90-07973-000	Tape Cleaner Assembly (Right)

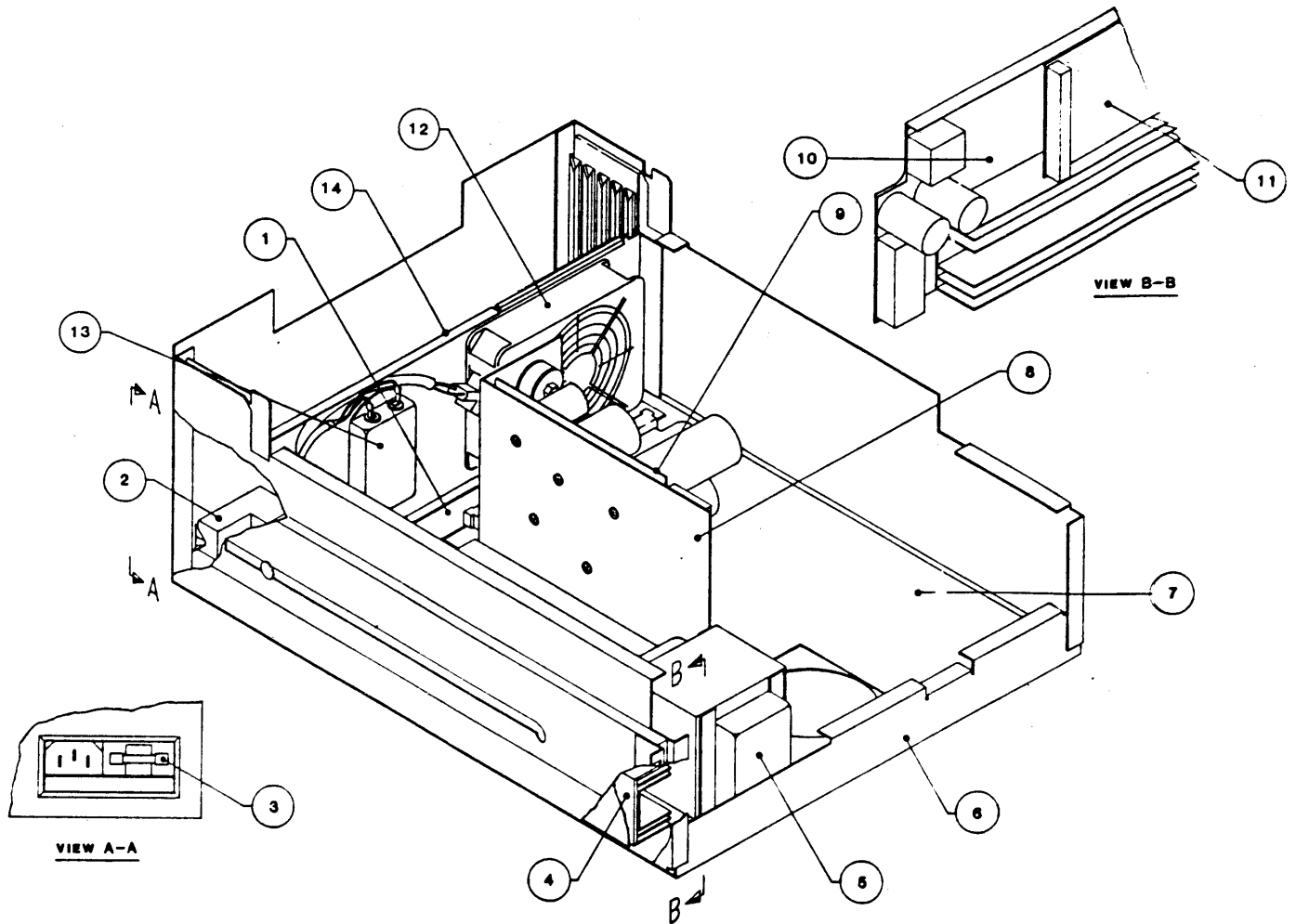
Figure 5-2. Deck Assembly, Top View (Sheet 2 of 2)



Parts List:

Item	Part Number	Description
1	90-06688-001	P.C. Card Capacitance Disk
2	35-00075-001	Gear Motor w/Switch
3	90-07320-102	Retract and Pivot Sensor Assembly
4	22-00054-001	Hub Lock Solenoid
5	90-07523-001	Reel Motor Assembly
6	90-07317-001	Blower Assembly
7	90-07333-001	Capstan Motor Assembly
8	90-07320-101	Retract and Pivot Sensor Assembly
9	90-07710-001	Position Sensor PCBA
10	35-00075-001	Gear Motor w/Switch
11	90-06688-001	PC Card Capacitor Disk (Hidden)
12	90-06923-001	Read Preamplifier PCBA
13	90-07228-001	Interconnect PCBA
14	90-07710-001	Position Sensor PCBA

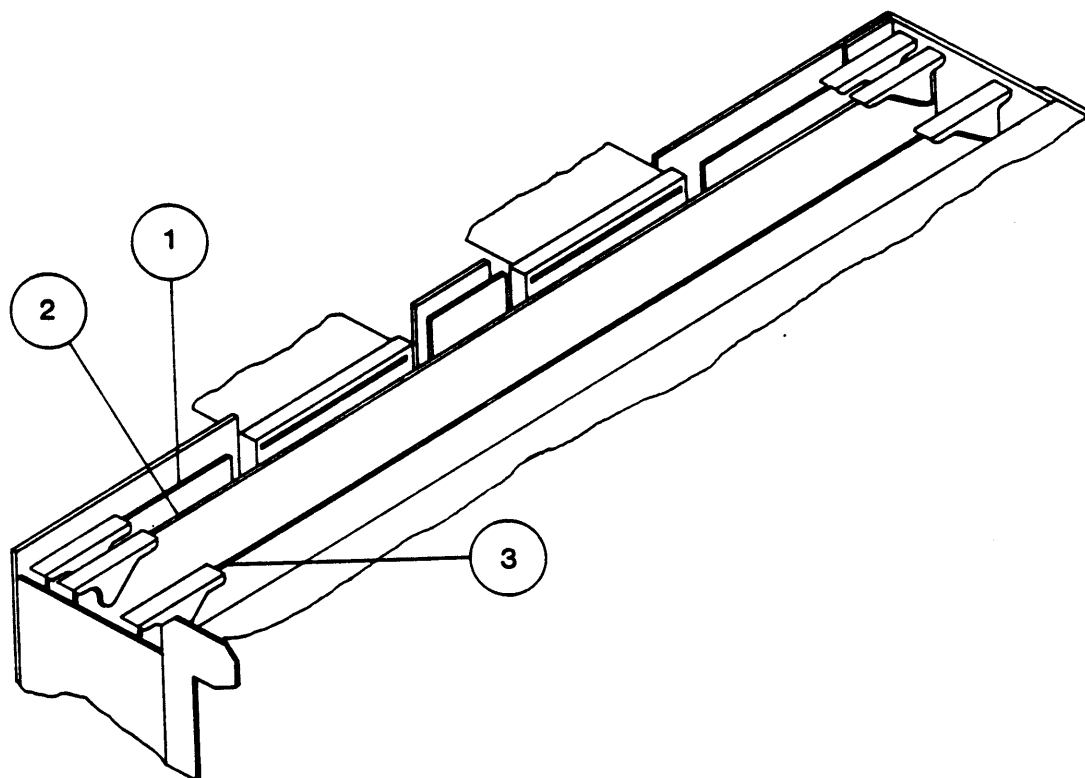
Figure 5-3. Deck Assembly, Bottom View



Parts List

Item	Part Number	Description
1	90-07108-001	Mother Board PCBA
2	90-07743-002	Power In Assembly
3	51-00133-060	Fuse, Normal 6A
4	90-07516-001	Servo Power Amplifier Final Assy
5	90-07318-001	Transformer
6	90-07316-001	Chassis Assembly
7	90-07952-001	Drive Electronics PCBA
8	90-07296-001	+5VDC Regulated Power Supply
9	90-07109-001	+5VDC Power Supply PCBA
10	90-07111-004	Servo Amplifier PCBA
11	90-07147-001	Servo Preamplifier PCBA
12	26-00027-001	Fan
13	27-00010-001	Filter, EMI
14	91-07722-002	Bracket, Fan

Figure 5-4. Chassis Assembly



Parts List:

Item	Part Number	Description
1	90-07951-001	Formatter PCBA
2	90-07917-021	Read Analog PCBA
3	90-07960-001	Read/Write Digital PCBA

Figure 5-5. Card Cage Printed Circuit Boards

**TABLE 5-1. RECOMMENDED SPARE PARTS
(Field Support)**

Item	Part Number	Description
2-6	90-05906-004	EOT/BOT Sensor Assembly
2-7	90-07295-001	+/-12 VDC Regulator Assembly
4-3	51-00133-030	Fuse, Norm Blo, 3A 250V, AGC3
4-3	51-00133-060	Fuse, Norm Blo, 6A 250V, Cer.
4-7	90-07110-004	Drive Electronics PCBA
4-8	90-07296-001	+5 VDC Regulated Power Supply
4-10	90-07111-004	Servo Amplifier PCBA
4-11	90-07147-001	Servo Preamplifier PCBA
5-1	90-07951-001	Formatter PCBA
5-2	90-07917-021	Read Analog PCBA
5-3	90-07960-001	Read/Write Digital PCBA

**TABLE 5-2. RECOMMENDED SPARE PARTS
(Depot Support)**

Fig-Item	Part Number	Description
1-3	90-07947-101	Operator Control Panel Assembly
1-6	90-07321-001	Panel Assembly
1-7	22-00008-002	Solenoid, 24VDC
2-1	90-07320-001	Sensor, Retract & Pivot - TU
2-2	91-07211-001	Roller
2-3	91-05699-001	Capstan
2-4	90-07333-001	Capstan Motor Assembly
2-5	90-06842-001	Vacuum Hub Assembly
2-6	90-05906-004	EOT/BOT Sensor Assembly
2-7	90-07295-001	+/-12 VCD Regulator Assembly
2-8	90-07332-001	Supply Hub Assembly
2-9	90-07483-001	Vacuum Motor Assembly
2-10	90-07148-001	12 VDC Regulator Assembly
2-11	90-07119-001	Read-in-Place Sensor Assembly
2-12	90-07144-001	File Protect Sensor Assembly
2-13	90-07235-001	Supply Arm Limit Sensor PCBA
1-14	90-07216-002	Arm Pivot Assembly
2-15	90-07319-002	Supply Arm Assembly (Bottom)
2-16	90-07320-002	Retract & Pivot Sensor (Supply)
2-17	90-07334-002	Tape-in-Channel Emitter Assembly
2-18	90-07334-001	Tape-in-Channel Sensor Assembly
2-19	90-07524-002	Magnetic Head Assy
2-21	90-07216-001	Arm Pivot Assembly
2-20	90-07974-000	Tape Cleaner Assembly (left)
2-22	90-07335-001	Head/Guide-Plate Assembly
2-23	90-07319-001	Take-up Arm Assembly (Top)

TABLE 5-2. RECOMMENDED SPARE PARTS (CONTINUED)
(Depot Support)

Fig-Item	Part Number	Description
2-24	90-07231-001	Take-up Limit Sensor PCBA
2-25	25-00073-006	Spring, Extension
2-29	90-07973-000	Tape Cleaner Assembly (Right)
3-3	90-07320-102	Retract & Pivot Sensor (Supply)
3-4	22-00054-001	Solenoid, Heavy Duty
3-5	90-07523-001	Reel Motor Assembly
3-6	90-07317-001	Blower Assembly
3-7	90-07320-101	Retract & Pivot Sensor (Takeup)
3-8	90-07710-001	Position Sensor PCBA (Tackup and Supply)
3-9	90-06688-001	PC Card Capacitance Disk Hidden)
3-10	90-06923-001	Read Preamplifier Assembly
3-11	90-07228-001	Interconnect PCBA
4-1	90-07108-001	Mother Board PCBA
4-2	90-07339-001	Power In Assembly
4-3	51-00133-030	Fuse, Norm Blo, 3A 250V, AGC3
4-3	51-00133-060	Fuse, Norm Blo, 6A 250V, Cer.
4-7	90-07110-004	Drive Electronics PCBA
4-8	90-07296-001	+5 VDC Regulated Power Supply
4-9	90-07109-001	+5 VDC Power Supply PCBA
4-10	90-07111-004	Servo Amplifier PCBA
4-11	90-07147-001	Servo Preamplifier PCBA
4-12	26-00027-001	Fan
4-13	27-00010-001	Filter, EMI
5-1	90-07951-001	Formatter PCBA
5-2	90-07917-021	Read Analog PCBA
5-3	90-07960-001	Read/Write Digital PCBA
	21-00198-001	Power Cord, 125V, 10A
	46-00153-003	Prom, Formatter, 8KX8 (U67)
	46-0xxxx-xxx	Prom, Formatter, Diag, 8KX8 (U78)
	46-00152-002	Prom, Drive Electronics (U27)

TABLE 5-3. RECOMMENDED MAINTENANCE TOOLS

PART NUMBER	DESCRIPTION
54-00098-001	Capstan Puller
54-00036-001	Skewmaster Tape
90-02324-001	Maintenance Kit
	Head Cleaner
	Hex Socket Keys - 6/16, 5/32, 1/8, 3/32
	Reflective Marker Strips
	Magnesee Visualizing Solution
	Lint-Free Swabs
	Loctite, Grade H
90-07117-001	Card Extender
99-00485-001	Hub Spanner Wrench
(Common)	Set of Nut Drivers or Open-End Wrenches
(Common)	Phillips and Standard Screwdrivers

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 9600A 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

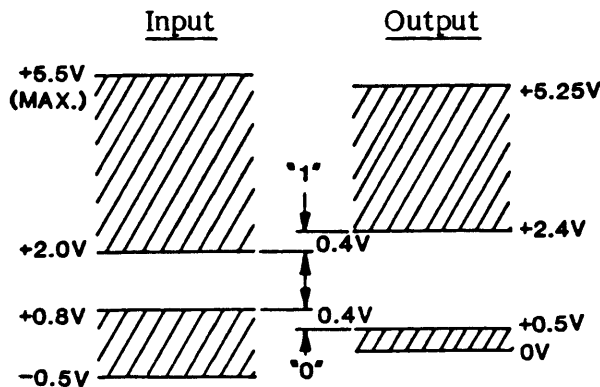
6.2.1 TTL LOGIC

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

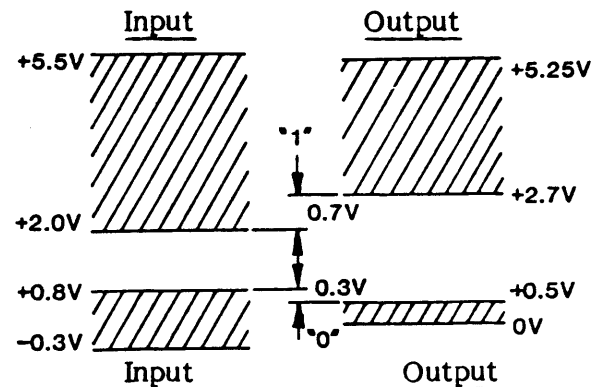
- Logic ONE = high
- Logic ZERO = low

Input/Output logic levels are defined as follows:

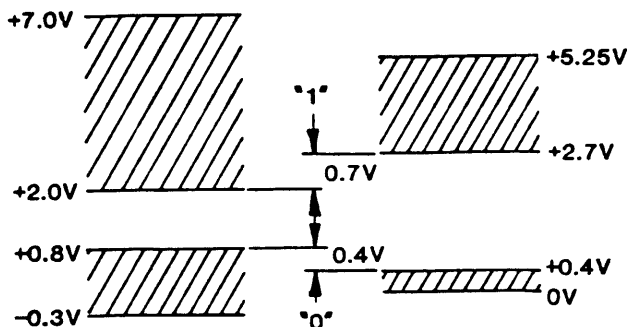
A. TTL Medium Speed IC Levels:



B. TTL Super High Speed IC Levels:



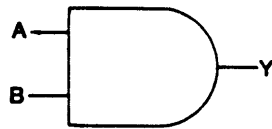
C. TTL Medium Speed Low Power Consumption IC Levels



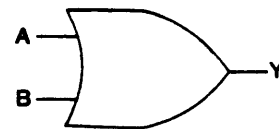
6.2.2 LOGIC SYMBOLOGY

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

AND Gate: $Y = AB$



OR Gate: $Y = A+B$



6.3 SCHEMATIC FLOW

Schematic diagrams 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 (Item Numbers included for easy reference)

<u>Title</u>	<u>Number</u>	<u>Item</u>	<u>Title</u>	<u>Number</u>	<u>Item</u>
+5 Volt Power Supply	401-7109-000	1	Motherboard	401-7108-000	8
12V Regulator	401-7148-000	2	Drive Electronics	401-7952-001	9
Interconnect Board	401-7228-000	3	Formatter	401-7951-000	10
Position Sensor	401-7710-000	4	R/W Digital	401-7960-000	11
Operator Cont Pan	401-7947-000	5	Read Preamplifier	401-6923-000	12
Servo Amplifier	401-7111-000	6	Read Analog	401-7917-000	13
Servo Preamp	401-7147-000	7			

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 (7952)	Drive Electronics
IERASE	4-J1	FMTR (7951)	Formatter
IEDIT		INTCON (7228)	Interconnect Board
IWFM		OCP (7947)	Operator Control Panel
IWRT		POSENS (7710)	Position Sensor
IREV		DIG R/W (7960)	Digital Read/Write
ILOL		READD (7115)	Read Digital
ILGAP		READPRE (6923)	Read Preamplifier
IGO		SERVPA (7111)	Servo Power Amplifier
IREW	4-J1	SERVPRE (7147)	Servo Preamplifier
IOFL	4-J2		
IFEN	4-J2		
IHSP	4-J2		
ITADO	5-J1		
IFAD	5-J2		
ITAD1	5-J2		
IW(0-7,P)	6-J1		

FROM FORMATTER (FMTR)

<u>Signal</u>	<u>From FMTR Sheet-Conn</u>	<u>To:</u>	<u>Schematic Sheet-Conn</u>
IR(0,1,4-7,P)	7-J2	Host	
IR(2,3)	7-J1		
IRSTB	9-J2		
IWSTB	9-J2	Host	
WD(0-7)	6-P1	DIG R/W	5-P1
LST WORD	8-P1	DIG R/W	5-P1
FDB(0-7)	10-P1	ELEC	3-P1
"		READA	
"		DIG R/W	
FSEL(0,1)		ELEC	
FSEL(0-6)		DIG R/W	3-P1
FSEL(2-6)	10-P1	READA	2-P1
FMTR STRB	11-P1	ELEC	3-P1
"		DIG R/W	3-P1
"		READA	2-P1
FMTR BUSY		ELEC	3-P1
FMTR ACKN	11-P1	ELEC	3-P1
ERASE PWR EN	13-P1	DIG R/W	14-P1
WRT PWR EN	13-P1	DIG R/W	14-P1
IFPT	5-J2	Host	
IRWD			
IRDY			
IONL	5-J2	Host	

FROM FORMATTER (FMTR) Continued)

<u>Signal</u>	<u>From FMTR Sheet-Conn</u>	<u>To: Host</u>	<u>Schematic Sheet-Conn</u>
IEEOT	5-J1		
IRSC	5-J1		
ILD P	5-J2		
IEOT	↑		
INRZ	↓		
ISPD	5-J2		
IDENT	5-J1		
IFBY	5-J2		
IHER	↑		
ICER	↓		
IFMK	5-J2		

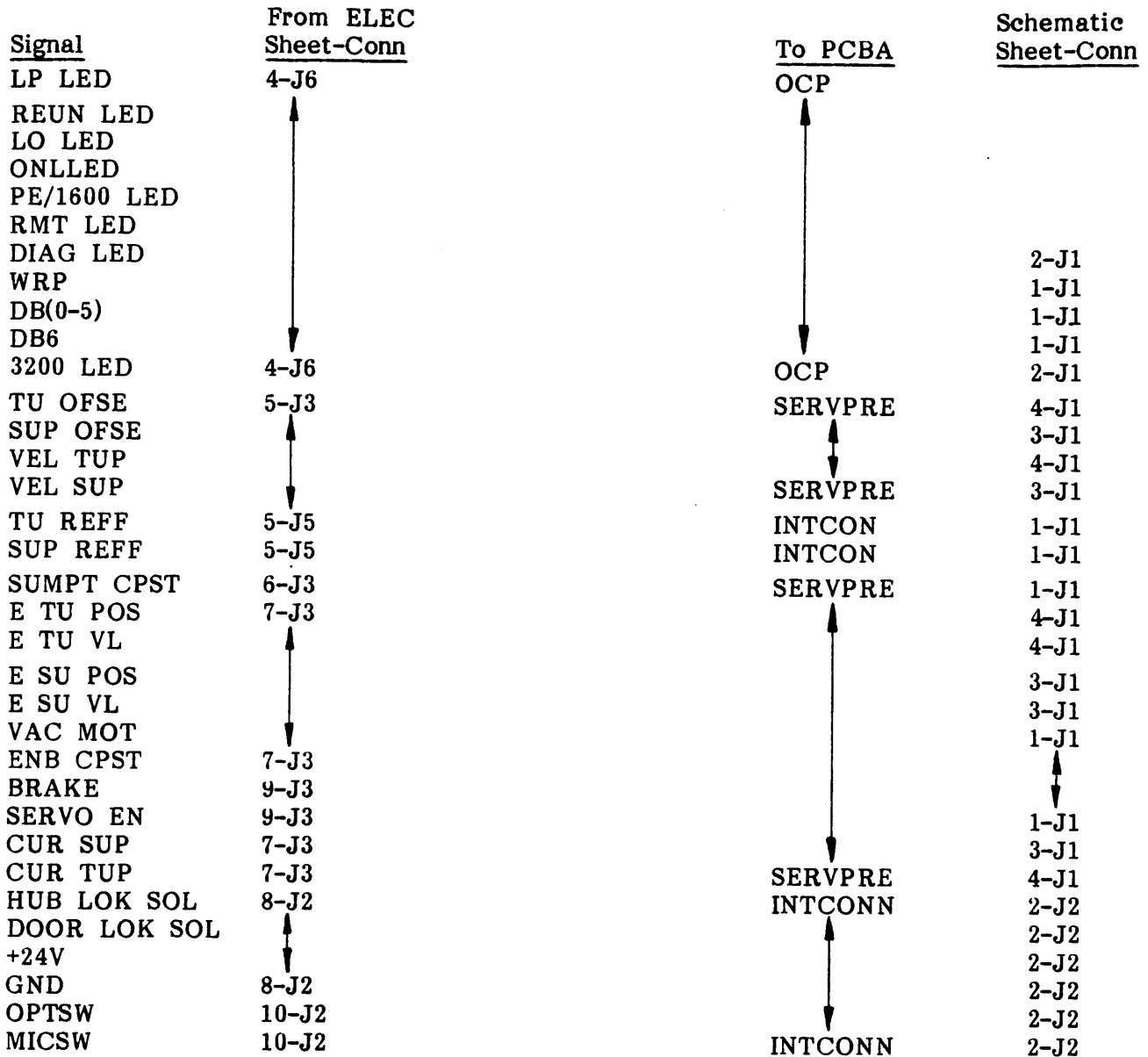
TO FORMATTER

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To FMTR Sheet-Conn</u>
FBREQ			10-P1
MSTR RES	3-P1	ELEC	2-P1
RD(0-7,P)	13-P2	DIG R/W	7-P2
RD DATA STRB	12-P2	↑	9-P2
WRT DATA STRB	2-P1	↓	9-P2
HRD ERROR	12-P1		10-P1
CRECTD ERROR	10-P1		10-P1
FILE MARK	10-P1	DIG R/W	10-P1
DDB(0-7)	3-P1	ELEC	11-P1
DRV SEL(0,1)	3-P1	↑	↑
TACH	4-P1	↓	↓
FWD/REV	4-P1		11-P1
DRV STRB	3-P1	ELEC	13-P1
RD BUSY	↑	DIG R/W	↑
WRT BUSY	↓	DIG R/W	↓
DRV BUSY		ELEC	
DRV ACKN	3-P1	ELEC	13-P1

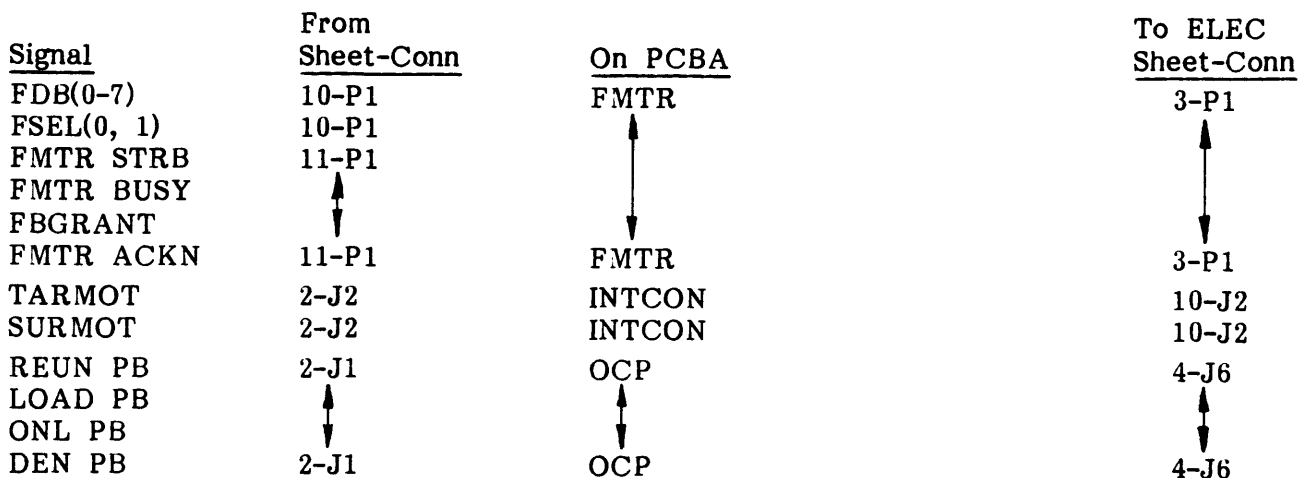
FROM DRIVE ELECTRONICS (ELEC)

<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
"	"	DIG R/W	3-P1
FWD/REV	4-P1	FMTR	11-P1
TACH	4-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

FROM DRIVE ELECTRONICS (ELEC) (Continued)



TO DRIVE ELECTRONICS (ELEC)



TO DRIVE ELECTRONICS (ELEC) (Continued)

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To ELEC Sheet-Conn</u>
RST PB	2-J1	OCP	4-J6
STRT PB	↕	↕	↕
SCAN PB	2-J1	↕	4-J6
DIAG PB	1-J1	OCP	2-J6
DSP FUL	↕	INTCON	4-J5
TPHA	↕	↕	4-J5
TPHB	↕	INTCON	7-J5
SUP POS	1-J1	INTCON	↕
TUP POS	4-J1	SERVPRE	↕
TUP MOV	3-J1	SERVPRE	7-J3
SUP MOV			

FROM OPERATOR CONTROL PANEL (OCP)

<u>Signal</u>	<u>From OPC Sheet-Conn</u>	<u>To: ELEC</u>	<u>Sheet-Conn</u>
REUN PB	2-J1	↕	4-J6
LOAD PB	↕	↕	↕
ONL PB	↕	↕	↕
DEN PB	↕	↕	↕
RST PB	↕	↕	↕
STRT PB	↕	↕	↕
SCAN PB	2-J1	↕	↕
DIAG PB	1-J1	ELEC	4-J6
DSP FUL			

TO OPERATOR CONTROL PANEL (OCP)

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

FROM READ ANALOG BOARD (READA)

<u>Signal</u>	<u>From READA Sheet-Conn</u>	<u>To:</u>	<u>Schematic Sheet-Conn</u>
EGC(1-9)	4-J1	READPRE	1-P2
ENV(0-7,P)	7-P2	READD	11-P2
TD(0-3)	↕	DIG R/W	7-P2
TD(4-6)	↕	DIG R/W	8-P2
TD(7, P)	7-P2	DIG R/W	9-P2

TO READ ANALOG BOARD (READA)

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To READA Sheet-Conn</u>
FSEL(2-6)	10-P1	FMTR	2-P1
FDB(0-7)	10-P1	FMTR	3-P1
FMTR STRB	11-P1	FMTR	2-P1
PE BLOCK	10-P1	DIG R/W	5-P1
HD(0-7,P)	15-P2	DIG R/W	8-P2
TRK(1-9)+	1-P2	READPRE	6-J1
TRK(1-9)-	1-P2	READPRE	6-J1

FROM READ PREAMPLIFIER (READPRE)

<u>Signal</u>	<u>From READPRE Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>
TRK(1-9)+	1-P2	READA	6-J1
TRK(1-9)-	1-P2	READA	6-J1

TO READ PREAMPLIFIER (READPRE)

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

FROM DIGITAL READ/WRITE BOARD (DIG R/W)

<u>Signal</u>	<u>From DIG R/W Sheet-Conn</u>	<u>To:</u>	<u>Sheet-Conn</u>	
RD(0-7,P)	13-P2	FMTR	7-P2	
CRECTD ERROR	10-P1	↑ ↓	10-P1	
HRD ERROR	12-P1		10-P1	
RD DATA STRB	12-P2		9-P2	
RD BUSY	3-P1		13-P1	
FILE MARK	10-P1		10-P1	
WRT BUSY	3-P1		13-P1	
WRT DATA STRB	2-P1		FMTR	9-P2
HD(0-7,P)	15-P2		READA	8-P2
ERASE HD+	14-J2		Erase Head (Black)	
ERASE HD-	14-J2		Erase Head (White)	
TRK(1-9)	15-J1	Write Head		
WRT VOL	15-J1	Write Head		

TO DIGITAL READ/WRITE BOARD (DIG R/W)

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To DIG R/W Sheet-Conn</u>
MSTR RES	3-P1	ELEC	3-P1
TD(0-3)	7-P2	READA	7-P2
TD(4-6)	7-P2	↑	8-P2
TD(7,P)	7-P2	↓	9-P2
ENV(0-7,P)	7-P2	READA	11-P2
FDB(0-7)	10-P1	FMTR	3-P1
FMTR STRB	11-P1	↑	3-P1
FSEL(0-6)	10-P1	↓	3-P1
WD(0-7)	6-P1	↑	5-P1
ERASE PWR EN	13-P1	↓	14-P1
WRT PWR EN	13-P1	↓	14-P1
LST WORD	8-P1	FMTR	5-P1

FROM SERVO PREAMPLIFIER (SERVPRE)

<u>Signal</u>	<u>From SERVPRE Sheet-Conn</u>	<u>To: SERVPA</u>	<u>Sheet-Conn</u>
VAC MOT	1-J3	↑	3-J3
SUMPT CPST	1-J3	↑	3-J3
ABRAKE	1-J3	↑	3-J3
SERVO EN	1-J3	↑	2-J3
ENB CPST	1-J3	↑	2-J3
OSC	2-J3	↑	3-J3
-REF	2-J3	↑	4-J3
+REF	2-J3	↑	↑
SUP MOD	3-J3	↑	↓
TUP MOD	4-J3	↑	4-J3
SUP MOV	3-J1	↑	8-J3
TUP MOV	4-J1	↑	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	↑	↑
ENB CPST	8-J3	↑	↓
BRAKE	8-J3	↑	1-J1
SERVO EN	8-J3	↑	3-J1
SUP OFSE	6-J3	↑	↑
E SU POS	8-J3	↑	↓
E SU VL	8-J3	↑	↑
SUP OFST	6-J3	↑	↓
CUR SUP	8-J3	↑	3-J1
CUR SUP GND	8-J3	↑	4-J1
VEL SUP	6-J3	↑	↑
TU OFSE	6-J3	↑	↓
E TU POS	8-J3	↑	↑
E TU VL	8-J3	↑	↓
CUR TUP	8-J3	↑	↑
CUR TUP GND	8-J3	↑	↓
TU OFST	8-J3	↑	↓
VEL TUP	6-J3	ELEC	4-J1

TO SERVO PREAMPLIFIER (SERVPRE)

<u>Signal</u>	<u>From Sheet-Conn</u>	<u>On PCBA</u>	<u>To SERVPRE Sheet-Conn</u>
I SUP	1-J2	SERVPA ↑ ↓ SERVPA	3-J3
V SUP	1-J2		3-J3
I TUP	1-J3		4-J3
V TUP	1-J3		4-J3
I SENS LO	1-J2		4-J3

FROM SERVO POWER AMPLIFIER (SERVPA)

<u>Signal</u>	<u>From SERVPA Sheet-Conn</u>	<u>To: SERVPRE</u>	<u>Sheet-Conn</u>
I SUP	1-J3	SERVPRE ↑ ↓ SERVPRE	1-J2
I TUP	↑		4-J3
V TUP	↓		1-J2
V TUP	1-J3		4-J3
V SUP	1-J2		3-J3
I SENS LO	↑		4-J3
TU MOT DRV	↓		
TU MOT RET	↓		
SU MOT DRV	↓		
SU MOT RET	1-J2		
VAC MOT DRV	3-J2		
VAC MOT RET	↑		
CPSTN MOT DRV	↓		
CPSTN MOT RET	3-J2		

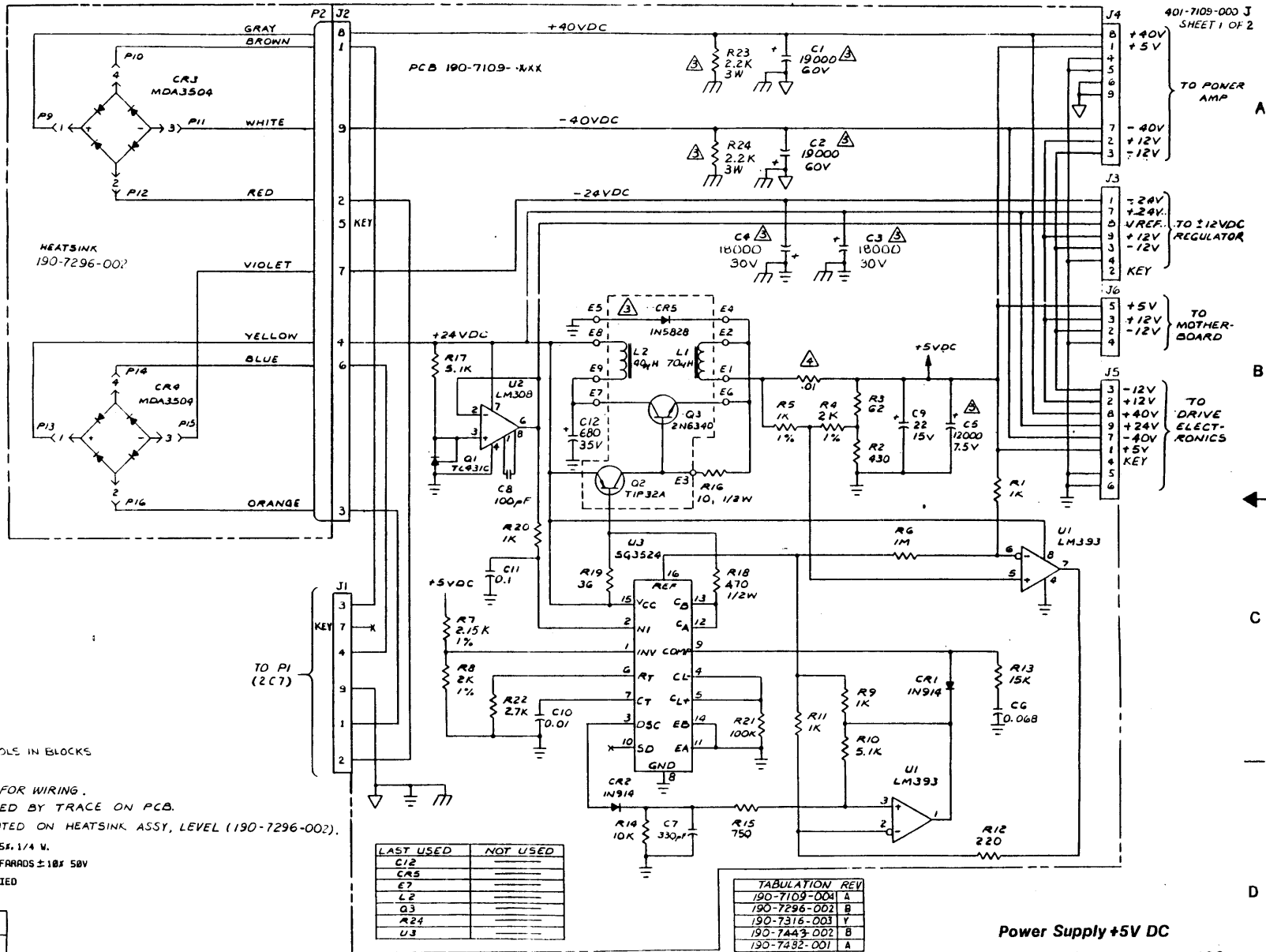
TO SERVO POWER AMPLIFIER (SERVPA)

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

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190-7109 TABULATION

DRSH NO	REV
-005	A



- ⚠ LETTERS AND SYMBOLS IN BLOCKS ARE TERMINALS.
- G. REF 108-0666-001
5. SEE 190-7145-001 FOR WIRING.
- ⚡ RESISTANCE CREATED BY TRACE ON PCB.
- ⚡ COMPONENTS MOUNTED ON HEATSINK ASSY, LEVEL (190-7296-002).
2. RESISTORS ARE IN OHMS ± 5%, 1/4 W.
1. CAPACITORS ARE IN MICROFARADS ± 10% 50V

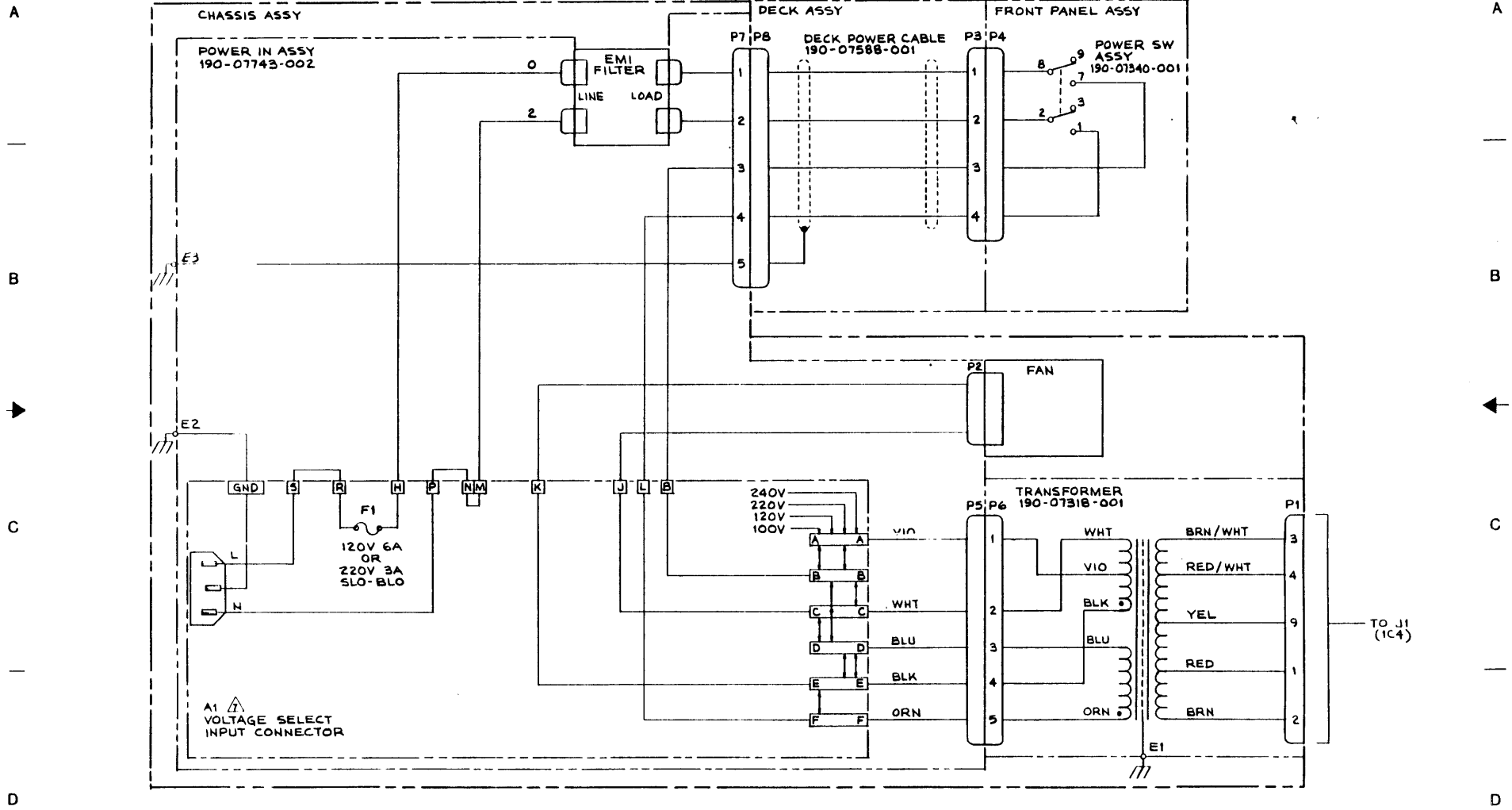
NOTES: UNLESS OTHERWISE SPECIFIED

REV STATUS OF SHEETS	REV	J	J
	SHEET	1	2

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

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

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

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

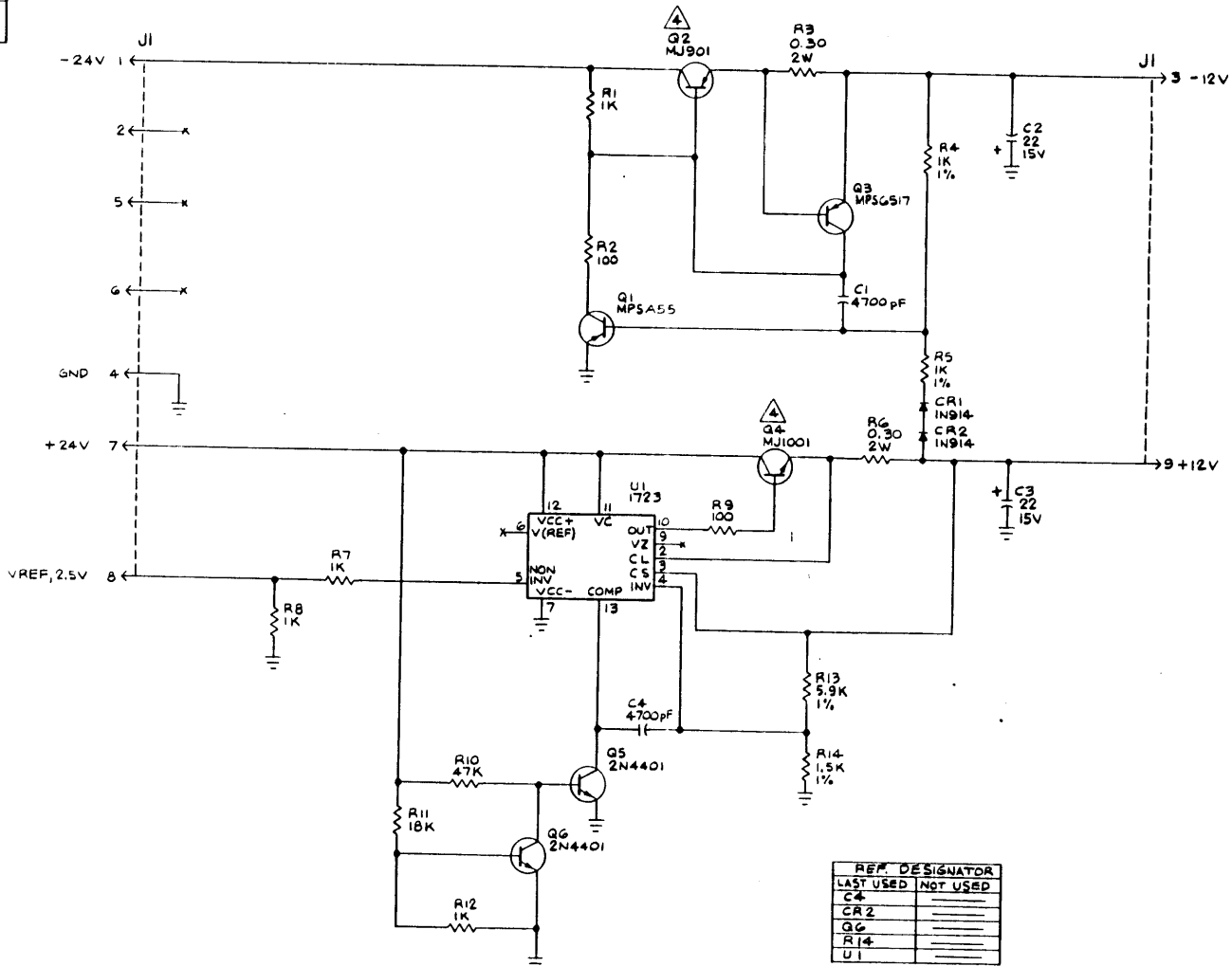
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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401-7148-000 B
SHEET 1 OF 1

90-07148-XXX TABULATION

A	REF DES	DASH NO	REV
		-003	A



B

C

D

A

B

C

D

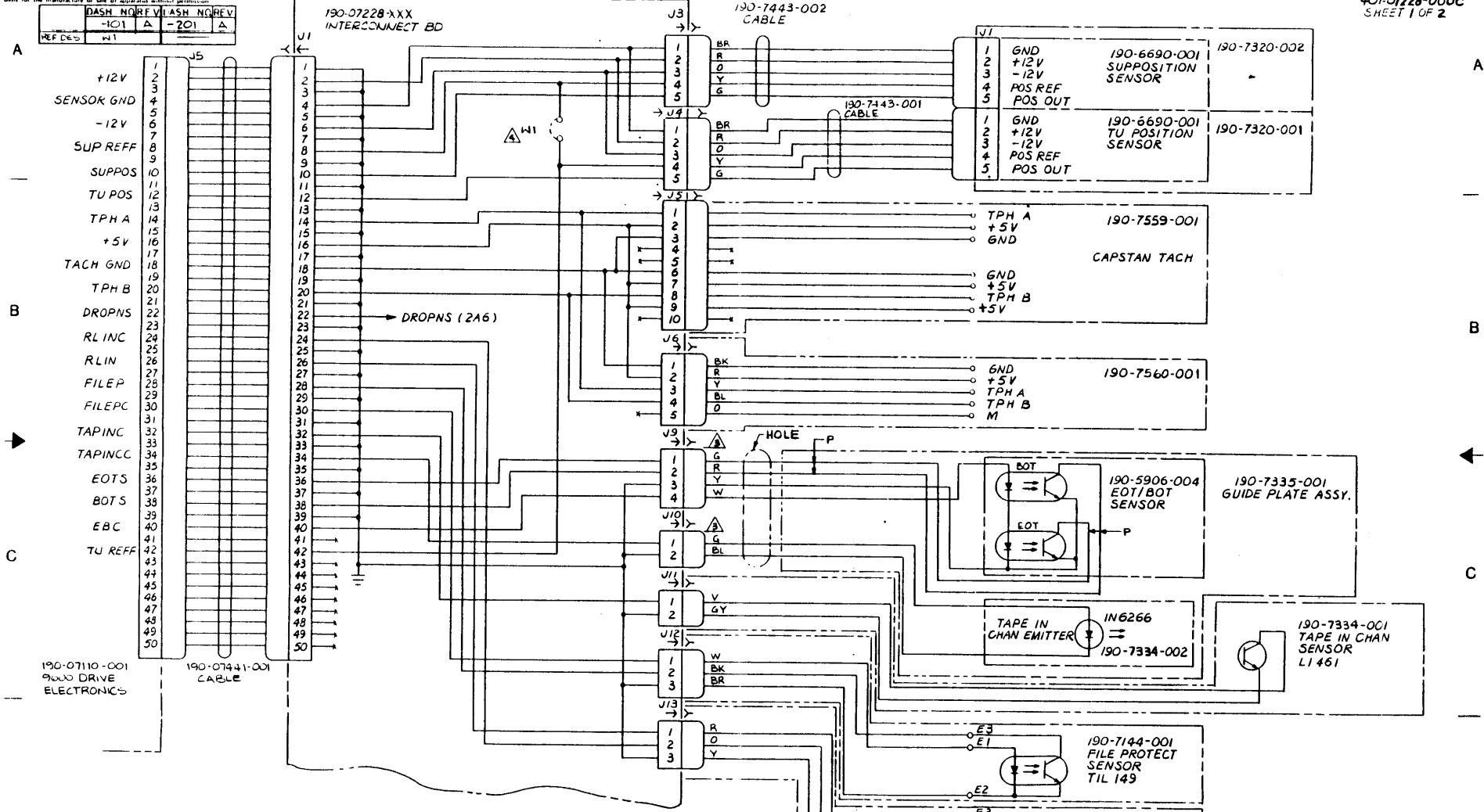
1. MOUNT ON HEAT SINK 304-7295-001.
 2. ALL CAPACITOR VALUE ARE IN MICROFARADS.
 3. ALL RESISTOR VALUE ARE IN OHMS ±5% 1/4 W.
 4. X INDICATES NO CONNECTION.
 NOTES: UNLESS OTHERWISE SPECIFIED.

± 12V Regulator
 Type 7148
 Schematic Diagram

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

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401-07228-000C
SHEET 1 OF 2



- D
- SEE TABULATION.
 - CONNECTORS LOCATED DECK ASSY 190-7336-XXX
 - RESISTOR VALUES ARE IN OHMS, 1/4 W, 15%.
 - X INDICATED NO CONNECTION.
- NOTES: UNLESS OTHERWISE SPECIFIED.

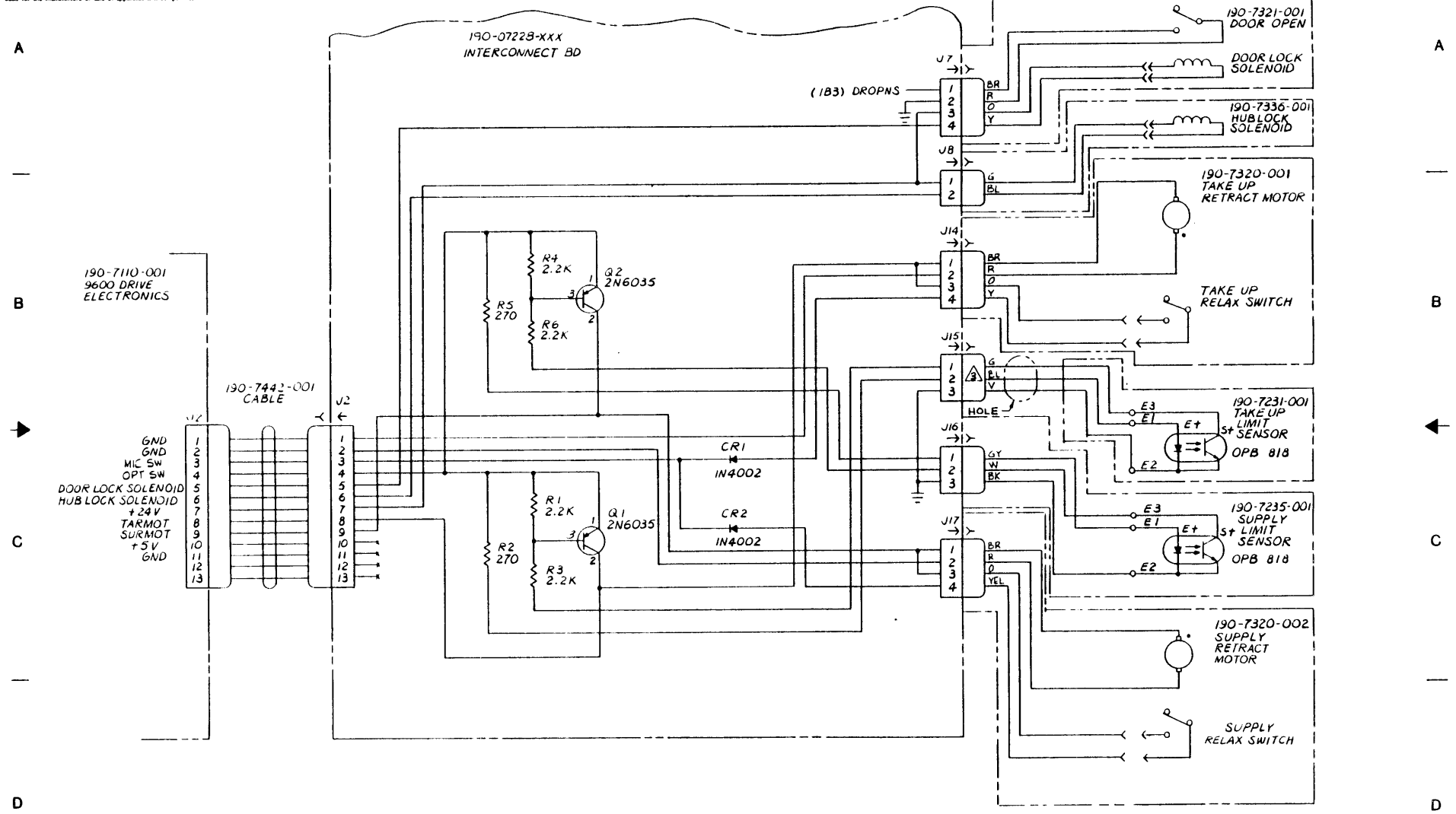
REF DES	
LAST USED	NOT USED
CR2	
J17	
J2	
R6	
H1	

REV STATUS	REV	C	D
OF SHEETS	SHEET	1	2

Interconnect Bd
Type 7228
Schematic Diagram

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401-07228-000D
SHEET 2 OF 2



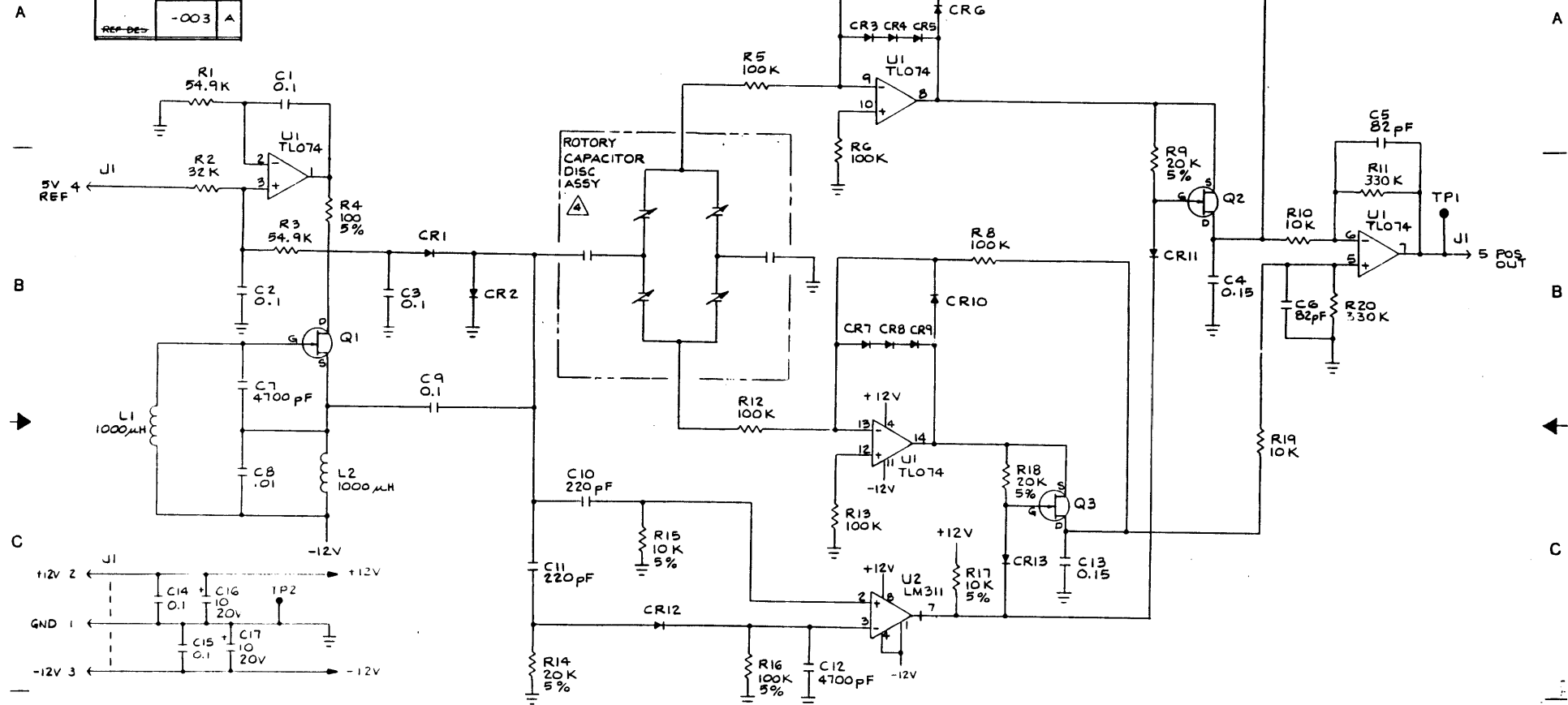
Interconnect Bd
Type 7228
Schematic Diagram

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190-7710 TABULATION

DRSH NO	REV
-003	A

401-07710-000C
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.

REF DESIGNATORS	LAST USED	NOT USED
C17		
CR13		
L2		
Q3		
R20		
TP2		
U2		

NOTES: UNLESS OTHERWISE SPECIFIED.

REV STATUS OF SHEETS	REV SHEET	C
	1	1

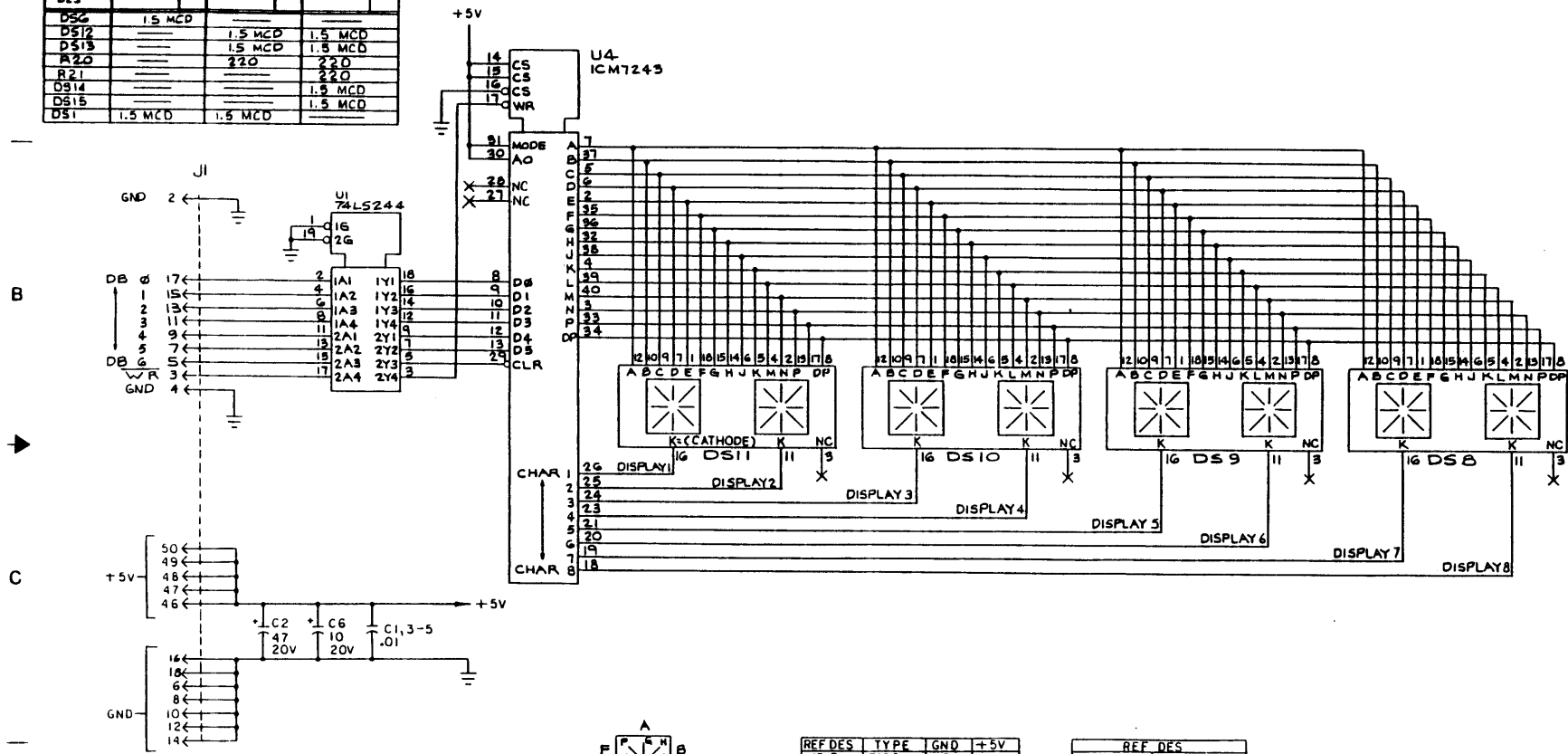
POSITION SENSOR
TYPE 7710
SCHEMATIC DIAGRAM

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401-07947-000
SHEET 1 OF 2

130-07947 TABULATION

REF DES	DASH NO	REV	DASH NO	REV	DASH NO	REV
A	-102	A	-203	A	-312	A
DS2	1.5 MCD					
DS12			1.5 MCD		1.5 MCD	
DS13			1.5 MCD		1.5 MCD	
R20			220		220	
R21					220	
DS14					1.5 MCD	
DS15					1.5 MCD	
DS1	1.5 MCD		1.5 MCD			



- SEE TABULATION FOR COMPONENTS USED.
- ALL DIODES ARE 1.5 MCD
 - RESISTORS ARE IN OHMS: 5%, 1/4 W.
 - CAPACITORS ARE IN MICROFARADS: 10%, 50V
- NOTE: UNLESS OTHERWISE SPECIFIED

REV STATUS OF SHEETS	REV	G	C
	SHEET	1	2

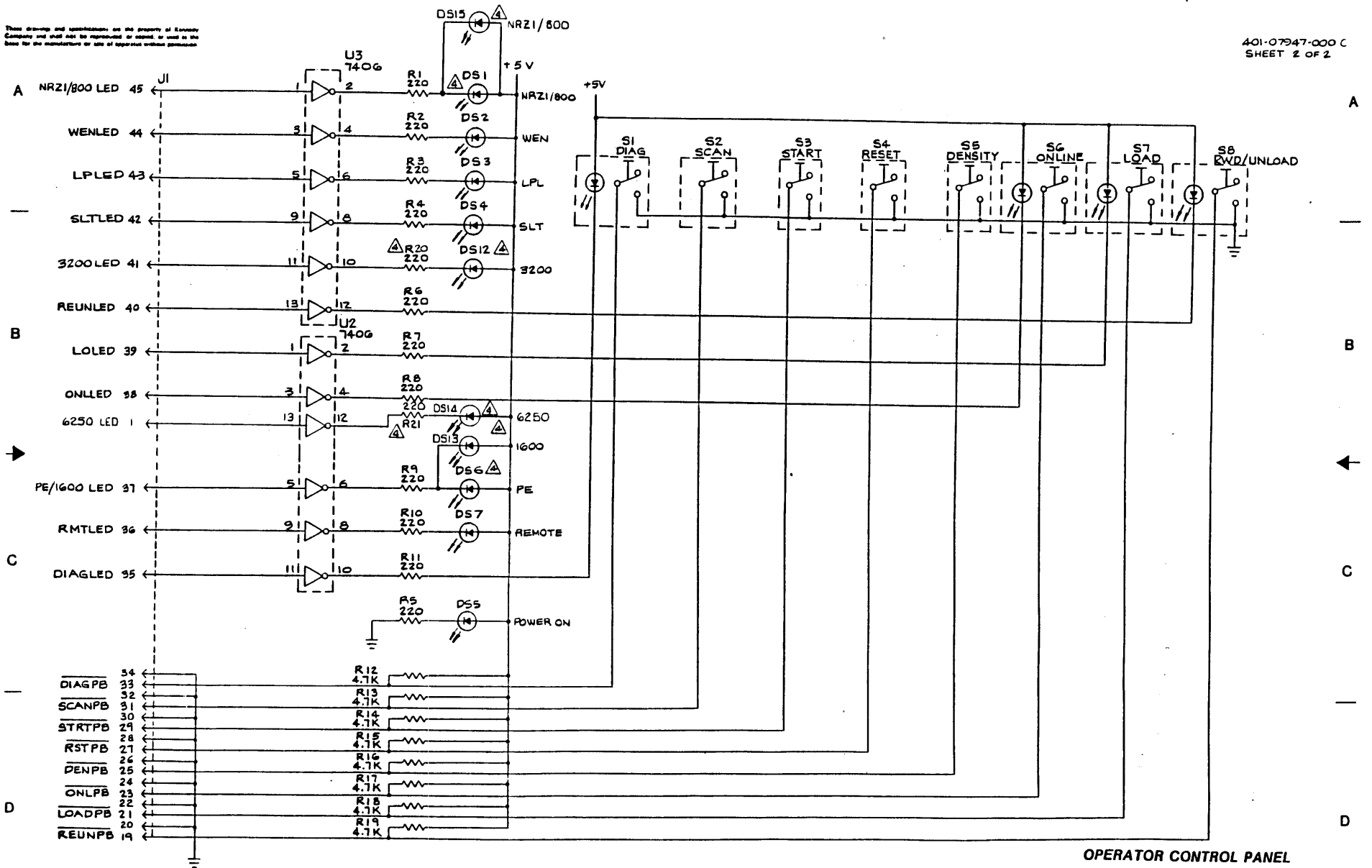
REF DES	TYPE	GND	+5V
U2,3	7406	7	14
U4	7243	22	1
U1	74LS244	10	20

REF DES	LAST USED	NOT USED
C6		
DS15		
J1		
R21		
S8		
U4		

OPERATOR CONTROL PANEL
TYPE 7947
SCHEMATIC DIAGRAM

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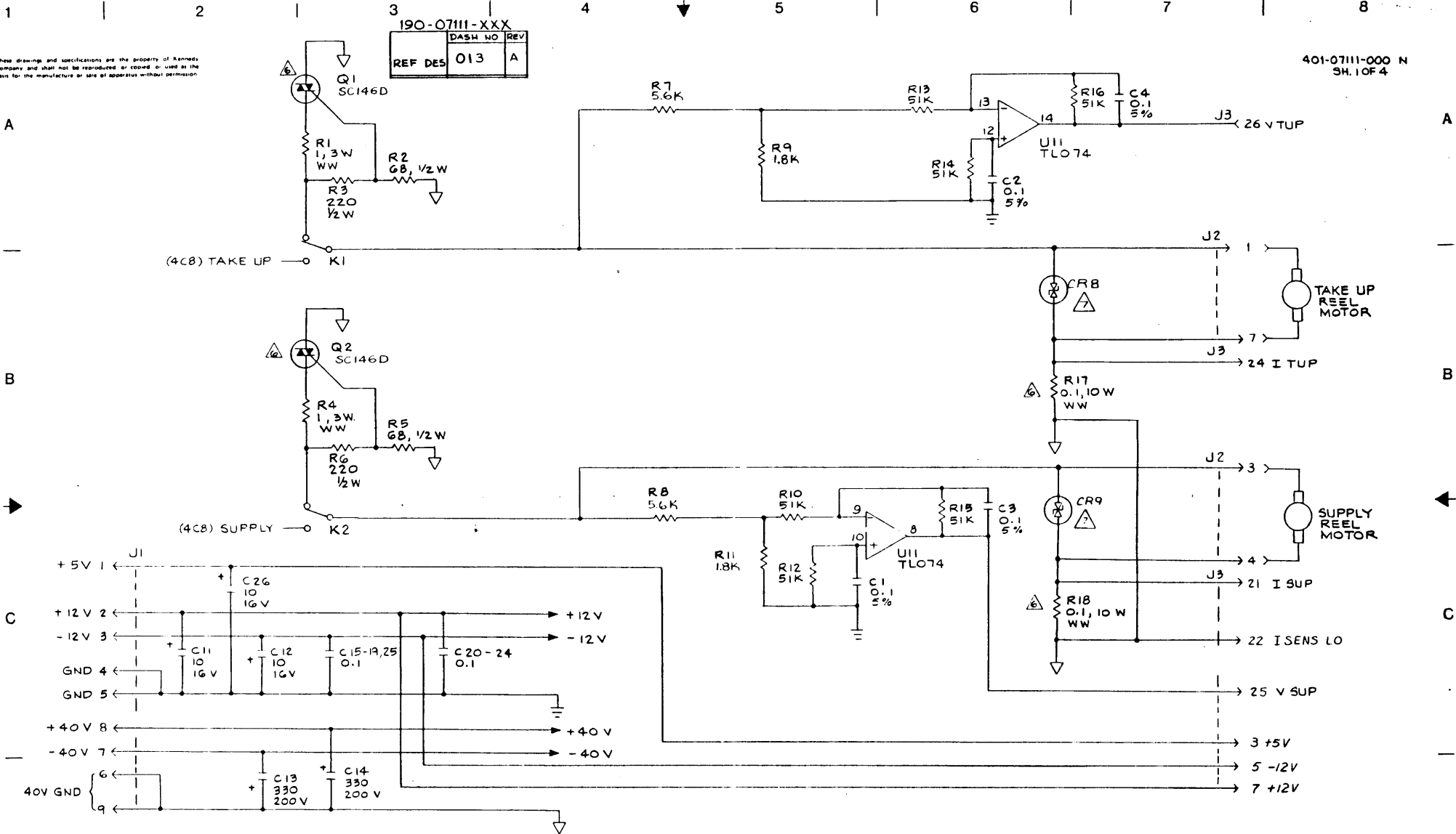
401-07947-000 C
SHEET 2 OF 2



OPERATOR CONTROL PANEL
TYPE 7947
SCHEMATIC DIAGRAM

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401-07111-000 N
SH. 1 OF 4



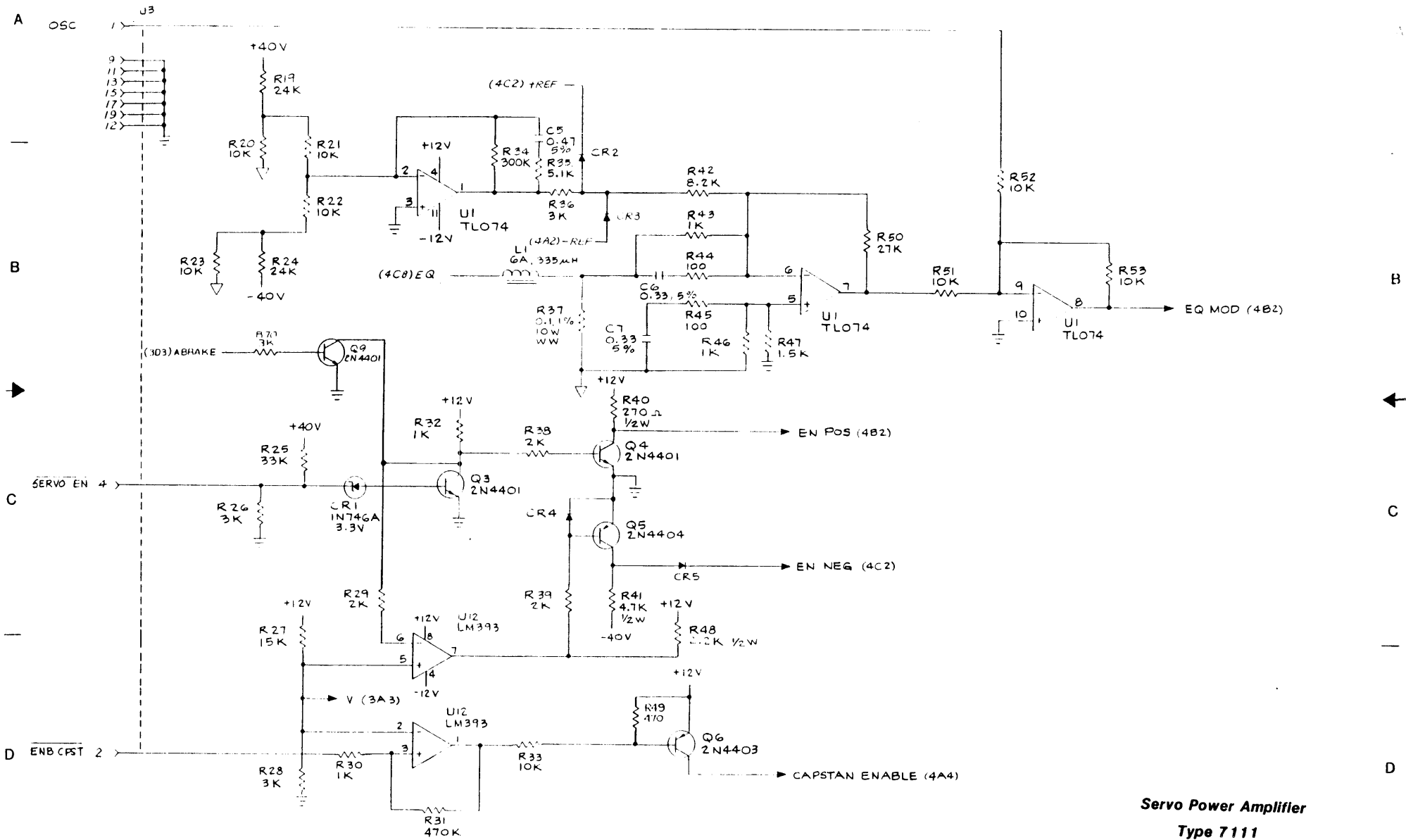
- D
- 1. COMPONENTS NOT USED, SHOWN FOR FULL CAPABILITY OF THE BOARD.
 - 2. COMPONENTS MOUNTED ON HEAT SINK. 190-7289-001
 - 3. SEE SH. 4 FOR NOTES ON TYPICAL SECTION.
 - 4. ALL DIODES ARE 1N914
 - 5. X INDICATES NO CONNECTION.
 - 6. ALL RESISTOR VALUES ARE IN OHMS $\pm 5\%$, 1/4-W.
 - 7. ALL CAPACITOR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

REF. DESIG.	
LAST USED	NOT USED
C 27	CB, 9
CR 10	
K 2	
L 1	
Q 9	
R 72	R 51, 58
U 15	U 2, 10

REV STATUS OF SHEETS	REV	N	N	N	C
	SHEET	1	2	3	4

**Servo Power Amplifier
Type 7111
Schematic Diagram**

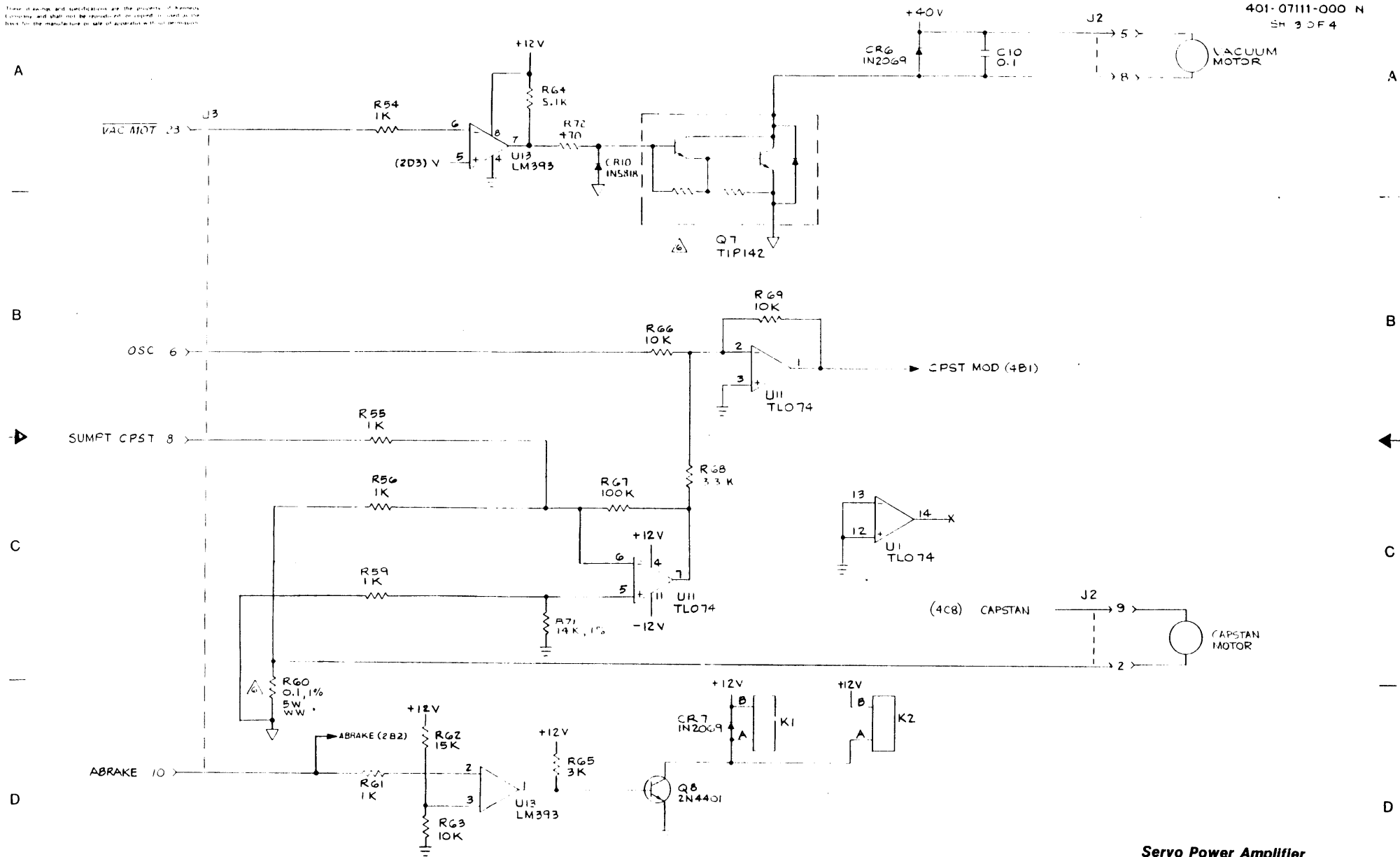
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Servo Power Amplifier
Type 7111
Schematic Diagram

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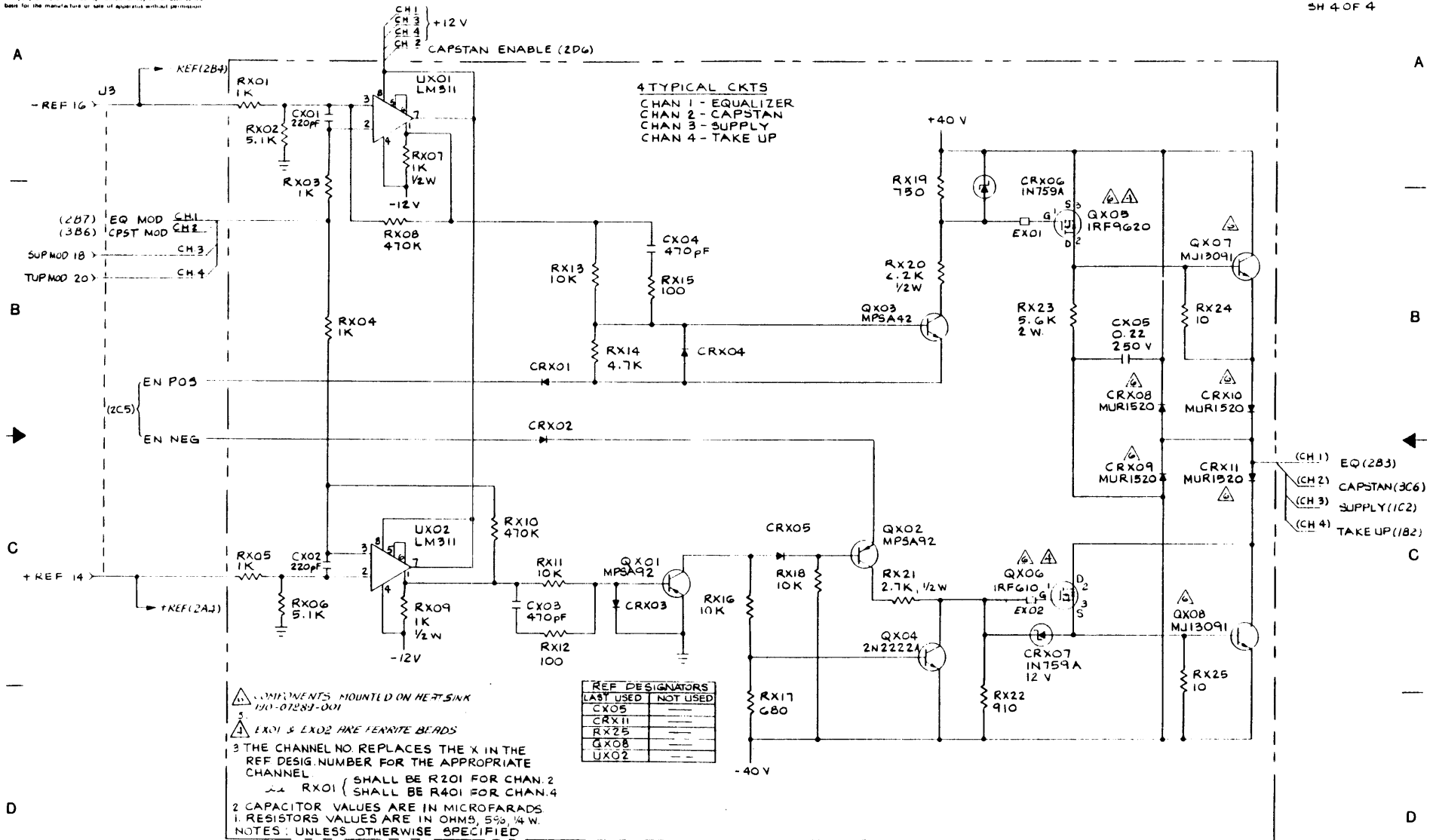
401-07111-000 N
SH 3 OF 4



Servo Power Amplifier
Type 7111
Schematic Diagram

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401-07111-000 C
SH 4 OF 4



Servo Power Amplifier
 Type 7111
 Schematic Diagram

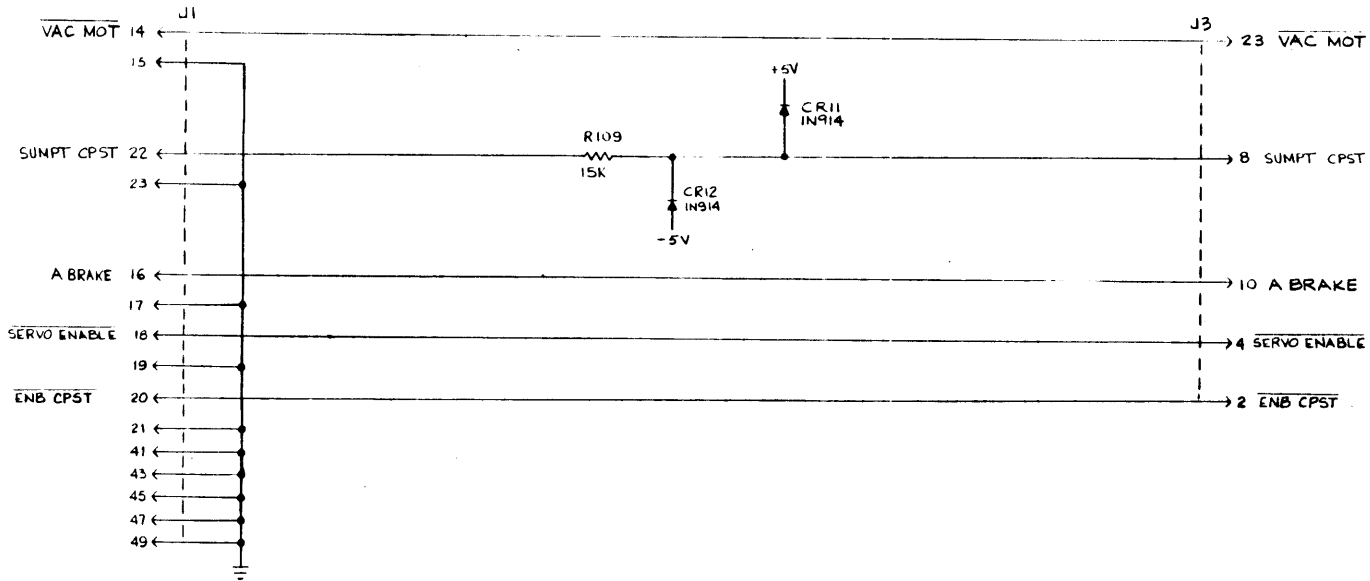
These drawings and specifications are the property of Kennedy Company and shall not be reproduced or copied or used as the basis for the manufacture or sale of apparatus without permission.

	DASH NO	REV
REF DES	003	B

401-7147-000 D
SHT. 1 OF 4

A

A



B

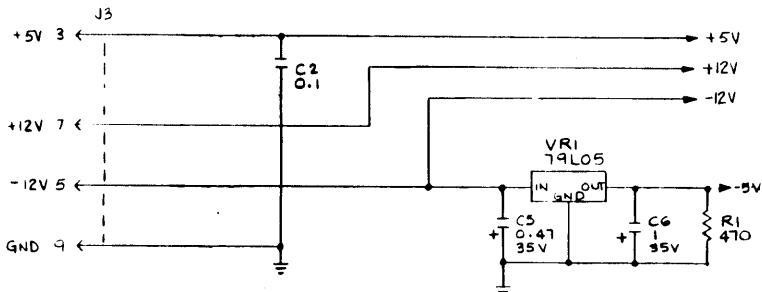
B

C

C

D

D



REF. DES.	TYPE	+5V	GROUND
U4	74LS02	14	7
U5	74LS32	14	7

REFERENCE	DESIG.
LAST USED	NOT USED
C41	C1
CR12	
Q2	
R113	
U11	
VR1	

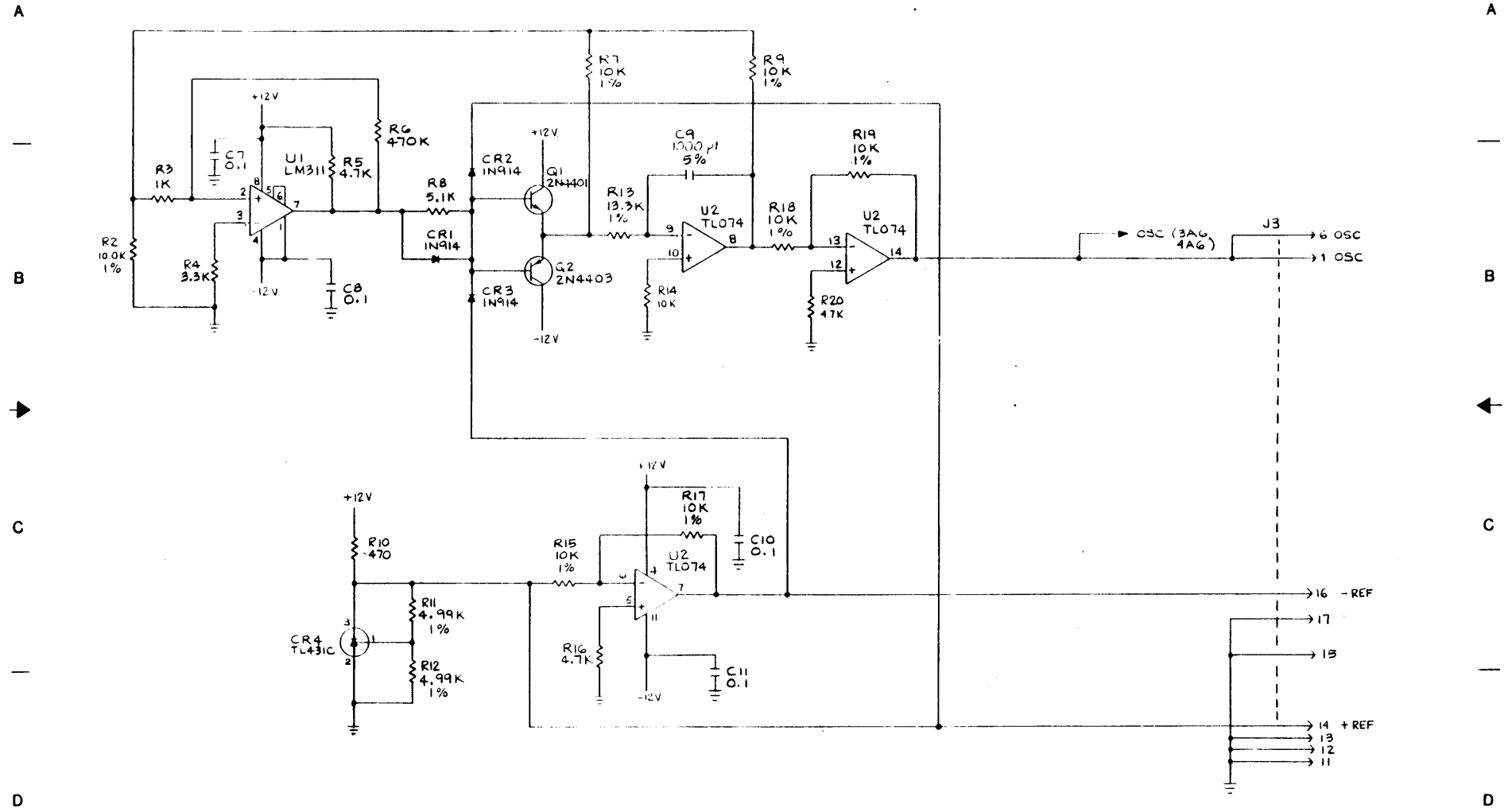
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS ± 5% 1/4 W.
1. X INDICATES NO CONNECTION.
NOTES: UNLESS OTHERWISE SPECIFIED.

REV STATUS OF SHEETS	REV	D	D	B	B
	SHEET	1	2	3	4

Servo Power Amplifier
Type 7147
Schematic Diagram

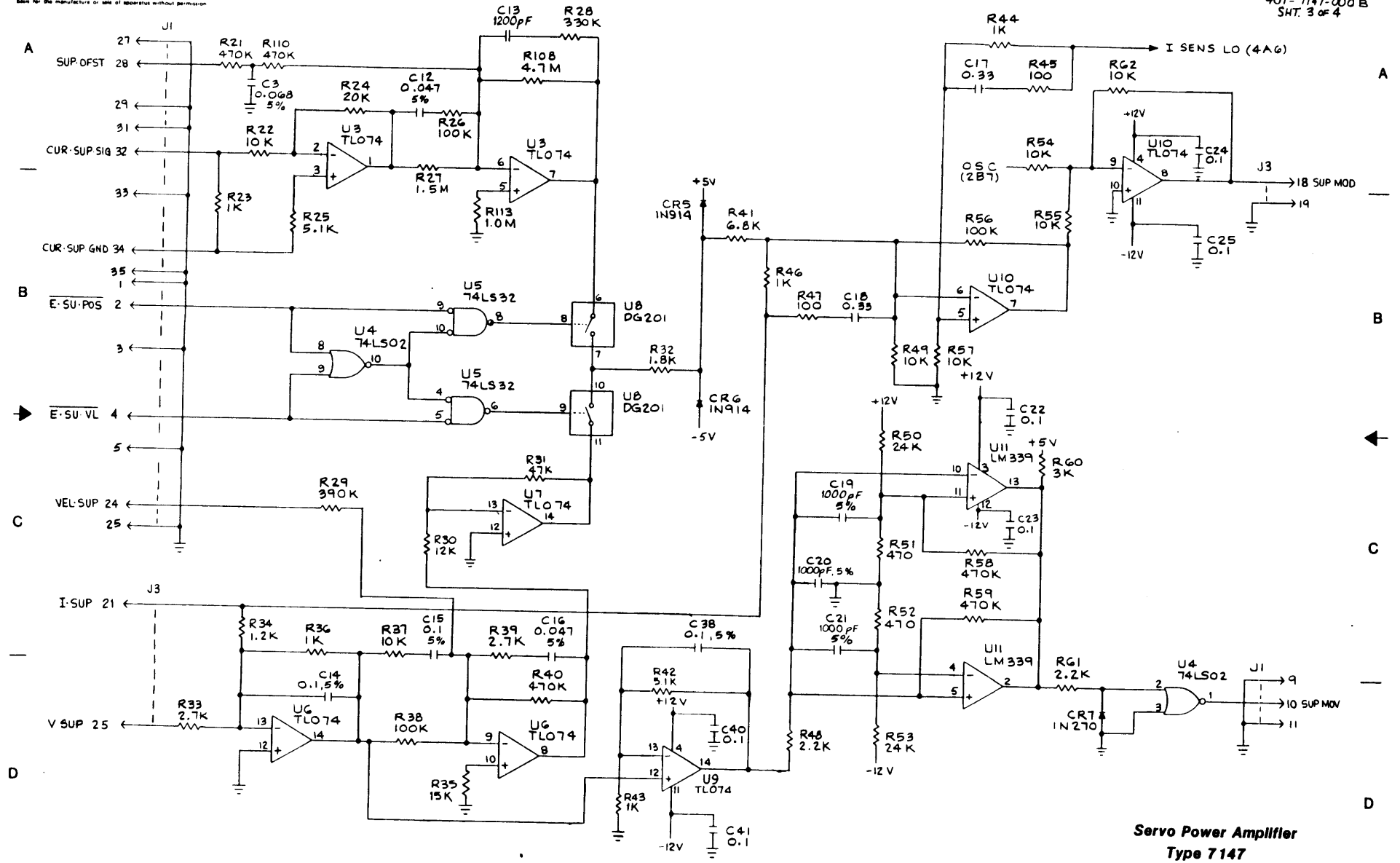
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401-7147-000 D
SHT. 2 OF 4



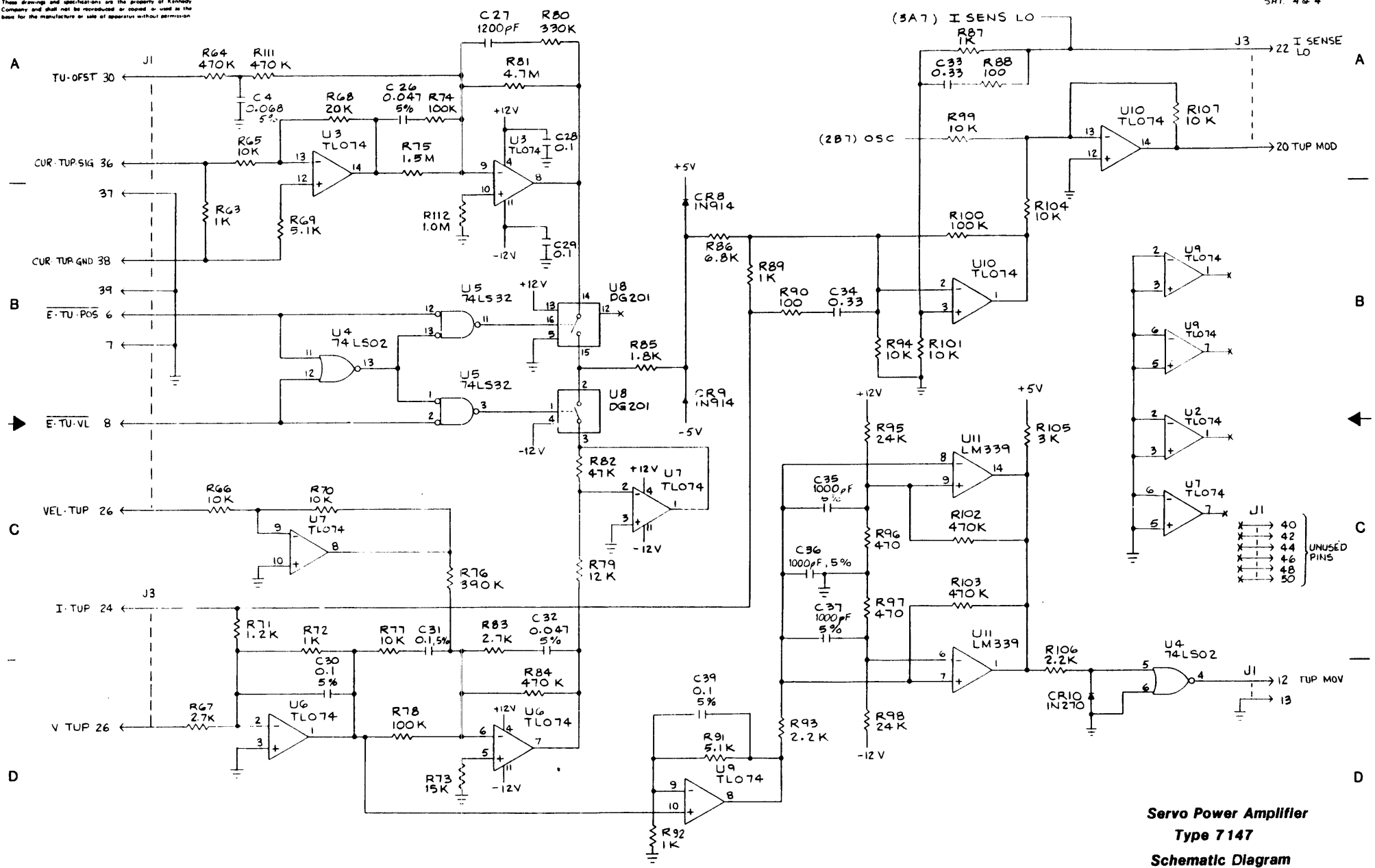
Servo Power Amplifier
Type 7147
Schematic Diagram

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**Servo Power Amplifier
Type 7147
Schematic Diagram**

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Servo Power Amplifier
Type 7147
Schematic Diagram

J1
40
42
44
46
48
50
UNUSED PINS

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

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401-07108-0006
SH. 1 OF 2

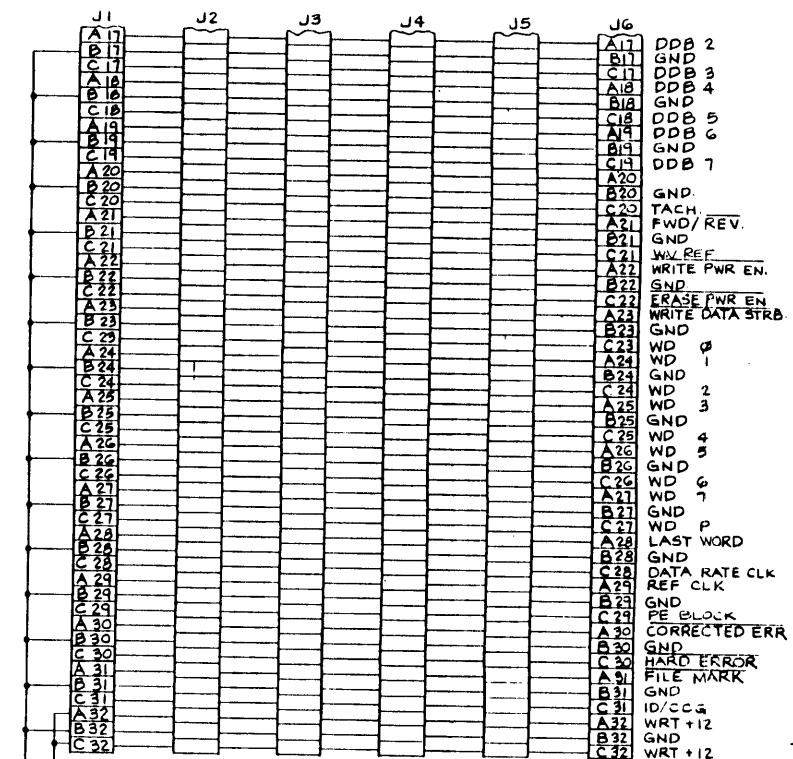
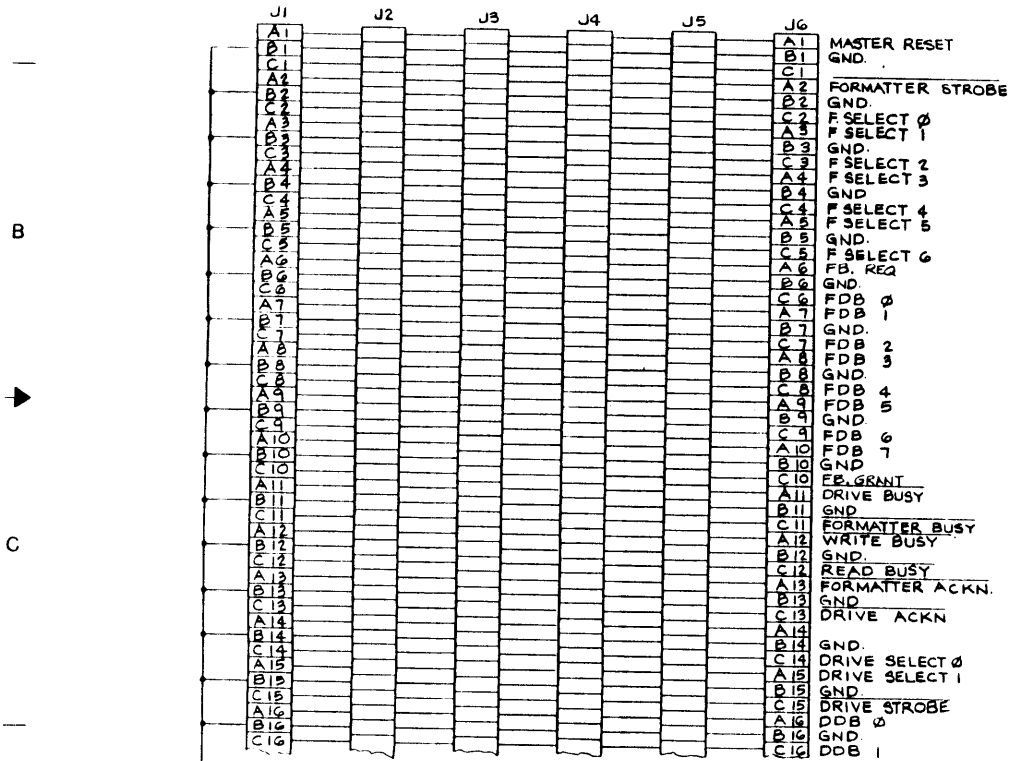
150-7108 TABULATION

A	DRAW NO	REV
	-001	D

REF. P1

REF. P1

CONTINUATION



WRT +12
(TO SHT. 2)

REV STATUS OF SHEETS	REV SHEET	6	6
		1	2

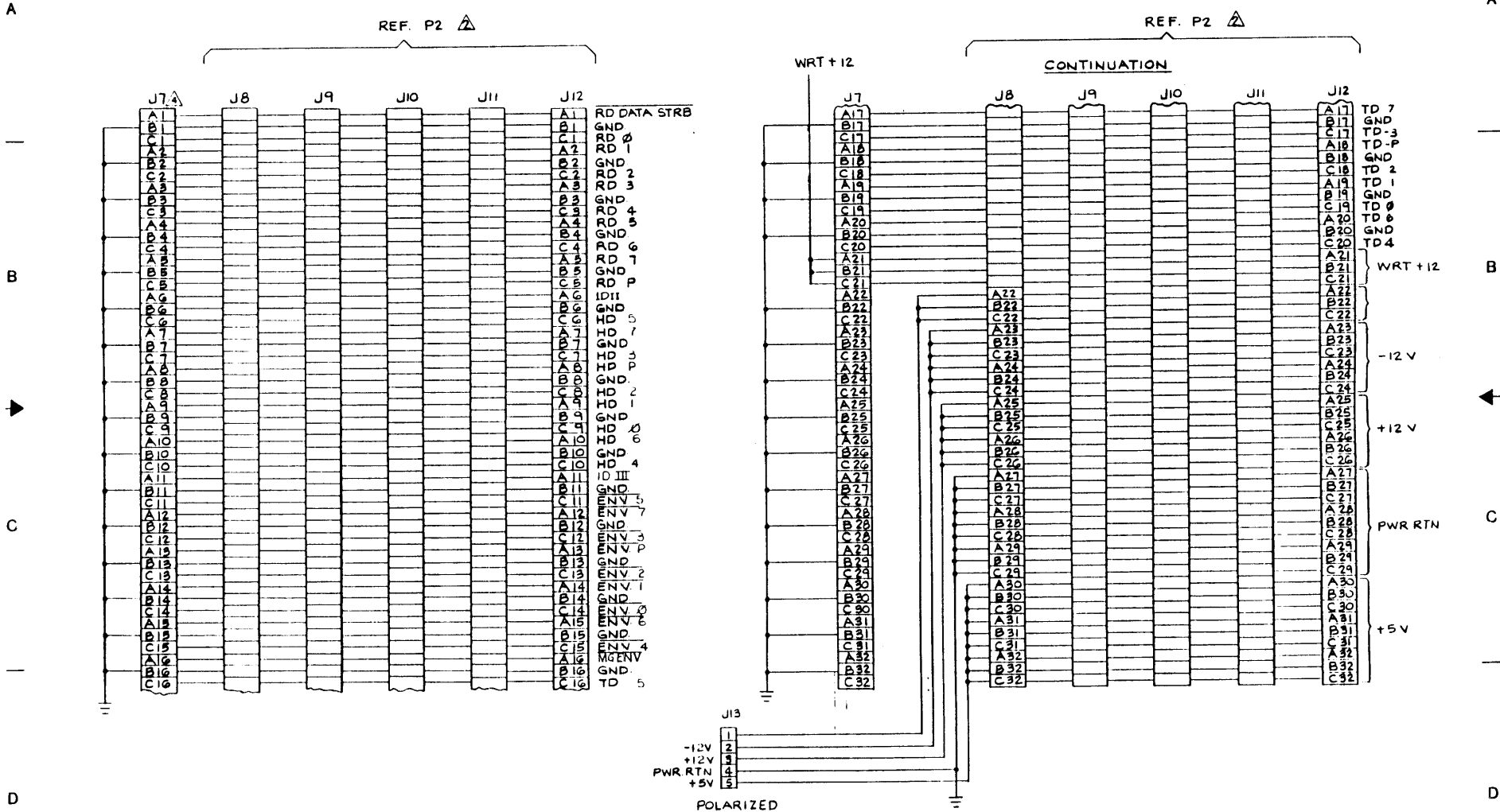
D
3 A CHANGE TO THIS DRAWING SHALL REQUIRE CO ORDINATION WITH ALL ASSOCIATED DRAWINGS
ALL BOARDS PLUGGED INTO J2-J6 AND J8-J12 ON THE MOTHER BOARD SHALL HAVE CONNECTORS IDENTIFIED AS P1 AND P2 P1'S MATE WITH J2-J6, P2'S MATE WITH J8-J12.
1 UNASSIGNED PINS ARE AVAILABLE FOR FUTURE USE.
NOTES: UNLESS OTHERWISE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

REMOVED

9600 Motherboard Signal Assignments
Type 7108
Schematic Diagram

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

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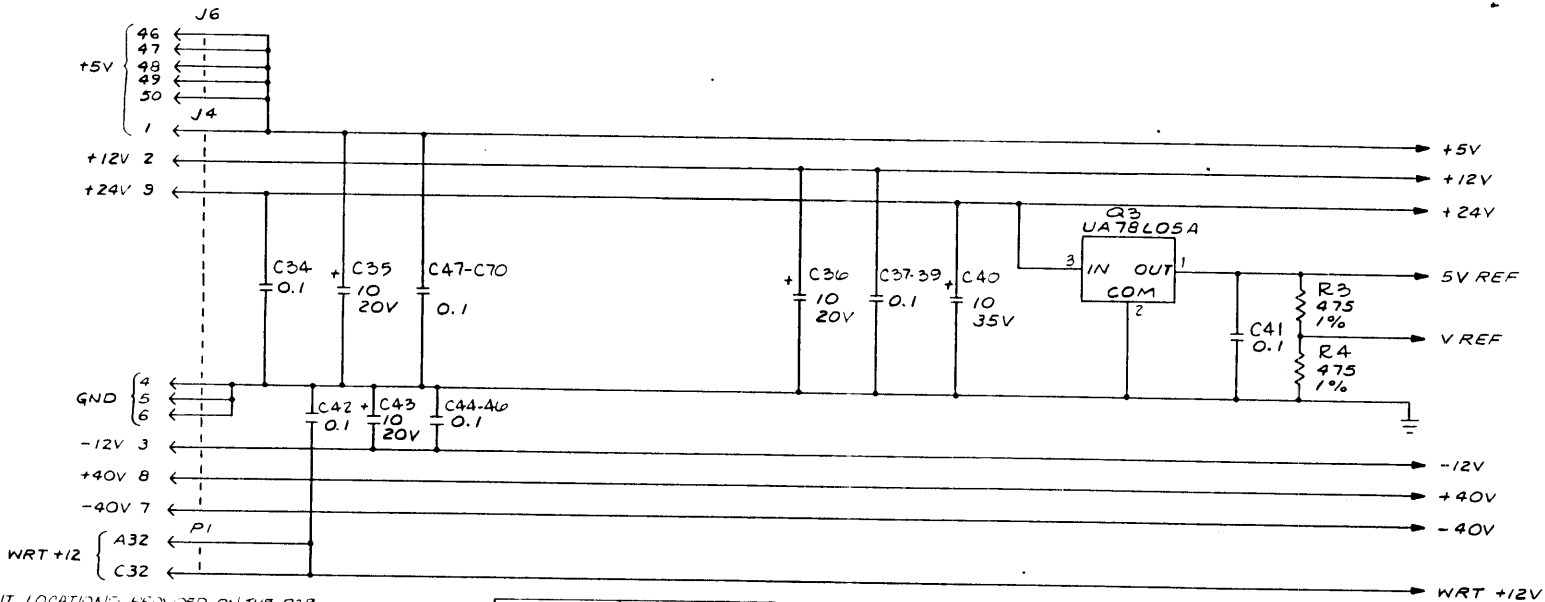
9600 Motherboard Signal Assignments
Type 7108
Schematic Diagram

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401-07952-000 R
SHEET 1 OF 10

190-07952 TABULATION

REF DES	DASH NO	REV	DASH NO	REV
	-012	A	113	B
U24	146-00193-007		146-00193-003	
U37	146-00191-002		146-00191-002	
U51	146-00192-001		146-00192-001	



△ COMPONENT LOCATIONS PROVIDED ON THE PCB, BUT ARE NOT USED.

△ CIRCUIT SHOWN USING 27250 IC TYPES 27128 AND 2764 ARE INTERCHANGEABLE WITH 27256, WITH THE EXCEPTION OF FUNCTIONS IN THE CONTROL BLOCK. SEE DIAGRAMS TO THE RIGHT.

5. ALL DIODES ARE 1N914.

△ P1 CONNECTOR PIN AND FUNCTIONS SHALL BE COORDINATED WITH THE MOTHER BOARD (401-07108-001). FOR PINS NOT SHOWN ON DRAWING.

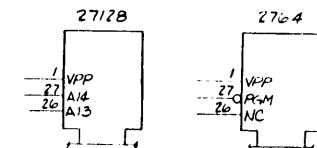
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS ± 5%, 1/4 W
1. X INDICATES NO CONNECTION.

NOTES: UNLESS OTHERWISE SPECIFIED.

REF DES	TYPE	QTY	5V
U28, 29, 28	74LS00	7	14
U6, 19, 57	74LS04	7	14
U7	74LS08	7	14
U18	74LS14	7	14
U45, 52	74LS32	7	14
U33, 53	74LS74	7	14
U4	7492	10	5
U6, 3	74LS07	7	14
U15	74LS93	7	14
U44	74LS148	8	14
U50	74LS165	8	14
U12, 22, 41, 65	74LS174	10	20
U25	74LS245	10	20
U3	74LS04	7	14

REF DES	TYPE	QTY	5V
U6, 1	74LS260	7	14
U1, 5, 16	74LS27	8	16
U29	74LS23	10	20
U42	74LS233	7	14
U21, 22, 34, 67	74LS270	8	16
U23	74LS270	14	28
U37	74LS270	7	14
U38	74LS270	7	14
U39	74LS270	7	14
U40	74LS270	7	14
U41	74LS270	7	14
U43	74LS270	7	14
U44	74LS270	7	14
U45	74LS270	7	14
U46	74LS270	7	14
U47	74LS270	7	14
U48	74LS270	7	14
U49	74LS270	7	14
U50	74LS270	7	14
U51	74LS270	7	14
U52	74LS270	7	14
U53	74LS270	7	14

REF DES	TYPE	QTY	5V
U24	74LS270	7	14
U25	74LS270	7	14
U26	74LS270	7	14
U27	74LS270	7	14
U28	74LS270	7	14
U29	74LS270	7	14
U30	74LS270	7	14
U31	74LS270	7	14
U32	74LS270	7	14
U33	74LS270	7	14
U34	74LS270	7	14
U35	74LS270	7	14
U36	74LS270	7	14
U37	74LS270	7	14
U38	74LS270	7	14
U39	74LS270	7	14
U40	74LS270	7	14
U41	74LS270	7	14
U42	74LS270	7	14
U43	74LS270	7	14
U44	74LS270	7	14
U45	74LS270	7	14
U46	74LS270	7	14
U47	74LS270	7	14
U48	74LS270	7	14
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U50	74LS270	7	14
U51	74LS270	7	14
U52	74LS270	7	14
U53	74LS270	7	14

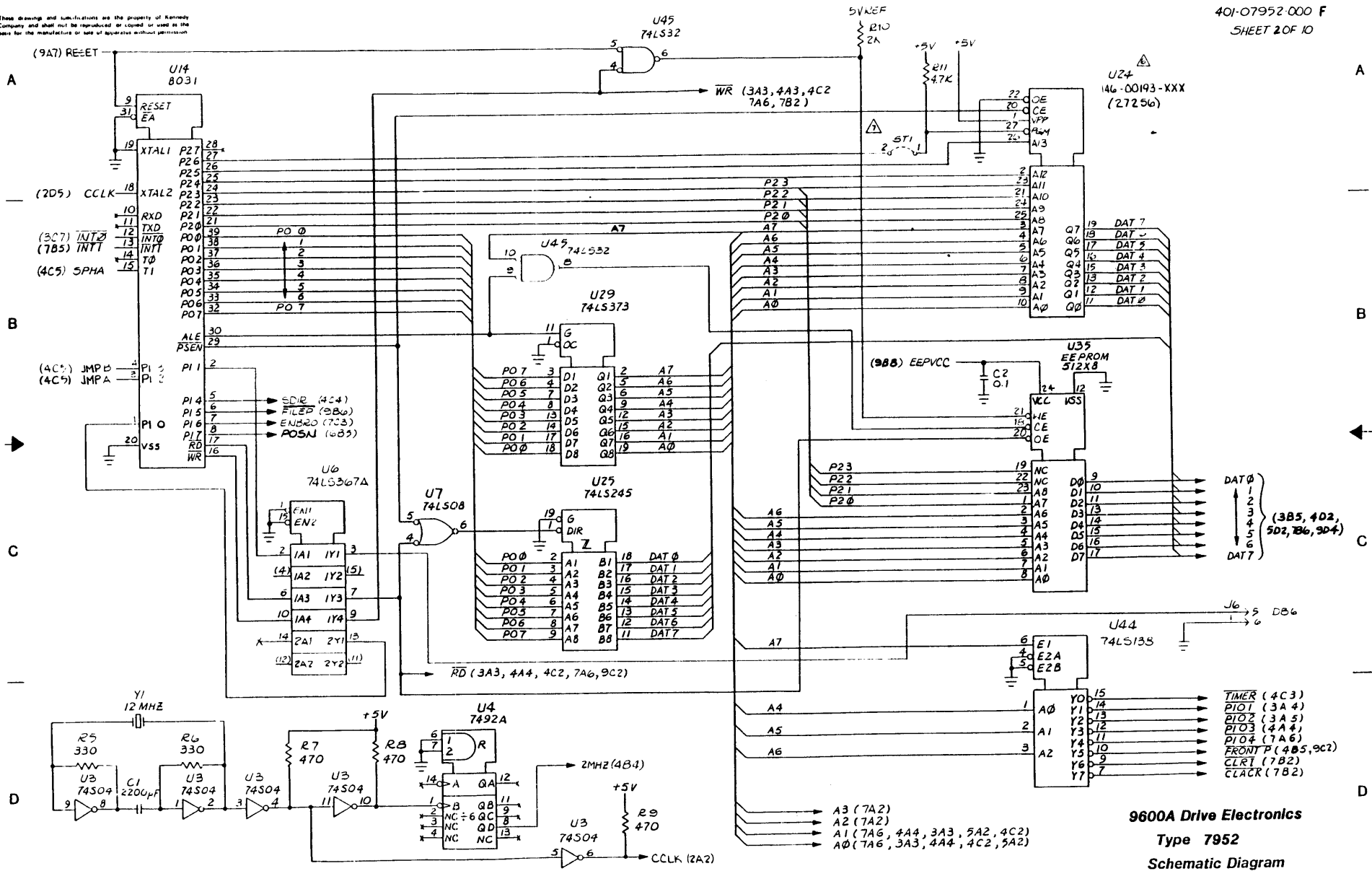


REV STATUS OF SHEETS	REV SHEET	K	N	B	F	A	B	A	F	B	B
		1	2	3	4	5	6	7	8	9	10

9600 Drive Electronics
Type 7952
Schematic Diagram

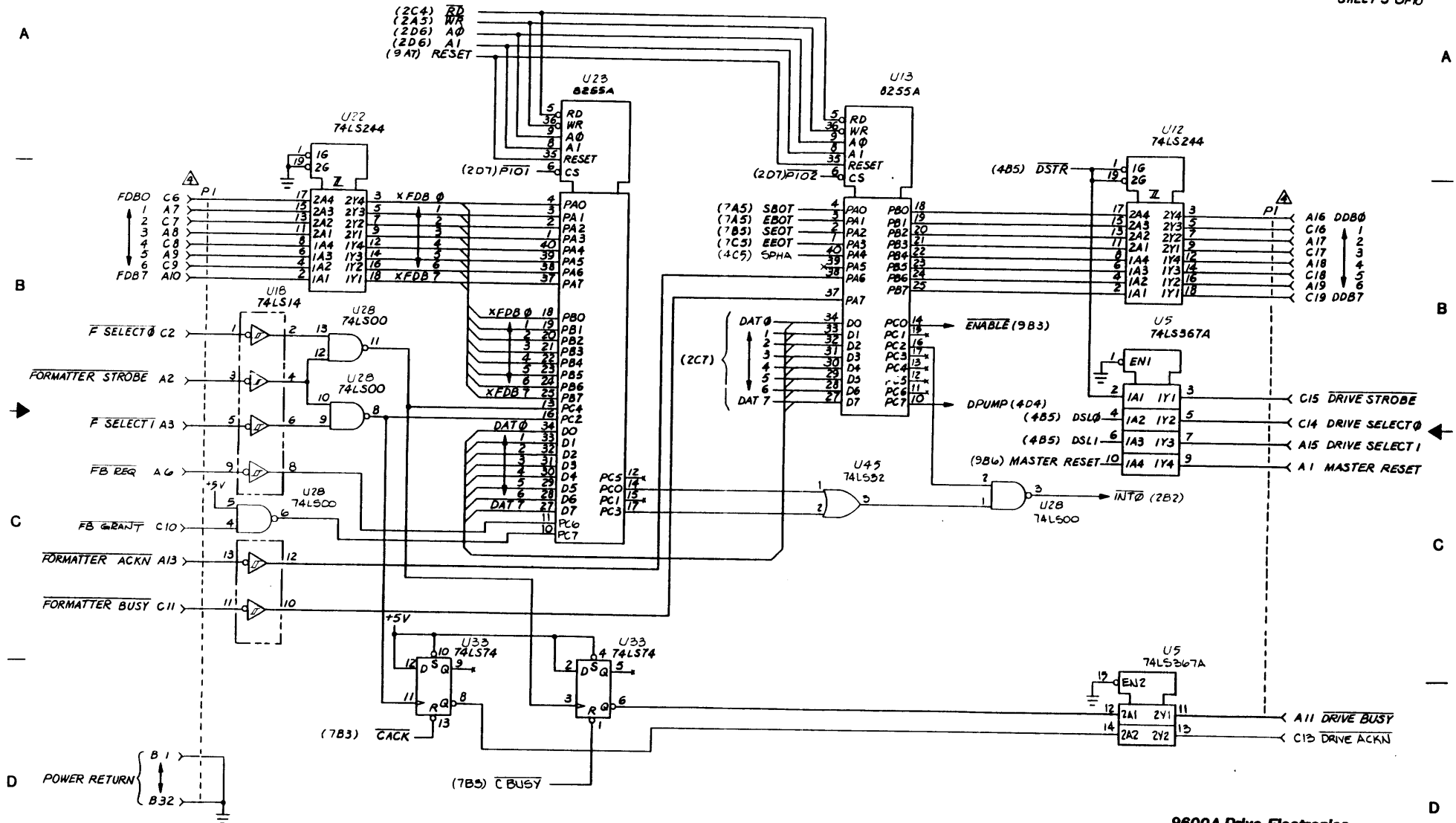
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401-07952-000 F
SHEET 2 OF 10



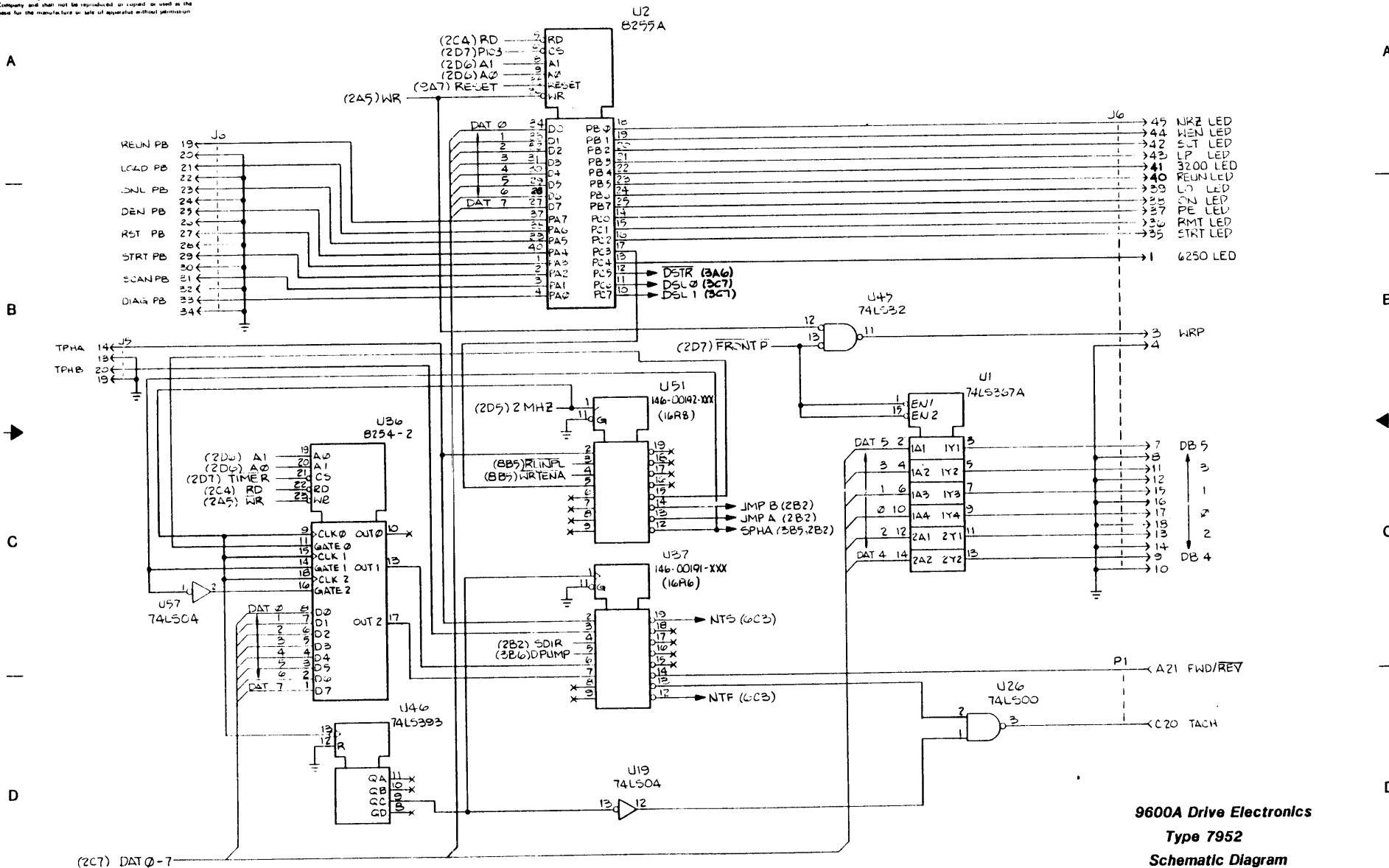
9600A Drive Electronics
Type 7952
Schematic Diagram

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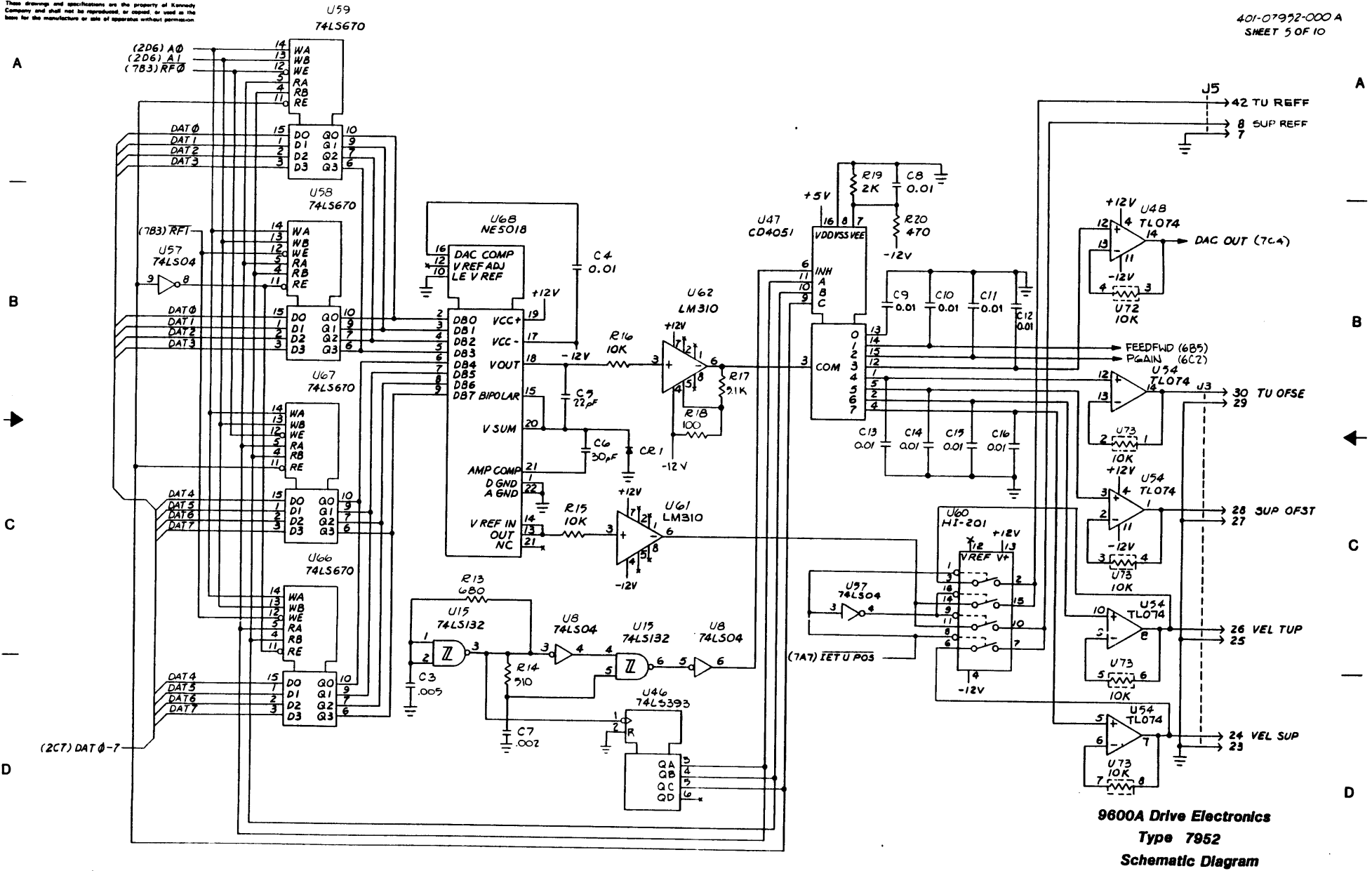
9600A Drive Electronics
Type 7952
Schematic Diagram

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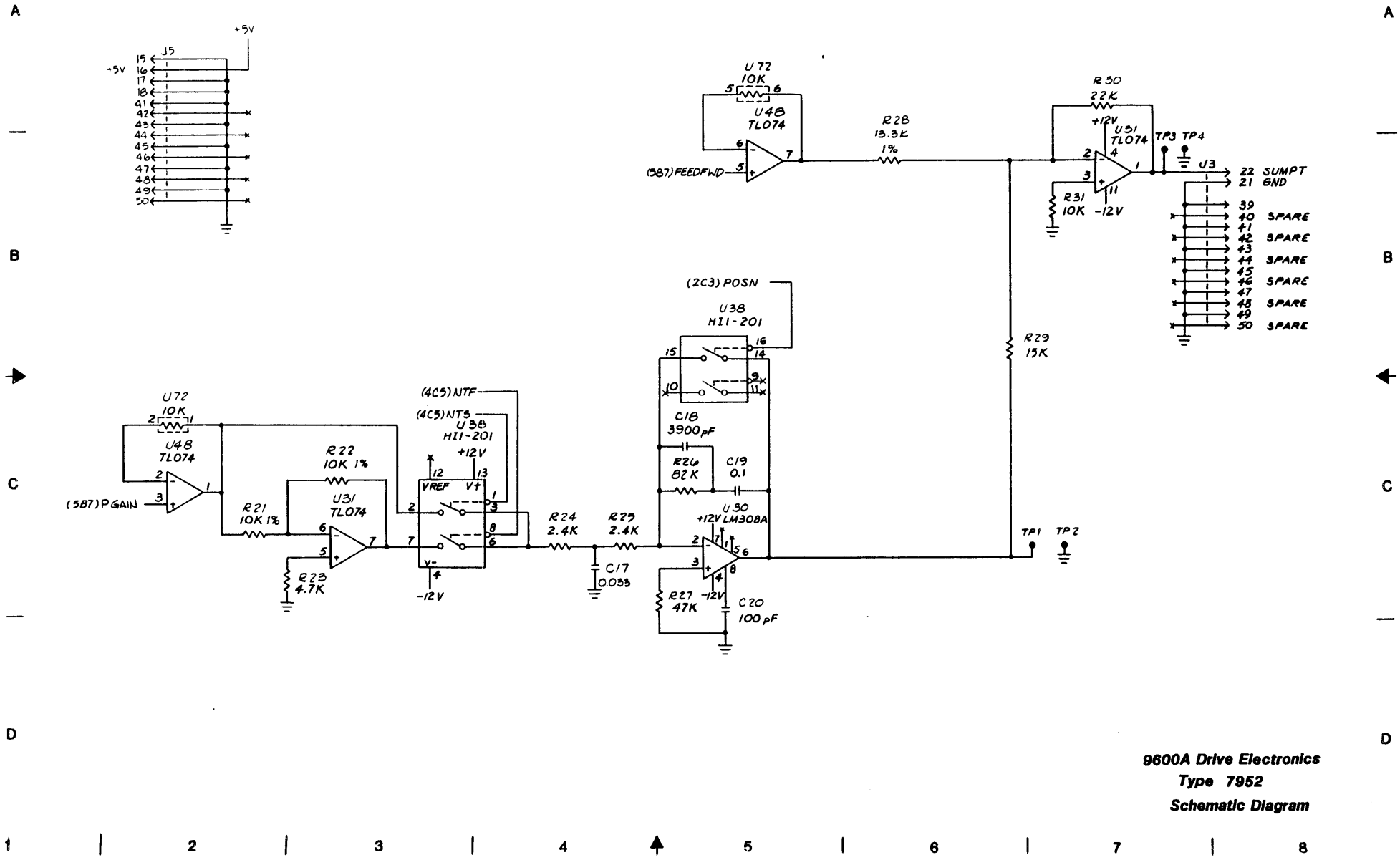
401-07952-000 A
SHEET 5 OF 10



9600A Drive Electronics
Type 7952
Schematic Diagram

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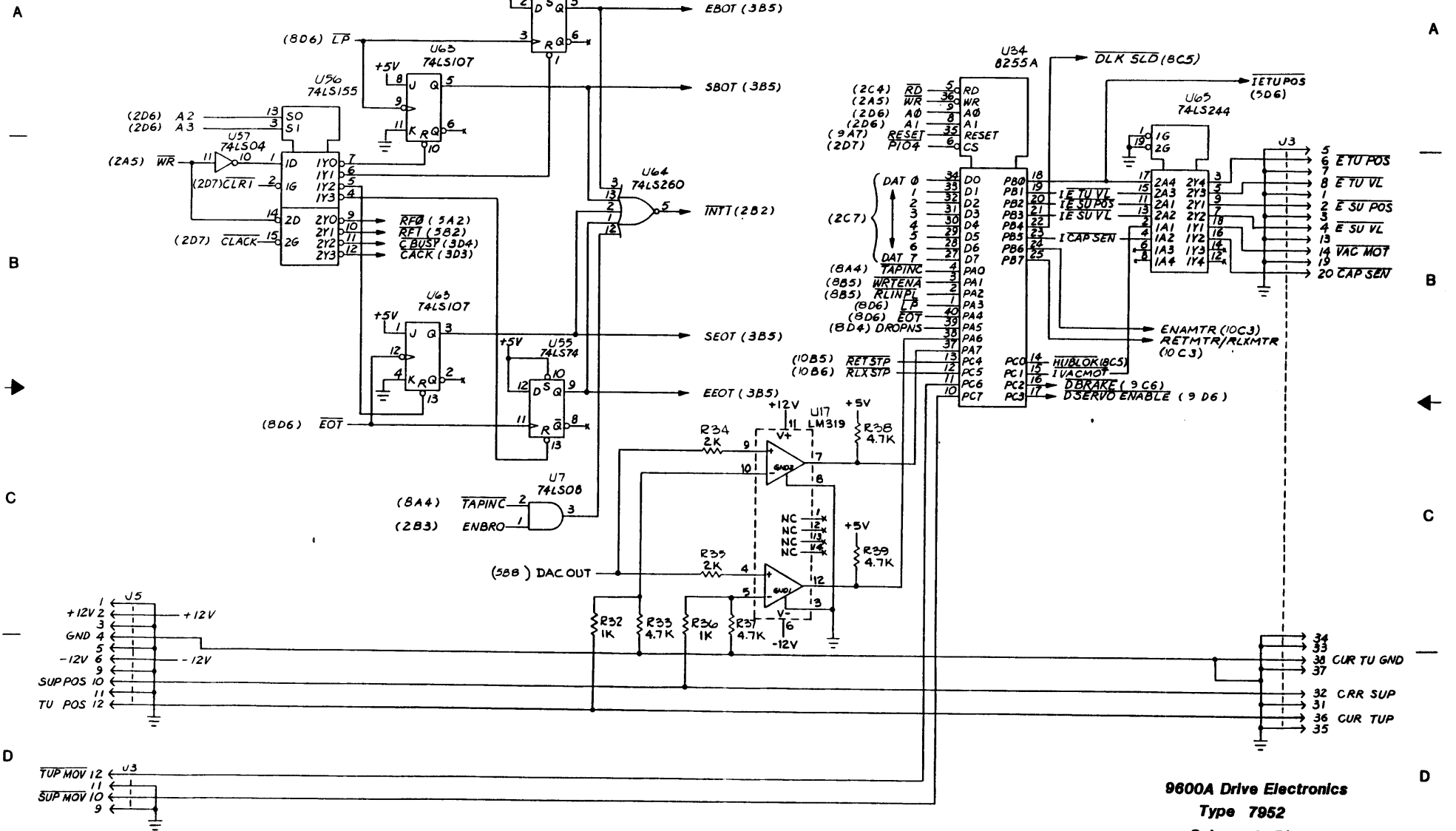
401-07952-000A
SHEET 6 OF 10



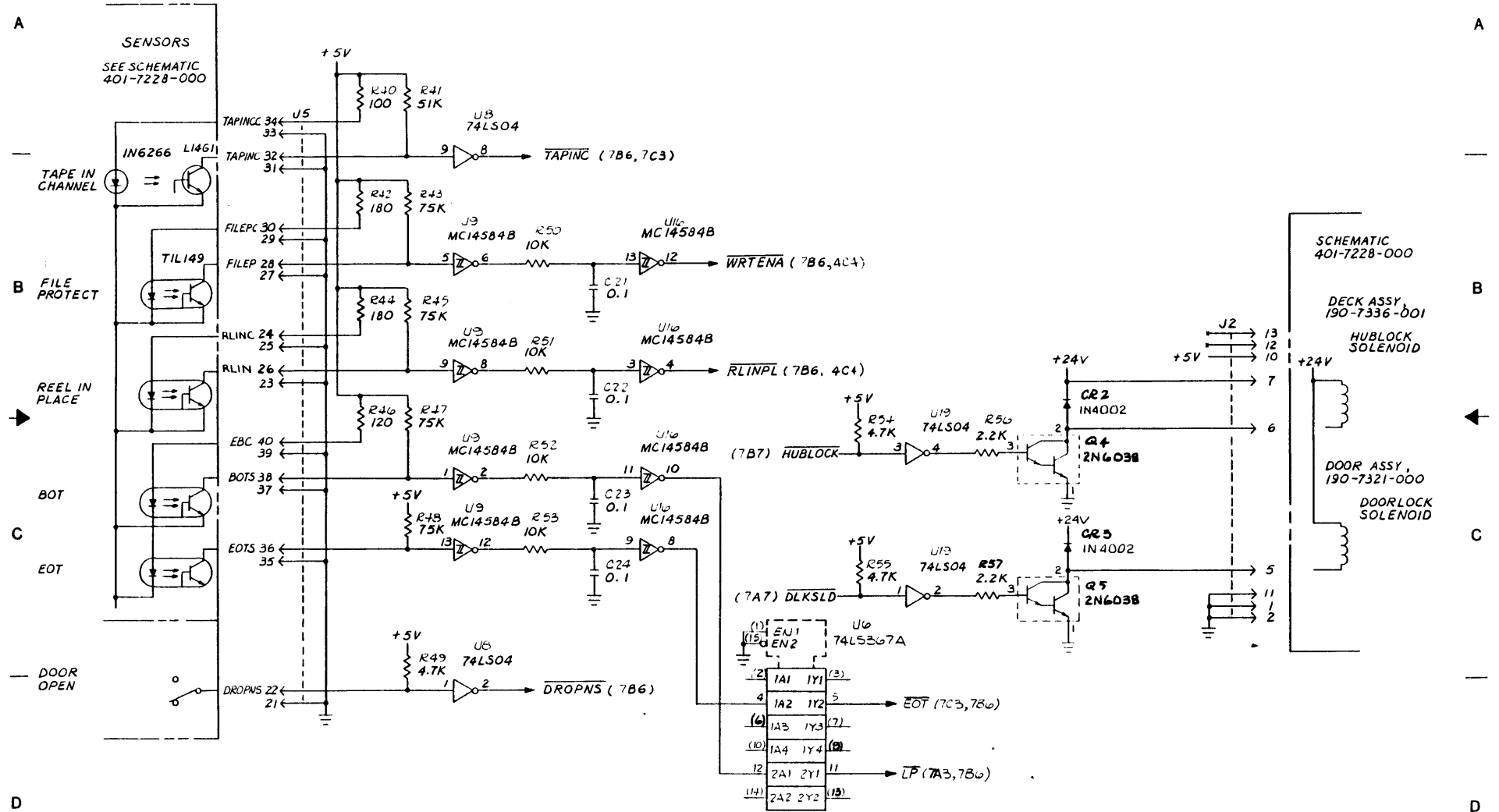
9800A Drive Electronics
Type 7952
Schematic Diagram

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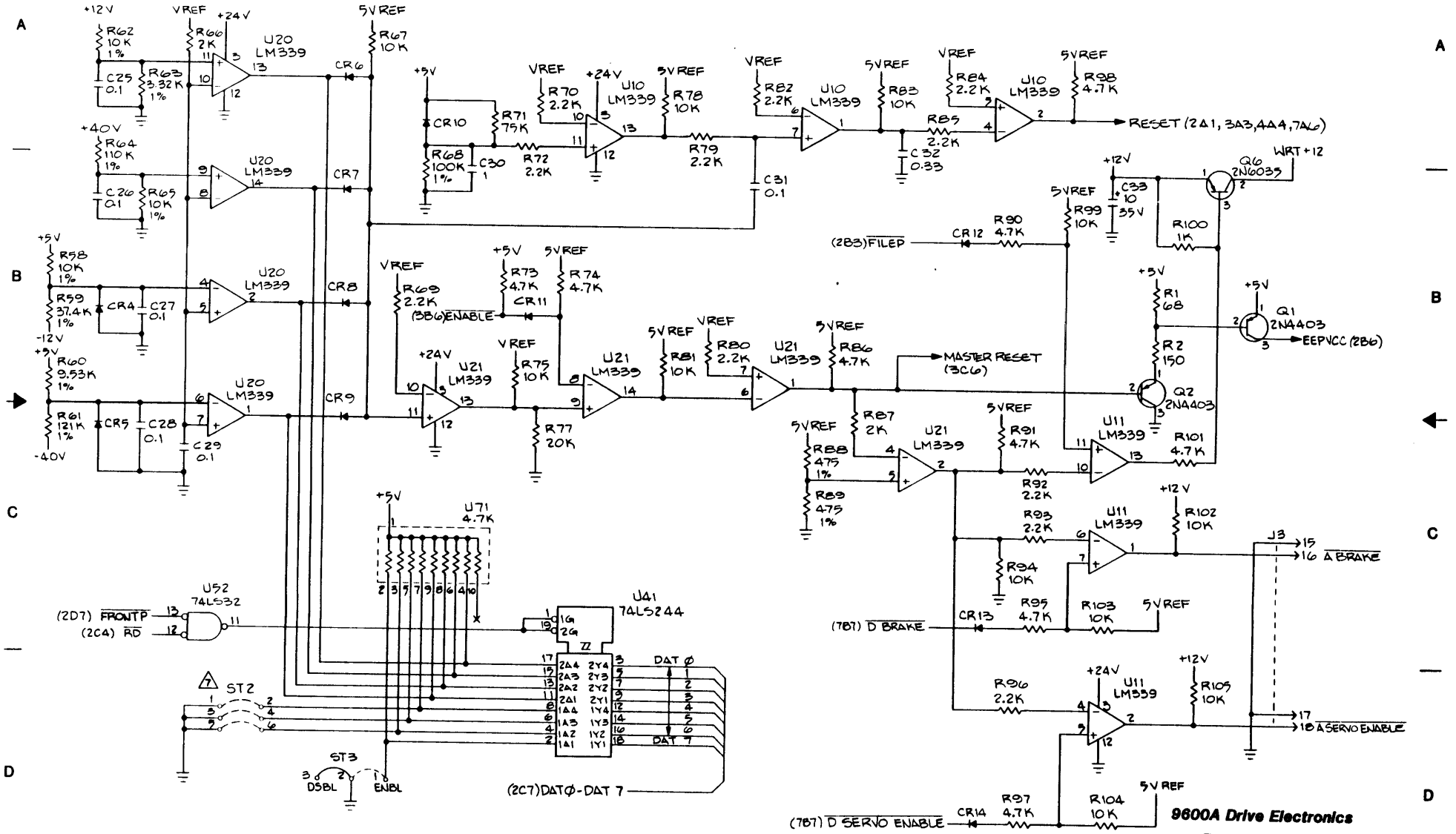
401-07952-000 A
SHEET 7 OF 10



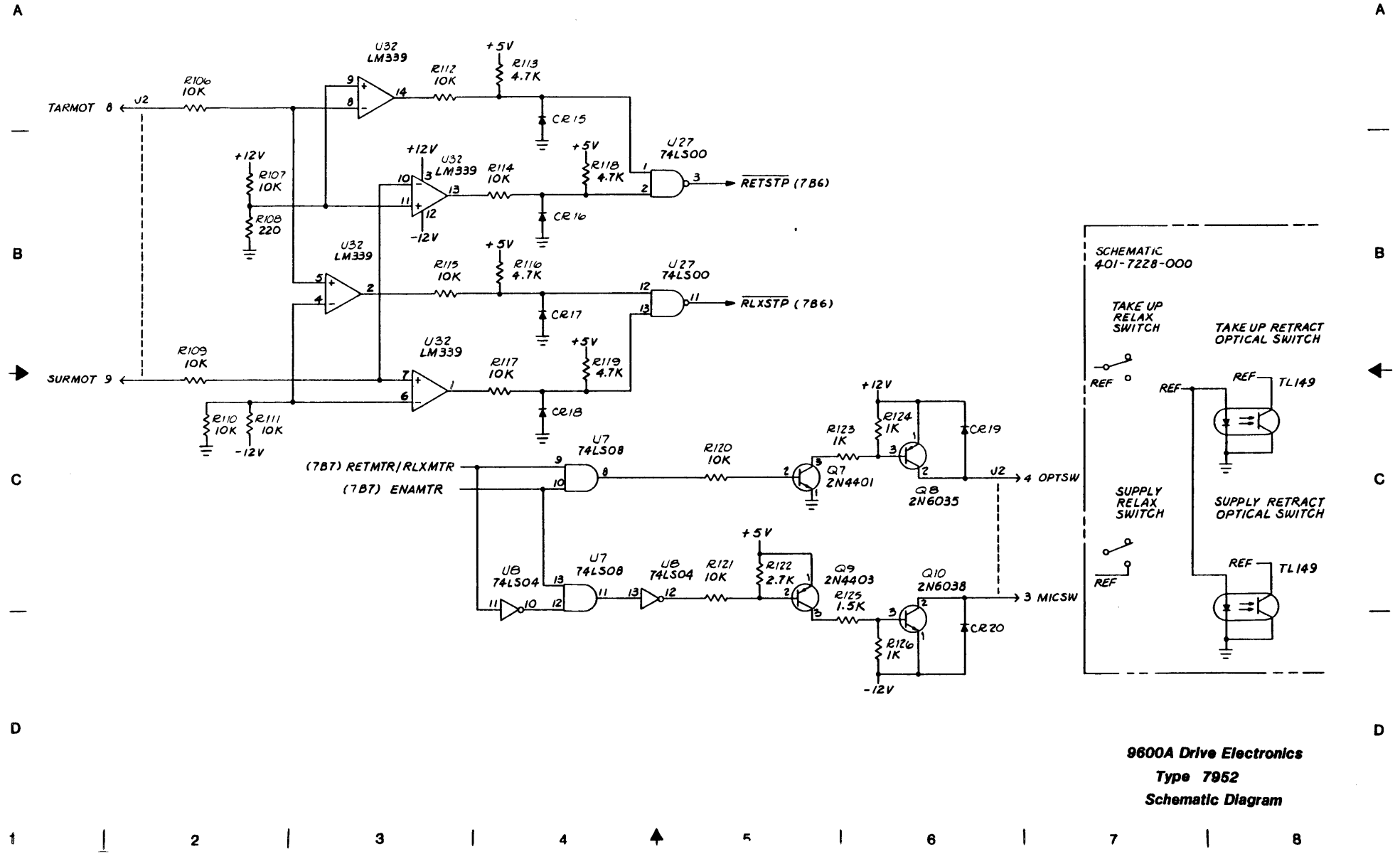
9600A Drive Electronics
Type 7952
Schematic Diagram



9600A Drive Electronics
Type 7952
Schematic Diagram



9600A Drive Electronics
Type 7952
Schematic Diagram



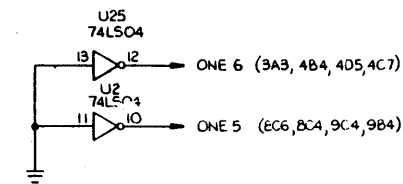
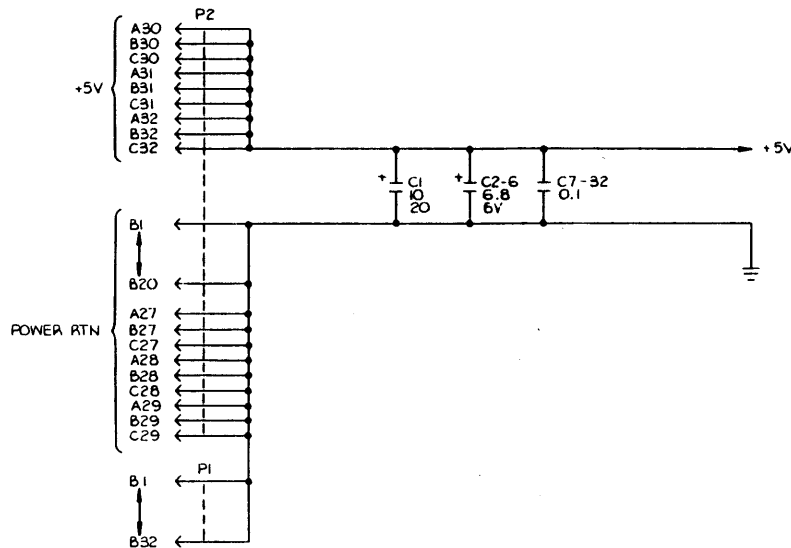
9600A Drive Electronics
Type 7952
Schematic Diagram

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401-07951-000 N
SHEET 1 OF 13

190-7951 TABULATION

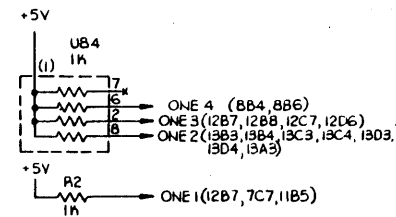
REF DES	DASH NO	REV
	-010	D
U61	146-00M7-00H	
U83	146-0014B-00B	



REF DES	TYPE	GND	+5V
U5	74LS16A4	10	20
U48, 55, 67	74LS16A8	10	20
U57, 60, 69, 87	74LS00	7	14
U114	74LS02	7	14
U12, 30, 25	74LS04	7	14
U104	74LS04	7	14
U18, 31, 86	74LS08	7	14
U42	74LS10	7	14
U9	74LS11	7	14
U6, 24, 27, 43, 34, 38	74LS138	8	16
U50	74LS139	8	16
U56, 68	74LS161	8	16
U7, 18, 29, 41, 54, 66, 73, 74	74LS169	8	16
U52	74LS20	7	14
U16, 17, 21, 88, 93	74LS240	10	20
U62	74FC04	7	14

REF DES	TYPE	GND	+5V
U40, 46, 53, 59	74LS244	10	20
72, 77, 80, 81, 89, 90, 107	74LS245	10	20
U91, 92	74LS25	7	14
U55	74LS27	7	14
U71	74LS27	7	14
U20, 19, 32, 48	74LS279	8	16
U47, 97, 98	74LS32	7	14
U108	74LS373	10	20
U26, 39, 65, 75, 76, 78, 79, 99, 101, 102, 109, 110, 111	74LS374	10	20
U33, 22, 15, 14, 15, 12, 10	74LS38	7	14
U100	74LS682	7	14
U43, 44, 51, 63, 64, 82, 94, 96, 103, 105, 106, 113	74LS74	7	14
U23	74LS85	8	16
U11	74LS86	7	14
U28	8031	40	
U70, 58	2114	18	
U85		7	14
U15		10	20
U61, 83	27C4	14	28

REF DES	LAST USED	NOT USED
S1		
J2		
P2		
E6		
U115		
R10	B5	
C37		
CR1		
Y2	Y1	



SEE TABULATION FOR DASH NUMBERS.

SPARE LOCATIONS PROVIDED ON BOARD.

P1 & P2 CONNECTOR PIN AND FUNCTION SHALL BE COORDINATED WITH THE MOTHER BOARD (401-7108-000) FOR PINS NOT SHOWN ON THIS DRAWING.

RESISTORS ARE IN OHMS 5% 1/4 W.

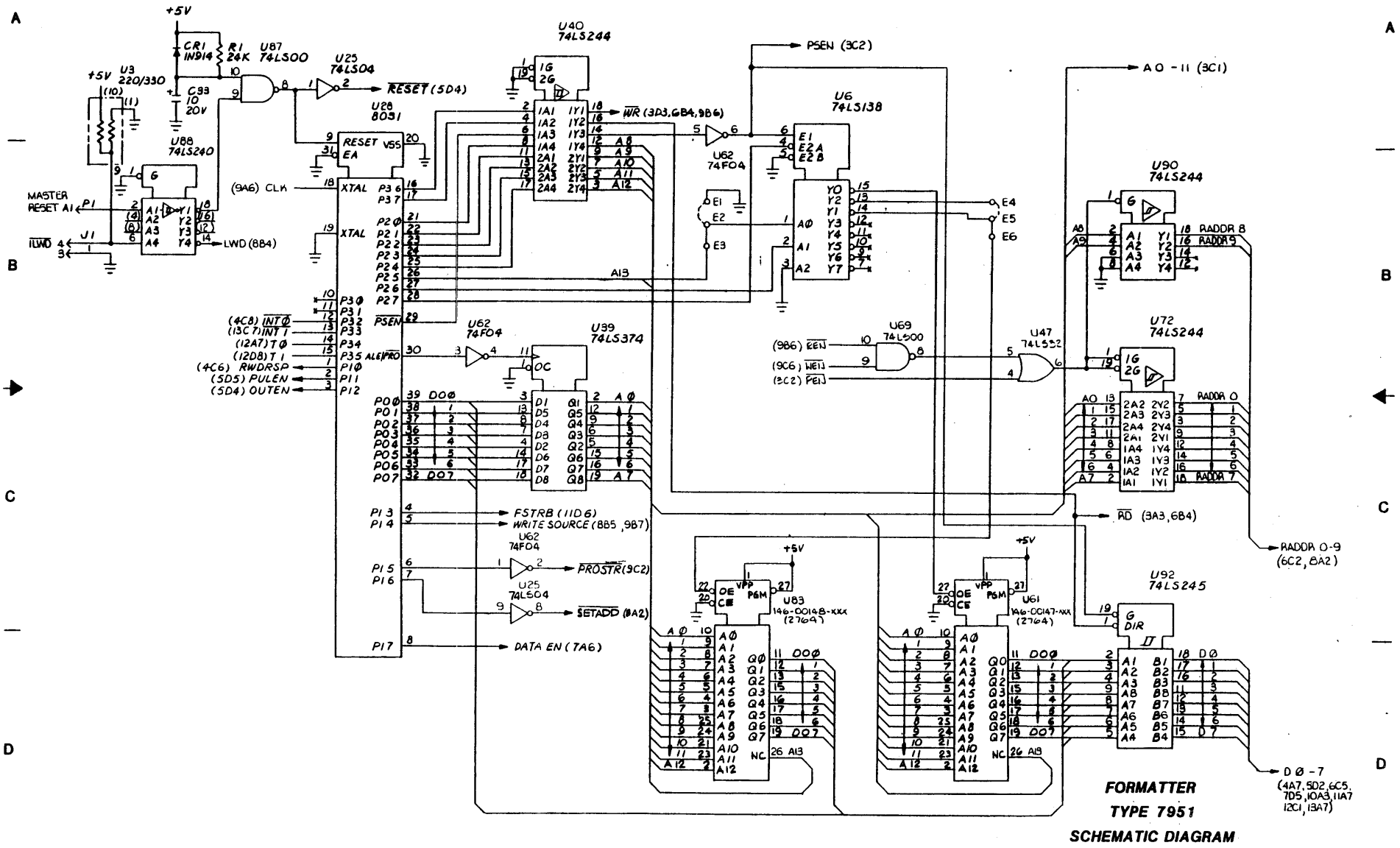
CAPACITORS ARE IN MICROFARADS 10% 50V

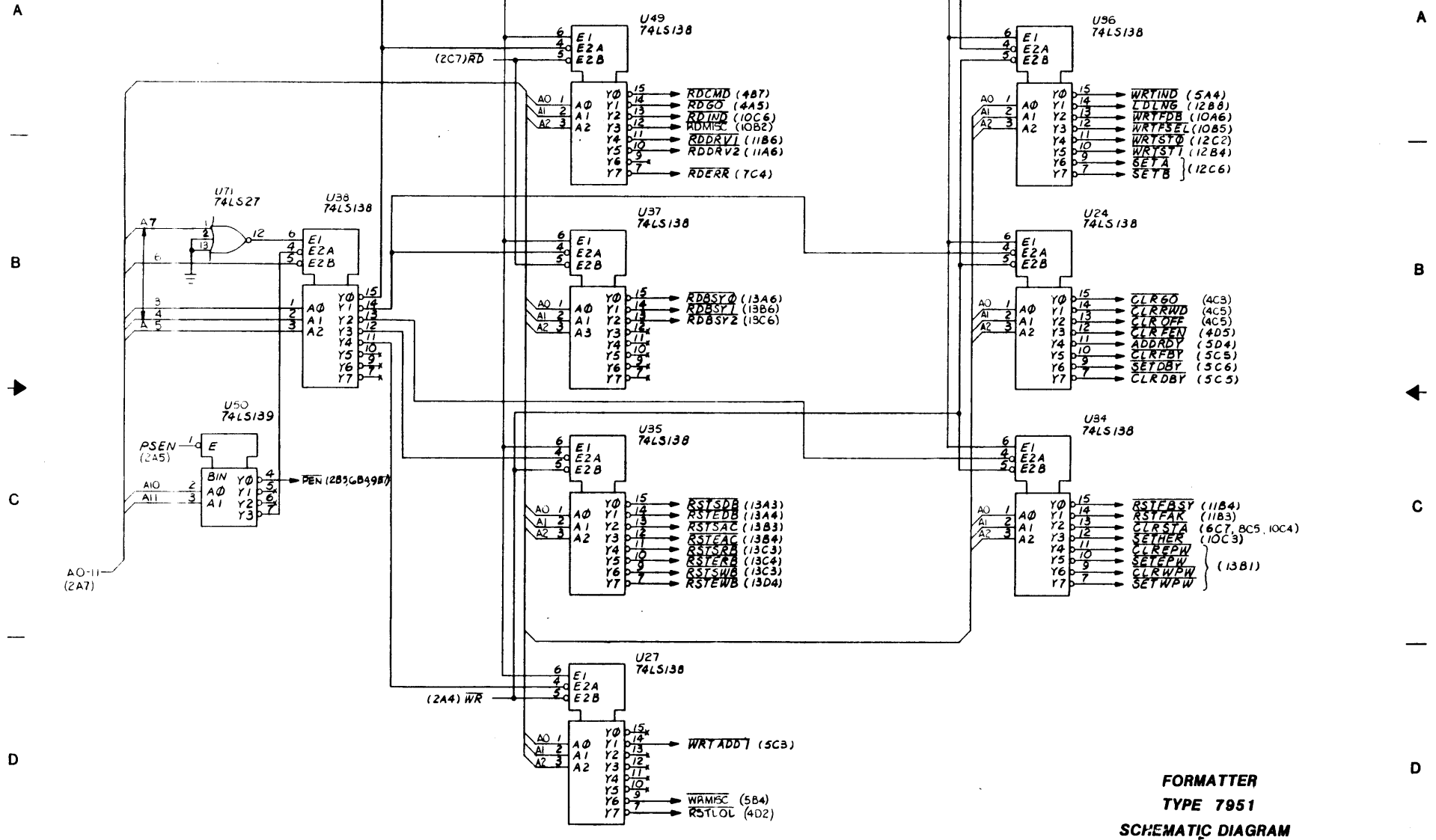
NOTES: UNLESS OTHERWISE SPECIFIED

REV STATUS OF SHEETS	REV SHEET	N	N	A	A	A	A	A	A	F	A	A	A	A
		1	2	3	4	5	6	7	8	9	10	11	12	13

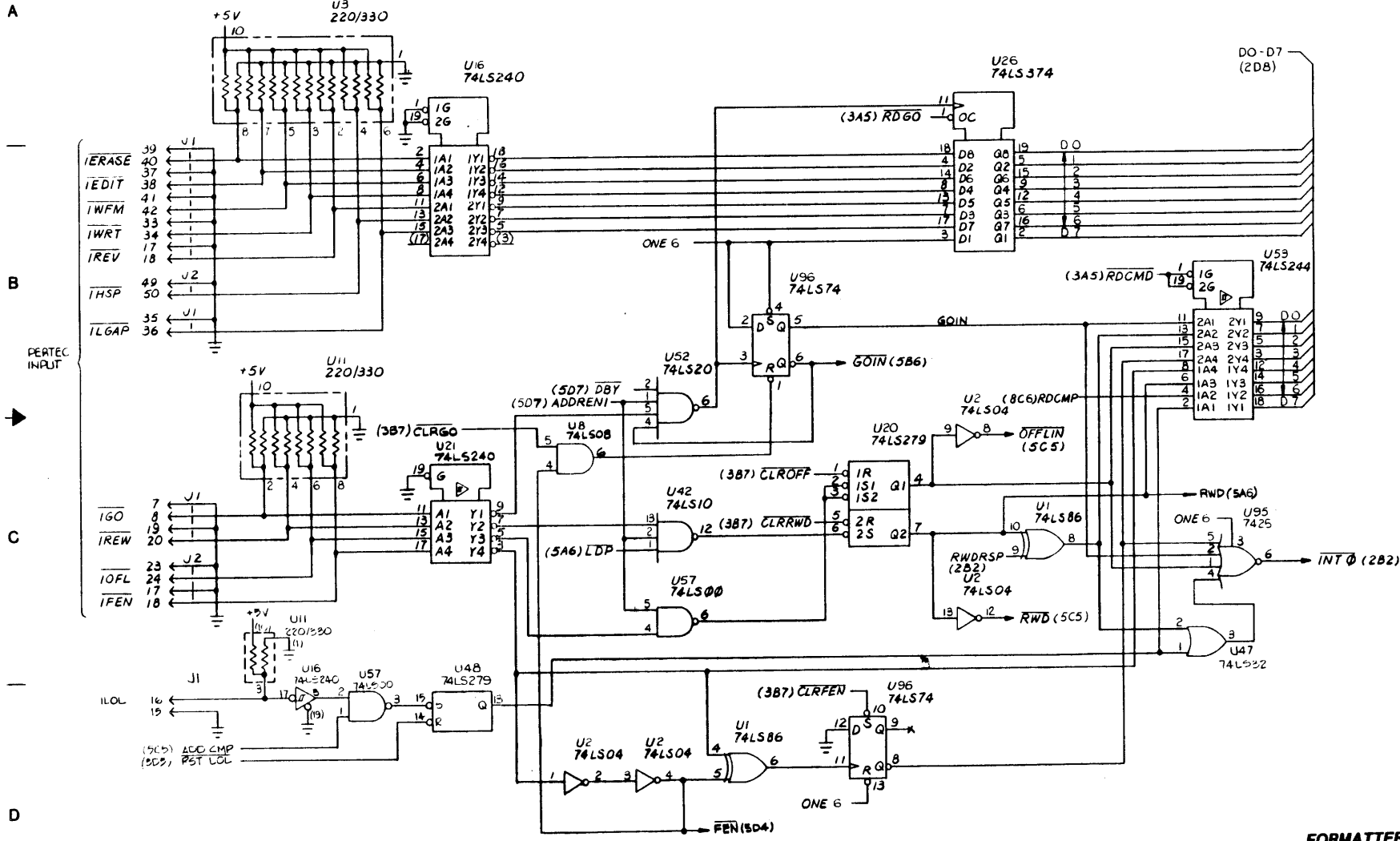
FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM

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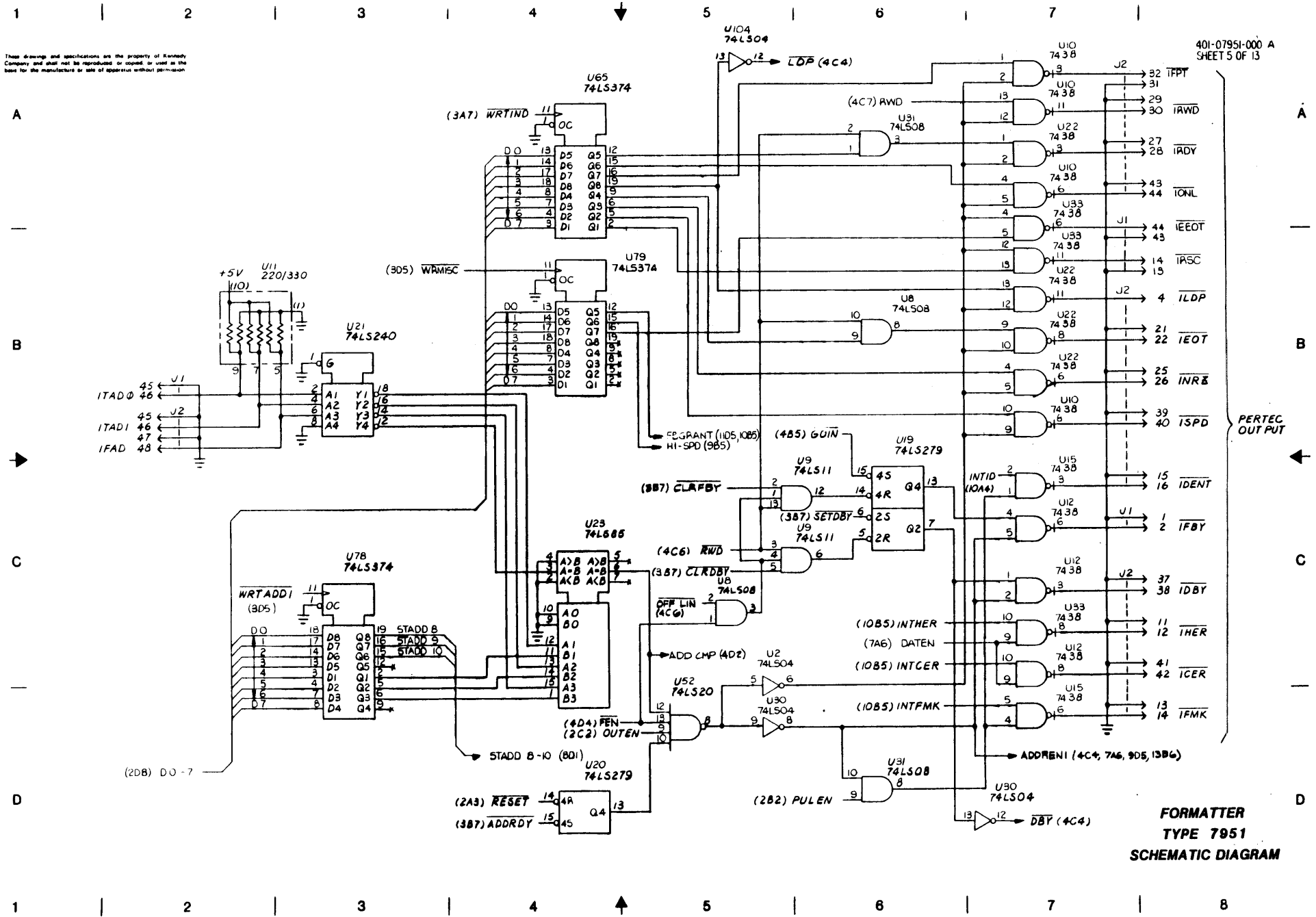


**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**



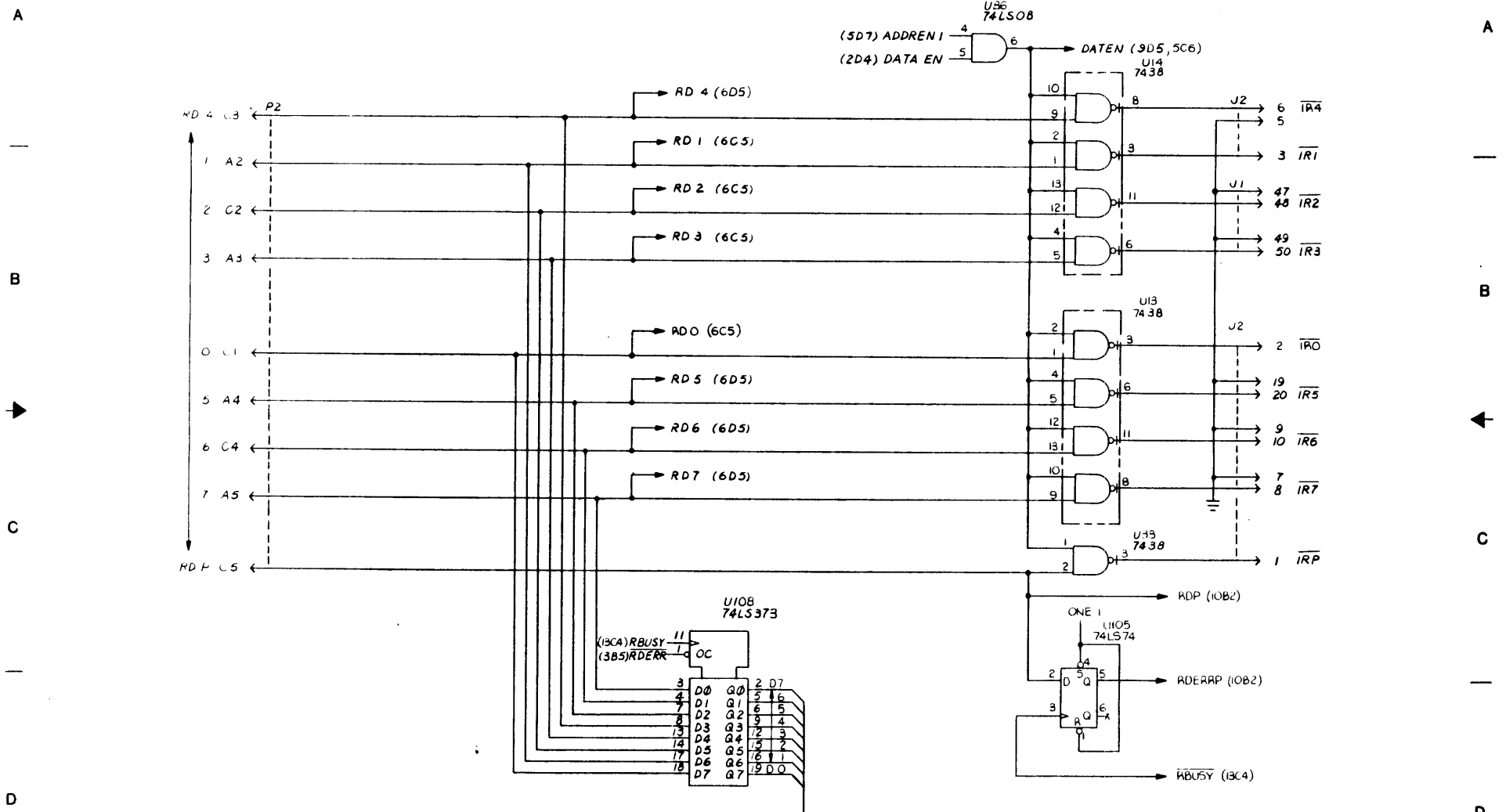
**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**

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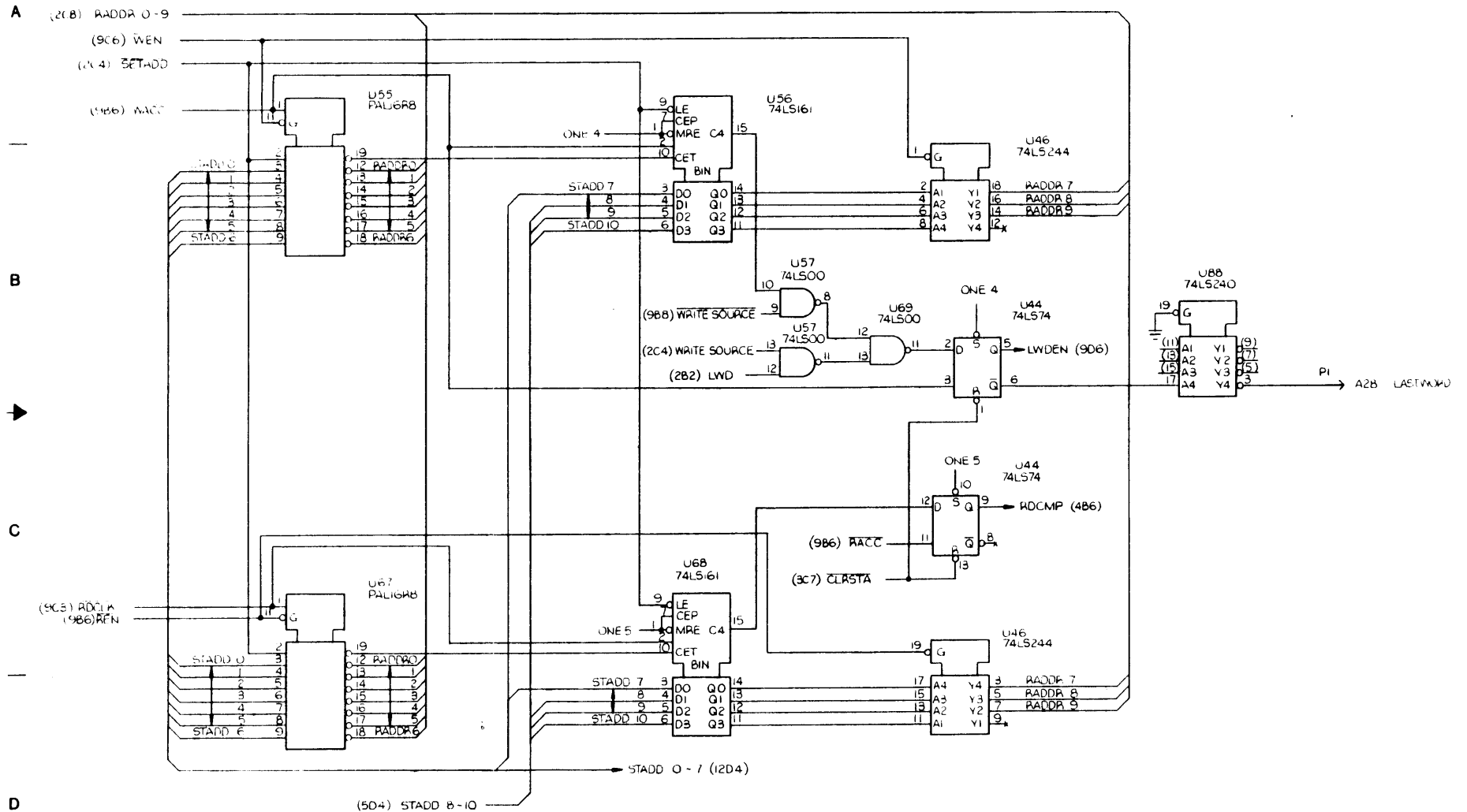


**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**

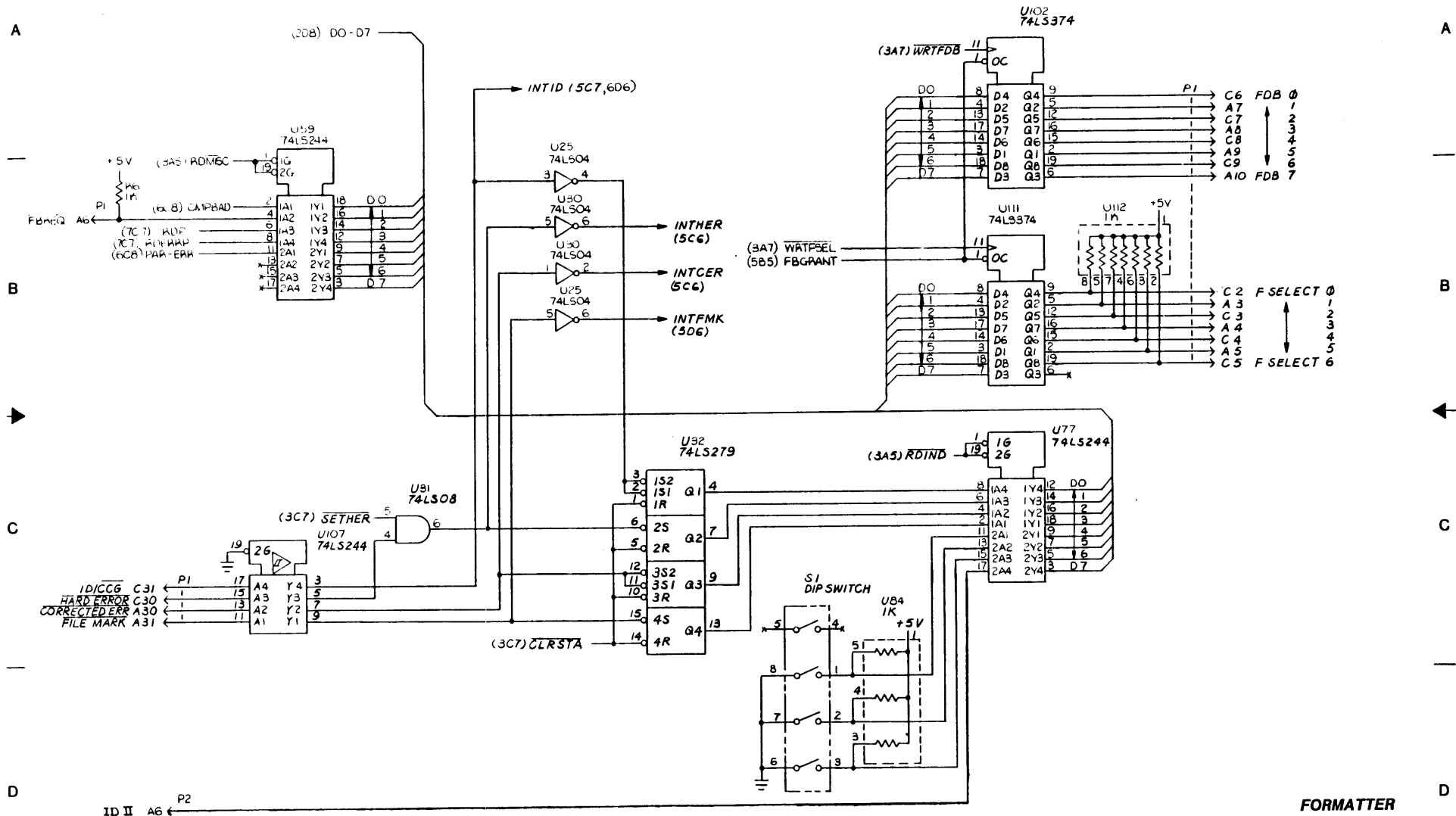
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**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**



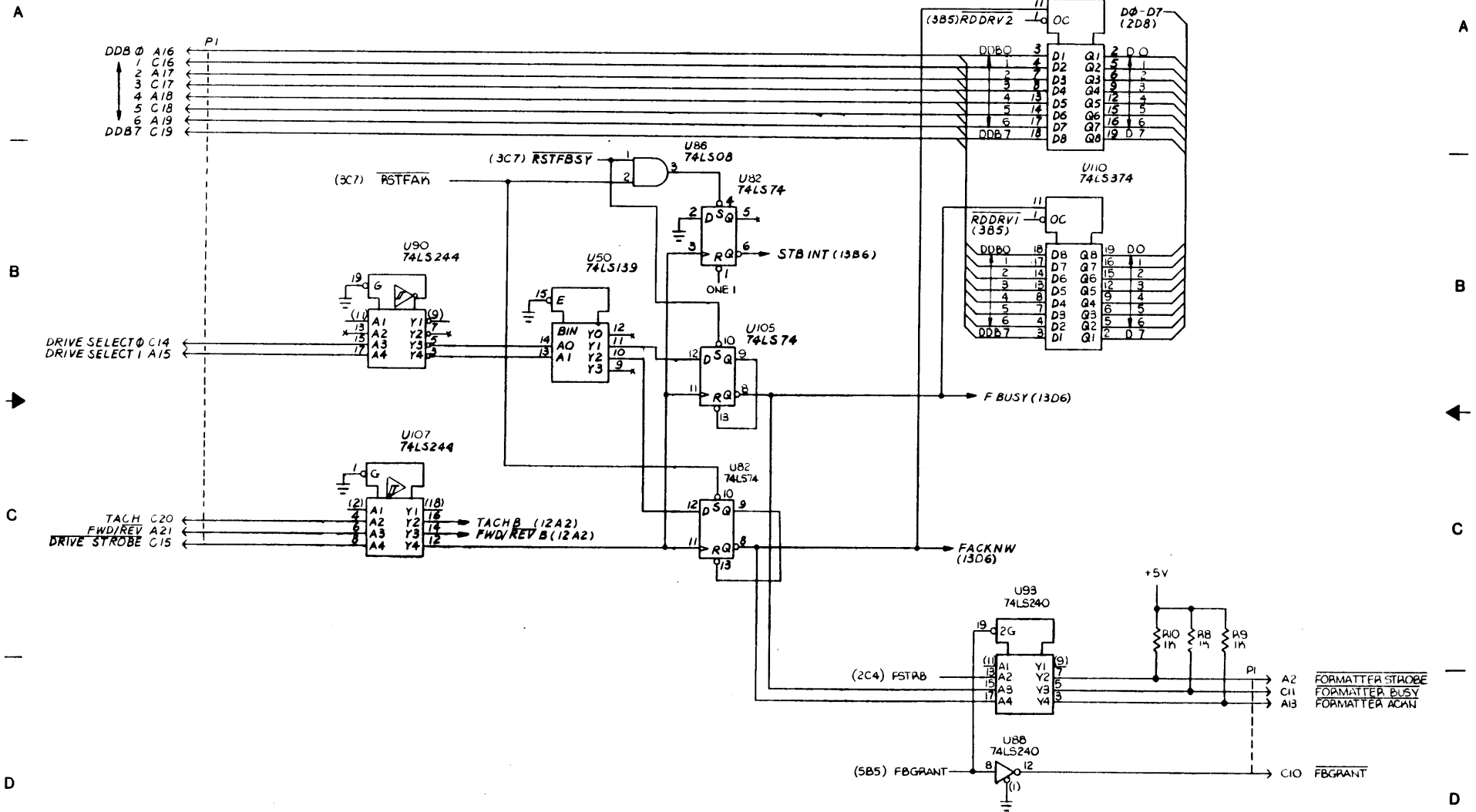
**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**



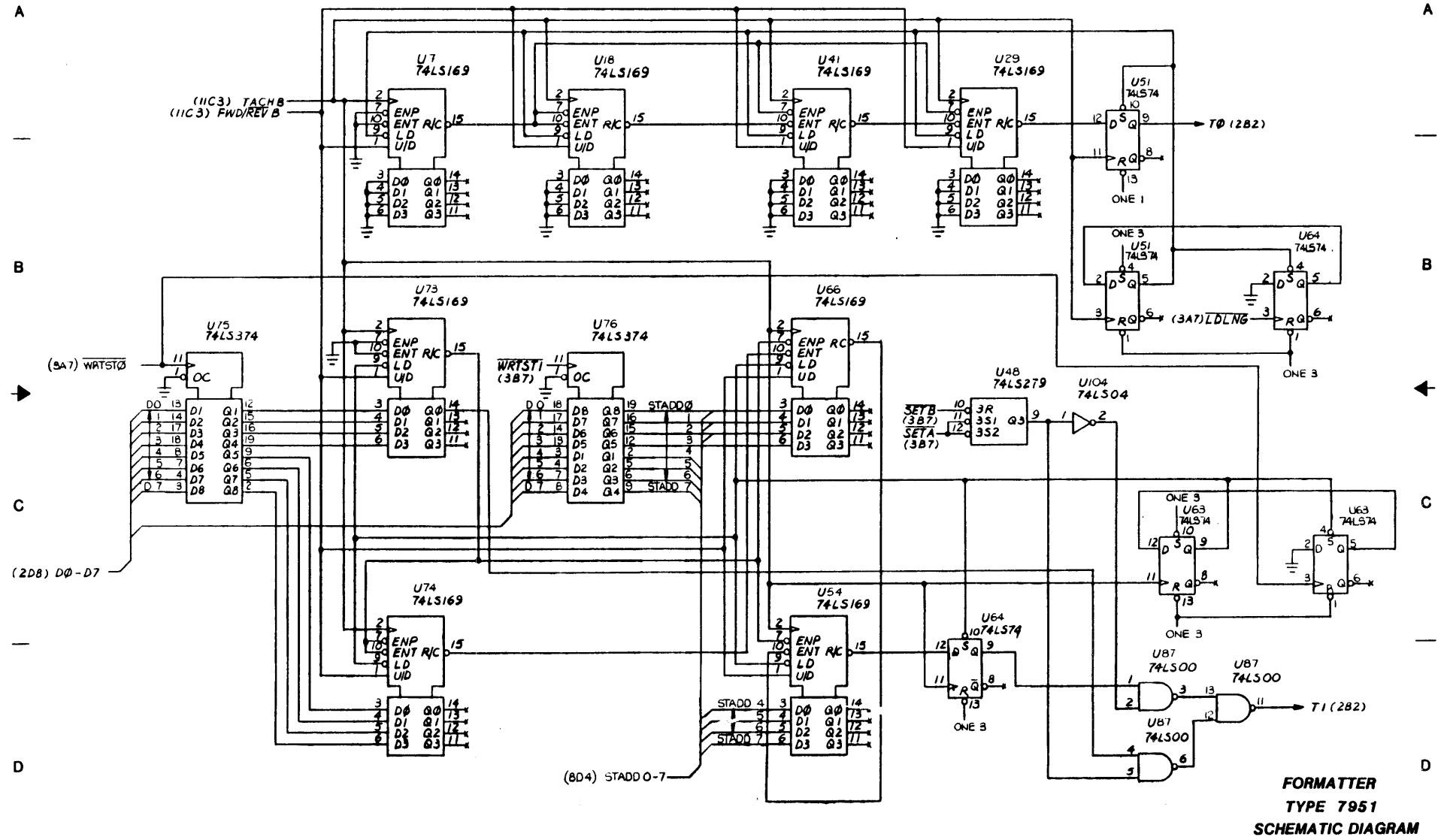
**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**

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401-0795H-000 A
SHEET 11 OF 13



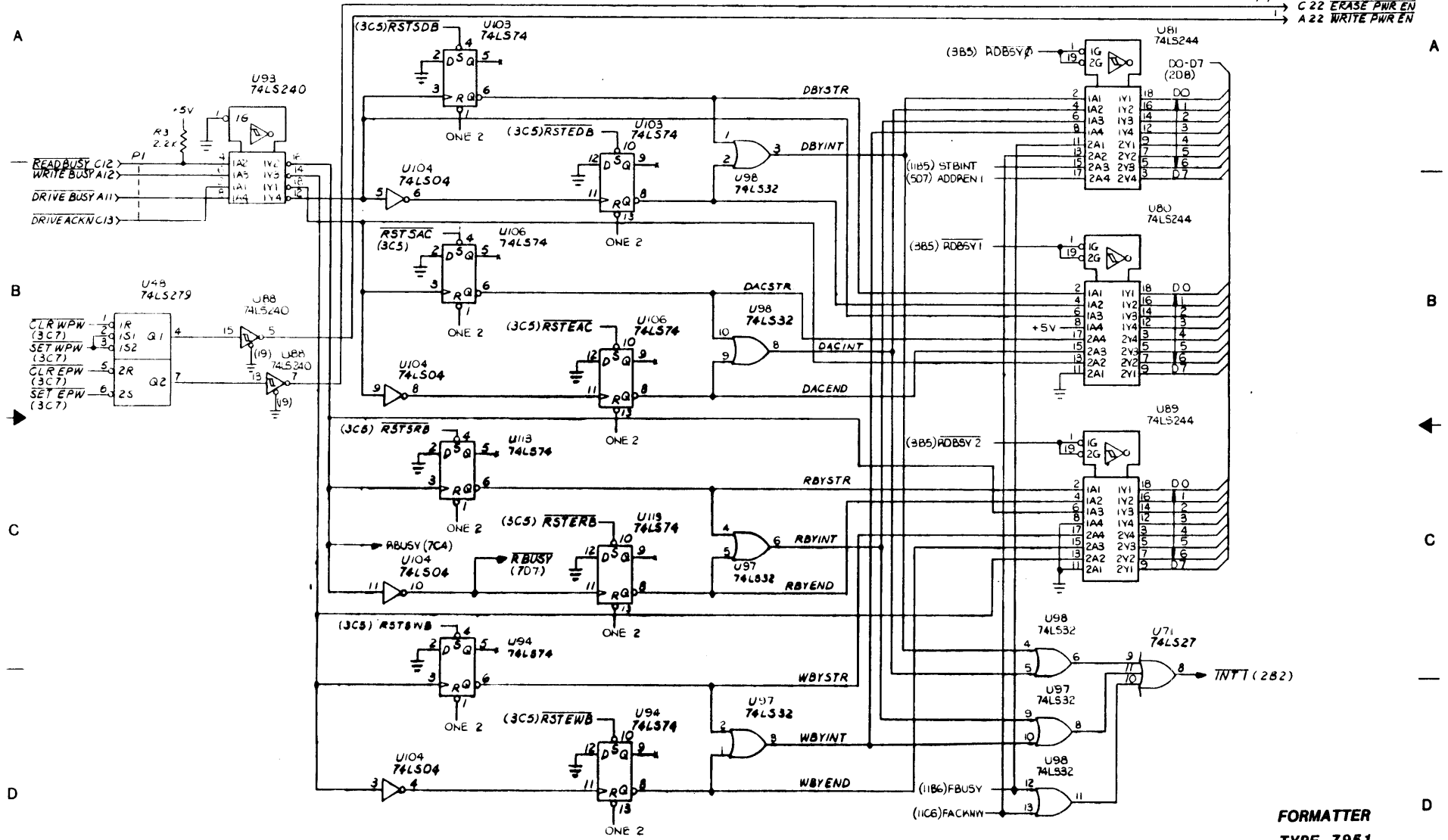
**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**



**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**

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401-07951-000 A
SHEET 13 OF 13
C 22 ERASE PWR EN
A 22 WRITE PWR EN

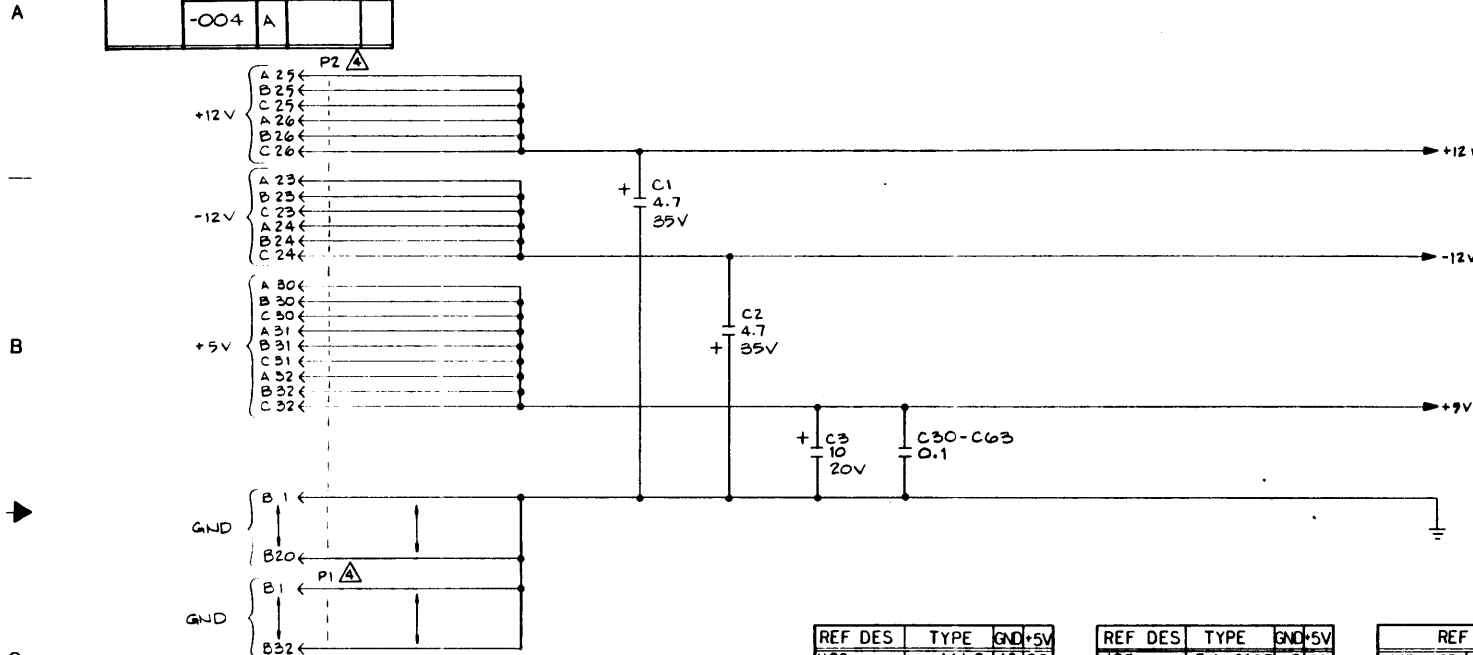


**FORMATTER
TYPE 7951
SCHEMATIC DIAGRAM**

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190-07960 TABULATION

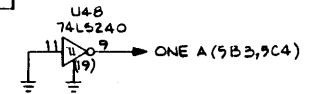
DRSH NO	REV	DASH NO	REV
-004	A		



REF DES	TYPE	GND	+5V
U9B	16LB	10	20
UR, 19, 33, 41, 62, 73, 75, 88, 92	16R4	10	20
U2, 20, 26, 29, 35, 36, 43, 44, 57, 70, 77, 80, 84, 89, 86, 90, 92, 100	16R6	10	20
U14, 21, 30, 37, 38, 45, 54, 58, 71, 81, 91, 101, 24, 59	16RB	10	20
U49	7406	7	14
U11, 47	74LS08	7	14
U28	74S151	8	16
U24, 65	74S189	8	16
U4, 82	74LS20	7	14
U67	74LS02	7	14
U60	74LS04	7	14
U72	74LS10	7	14
U40	74LS26	7	14
U61	74LS27	7	14
U42	74LS32	7	14
U24	74LS54	7	14
U22, 23	74LS74	7	14
U18	74S02	7	14

REF DES	TYPE	GND	+5V
U25	74LS109	8	16
UB5	74LS129A	7	14
U16	74LS153	8	16
U27	74LS157	8	16
U7	74LS162	8	16
UB9	74LS164	7	14
U3, 5, 110	74LS166	8	16
U62	74LS174	8	16
U96	74180	7	14
U10, 12, 17, 48, 104	74LS240	10	20
U46, 107, 108, 111	74LS244	10	20
U109	74LS245	10	20
U55	74LS260	7	14
U87, 89, 106	74LS274	10	20
U15, 72, 51, 99, 102, 109	74LS377	10	20
U6	82S131	8	16
U103	82S137	9	18
U50, 69, 74	82S147A	10	20
U50, 51, 52	82S155	10	20
U68	LM339	12	3
U1, 8, 9	74LS163A	8	16
U79	74S274	8	16

REF DES	
LAST USED	NOT USED
C69	C24-29
CR1	
R47	
U111	
Y1	
Q7	



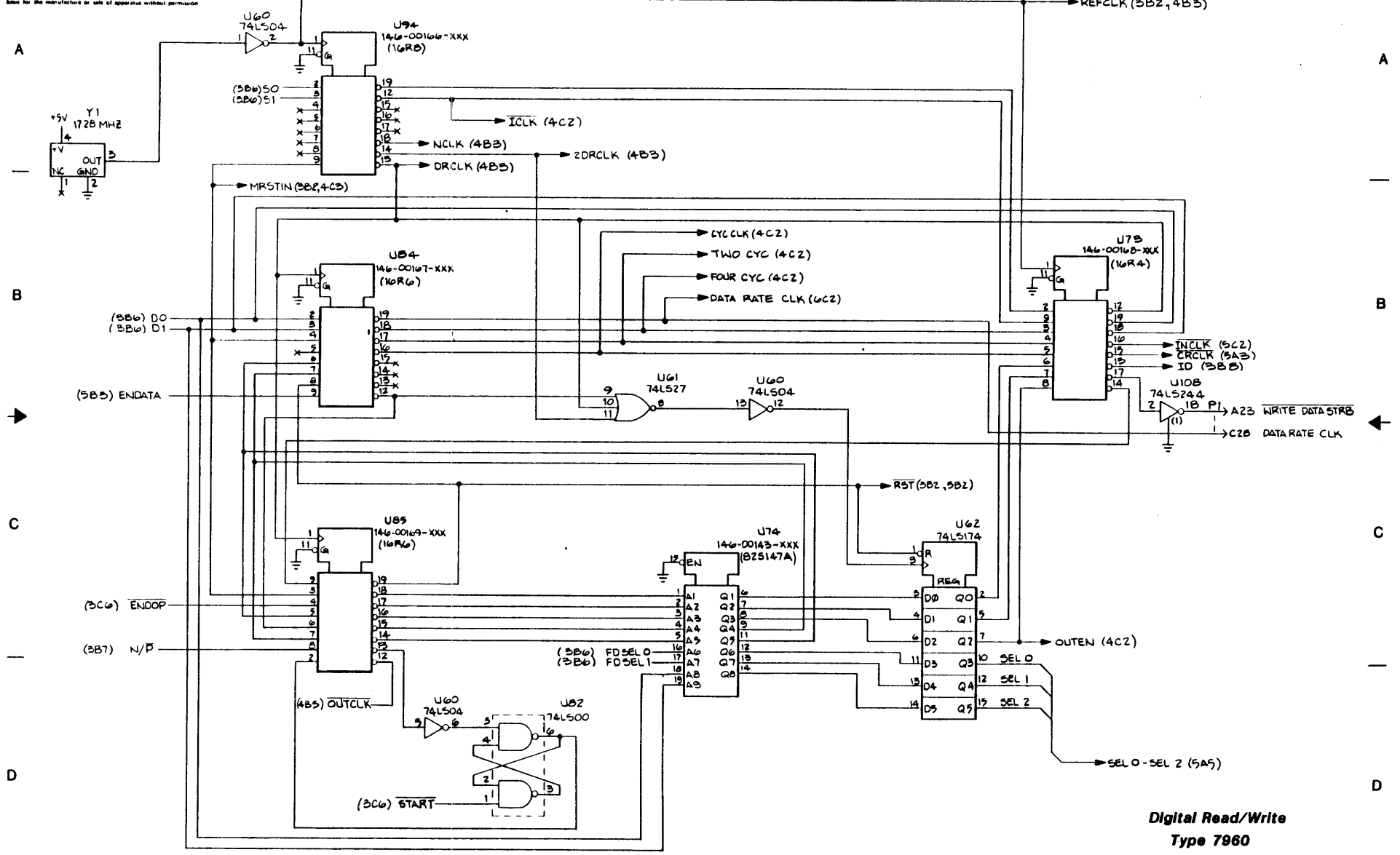
- △ DASH LINE AND FUNCTION ARE REF ONLY.
- △ CONNECTOR PINS AND FUNCTIONS SHALL BE COORDINATED WITH THE MOTHER BD (401-07108-000) FOR PINS NOT SHOWN ON DWG.
- 3. NOTES FOR TYPICAL CIRCUITS SHOWN ON SHEET 15.
- 2. RESISTORS ARE IN OHMS 5% 1/4 W.
- 1. CAPACITORS ARE IN MICROFARADS 18% 50V.

NOTES: UNLESS OTHERWISE SPECIFIED

REV STATUS OF SHEETS	REV SHEET	E	A	A	A	A	A	A	A	A	D	A	A	A	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digital Read/Write
Type 7960
Schematic Diagram

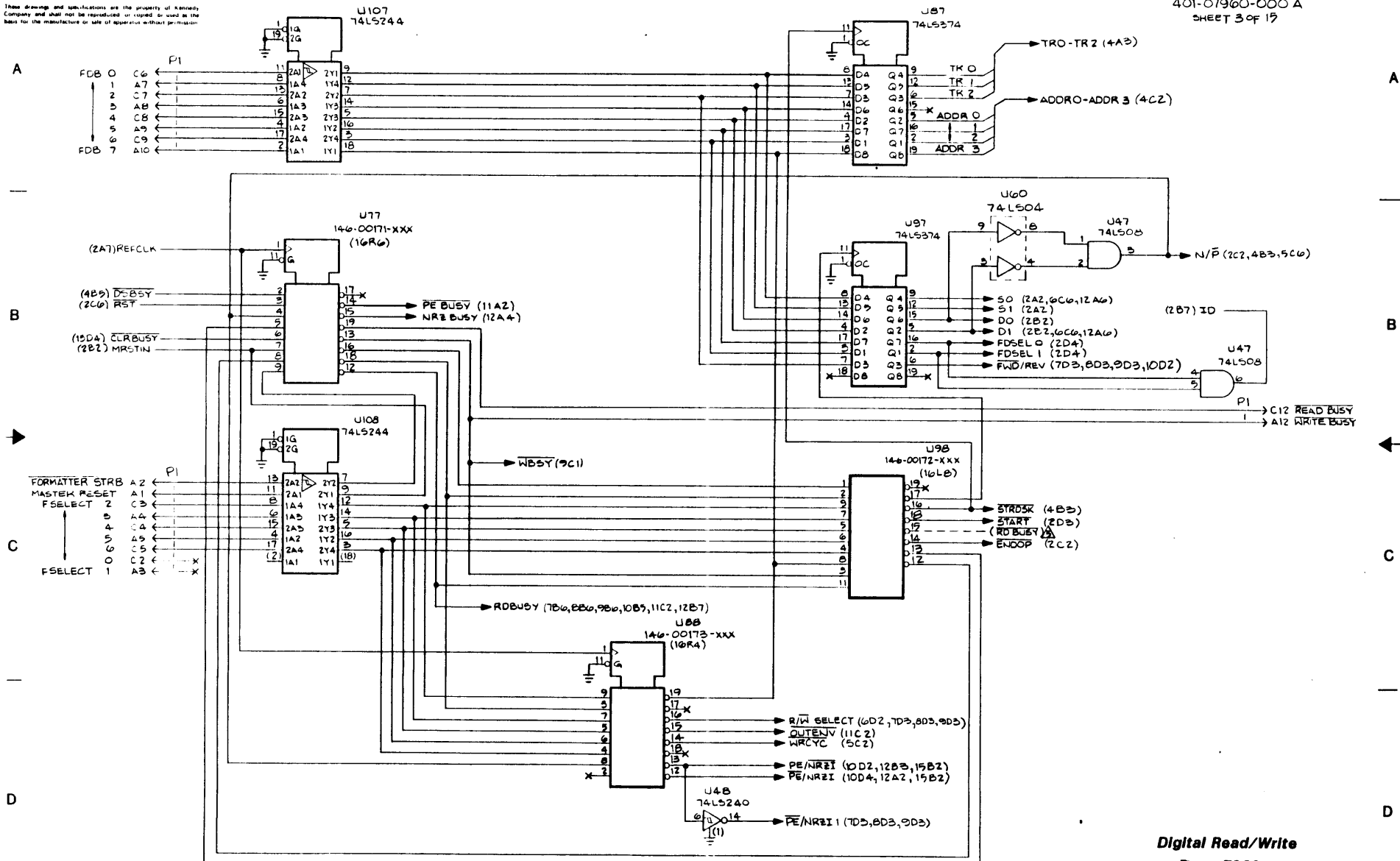
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Digital Read/Write
Type 7960
Schematic Diagram

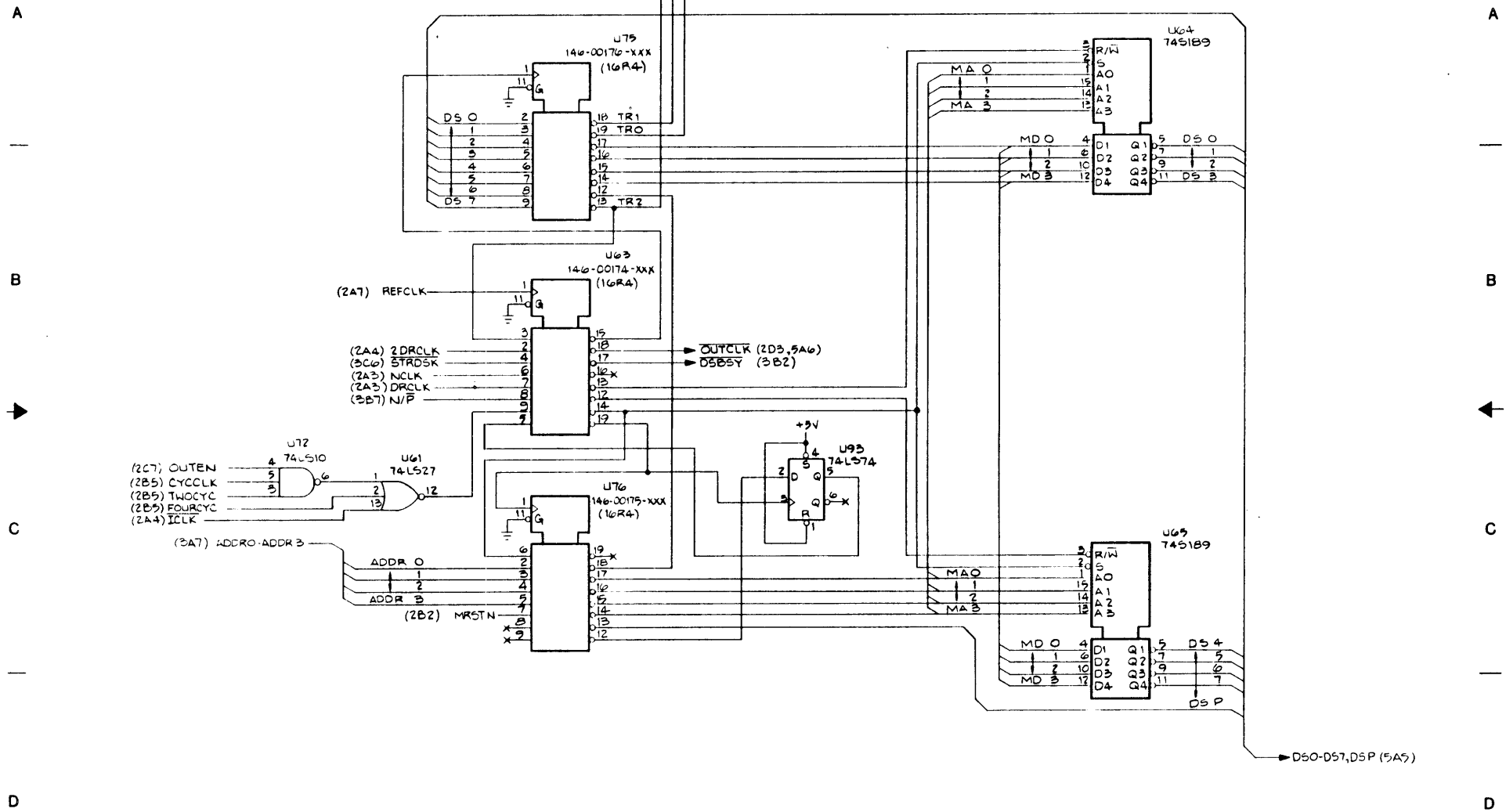
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401-07960-000 A
SHEET 3 OF 17



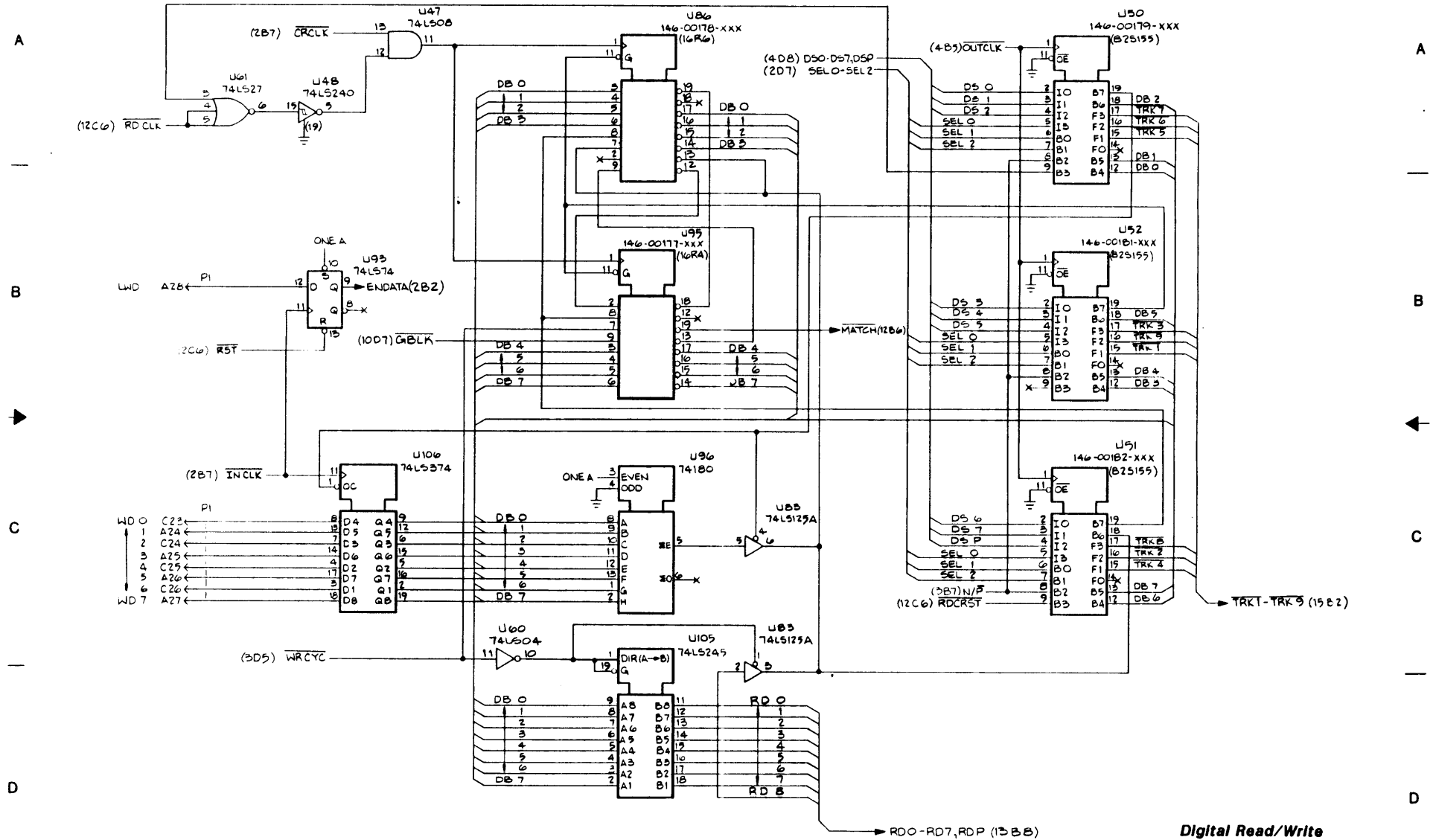
Digital Read/Write
Type 7960
Schematic Diagram

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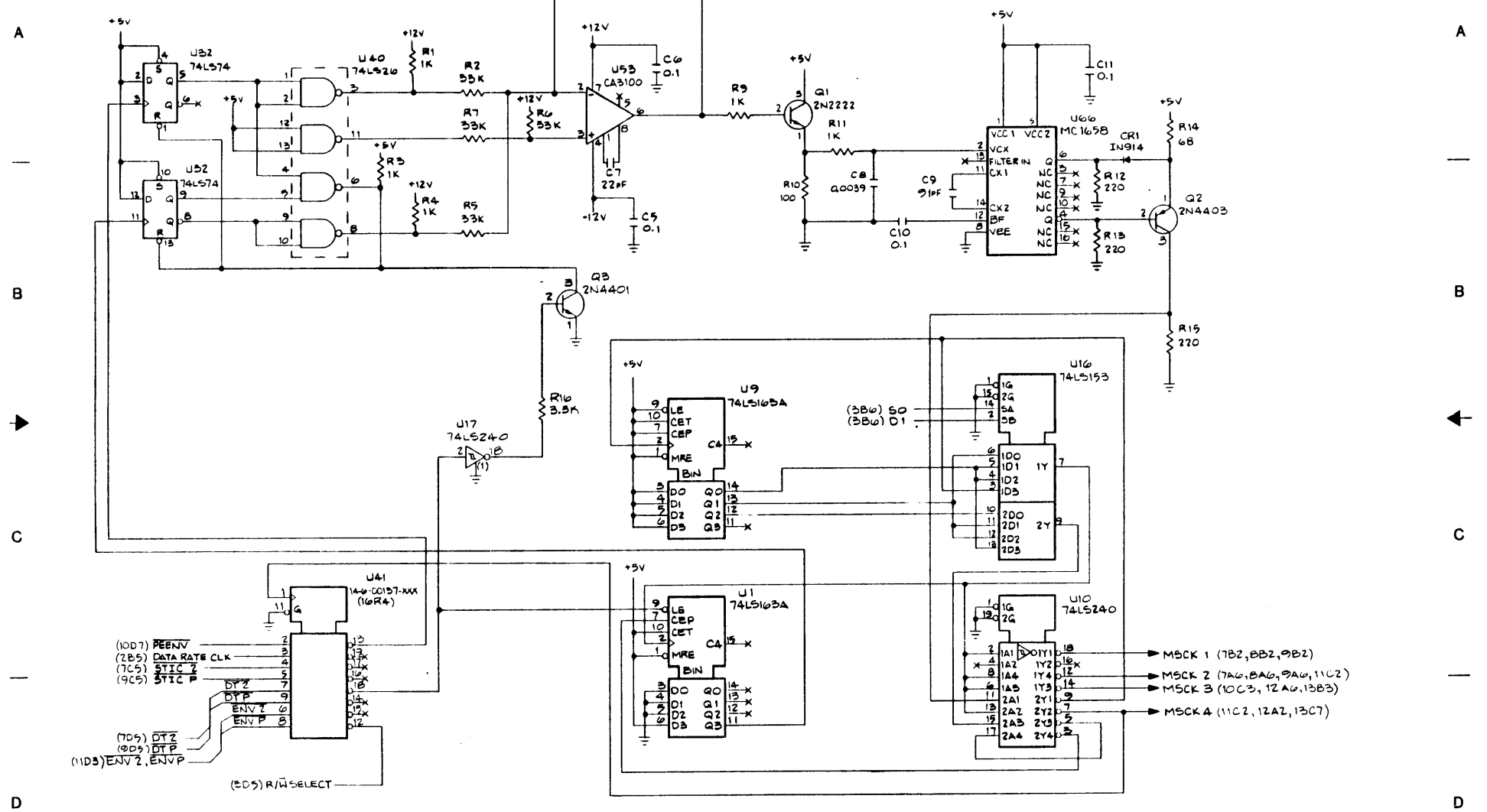
Digital Read/Write
Type 7960
Schematic Diagram

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Digital Read/Write
Type 7960
Schematic Diagram

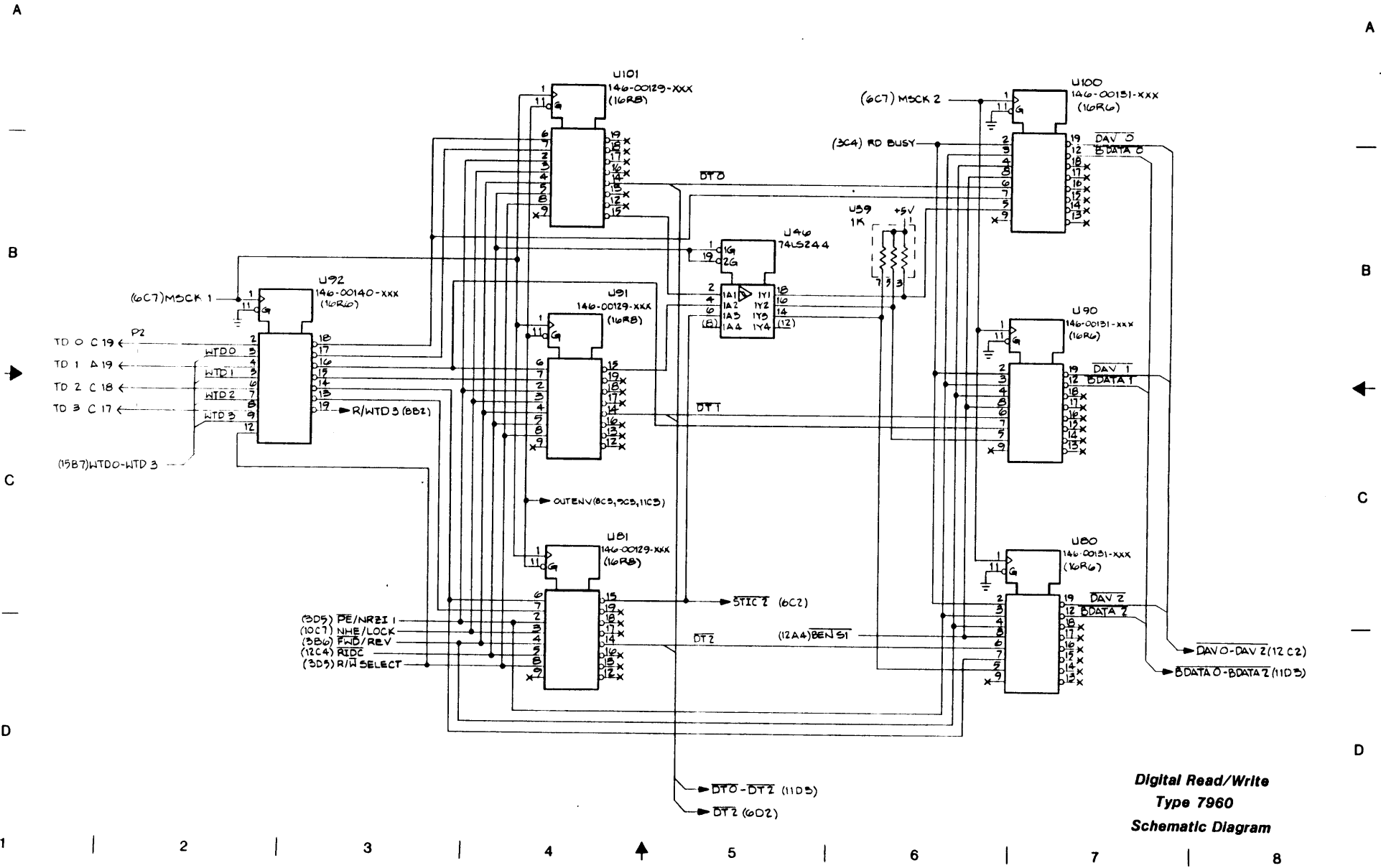
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**Digital Read/Write
 Type 7960
 Schematic Diagram**

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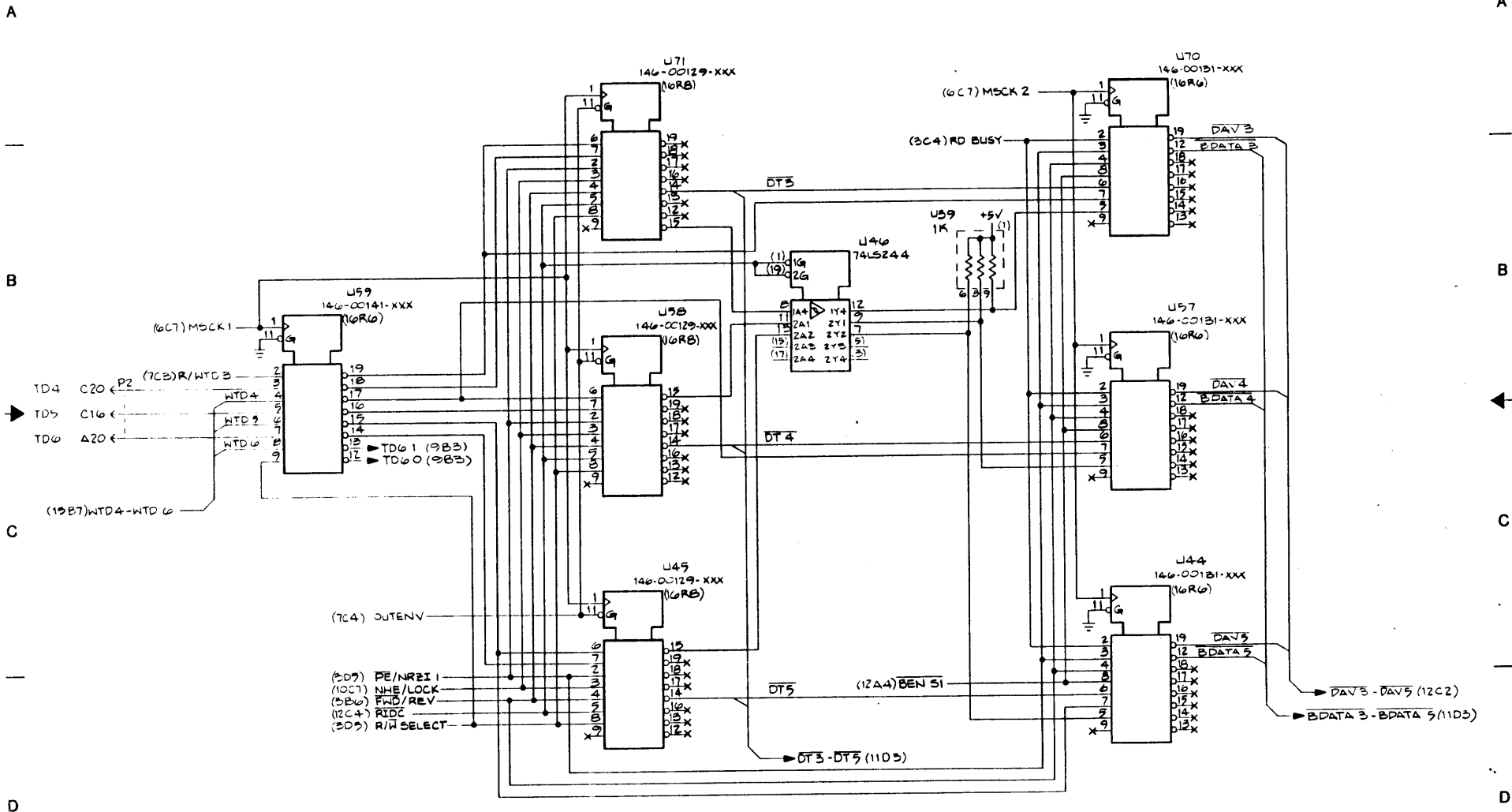
401-07960-000A
SHEET 7 OF 15



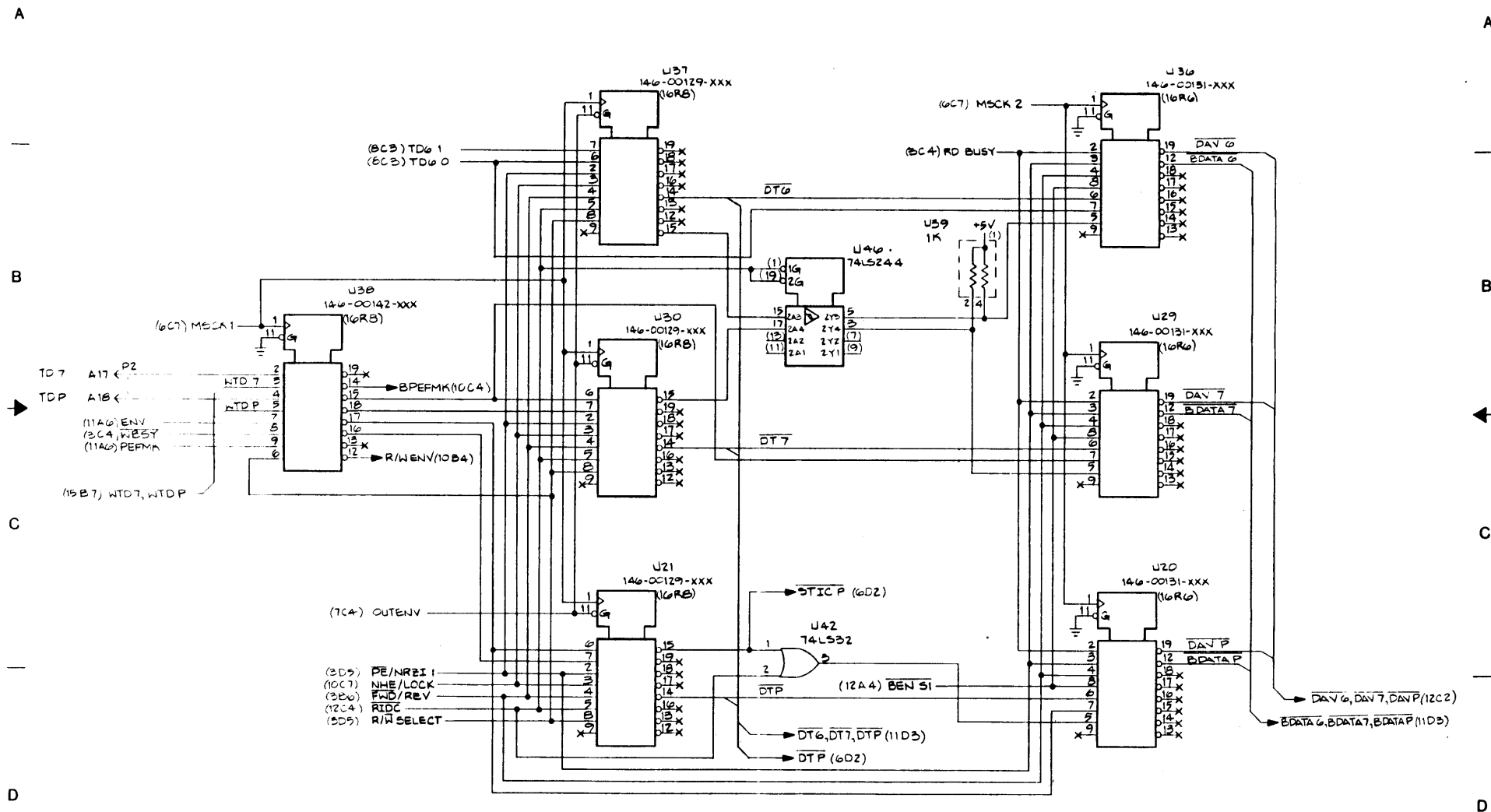
Digital Read/Write
Type 7960
Schematic Diagram

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401-07960-000A
SHEET B OF 15

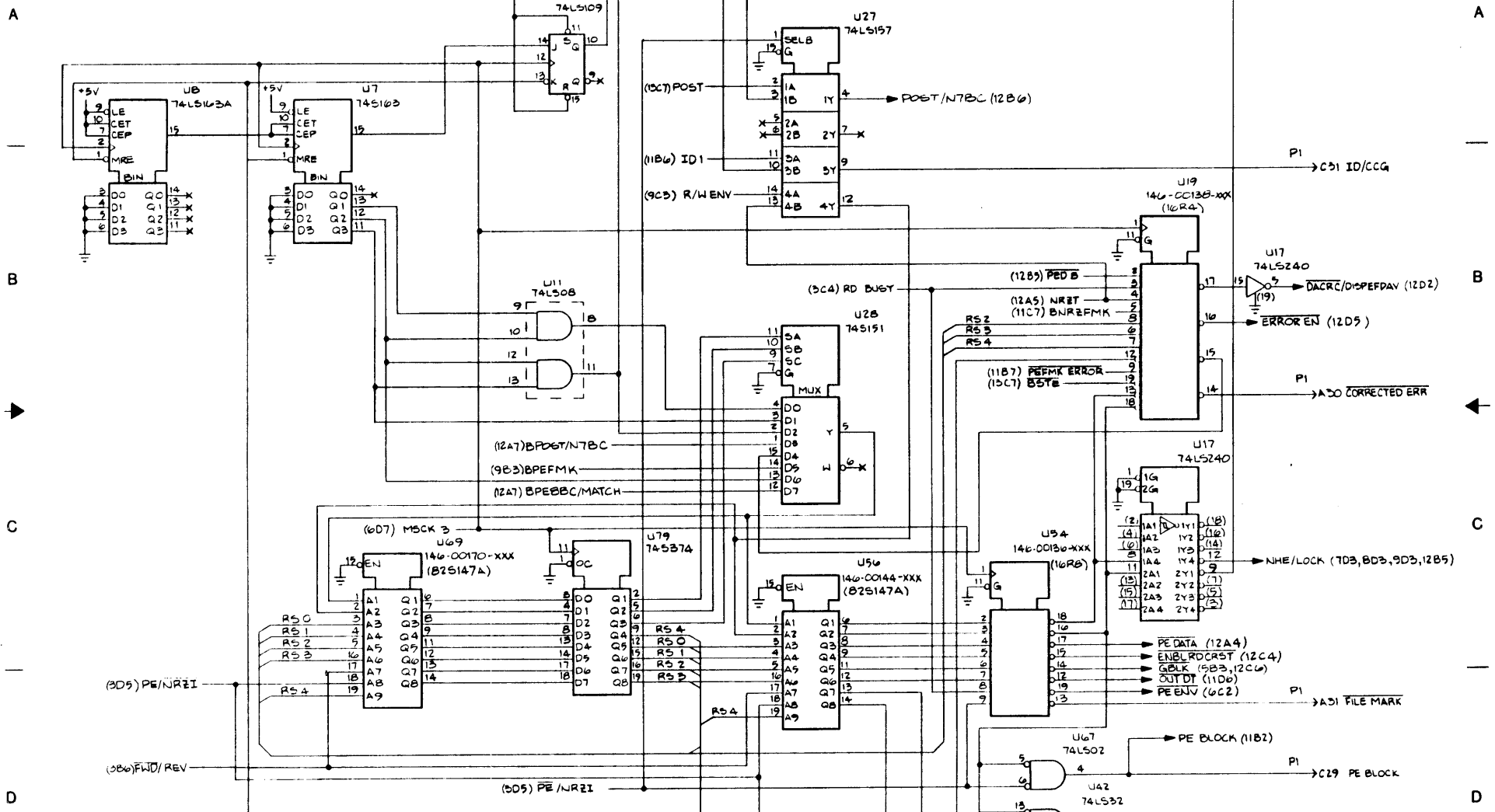


Digital Read/Write
Type 7960
Schematic Diagram



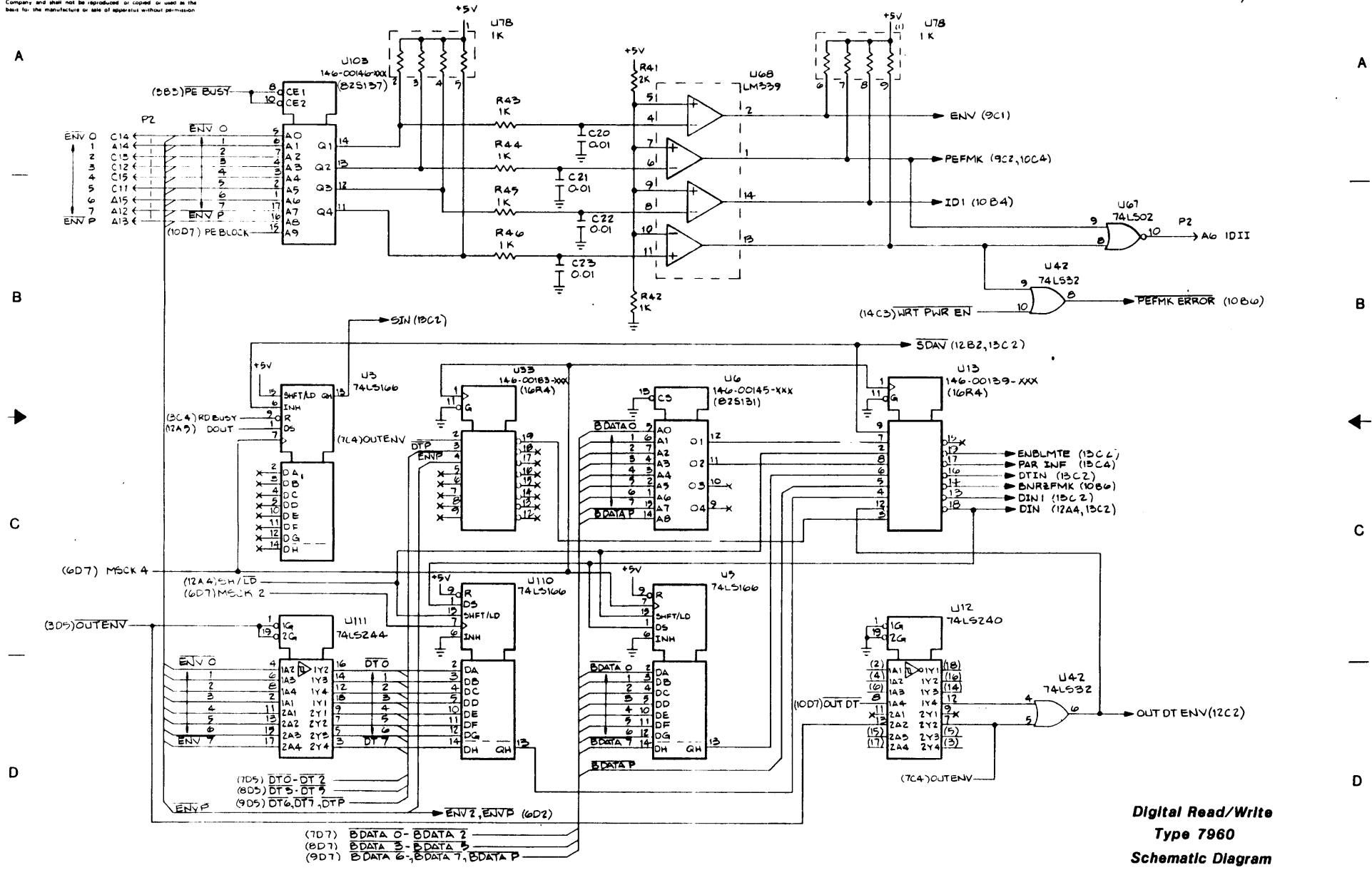
Digital Read/Write
Type 7960
Schematic Diagram

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Digital Read/Write
Type 7960
Schematic Diagram

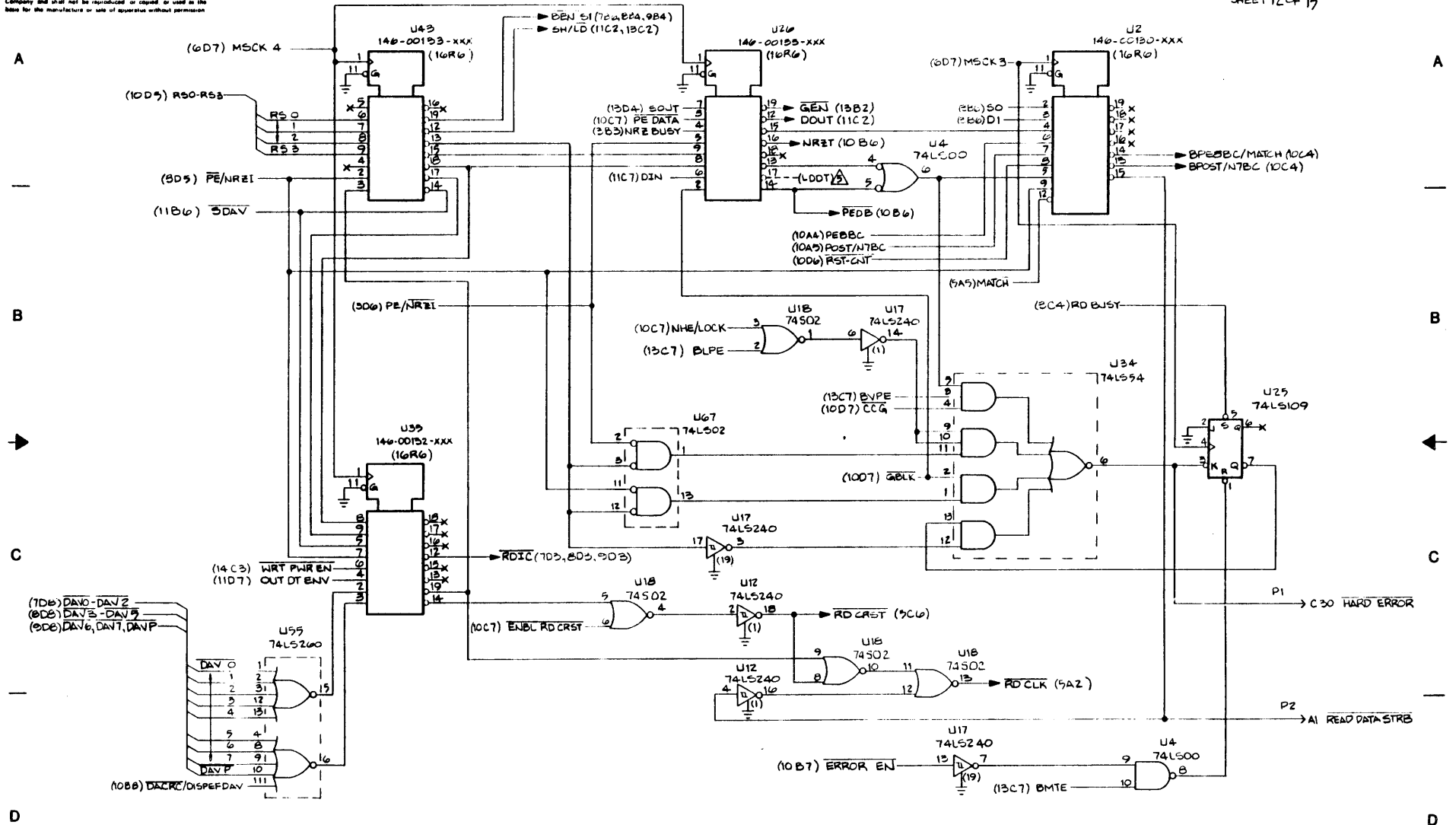
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Digital Read/Write
Type 7960
Schematic Diagram

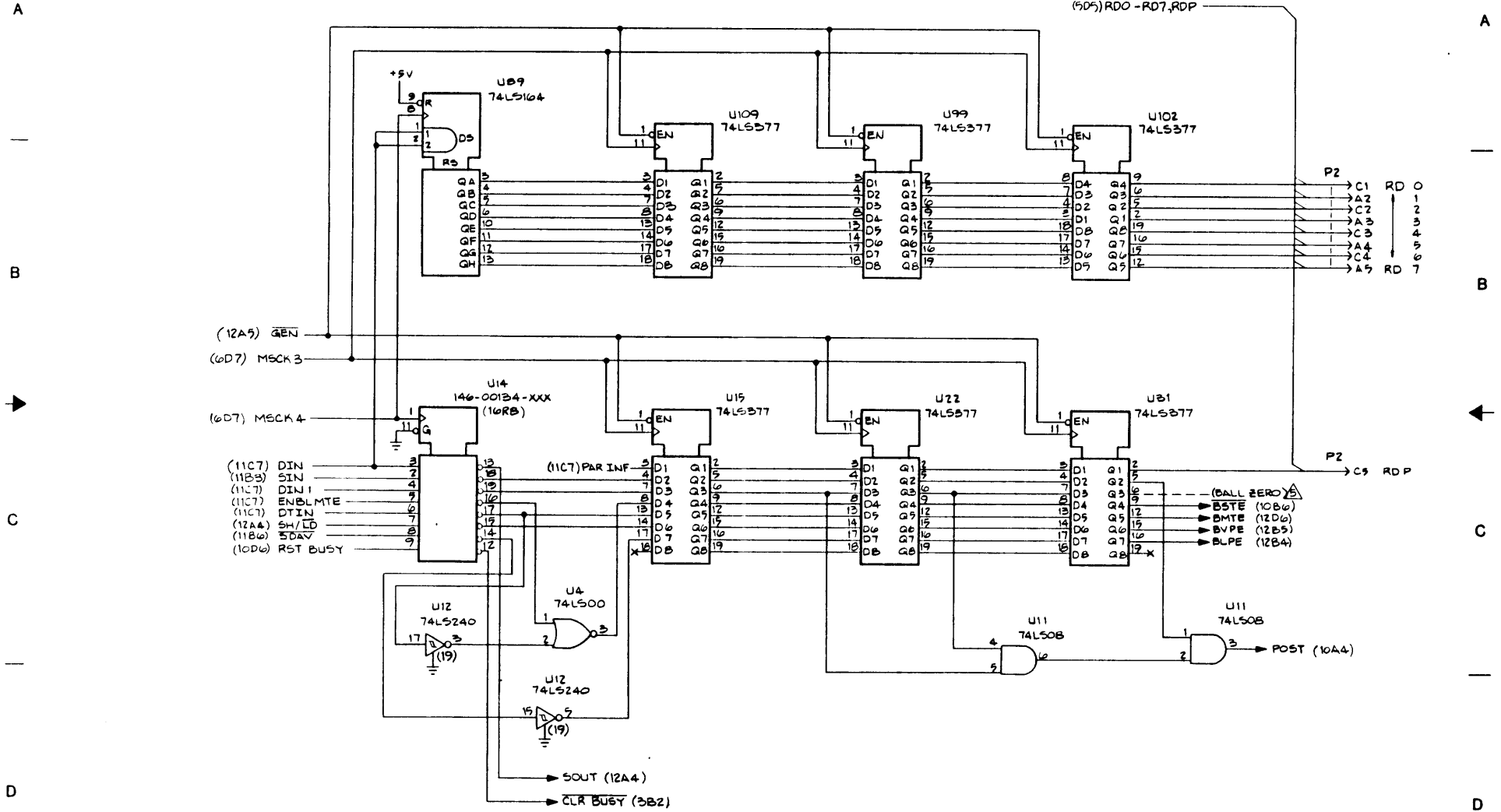
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401-07960-000 D
SHEET 12 OF 15



Digital Read/Write
Type 7960
Schematic Diagram

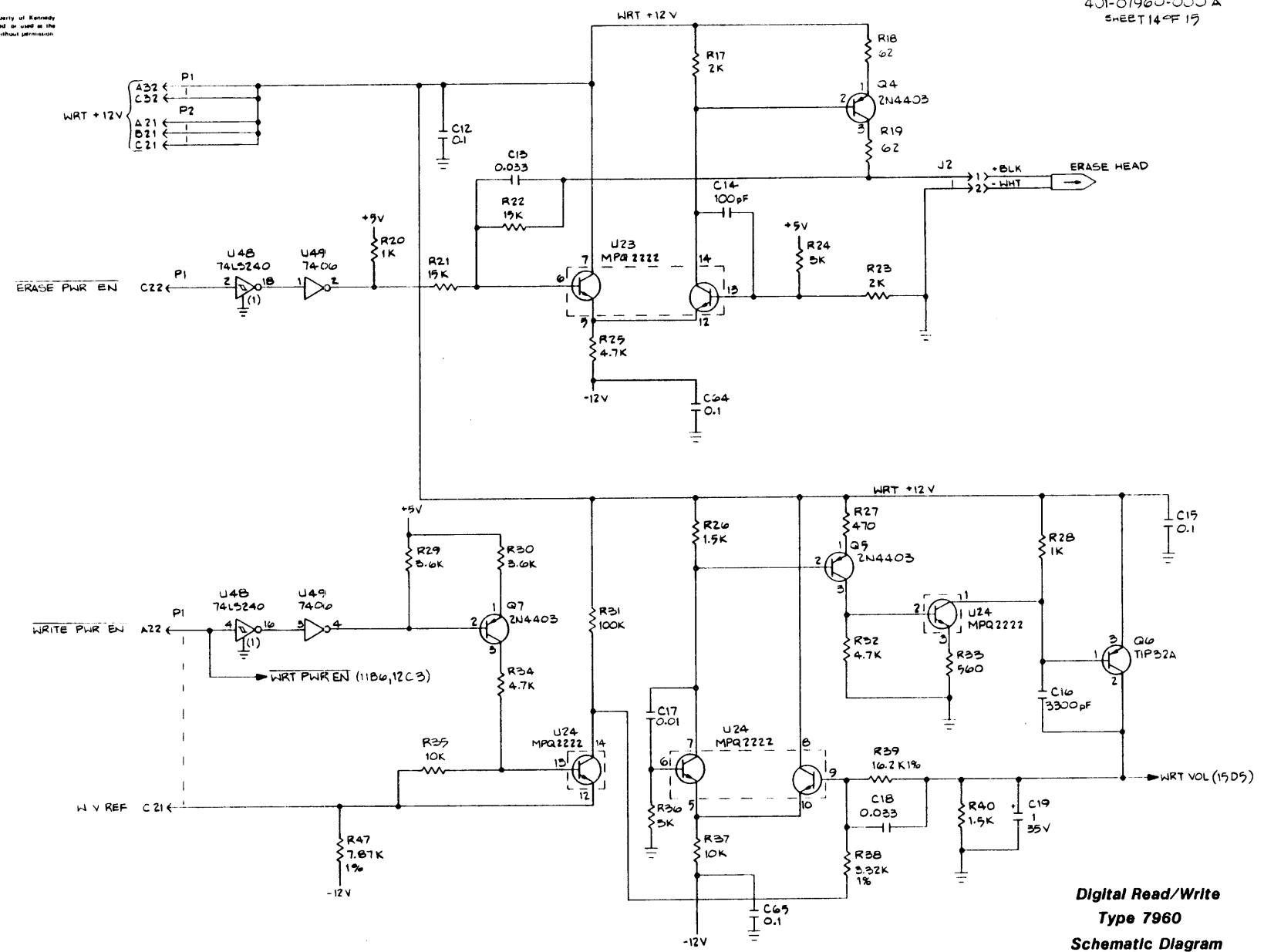
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Digital Read/Write
Type 7960
Schematic Diagram

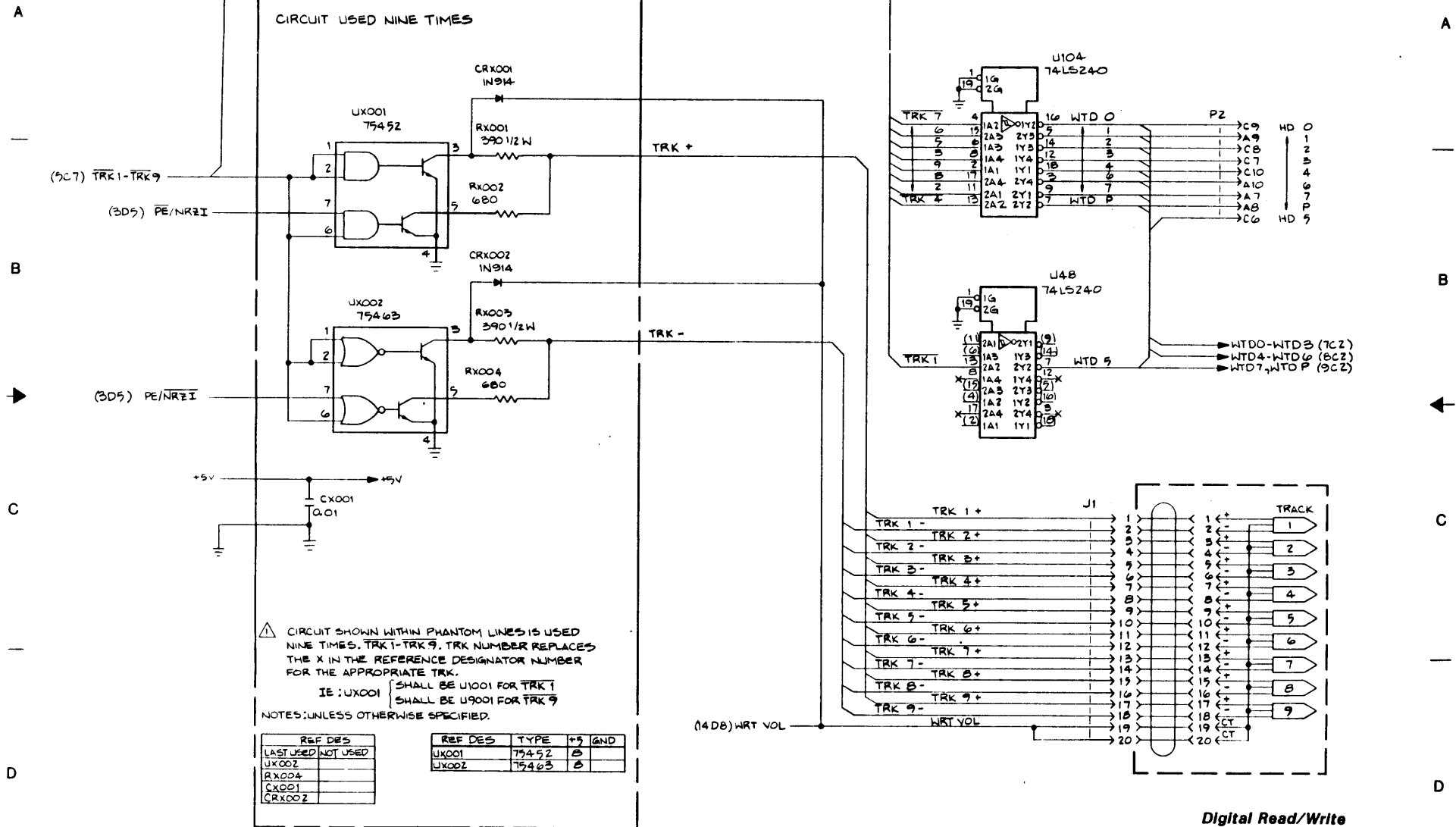
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401-07960-000 A
SHEET 14 OF 19



Digital Read/Write
Type 7960
Schematic Diagram

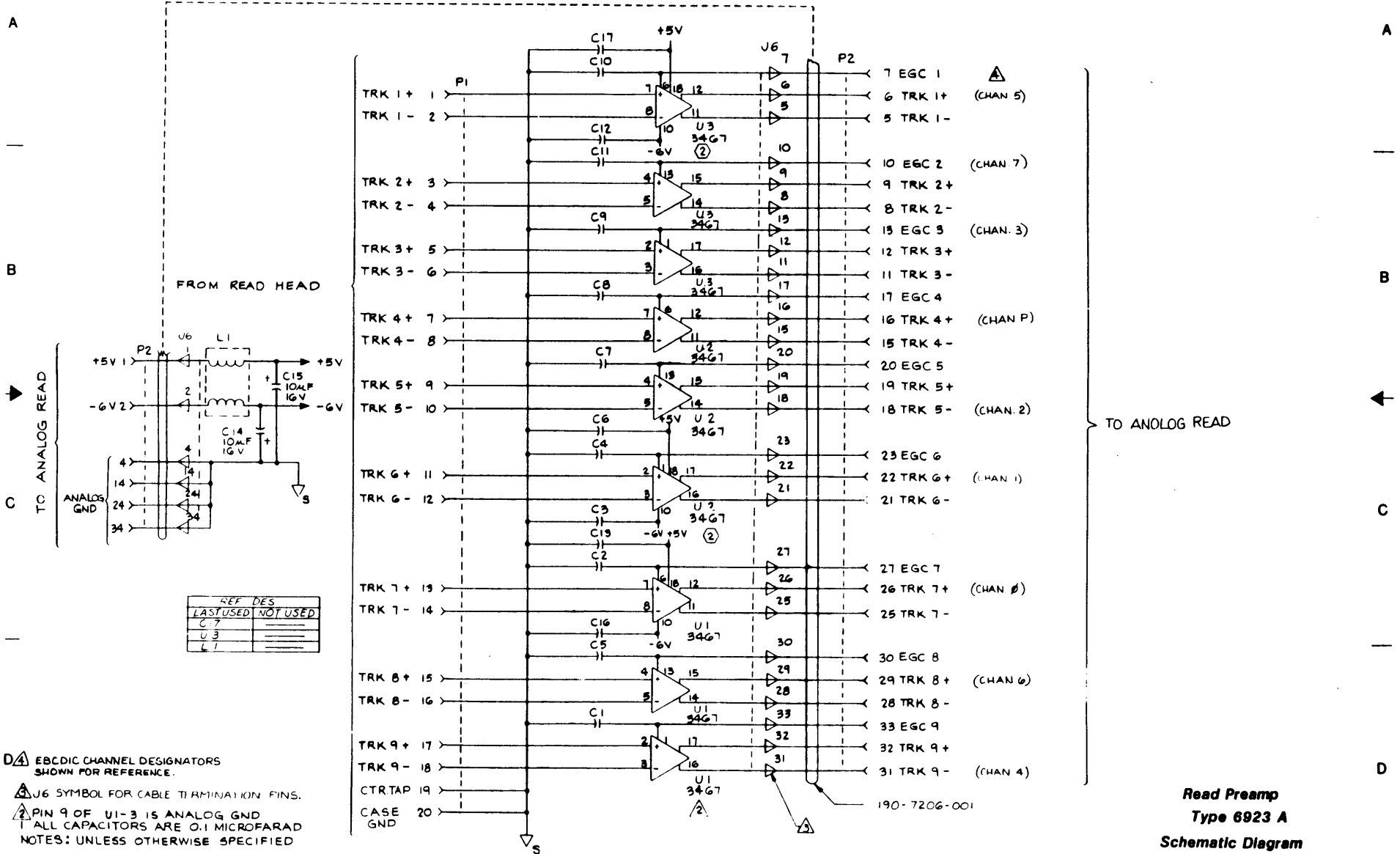
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Digital Read/Write
Type 7960
Schematic Diagram

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401-6923-000 REV A
3H 10F1



Read Preamp
Type 6923 A
Schematic Diagram

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401-7917-000F
SHEET 1 OF 8

190-7917 TABULATION

REF DES	DRSH NO	REV
	-006	A
U23	44-00167-001	
U25	44-00168-002	
U30	44-00169-001	
UX08	44-00166-001	

A

B

C

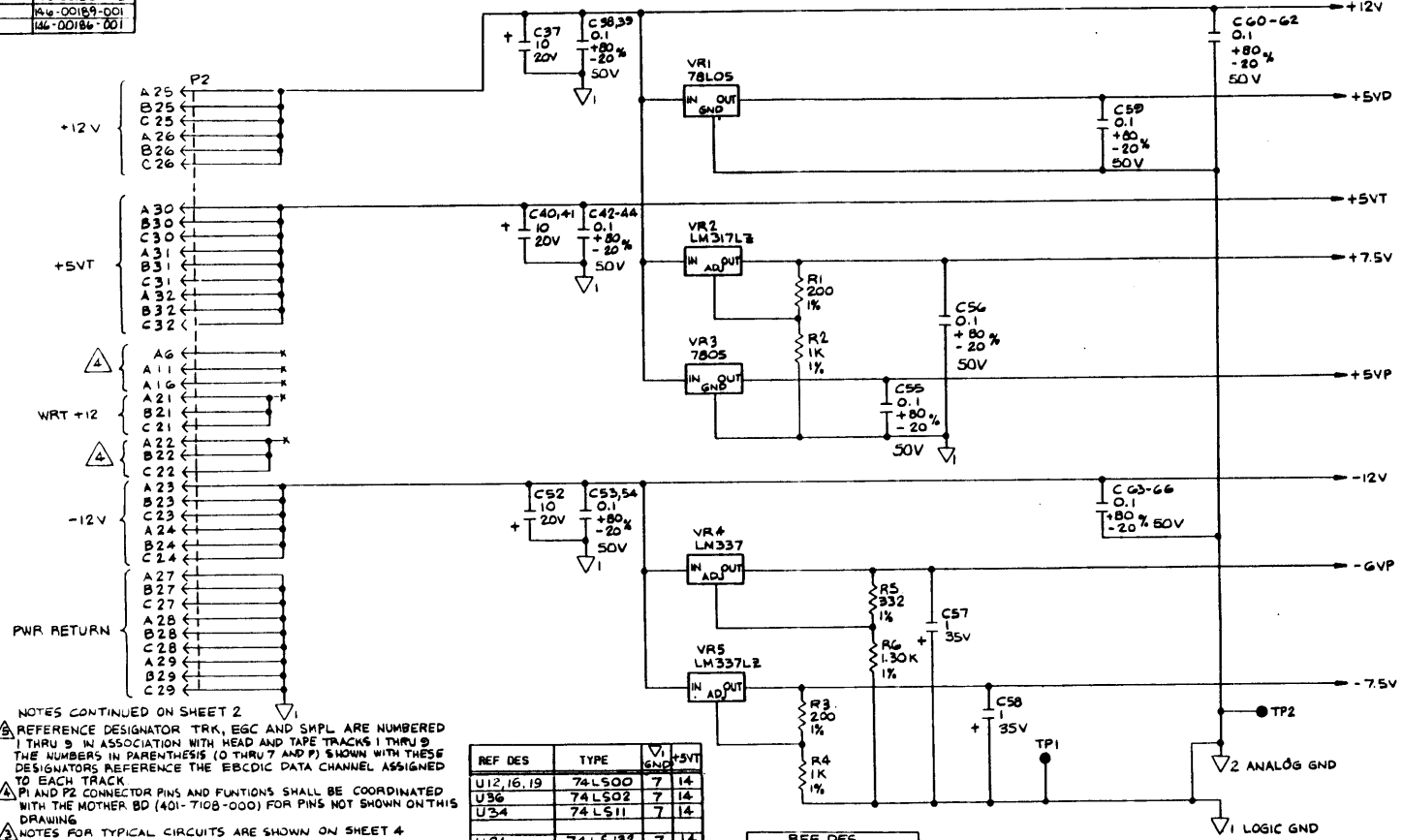
D

A

B

C

D



NOTES CONTINUED ON SHEET 2
 REFERENCE DESIGNATOR TRK, EGC AND SHPL ARE NUMBERED 1 THRU 9 IN ASSOCIATION WITH HEAD AND TAPE TRACKS 1 THRU 9 THE NUMBERS IN PARENTHESIS (O 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 BD (401-7108-000) FOR PINS NOT SHOWN ON THIS DRAWING.
 NOTES FOR TYPICAL CIRCUITS ARE SHOWN ON SHEET 4

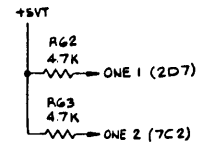
- RESISTORS ARE IN OHMS = 5%, 1/4 W.
- CAPACITORS ARE IN MICROFARADS ± 10% 50V

NOTES: UNLESS OTHERWISE SPECIFIED

REV STATUS	REV	F	C	C	B	C	B	B	D
	SHEET	1	2	3	4	5	6	7	8

REF DES	TYPE	V _I	V _O	±%
U12,16,19	74LS00	7	14	
U36	74LS02	7	14	
U34	74LS11	7	14	
U24	74LS132	7	14	
U28,33	74LS151	8	16	
U13	74LS161	8	16	
U32	74LS163	8	16	
U15	74LS193	8	16	
U11,17,27	74LS240	10	20	
U14,35	74LS244	10	20	
U8,26,31	74LS374	10	20	
U37	74LS393	7	14	
U23,25,30	825123	8	16	
U21	7406	7	14	
U22	2114	-	18	
U29,38-41	74LS221	8	16	

REF DES	LAST USED	NOT USED
C47		C45-51
Q1		
R45		
U42		
VR5		
TP2		

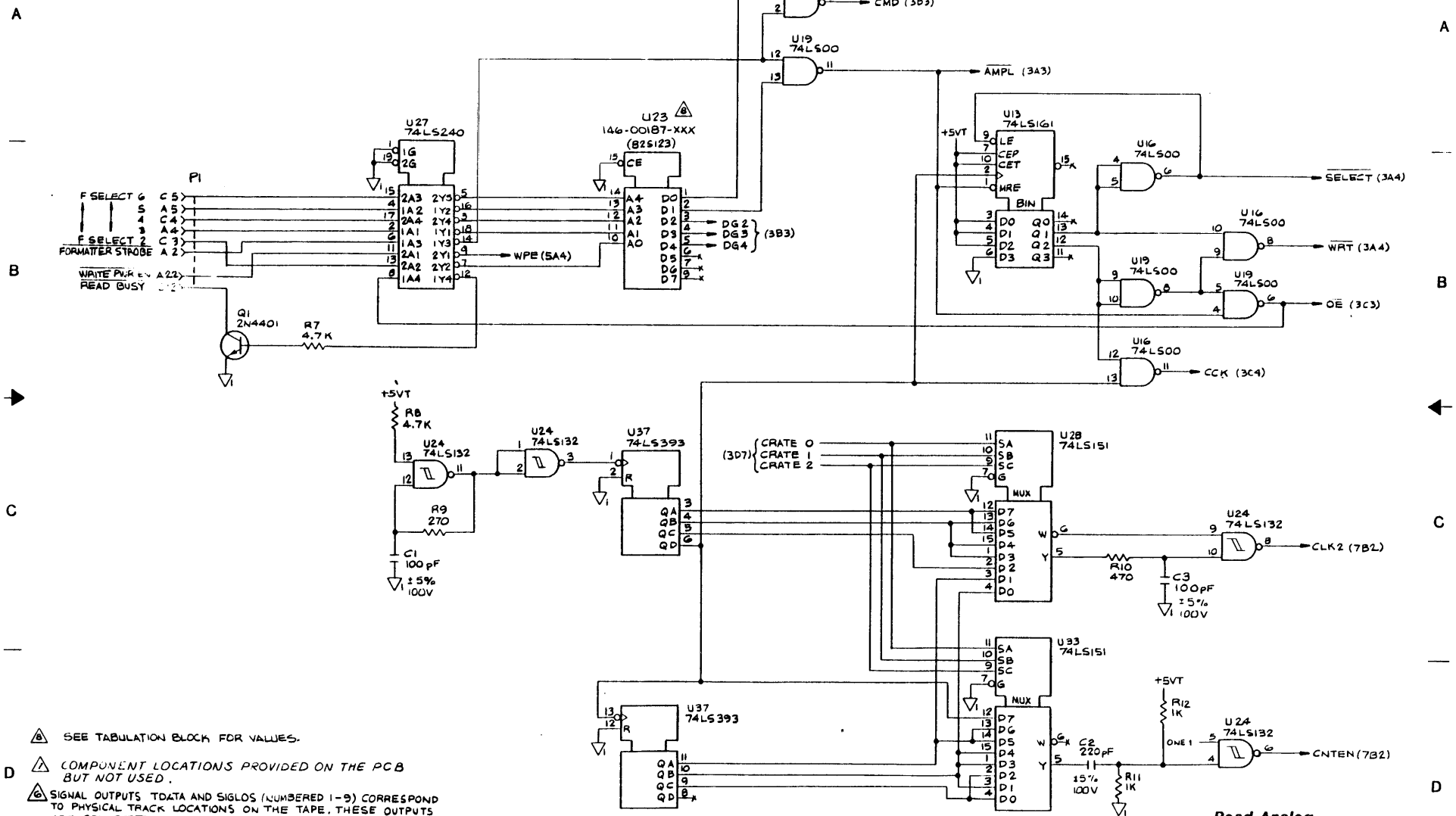


Read Analog
Type 7917
Schematic Diagram

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

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401-7917-000C
SHEET 2 OF 8

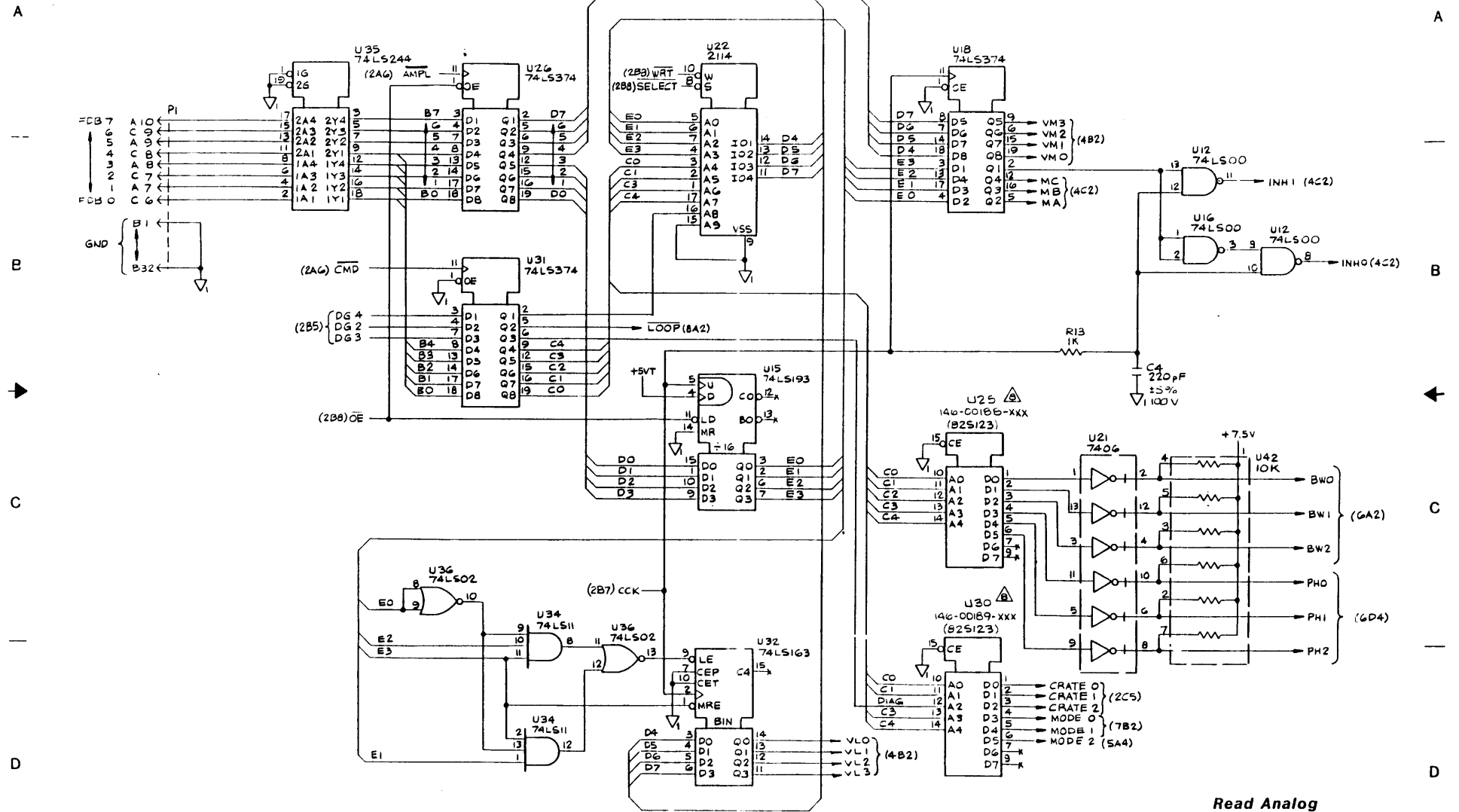


- △ SEE TABULATION BLOCK FOR VALUES.
- △ COMPONENT LOCATIONS PROVIDED ON THE PCB BUT NOT USED.
- △ SIGNAL OUTPUTS TDATA AND SIGLOS (NUMBERED 1-9) CORRESPOND TO PHYSICAL TRACK LOCATIONS ON THE TAPE. THESE SIGNALS ARE CONNECTED TO THE DATA PATH SIGNAL LINES TD AND ENV (NUMBERED 10-P) PER THE EBCDIC CONVENTION.

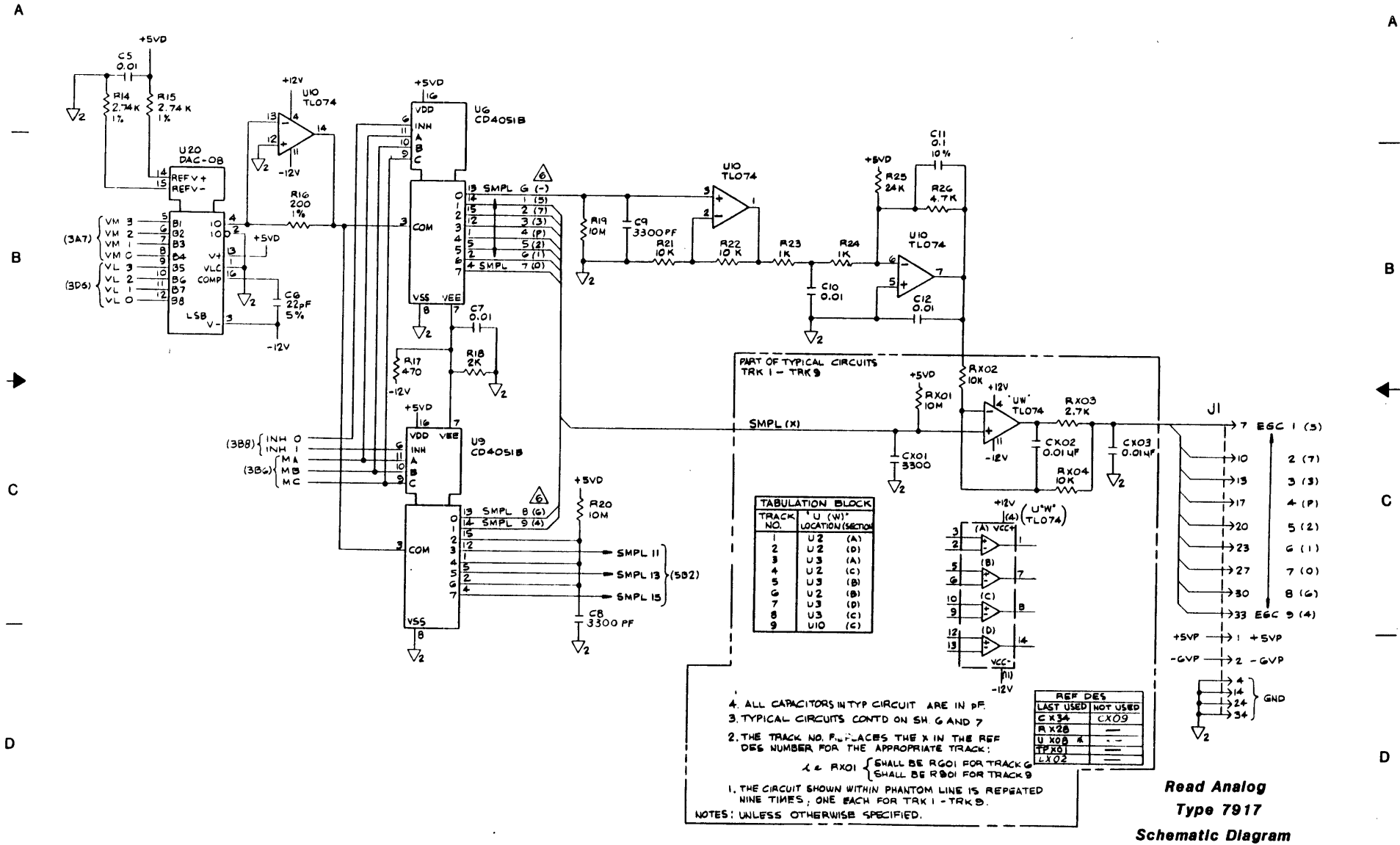
Read Analog
Type 7917
Schematic Diagram

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

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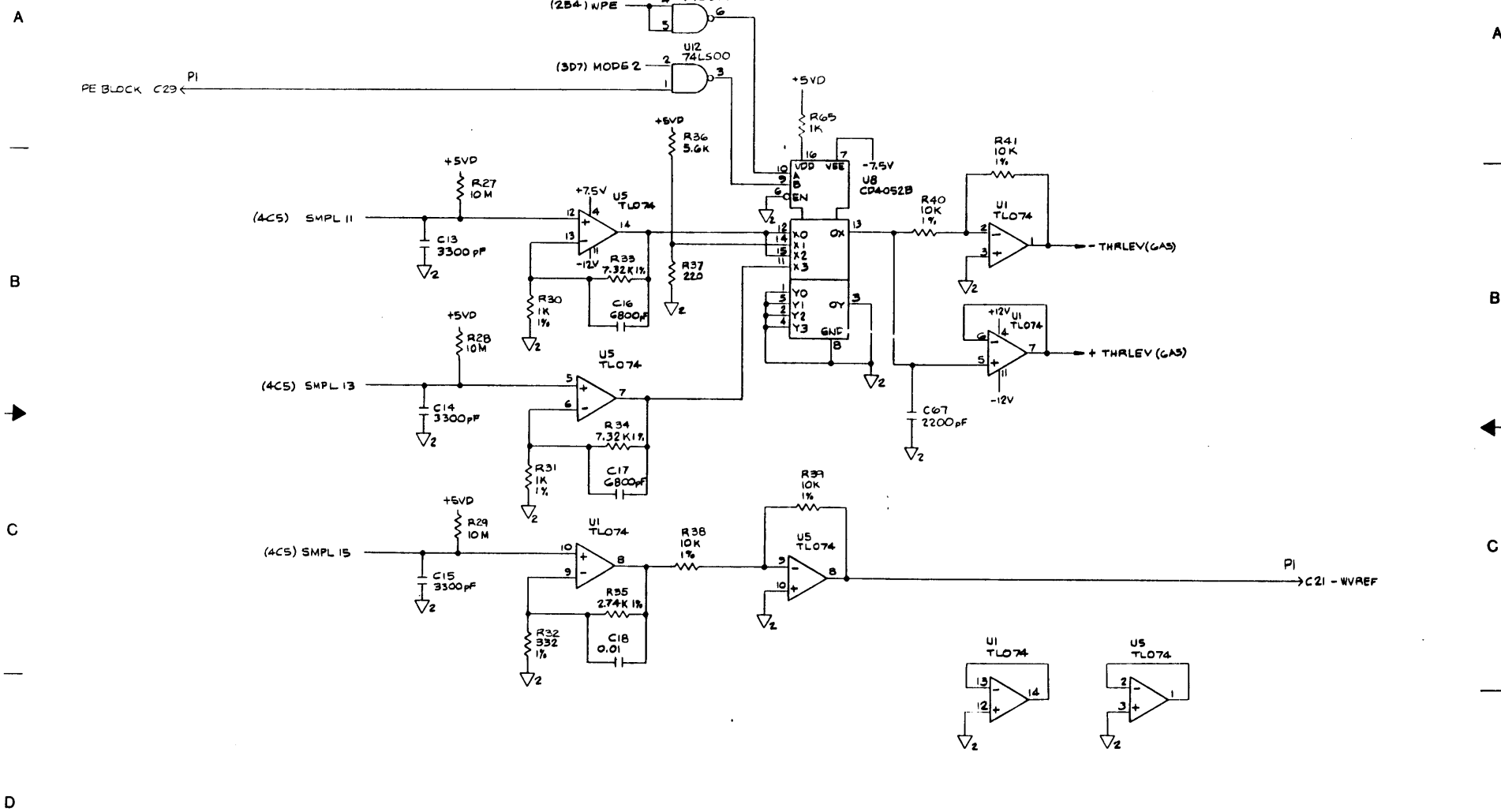
Read Analog
Type 7917
Schematic Diagram



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

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401-7917-000 C
SHEET 5 OF 8



D |

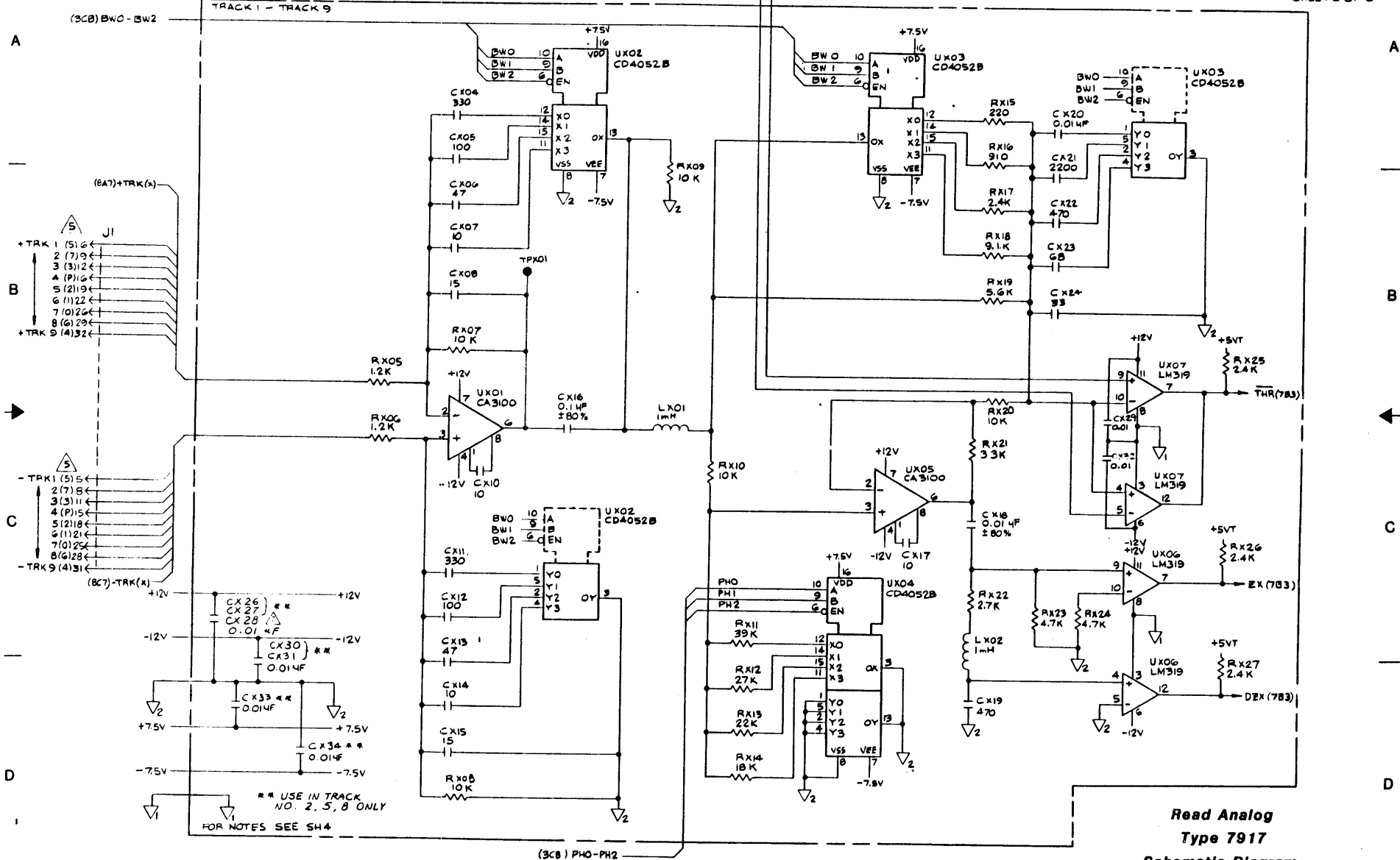
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

**Read Analog
Type 7917
Schematic Diagram**

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

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401-7917-000B
SHEET 6 OF 8



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

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

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401-7917-0008
SHEET 7 OF 8

A

A

B

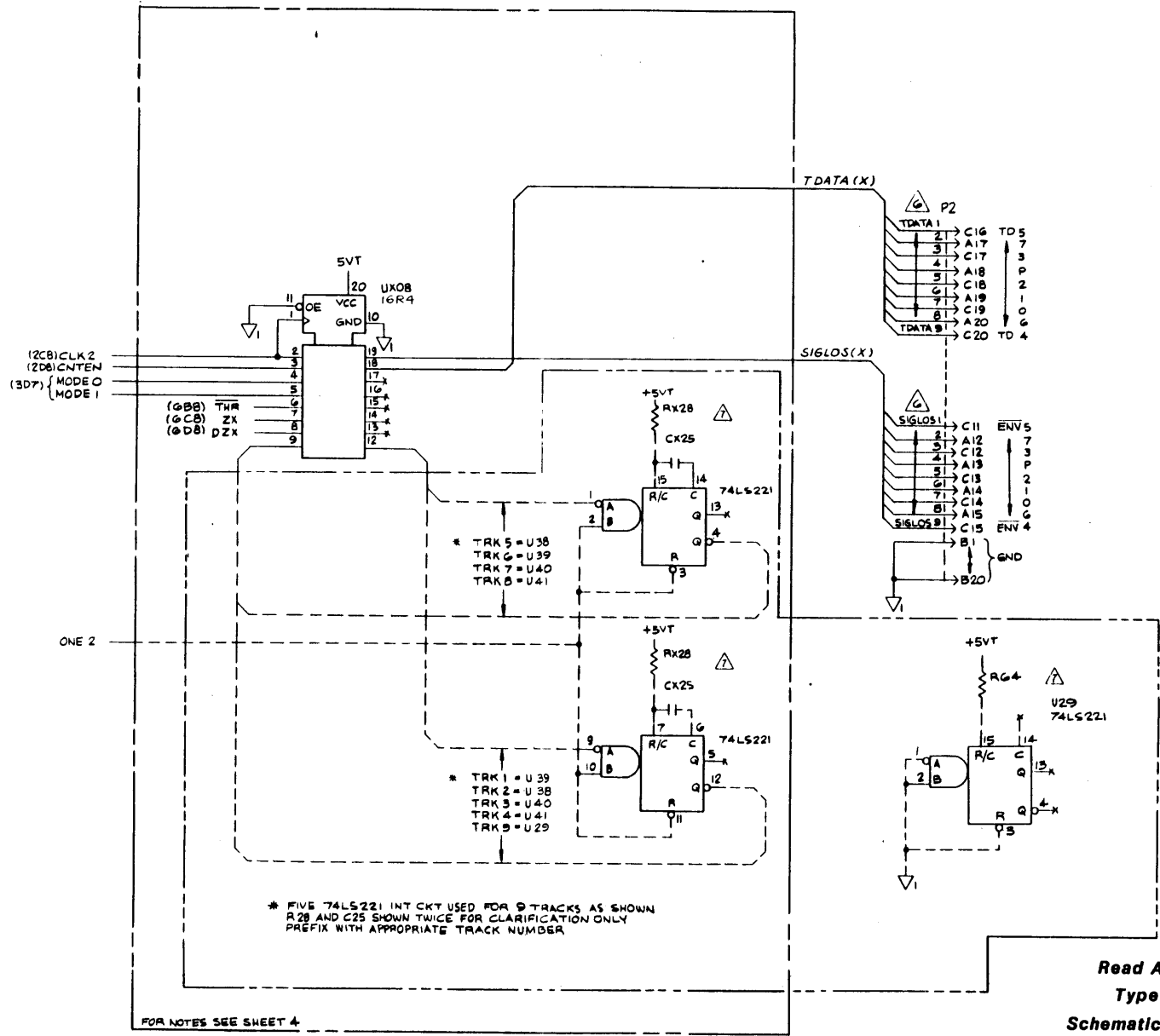
B

C

C

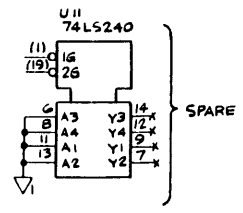
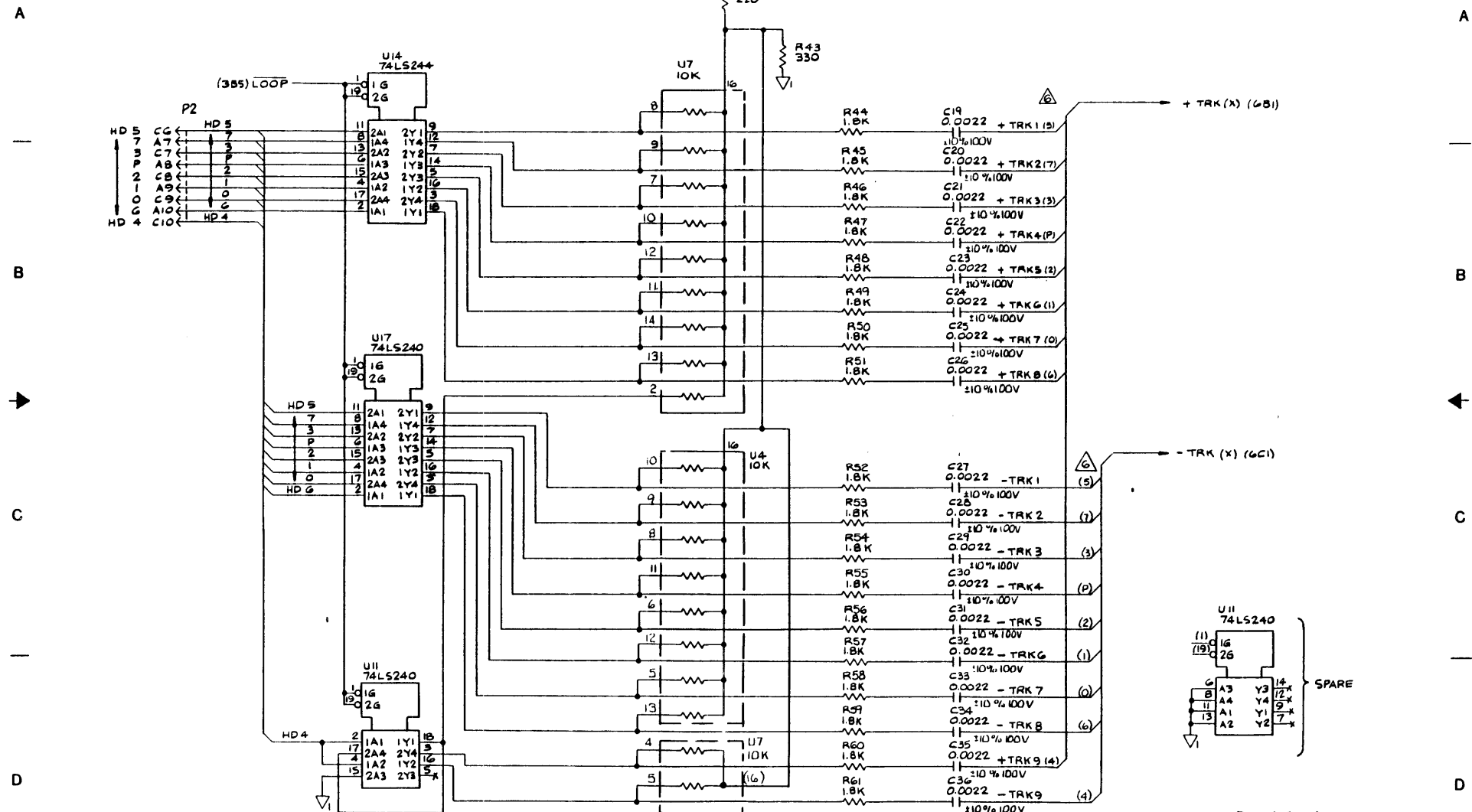
D

D



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

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Read Analog
Type 7917
Schematic Diagram

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



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