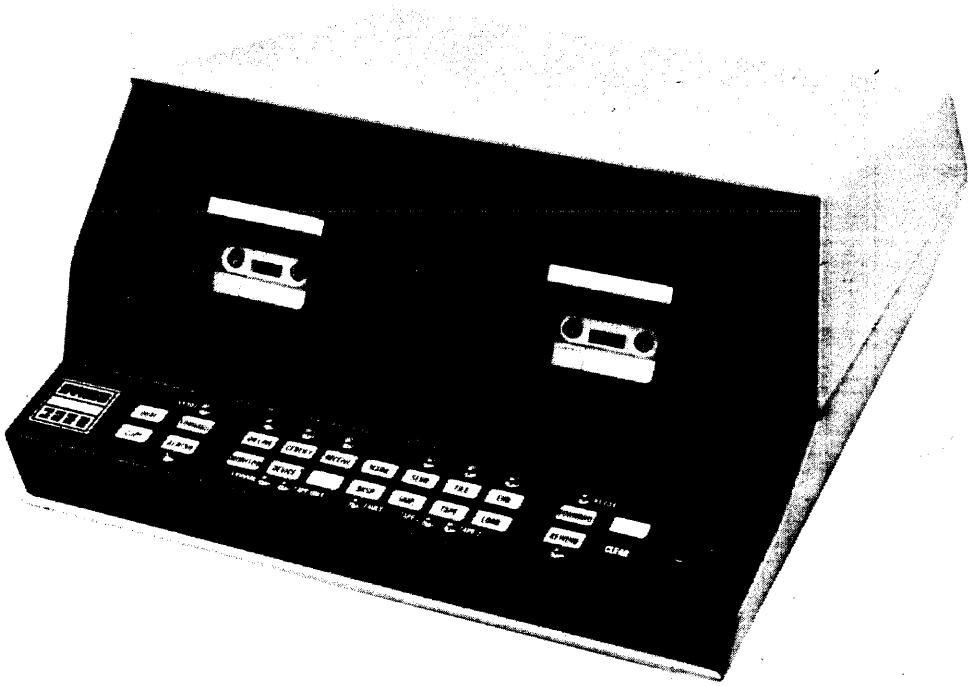
SERIES 3000 SERVICE MANUAL



- EIA Cassette Tape System
- Cassette Tape Controller

SYKES

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SERVICE MANUAL
for
Series 3000
EIA Cassette Tape System
and
Cassette Tape Controller

Prepared by

SYKES DATATRONICS, INC.

CUSTOMER SERVICE DEPARTMENT

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SCOPE OF MANUAL

This document provides service information for two Series 3000 devices and their options: the Series 3000 Cassette Tape Controller Unit and the Series 3000 EIA System. Descriptions of these devices, their specifications and functions are contained in Section 1 of this manual.

Sections 2 through 10 describe the various major components of the Series 3000 Units as indicated on the index tabs. These Sections include instructions for dismantling and assembling of the indexed component(s) and any subassemblies; also parts illustrations and replacement parts lists for equipment included in the Section.

Adjustment and periodic maintenance information are contained in Section 11, followed by a troubleshooting guide in Section 12, and a complete set of logic schematic and other diagrams filed in Section 13.

CONTENTS

ILLUSTRATIONS

1.0 SECTION 1 - GENERAL DESCRIPTION OF EQUIPMENT

1.1 SERIES 3000 EQUIPMENT

Sykes Datatronics, Inc. Series 3000 equipment employs Sykes high performance cassette-loaded tape transports in combination with a functionally oriented cassette type controller which can be interfaced to a variety of systems.

This manual deals primarily with two Series 3000 devices; the Series 3000 Cassette Tape Controller (CTC) and the Series 3000 EIA System. The former is a general purpose CTC which can be interfaced to various systems, and the latter is an EIA compatible version of the CTC with added operator keyboard, remote control capability and EIA RS-232-C plug-to-plug interfaces. Both devices are available with either desk top enclosure (Figures 1-1, 1-2) or rack mountable enclosure (Figure 1-3).

The ensuing paragraphs in this Section describe the two Series 3000 devices and their functions in more detail.

1.1.1 Series 3000 Cassette Tape Controller Unit

The Series 3000 Cassette Tape Controller Unit is a general purpose unit designed for interfacing to a variety of devices such as data communications terminals and small or medium size computers or for use in special systems applications.

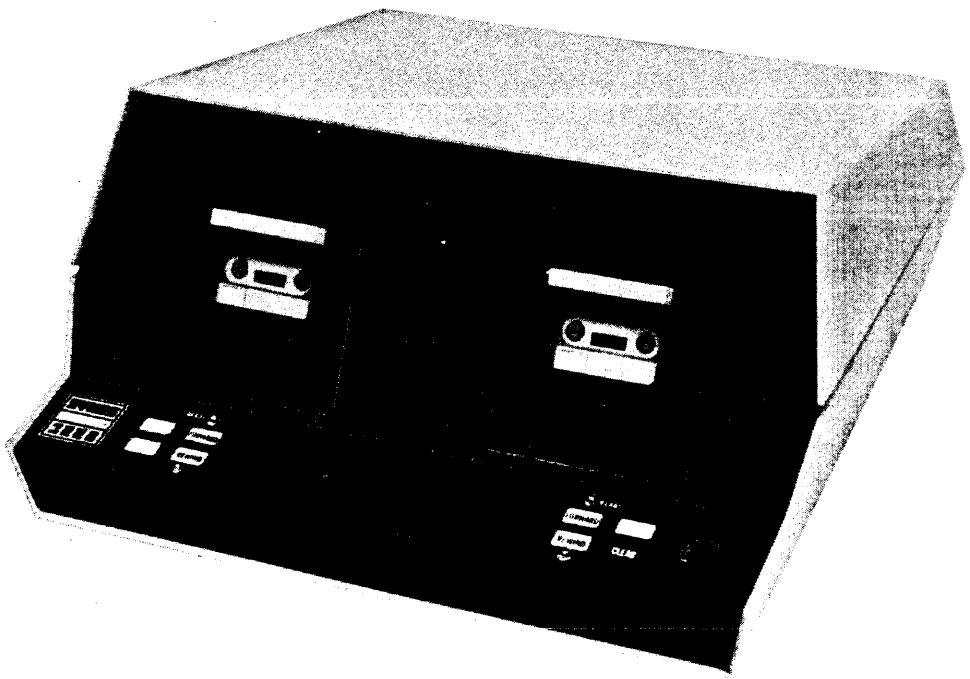


FIGURE 1-1 3220 CTC UNIT, DESK TOP VERSION

The unit is equipped with transport(s) configured either for 5 ips or 12 ips read and write operations. Both (5 ips and 12 ips) transport types can perform read and write operations on either of two tape tracks.

The Series 3000 CTC is composed primarily of the following subassemblies:

One (Model 3120) or two (Model 3220) TT120 Tape Transports
Power Supply Assembly
Controller Logic Assembly
Front Panel Controls
User Designed Interface

Series 3000 CTC options include:

HIGH SPEED SEARCH which allows the user to access any file directly by file address at an average speed of 120 ips.

VACUUM TAPE CLEANER which removes particles of dirt, dust, and oxide deposits with every pass of the tape.

CARRYING CASE which allows units in desk top configuration to be easily transported.

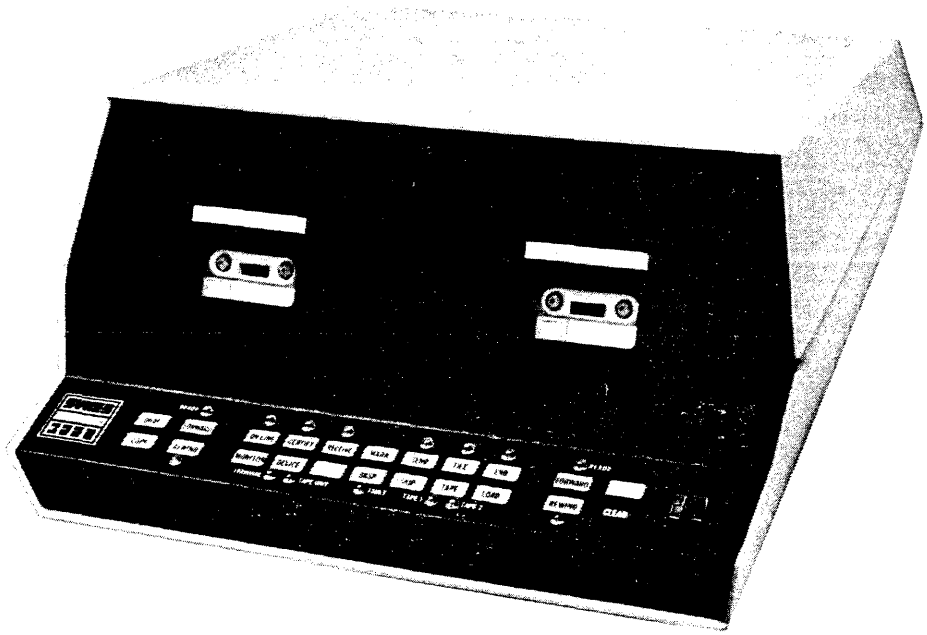


FIGURE 1-2 3220 EIA SYSTEM, DESK TOP VERSION WITH INTEGRAL KEYBOARD

1.1.2 Series 3000 EIA System

The Series 3000 EIA System is designed to function in a data communications enviroment. It can function as a stand-alone commu-

nications terminal in either a manual or unattended mode. The unit has keyboard control for local operation and can also be operated remotely by means of user selected codes sent from either an associated I/O device or directly from the communications line. The unit is equipped with transports configured to operate at 5 ips during read/write operations, utilizing a single .080 inch wide tape track. The keyboard may be integral to the unit or the optional peripheral type illustrated in Figure 1-4. The unit is plug-to-plug compatible with equipment interfaced in accordance with EIA Standard RS-232-C and CCITT (European). Two interfaces are available: one for direct connection to operator oriented devices such as CRT display terminals, and one for connection to a remote device, usually via a communications link. Each of these interfaces has a separate baud rate selector switch.

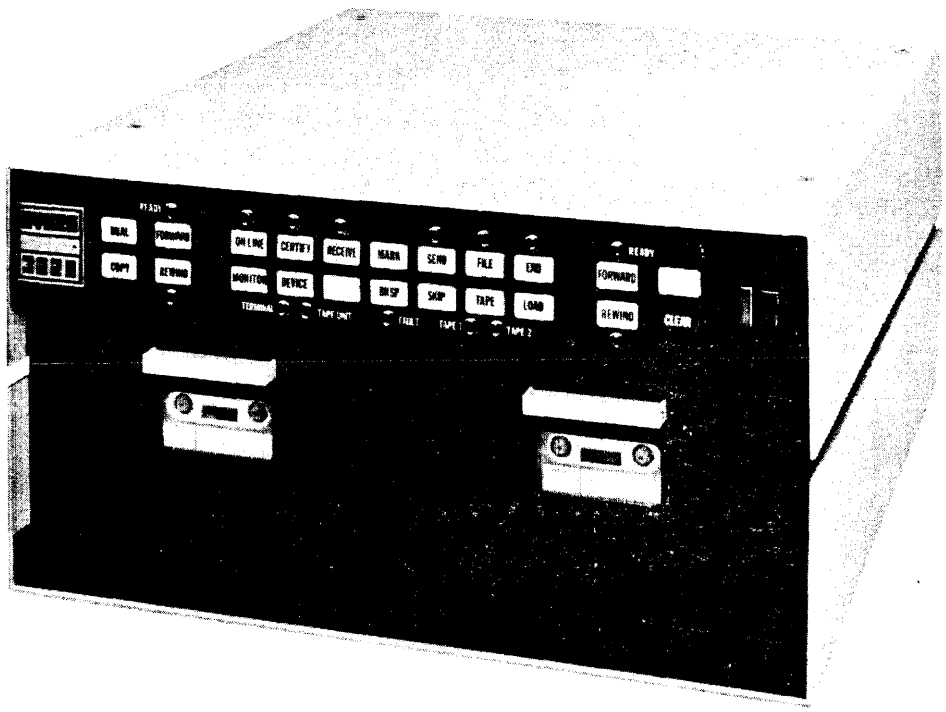


FIGURE 1-3 3220 EIA SYSTEM, RACK MOUNTABLE VERSION WITH INTEGRAL KEYBOARD

Standard operational features of the basic Series 3000 EIA System include Off-Line Operation; 110, 150 and 300 baud operation; Rewind, Clear, Send, Load, Mark, File and End keyboard functions; Start Send, Stop Send, Start Receive, Exit Receive, Reset, Character Delete, Line Cancal and Store Record remote commands.

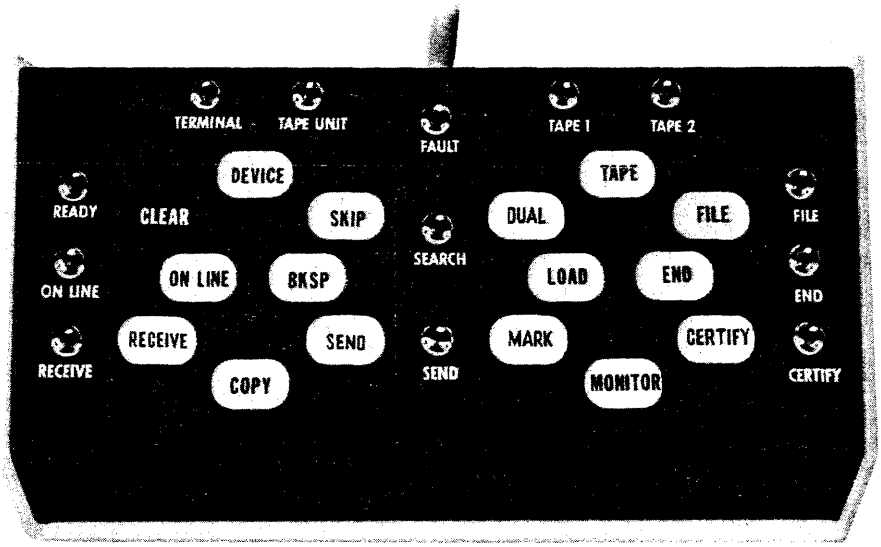


FIGURE 1-4 PERIPHERAL KEYBOARD ASSEMBLY

The Series 3000 EIA System is composed primarily of the following subassemblies:

One (Model 3120) or two (Model 3220) TT120 Tape Transports
Power Supply Assembly
Controller Logic Assembly
Basic Front Panel Controls
Keyboard Assembly (either Integral or optional Peripheral)
EIA Interface Assembly
Rear Panel Controls and Connectors

Series 3000 EIA System options include those listed in Section 1.1.1, plus:

ON-LINE/DEVICE SELECT which provides two separate keys used for placing either the terminal or tape unit on-line.

MANUAL SEARCH which provides FORWARD, BACKSPACE and SKIP keys.

COPY/DUAL which enables dual transport systems to copy a record, file or complete tape from tape 1 to tape 2, or to write information on two tapes simultaneously.

CERTIFY which provides a key which allows data to be checked for parity errors. A record, file or complete tape can be certified. If a parity error is found, the fault indicator will blink and the transport will stop.

MONITOR which allows the tape unit to record data communications between the on-line terminal and the modem; also the terminal may monitor data to the tape unit when the tape unit is on-line.

TAPE which, on a dual transport system, allows alternate selection of tape 1 or tape 2 from the keyboard.

EXPANDED REMOTE OPERATION OPTION which provides 16 additional remote commands:

Write File Mark
Write End Mark
Load Point
Load Point, Send to End
Retransmit
Send Record
Escape
Tape 1 Select
Tape 2 Select
Terminal Select
Tape Unit Select
Start Transparent Receive
Page
Search and Send
Search and Respond
Enquiry

1.2 EXPLANATION OF TERMS

BAUD (or BAUD RATE) - A unit of speed (signal elements per second) in data communications. The term baud is used to designate the total number of bits (both useful information bits and position or locating bits) transmitted per second. The total number of useful information bits only which are transmitted per second is usually stated as the bit rate in bits per second.

BUFFER - A device for temporarily storing information, between a keyboard and a tape unit, for example. Such storage capacity provides capability of editing data after it has been typed but before it is recorded on tape. A buffer also provides capability for either asynchronous or synchronous operation of the system.

ASYNCHRONOUS OPERATION - A method of serializing data for transmission in which each bit within a character starts at a time which is fixed with respect to the start pulse and to the start time of the other bits in the character, but the time interval between the characters is indeterminate. A Typical example of asynchronous operation is input data typed by a live operator. Asynchronous operation is also called incremental operation.

HALF DUPLEX - A mode of data transmission in which information is conveyed in only one direction at a time. This is in contrast to the full duplex mode which provides for simultaneous communication in both directions.

MODEM - Contraction for modulator-demodulator. A modem is a device which modulates signals entering and leaving a communications line.

1.3 TAPE CASSETTE REQUIREMENTS

The TT120 transport in the Series 3000 Units accepts all reel-to-reel cassettes which conform with the ECMA-34 and proposed ANSI Standards for cassettes. The magnetic tape contained must be preceded by and followed by approximately twenty inches of transparent tape for BOT and EOT sensing, and must not have the EOT and BOT sensing holes.

Although the TT120 transport will operate with any cassette meeting the above requirements, the performance and reliability of both the cassette and the transport can be guaranteed only if Sykes cassettes (Part No. 1001A0171) are used. Cassettes available from Sykes contain 300 feet of certified computer grade polyester magnetic tape 0.150 inches wide, with 0.5-mil backing thickness and 0.2-mil oxide thickness. Approximately 20 inches of 1.5-mil thick clear tape leader and trailer is attached between the ends of magnetic tape and the reels (refer to Figure 1-5). Cassettes

have two track protection openings which work in conjunction with two miniature switches on the transport; these provide protection against writing on the tape tracks.

1.4 SERIES 3000 INTERFACES

1.4.1 Series 3000 EIA Cassette Tape System Interface

See Section 7 of this manual for EIA interface description and parts lists.

1.4.2 Series 3000 CTC Breadboard Interface Kit

The Sykes Series 3000 CTC Wire-Wrap Breadboard Interface Kit is available to the interface designer who wishes to develop an interface to a data communications terminal, small or medium sized computer or other device. See Section 9 for details.

1.5 SPECIFICATIONS

1.5.1 General

Model No. Designation - 3120 (with one tape transport)
3220 (with two tape transports)

Logic Circuitry - DTL, TTL, MOS LSI

Cabinet Dimensions
Table Top - 18.6" w x 21.75" d x 8.81" h
Rack Mount - 19" w x 21.5" d (behind panel) x 8.745" h

Peripheral Control Keyboard Dimensions - 10" w x 6" d x 2.5" h

Cabinet Weight	3120	3220
Table Top -	50 lbs.	63 lbs.
Rack Mount -	55 lbs.	68 lbs.

Peripheral Control Keyboard Weight - 2-3/4 lbs.

Operating Temperature Range - 4° to 45° C

Operating Humidity Range - 20% to 90% RH without condensation

Power Requirements - 120/240 vac ±15%; 60 Hz; 200 watts (two transports); (50 Hz optional)

1.5.2 Tape Transport Performance

1.5.2.1 Specifications Applicable Regardless of Read/Write Speed

Recording Density	1000 bpi 2000 frpi, max; 400 frpi, min
High Speed (head retracted)	
Wind/Rewind Time (300' of tape)	35 seconds max
Stop Time	260 milliseconds max
Stop Distance	12 inches max
Search Speed	120 ips average
Low Speed (head engaged)	
Wind/Rewind Time (300' of tape)	6.5 minutes max
Stop Time	45 milliseconds max
Stop Distance	.30 inch max
Jitter	3.5% rms

1.5.2.2 Specifications Differing with Read/Write Speed

	*5 ips Deck	12 ips Deck
Read/Write Speed	5 ips ± 2%	12 ips ± 2%
Start Time	20 ms max	30 ms max
Stop Time	30 ms max	45 ms max
Start Distance	.10" max	.30" max
Stop Distance	.05" max	.35" max

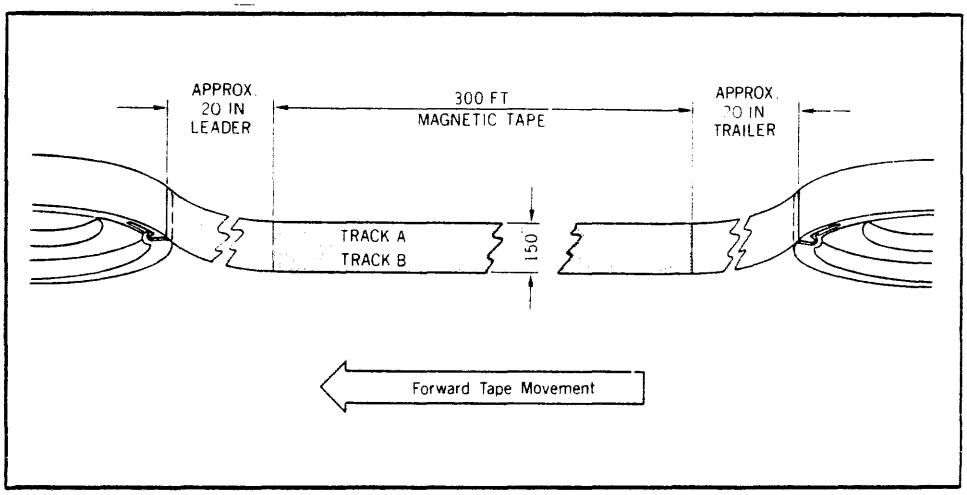


FIGURE 1-5 TAPE LEADER, TRAILER AND TRACKS

1.6 TAPE FORMAT INFORMATION

1.6.1 General

The 300 feet of .150" wide magnetic tape in the standard Sykes cassette (Part No. 1001A0171) has 20 inch transparent sections at both ends which allow end-of-tape sensing.

Two tracks of recorded data may reside on the magnetic tape. Except with Series 3000 EIA Units, either Track A (.040" wide) or Track B (.080" wide) may be selected and recorded with the tape marks and data characters which comprise the tape format. With the Series 3000 EIA System, only the wider track is used.

*Series 3000 EIA Systems are equipped only with 5 ips decks.

1.6.2 Character Format

When written on tape, each character consists of eight data bits and a double width parity bit. The recording technique is phase encoding as shown in Figure 1-6. The first bit of successive characters on tape immediately follows the end of the parity bit of the previous character; thus, the start transition is present only on the first character of a record.

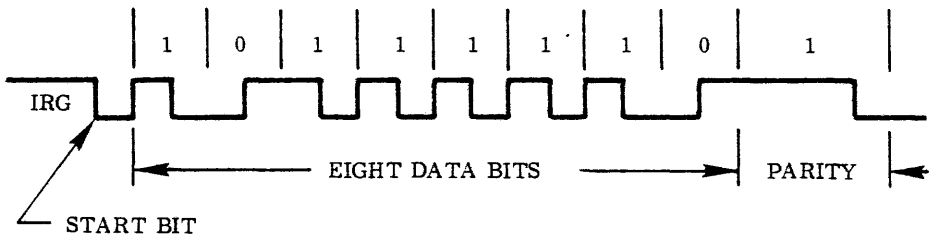


FIGURE 1-6 CHARACTER FORMAT

1.6.3 Tape Format

Refer to Figure 1-7 which illustrates the format of the data files and control characters recorded on magnetic tape by the controller (controller logic assembly). The various elements comprising the format are as follows:

1. Load Point - A load point is a file character (or more than one character written contiguously). The load point marks the beginning of the first file on a cassette. After writing or seeking the load point, tape is positioned in the inter-record gap just past the file character(s) ready to write new data or read previously written data after the load point.

2. Data Records - Data is written in groups of contiguous eight bit characters called records. The controller writes data on a demand basis, thus, a record will consist of as many characters as are supplied. When no more characters are supplied, the controller automatically terminates the record and the Write mode.

3. Inter-Record Gap - When writing, the stopping of tape movement causes a gap between the last character of one record

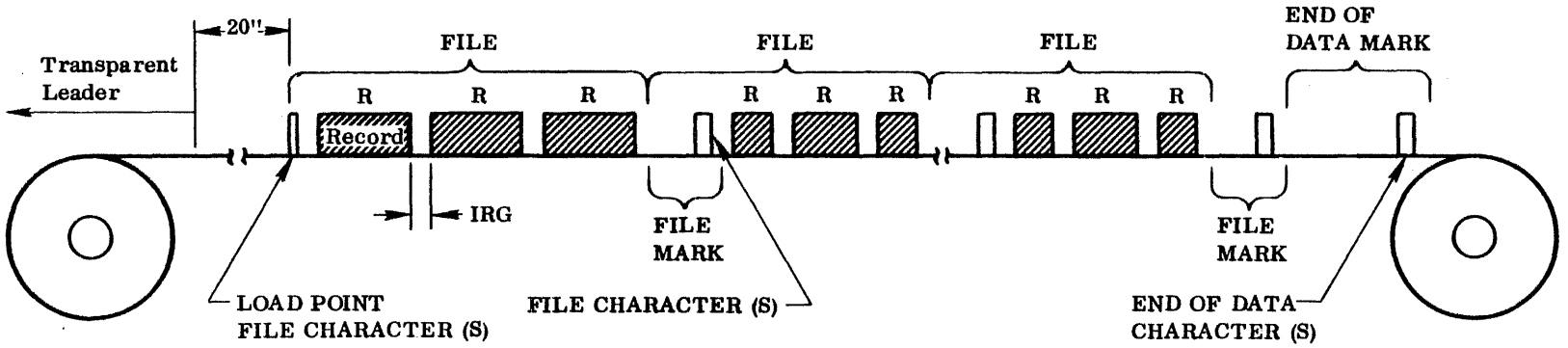


FIGURE 1-7 TAPE FORMAT

and the first character of the next. This gap length is .10" for transports having a 5 ips read/write speed, or .45" if the read/write speed is 12 ips. The tape is erased during deceleration to a stop after writing and also when accelerating to read/write speed following a write command. The entire inter-record gap is thus cleared of previously recorded information.

4. Data File - A group of one or more data records, as specified by the user, is called a File. Data Files are identified by placing a File mark, described below, both before and after the group of records in the File.

5. File Mark - Files are separated by File marks. A File mark includes 0.8 inches of erased tape (5 ips) or 1.45 inches of erased tape (12 ips); then one or more characters (written contiguously) which complete the mark. Any number of characters may be written contiguously in the File mark under interface control. With the High Speed Search Option, two characters (16 bits) are written in the File mark under HSSO control. These contain 4 octal digits (12 bits) which correspond to tape addresses.

6. End of Data Mark - The last file written on a cassette is usually followed by an End of Data mark. An End of Data mark includes 1.6 inches (5 ips) or 2.90 inches (12 ips) of erased tape then one or more data characters which complete the mark. With the High Speed Serach Option, two characters (16 bits) are written in the End of Data mark under HSSO control. These contain 4 octal digits (12 bits) which correspond to the tape address of the end of data.

1.7 SYNCHRONIZATION AND CHARACTER ERROR DETECTION

To assure proper reading of information stored on magnetic tape, bit synchronization and character synchronization must be established. If this were not done, reading might begin at mid-bit or mid-word, resulting in transfer of erroneous characters.

Bit Synchronization: When the Series 3000 Controller receives a read command, the bit sync circuitry senses a start transition

prior to the first character to establish bit sync for the remainder of the read cycle. If bit sync should be lost, the circuitry will re-establish sync immediately at the next 1, 0 or 0, 1 bit combination or at the end of a character, whichever occurs first.

Continuous Frame Synchronization: Parity bits written on tape by the transport are unique, since each occupies the same length of tape as two information bits. As the Manchester code is applied, each information bit has a mid-bit flux transition; however, the parity bits have no flux changes in the first bit period and then have a flux transition in the middle of the second period.

While reading data, character sync circuits constantly sense the bits read from magnetic tape, checking for the unique parity bit. If the ninth bit sensed is a parity bit, character sync is assumed. If the ninth bit sensed is not the unique parity bit, a bit by bit search is then conducted until the next parity bit is found and character sync is re-established on this bit. In this way, the continuous character sync circuits can overcome loss, for any reason, of character sync, thus re-establishing sync on the next character. Information lost will be restricted to the erroneous character and, sometimes, the next character used to re-establish sync. Character sync loss will be signalled as a Character in Error.

1.8 Overall Functional Description

A system block diagram appears in Figure 1-8. The heart of this system is the 3000 controller PC board, which is responsible for the complete control of both transports. This board receives direction from either the interface or the basic front panel controls. These basic controls consist of high speed Forward and high speed Rewind for each transport, Clear and Power. All other commands are received from the interface. The interface, in turn, couples the tape system to the user's system as well as other control systems. In the case of the EIA interface PC board, this offers both RS-232-C and current loop ports for connection to the user's system. This also provides a control keyboard which offers several additional control functions as well as an Option Board and a High Speed Search Option Module. If a user generated interface is used, a host of control operations may be devised by the user to accommodate his particular application. A more detailed description of each element in the block diagram is presented in the following Sections of this document.

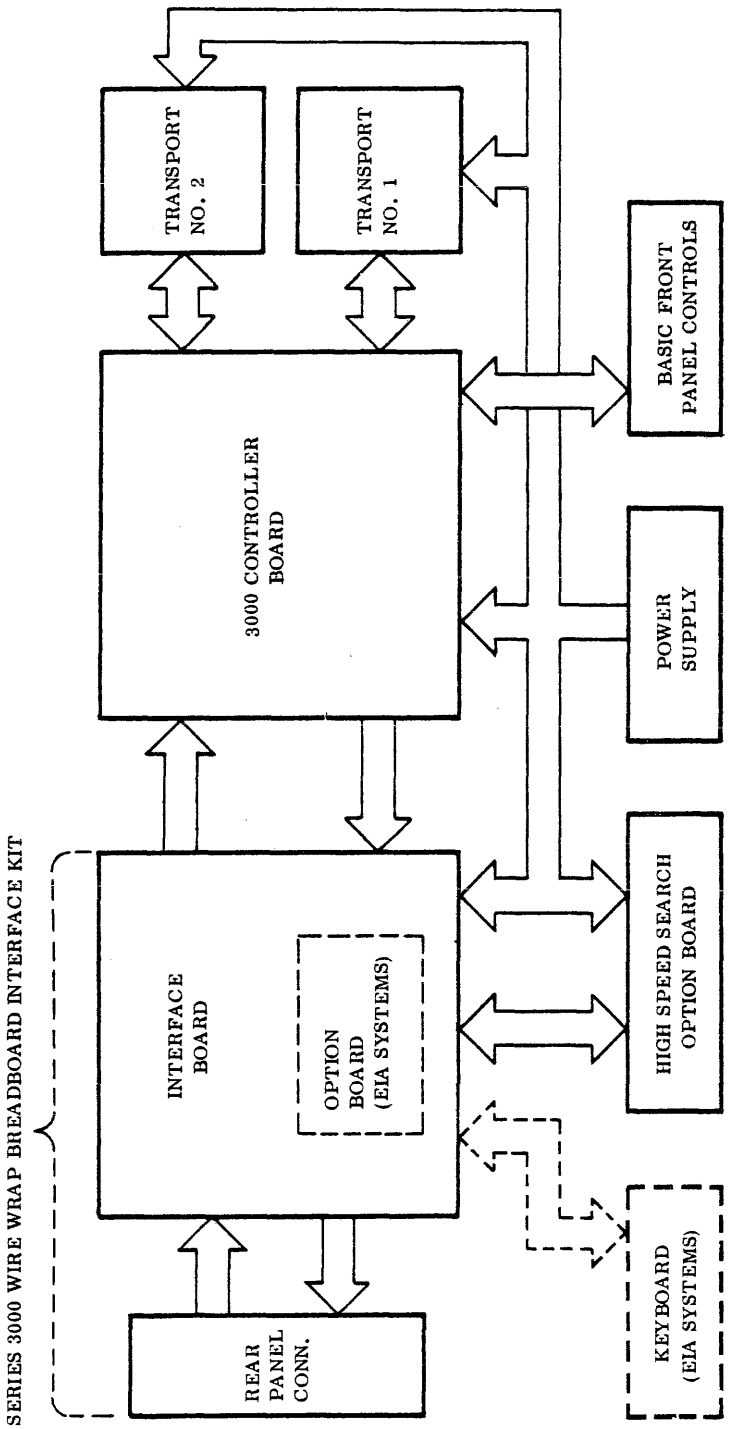


FIGURE 1-4 BLOCK DIAGRAM, SERIES 3000 CTC OR EIA UNIT

2.0 SECTION 2 - ENCLOSURE COMPONENTS

NOTE: In this Section, the numbers in parenthesis following part names in the text are for the purpose of parts identification. They are reference numbers which appear in the appropriate Parts Illustration and Parts List at the end of this Section.

2.1 DESK TOP UNIT ENCLOSURE (Figure 2-3)

2.1.1 Top Cover

2.1.1.1 Removal/Replacement

1. Disconnect the Series 3000 Unit from the power source.
2. At the rear of the enclosure, remove the 2 screws (27) in the rear panel which retain the top cover; then move the cover toward the front slightly and lift it off.
3. Replace in reverse order, making certain the front tabs on the underside of the cover enter the appropriate slots in the tie bar above the transports, also that the rear tabs are placed inside the rear panel; then fasten with the two retaining screws.

2.1.2 Front Panel Assembly

2.1.2.1 General

The power switch/indicator and a control switch printed wire

board assembly are mounted to the front panel. See Section 10 for details. The panel is retained by three quarter-turn fasteners which are accessible from beneath the unit, near the front.

2.1.2.2 Removal/Replacement

1. Disconnect the Series 3000 Unit from the power source.
2. Remove the top cover from the unit (Sec. 2.1.1.1).
3. Open the cassette holder(s) of the transport(s).
4. Three quarter-turn fasteners (54) for the panel are located beneath the unit, near the front edge. Turn these fasteners 90° counterclockwise to release the panel.
5. Detach the panel by raising it slightly and pulling it forward.
6. Disconnect the connector for the power switch/indicator (press tabs on both sides to release) and disconnect the 10-pin connector from the control switch PC board. On EIA units with integral keyboard, grasp both ends of the ribbon-cable connector (not the cable) and pull straight outward to disconnect from keyboard PC board.
7. When reconnecting the cables, note that an eleventh pin on the board remains outside the 10-pin connector for the purpose of orientation.

   CAUTION: On EIA units with integral keyboard, the slack in the keyboard ribbon-cable must be drawn into the unit so it will not be pinched between the front panel and mounting frame. To do this, raise the logic assembly to vertical (Sec. 2.3.1.2); then gently pull the slack ribbon-cable into the unit while placing the front panel in mounting position as described below.

8. Open the cassette holder(s) to allow attachment of the front panel. Make certain that the retaining tab indents at the top of the panel enter the appropriate slots in the tie bar (51) above the transports and that no wires or cables are trapped under the panel; then secure the panel with the three quarter-turn fasteners.
9. Lower and secure the logic assembly if it was raised (Sec. 2.3.1.2) and replace the top cover on the unit (Sec. 2.1.1.1).

2.2 RACK MOUNTABLE UNIT ENCLOSURE (Figure 2-4)

2.2.1 Top Cover

2.2.1.1 Removal/Replacement

1. Disconnect the Series 3000 Unit from the power source.
2. Turn each of the four quarter-turn fasteners on the top cover counterclockwise, 90° and lift the cover from the unit.
3. Replace in reverse order.

2.2.2 Front Panel Assembly

2.2.2.1 General

The power switch/indicator and the switch modules PC board assembly are mounted to the front panel. The panel is retained by two quarter-turn fasteners (61) which are accessible after removal of the top cover.

2.2.2.2 Removal/Replacement

1. Disconnect the Series 3000 Unit from the power source.
2. Remove the top cover from the unit (Sec. 2.2.1.1).
3. Open the cassette holder(s) of the transport(s).
4. The front panel is retained by two quarter-turn fasteners (61) accessible from behind the panel. Turn each of the fasteners 90° counterclockwise to release the panel.
5. Disconnect the connector for the power switch/indicator (press tabs on both sides to release) and disconnect the 10-pin connector from the control switch PC board. On EIA units with integral keyboard, grasp both ends of the ribbon-cable connector (not the cable) and pull straight outward to disconnect from keyboard PC board.
6. When reconnecting the cables, note that an eleventh pin on the board remains outside the 10-pin connector for the purpose of orientation.

CAUTION: On EIA units with integral keyboard, the slack in the keyboard ribbon-cable must be drawn into the unit so it will not be pinched between the front panel and mounting frame. To do this, raise the logic assembly to vertical (Sec. 2.3.1.2); then gently pull the slack ribbon-cable into the unit while placing the front panel in mounting position as described below.

7. Open the cassette holder(s) to allow attachment of the front panel. Tilt the panel as necessary to cause the tabs on the mounting frame bottom plate to enter the slots in the bottom of the front panel; then secure the panel with the two quarter-turn fasteners.
8. Lower and secure the logic assembly if it was raised (Sec. 2.3.1.2) and replace the top cover on the unit (Sec. 2.2.1.1).

2.3 COMPONENTS COMMON TO BOTH ENCLOSURE TYPES

2.3.1 Pivoting Support Bar for Logic Assembly

2.3.1.1 General

The controller PC board and interface PC board are mounted on a pivot bar (36 or 71) at the rear of the mounting frame. Latches at both ends of the bar can hold the boards in a vertical position.

2.3.1.2 Raising Logic Assembly to Vertical Position

1. Remove the top cover from the Series 3000 Unit (Sec. 2.1.1.1 or 2.2.1.1). Unit should be disconnected from power.
2. Carefully remove the three retaining screws from the front edge of the controller PC board.
3. Grasp the controller board at both sides and raise the board(s) to a nearly vertical position, causing the latches to engage.
4. When returning the logic assembly to the normal position, prevent the board(s) from dropping while releasing the latches; then lower slowly.
5. Carefully replace the three hold-down screws.

2.3.1.3 Removing Pivot Bar

1. Raise the logic assembly to the vertical position as described in section 2.3.1.2 . Unit should be disconnected from power.
2. Detach the PC board(s) from the pivot bar (or disconnect the cabling from the PC boards if removing bar with boards attached).
3. Removing the pivot screw (25) from one end of the bar will free the bar from the other pivot.
4. Replace in reverse order.

   CAUTION: When replacing pivot bar or mounting PC boards on the bar, the bar must be oriented so standoff bushings on the bar (not flat surface) contact the controller board; otherwise, traces on the board will be shorted out.

2.3.2 Power Switch/Indicator Assembly

2.3.2.1 General

The power switch/indicator (5) is a combination single pole, single throw miniature rocker switch and 1/4 watt neon indicator lamp, snap-in mounting type. The switch is rated 12 amp @ 125 vac and 6 amp @ 250 vac. The switch is connected in the high side of the line to the power supply.

2.3.2.2 Removal/Replacement

1. Disconnect the Series 3000 Unit from the power source.
2. Remove the front panel (Sec. 2.1.2.2 or 2.2.2.2).
3. Disconnect the power switch connector; then depress the locking tabs on the body of the switch/indicator to free it from the panel.
4. Replace in reverse order.

2.3.3 Cooling Fan Assembly

2.3.3.1 General

The fan assembly contains an axial cooling fan with a multi-blade

molded impeller. The motor operates on 115 vac, 50/60 Hertz. Expected life at an ambient 22° C temperature is in excess of 5 years continuous operation.

2.3.3.2 Removal/Replacement

1. Remove the top cover of the unit. (Sec. 2.1.1.1 or 2.2.1.1).
2. Raise the logic assembly to the vertical position.
3. Disconnect the fan electrical connector.
4. Remove the 4 hex nuts and lock washers retaining the fan assembly and lift the fan assembly from the mounting studs.

   NOTE: If the unit is the desk top type and is equipped with the vacuum tape cleaner option, install the original deflector (with filters) on the new fan assembly. Be aware that the direction of air flow must be <u>into</u> the enclosure.
5. Replace in reverse order.

2.3.4 Fan Filter

2.3.4.1 General

The fan filter is a washable air filter constructed of layers of slit and expanded aluminum and treated with a water soluble, renewable adhesive coating.

For proper performance, the adhesive dust-collecting coating must be renewed each time the filter is cleaned. (See cleaning instructions in Sec. 11.3.3).

A foam rubber pad in one side of the filter housing provides the spring-like action which retains the filter.

2.3.4.2 Removal/Replacement

1. Make certain the Series 3000 Unit power switch is OFF.
2. a. <u>Desk top unit:</u> lift the front of the unit for access to the underside; then slide the filter and its guard towards the front of the unit until released from the holder.

b. Rack mountable unit: if mounted on slides, pull the unit outward as far as the slides permit (or otherwise gain access to bottom center of unit) and release the quarter-turn fastener which retains the filter cover (65). The cover will drop free, exposing the filter.

2.3.5 Transport Tie Bar

2.3.5.1 Removal/Replacement

1. To allow removal of either transport, remove the 8 retaining screws and lift off the transport tie bar (51 or 76).
2. Replace in reverse order.

2.3.6 Fuseholder and Fuse

2.3.6.1 Fuse Replacement

The 2-1/2 amp., type 3AG fuse should be replaced only with a fuse of equal value. Twist the fuseholder cap counterclockwise to remove the fuse; push in and twist clockwise to lock when replacing.

2.3.6.2 Fuseholder Removal/Replacement

1. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the three hold-down screws from the front edge of the controller PC board and raise the logic board assembly to the vertical position (supported by latches). On desk top units, the pivoting support bar with attached PC boards must be removed from the mounting frame by removing the pivot screw for one end of the bar.
3. Disconnect the two wires on the fuseholder tabs.
4. Remove the hex nut that is securing the fuseholder to the chassis.
5. Pull the fuseholder straight out.
6. Replace in reverse order.

2.3.7 Power Line Filter

2.3.7.1 General

This component is a general purpose power line filter which provides EMI control of line to ground noise. The voltage rating is 115-250 vac; max. leakage current each line to ground at 115 vac is 0.5 ma; capacitance, line to ground, is 10,000 pf; operating frequency is 50-400 Hz.

2.3.7.2 Removal/Replacement

1. Remove the top cover from the Series 3000 Unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the three hold-down screws from the front edge of the controller PC board and raise the logic board assembly to the vertical position (supported by latches).
3. Disconnect the line filter connector.
4. Remove the two screws which retain the line filter on the back panel of the enclosure.
5. Replace in reverse order, transferring the speed nuts from the original line filter to its replacement.

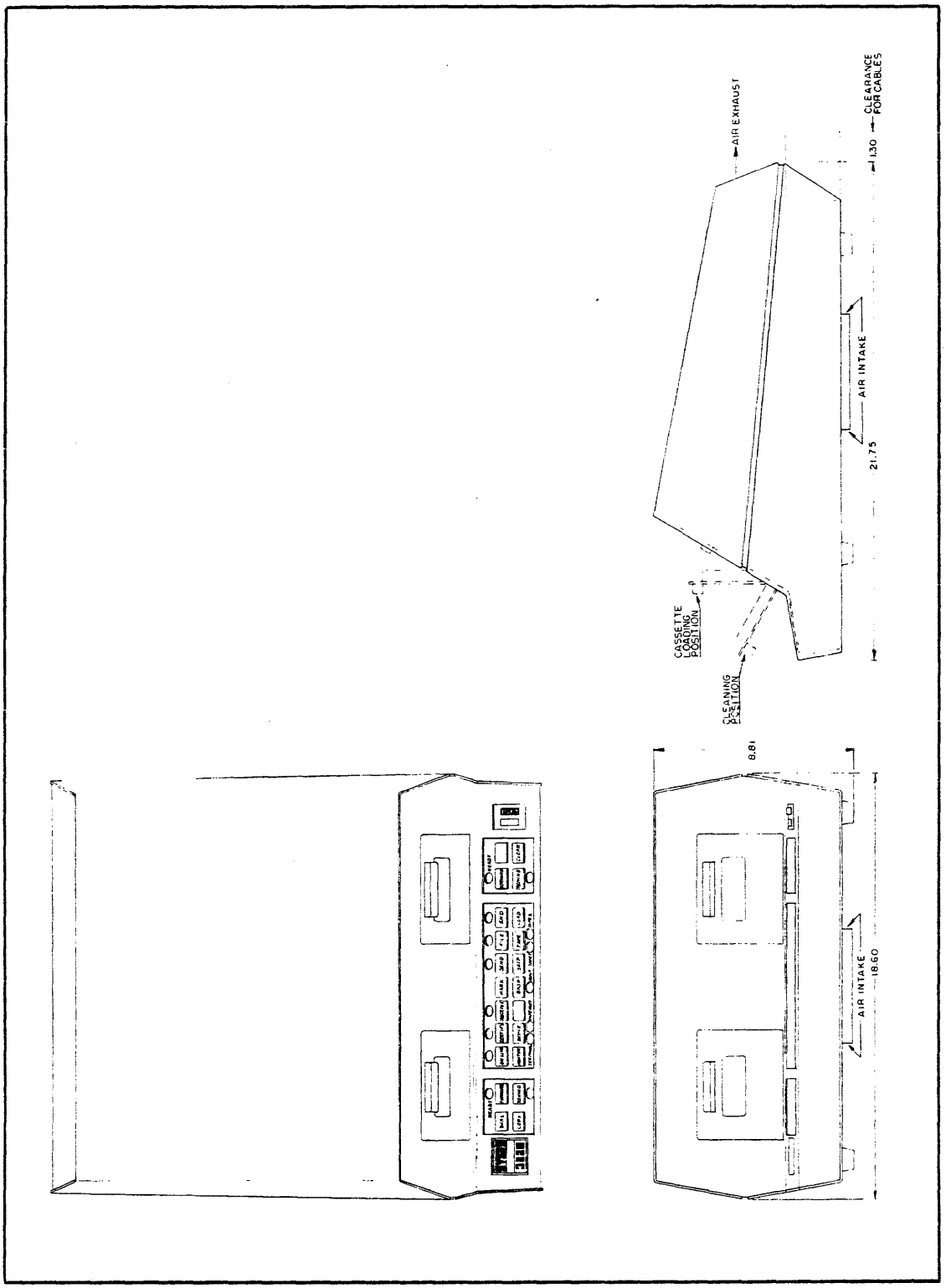


FIGURE 2-1 DIMENSIONS - DESK TOP UNITS

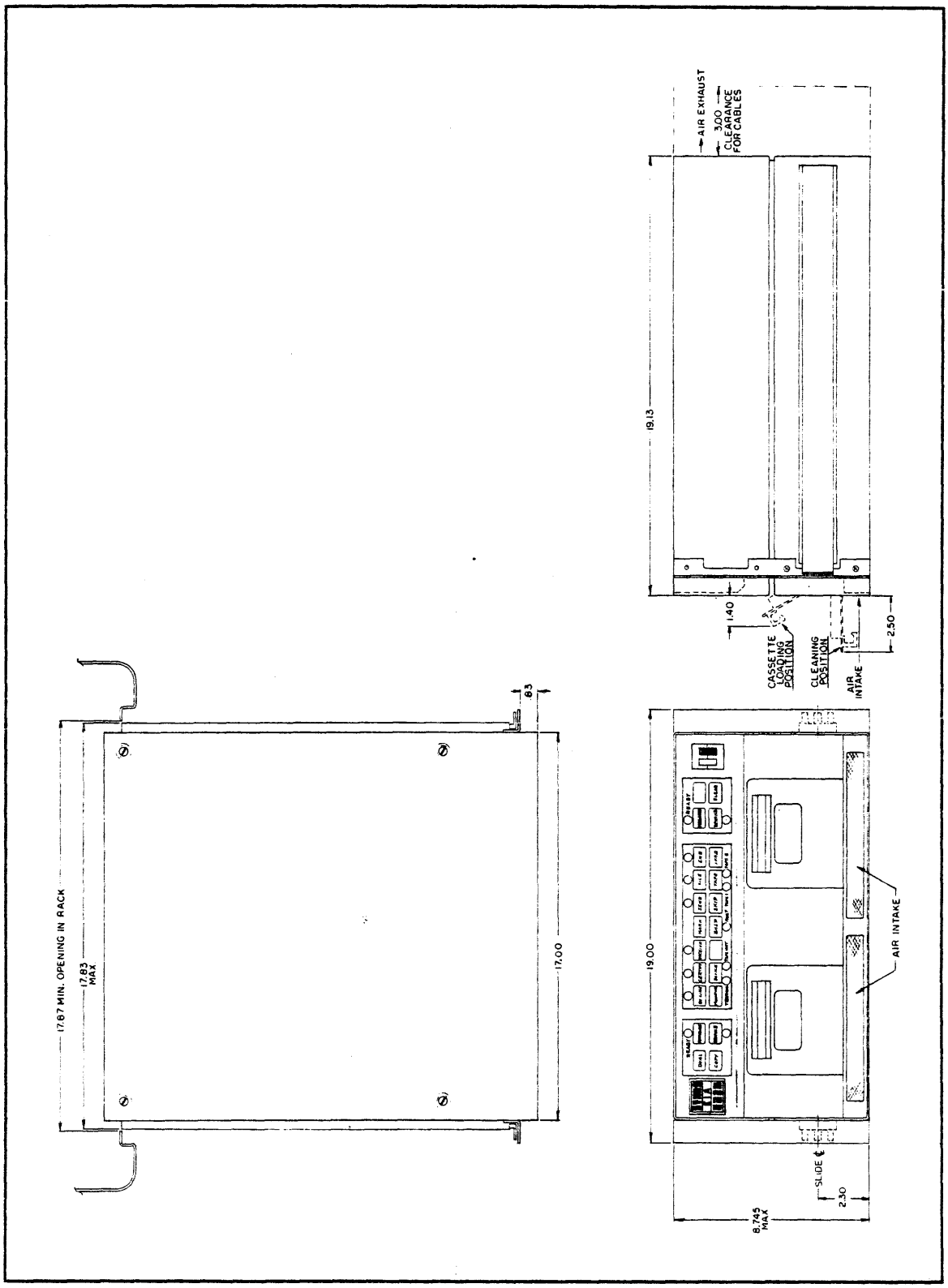


FIGURE 2-2 DIMENSIONS - RACK MOUNTABLE UNITS

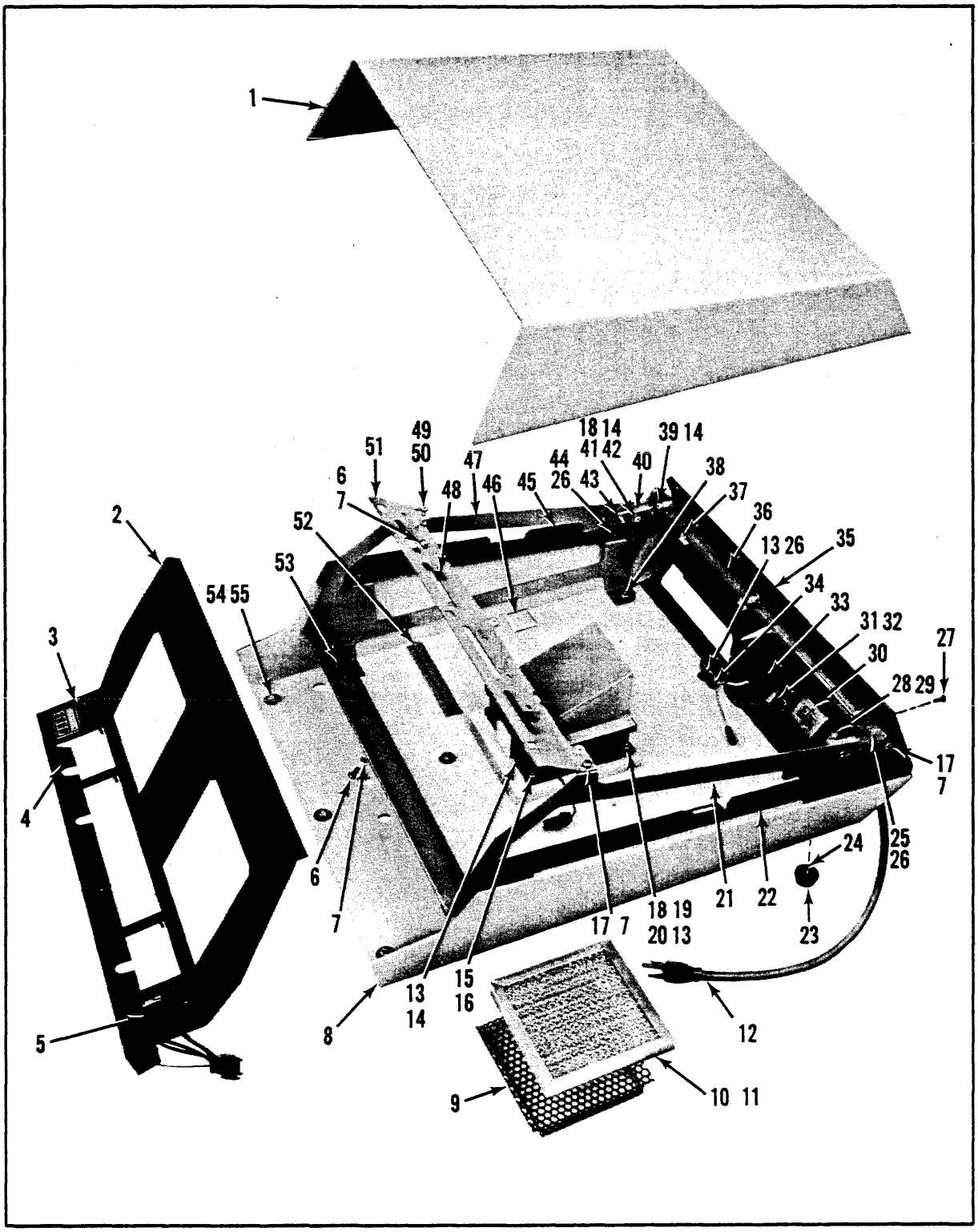


FIGURE 2-3 DESK TOP ENCLOSURE COMPONENTS

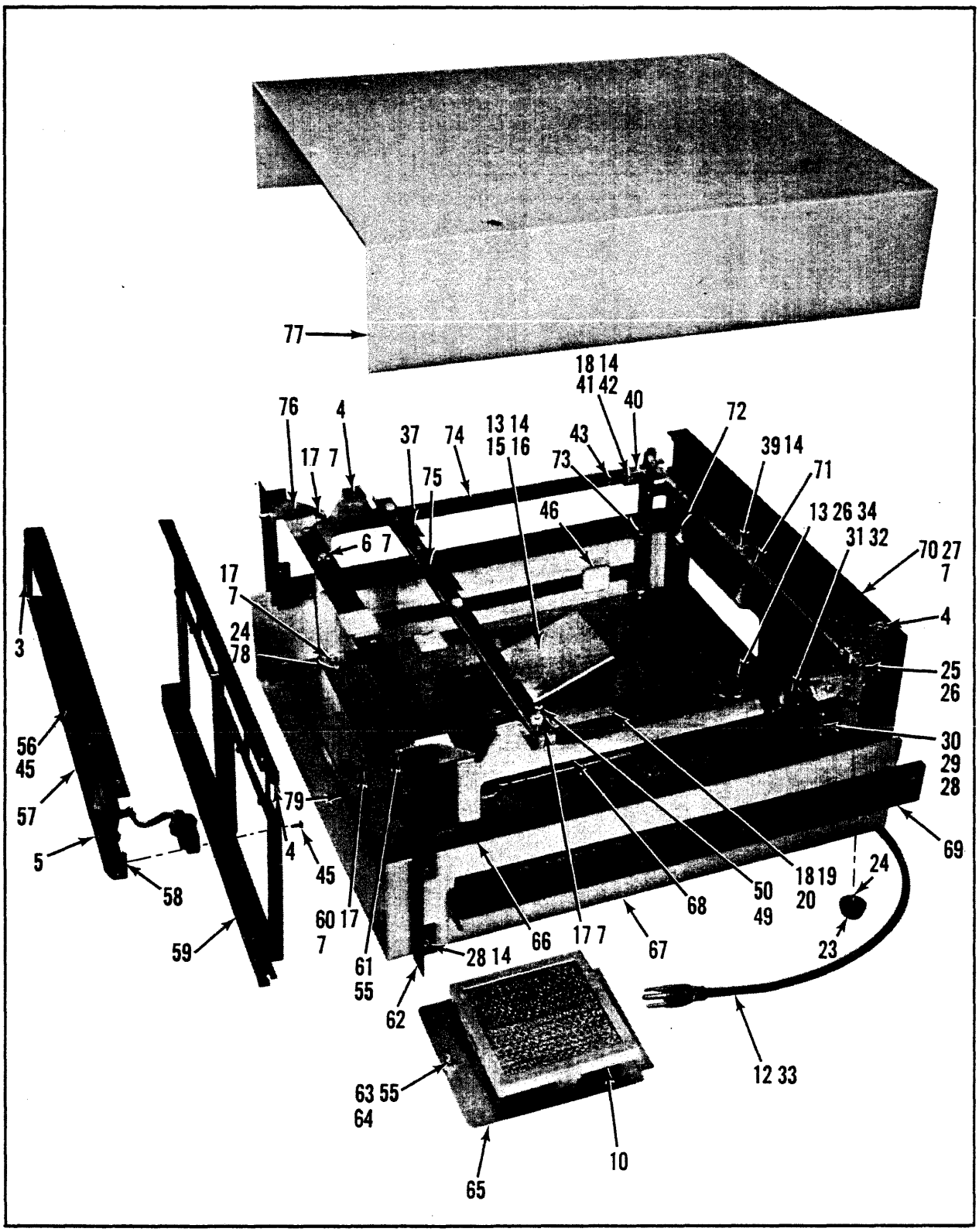


FIGURE 2-4 RACK MOUNTABLE ENCLOSURE COMPONENTS

2.4 PARTS LIST - ENCLOSURE COMPONENTS, DESK TOP & RACK MOUNT

REF NO.	SYKES NO.	DESCRIPTION
1	1050A0142	TOP COVER ASSEMBLY - DESK TOP UNITS
2	1050A0411	FRONT PANEL, DESK TOP, 3120, WITH NO EIA KEYBOARD SWITCH MODULE OPENING
2	1050A0391	FRONT PANEL, DESK TOP, 3220, WITH NO EIA KEYBOARD SWITCH MODULE OPENING
2	1050A0351	FRONT PANEL, DESK TOP, 3120, WITH EIA KEYBOARD SWITCH MODULE OPENING
2	1050A0381	FRONT PANEL, DESK TOP, 3220, WITH EIA KEYBOARD SWITCH MODULE OPENING
3	1050B0282	3220 NAME PLATE
3	1050B0286	3120 NAME PLATE
4	500H70006	QUARTER-TURN RECEPTACLE, CLIP-ON
5	1050A0584	POWER SWITCH/INDICATOR ASSEMBLY
6	100H03806	HEX HD SCREW 8-32 x 3/8 (TRANSPORT RETAINING)
7	200H01801	LOCK WASHER #8, EXT TOOTH
8	1050A0421	BOTTOM COVER - DESK TOP UNITS
9	1050B0211	FAN FILTER GUARD - DESK TOP UNITS
10	102M02002	FAN FILTER
11	100A06003	FILTER RETAINER PAD, RUBBER - DESK TOP UNITS
12	1050A0012	POWER CORD ASSEMBLY
13	500H01601	HEX NUT 6-32
14	200H03060	LOCK WASHER #6, INT TOOTH
15	1050A0011	COOLING FAN ASSEMBLY, COMPLETE WITH DEFLECTOR
16	1050B0023	FAN DEFLECTOR
17	100H01806	PHILLIPS PAN HD SCREW 8-32 x 3/8
18	100H01610	PHILLIPS PAN HD SCREW 6-32 x 5/8
19	200H02601	LOCK WASHER #6, SPLIT
20	200H10601	PLAIN WASHER # 6
21	1050A0028	MOUNTING FRAME, R.H. SIDE - DESK TOP UNITS
22	1050B0131	RIGHT SIDE FEATURE STRIP - DESK TOP UNITS
23	100A03113	RECESSED BUMPER
24	100H01160	PAN HD SCREW 10-32 x 5/8
25	1001B4030	HINGE SCREW
26	200H01601	LOCK WASHER #6, EXT TOOTH
27	100H16000	PHILLIPS PAN HD SCREW (BLACK) 6-32 x 3/8
28	100H01604	PHILLIPS PAN HD SCREW 6-32 x 1/4
29	500H70009	SPEED NUT
30	1001A5006	POWER LINE FILTER ASSEMBLY
31	100F01001	FUSE HOLDER
32	200F01047	FUSE, 2-1/2 AMP
33	100W01003	STRAIN RELIEF BUSHING
34	1050B0021	BUS CLIP, MVPS GROUND
35	1050A0162	REAR PANEL - DESK TOP UNITS
36	1050B0033	PIVOT BAR, LOGIC BOARDS - DESK TOP UNITS
37	100A07033	PC BOARD STAND-OFF
38	500H10151	HEX NUT 10-32
39	100H01603	PHILLIPS PAN HD SCREW 6-32 x 3/16
40	1050A0051	PIVOT BAR CATCH (2 USED)
41	200H10602	PLAIN WASHER #6
42	700H02007	SPACER, 1/4 DIA x 7/16 LONG
43	800S01101	EXTENSION SPRING
44	100H01606	PHILLIPS PAN HD SCREW 6-32 x 3/8
45	1050B0121	LEFT SIDE FEATURE STRIP - DESK TOP UNITS
46	200W05102	CABLE TIE MOUNT
47	1050A0029	MOUNTING FRAME, L.H. SIDE - DESK TOP UNITS
48	500H70001	SPEED CLIP
49	500H08004	EXPANSION NUT
50	100H10810	PHILLIPS PAN HD SCREW 8-32 x 5/8, SELF-TAPPING
51	1050B0031	TRANSPORT TIE BAR - DESK TOP UNITS
52	100A07008	PC BOARD GUIDE
53	1050A0030	MOUNTING SHELF FOR TRANSPORTS - DESK TOP UNITS
54	500H70004	QUARTER-TURN FASTENER
55	500H70005	QUARTER-TURN FASTENER RETAINER RING
56	500H70012	FASTENER, MOLDED, 6-32
57	1050B0341	SWITCH MODULE COVER, 3120, WITH NO EIA KEYBOARD SWITCH MODULE OPENING
57	1050B0342	SWITCH MODULES COVER, 3120, WITH EIA KEYBOARD SWITCH MODULE OPENING
57	1050B0343	SWITCH MODULES COVER, 3220, WITH NO EIA KEYBOARD SWITCH MODULE OPENING

2.4 PARTS LIST - ENCLOSURE COMPONENTS, DESK TOP & RACK MOUNT

REF NO.	SYKES NO.	DESCRIPTION
57	1050B0344	SWITCH MODULES COVER, 3220, WITH EIA KEYBOARD SWITCH MODULE OPENING
58	500H70009	SPEED NUT 6-32
59	1050A0371	FRONT PANEL, RACK MOUNTABLE 3120 UNIT
59	1050A0351	FRONT PANEL, RACK MOUNTABLE 3220 UNIT
60	1050A0278	TRANSPORT MOUNTING PLATE - RACK MOUNTABLE UNITS
61	500H70007	QUARTER-TURN FASTENER
62	1050A0631	RACK MOUNTING TRIM PANEL (2 USED)
63	500H70008	QUARTER-TURN FASTENER, FLAT HEAD
64	500H70011	QUARTER-TURN RECEPTACLE, CLIP-ON
65	1050A0277	FILTER COVER AND SUPPORT ASSEMBLY - RACK MOUNTABLE UNITS
66	1050A0331	FEATURE STRIP - RACK MOUNTABLE UNITS
67	1050A0311	BOTTOM COVER - RACK MOUNTABLE UNITS
68	1050A0252	MOUNTING FRAME, RIGHT HAND SIDE - RACK MOUNTABLE UNITS
69	1050T0630	RACK MOUNTING KIT - SLIDES, TRIM PLATES, AND HARDWARE
69	100V01005	RACK MOUNTING SLIDES, (PAIR) WITH MOUNTING HARDWARE
70	1050A0361	REAR PANEL - RACK MOUNTABLE UNITS
71	1050A0256	PIVOT BAR, LOGIC BOARDS - RACK MOUNTABLE UNITS
72	100A07031	PC BOARD STAND-OFF, 1/4
73	500H70010	DART CLIP
74	1050A0253	MOUNTING FRAME, LEFT HAND SIDE - RACK MOUNTABLE UNITS
75	1050A0610	MOUNTING FRAME CROSS BAR - RACK MOUNTABLE UNITS
76	1050A0255	TRANSPORT TIE BAR - RACK MOUNTABLE UNITS
77	1050A0301	TOP COVER - RACK MOUNTABLE UNITS
78	200H01101	LOCK WASHER #10, EXT TOOTH
79	1050A0278	MOUNTING FRAME BASE PLATE - RACK MOUNTABLE UNITS

3.0 SECTION 3 - TAPE TRANSPORT ASSEMBLY

NOTE: In this Section, the numbers in parenthesis following part names in the text are for the purpose of parts identification. They are reference numbers which appear in the appropriate Parts Illustration and Parts List at the end of this Section.

3.1 DESCRIPTION OF TAPE TRANSPORT

Refer to Figures 3-1 and 3-2. The Sykes TT120 transports employed in Series 3000 CTC Units and 3000 EIA Systems are computer grade, precision engineered, industrial digital cassette transports which consist of a single tape deck mechanism, three-motor drive system, motor control electronics, and read/write electronics. The transports are furnished in various configurations, as required. These include 40-80 read/write head, 5 or 12 ips read/write speed, and 50 or 60 Hertz operation. Note that the Series 3000 EIA Systems are only available with a single 80 mil track, and operate at a 5 ips read/write speed.

The decks have the capability to directly access recorded information on tape at 120 ips without the requirement of reading prior information. This direct accessing is controlled by the optional High Speed Search Board in association with the interface and the controller board.

To load a transport with a cassette, pull the door open and place the cassette in the holder on the back of the door. Close the door to automatically place the cassette in the operating position. An interlock prevents the door from being opened when the tape head is in contact with the tape.

3.1.1 Removal/Replacement of Transport

3.1.1.1 Transport in Desk Top Unit

1. Remove the top cover of the unit enclosure (Sec. 2.1.1.1).
2. Remove the front panel from the unit (Sec. 2.1.2.2).
3. Remove the 3 retaining screws near the front edge of the controller PC board and raise the hinged logic board assembly to the vertical position (supported by detents).
4. Remove the tie bar for the deck plates by removing the four or six hex head screws and two Phillips pan head screws.
5. On the transport, disconnect the harness connectors from J1 and J2 on the upper PC board (detach the tie-wraps retained by screws) and from J4 and J6 on the lower PC board (see Figure 3-2). Free the harness leg for J1 and J6 from the PC board support post by slipping the tie-wrap off the post (or cut tie-wrap; then tie harness to post when reassembling).
6. To free the transport for removal, insert a 1/4" hex nut driver through the clearance holes in the bottom cover of the unit and remove the two hex head screws and lock washers which enter the transport deck plate from below. (Front of unit can overhang bench to allow insertion of nut driver.)
7. When reassembling, connect the wiring to the transport and mount the transport in the unit, turning all retaining screws (11) for the transport and the tie bar finger-tight only. This will allow alignment of the transport with the front panel as described in the following steps.
8. Open the cassette holder door(s) and assemble the front panel to the unit (with retaining screws in tie bar and deck still not tight; but with the quarter-turn fasteners for the panel secured).
9. Push the right end of the front panel inward against the mounting frame in the unit and tighten the screw which secures the right end of the tie bar to the mounting frame. Repeat the same procedure at the left end of the panel and tie bar, tightening the similar screw.
10. Carefully close the cassette holder doors, changing the position of the replaced deck as necessary until its door is flush with the front surface of the panel when fully closed; then tighten the retaining screws which enter the top of the deck plate.
11. Using a 1/4" hex nut driver inserted through the clearance holes in the bottom cover, securely tighten the two retaining screws in the bottom of the deck plate.
12. Again check the fit of the cassette holder door to the front panel

and complete the assembly of the unit, reversing the procedure in steps 1, 3 and 5.

3.1.1.2 Transport in Rack Mountable Unit

1. Remove the top cover of the unit enclosure (Sec. 2.2.1.1).
2. Remove the front panel from the unit (Sec. 2.2.2.1).
3. Remove the 6 or 8 screws retaining the tie bar for the deck plates and move the tie bar aside as permitted by wiring.
4. Remove the 3 retaining screws near the front edge of the controller PC board and raise the hinged logic board assembly to the vertical position (supported by detents).
5. On the transport, disconnect the harness connectors from J1 and J2 on the upper PC board (detach the tie-wraps retained by screws) and from J4 and J6 on the lower PC board (see Figure 3-2). Free the harness leg for J1 and J6 from the PC board support post by slipping the tie-wrap off the post (or cut tie-wrap; then tie harness to post when reassembling).
6. To free the transport for removal, insert a 1/4" hex nut driver through the clearance holes in the bottom cover of the unit and remove the two hex head screws and lock washers which enter the transport mounting plate from below. (Front of unit can overhang bench to allow insertion of nut driver.)
7. Lift the transport slightly and withdraw from front of enclosure.
8. When reassembling, connect the wiring to the transport and mount the transport in the unit, turning all retaining screws for the transport mounting plate and tie bar finger-tight only. This will allow alignment of the transport with the front panel as described in the following steps.
9. Open the cassette holder(s) and reposition the front panel on the unit, making certain the tabs on the mounting frame base plate enter the slots in the bottom of the front panel, at the corners.
10. Secure the 2 quarter-turn fasteners for the front panel. Carefully close the cassette holder(s), changing the position of the replaced desk as necessary until its fully closed door is flush with the front surface of the panel; then tighten the screws which secure the tie bar and enter the top of the deck plates.
11. Using a 1/4" hex nut driver inserted through the clearance holes in the bottom cover, securely tighten the 2 hex head retaining screws for the transport's bottom mounting plate.
12. Again check the fit of the cassette holder door to the front panel and complete the assembly of the unit, reversing the procedure in steps 1, 4 and 5 above.

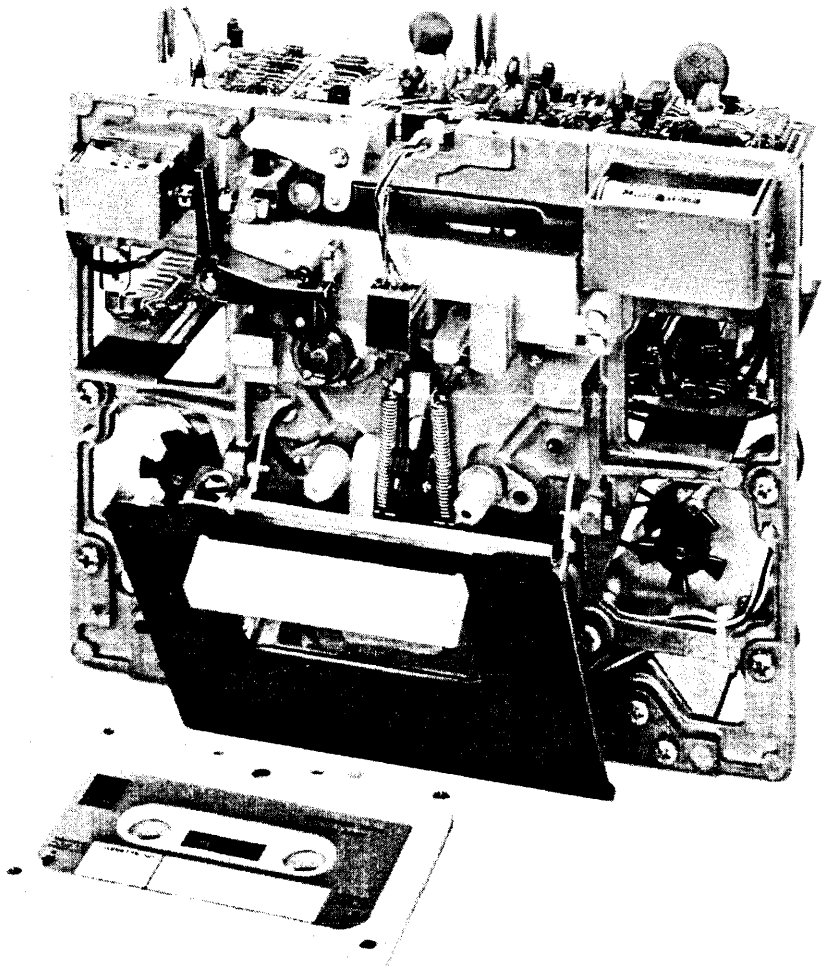


FIGURE 3-1 TAPE TRANSPORT ASSEMBLY, FRONT VIEW

3.2 CASSETTE HOLDER ASSEMBLY

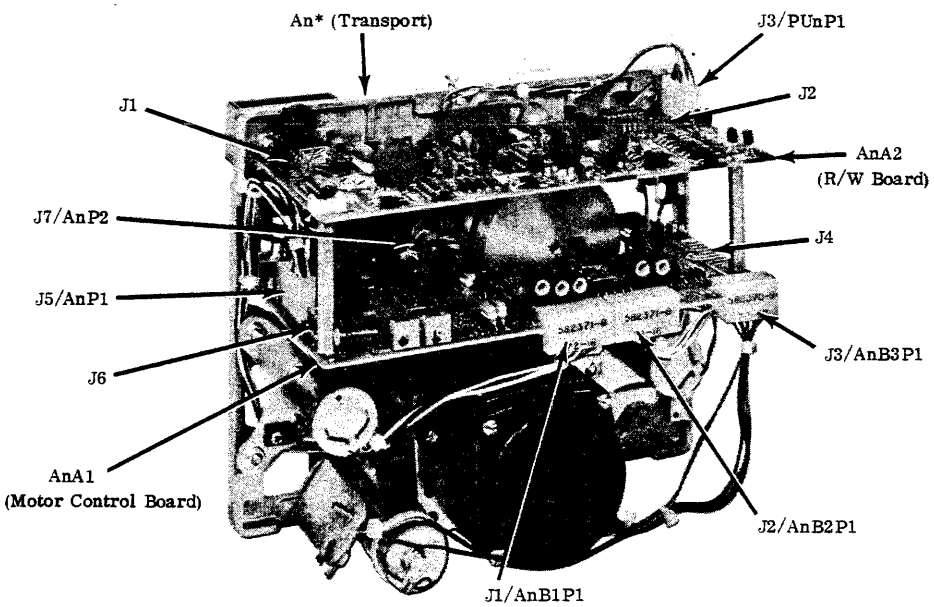
3.2.1 General

The cassette holder (24) is hinged on the deck plate. When opened approximately 30°, the holder is stopped by a detent in the ideal position for cassette loading or unloading. The detent, when depressed by the operator, releases the holder to open approximately 90°. This allows access to the tape head, tape guide and pinch roller for cleaning.

A spring-operated catch (33) provides a positive closing force for cassette positioning. When the tape head slide plate is lowered to engage the tape head for reading or writing, the slide plate shaft (2) enters a hole in the cassette holder, locking the holder in the closed position.

3.2.2 Removal/Replacement

1. Remove the front panel assembly (Sec. 2.1.2.2 or 2.2.2.2).
2. With the cassette holder in the 90° position, remove the right hinge screw (30).
3. Angle the right side of cassette holder forward and to the right to free the holder from the left pivot.
4. Disconnect the wires from the switches on the holder assembly.
5. Replace in reverse order, connecting the white wires to the common terminals and the black wires to the N.O. terminals of the switches.



*n=2 for R.H. Transport
n=3 for L.H. Transport (Dual Transport Unit only)

FIGURE 3-2 TAPE TRANSPORT ASSEMBLY, REAR VIEW, SHOWING CONNECTOR CODES

3.3 TAPE HEAD SLIDE PLATE ASSEMBLY

3.3.1 General

The slide plate (43) serves to move the attached tape head and tape guide to a head engaged (low) position or a head disengaged (high) position. The slide plate slides vertically, with downward motion provided by energizing of a solenoid (44) and upward motion provided by contraction of a return spring (9).

3.3.2 Removal/Replacement

1. Remove the front panel assembly (Sec. 2.1.2.2 or 2.2.2.2).
2. Remove the read/write board (Sec. 3.17.2).
3. Place the cassette holder in the 90° position.
4. Remove the slide plate solenoid (Sec. 3.4.2).
5. Remove the screw holding the slide plate grounding wire to the rear of the deck casting.
6. Carefully cut the tie-wrap holding the tape head lead wires to the top of the casting.
7. Remove the retaining ring (3) and remove the slide plate solenoid cam and solenoid plunger.
8. Detach the slide plate return spring (9) from its mounting pin on the deck casting.
9. Loosen the slide plate set screw (6) located in the left end of the slide plate (3/64" Allen wrench).
10. Remove the slide plate shaft retaining ring, located on the slide shaft (2) just above the slide plate.
11. Remove and retain the metal shim (43A) located on top of the slide plate, straddling the slide shaft.
12. Pull the slide shaft slowly upward and out of the casting.

    NOTE: If the transport is equipped with the Vacuum Tape Cleaner option, detach the vacuum tubing from the fitting on the tape guide.

13. Carefully remove the slide plate assembly, moving it to the left and pivoting the left end outward.
14. Replace in reverse order, adjusting the slide plate solenoid and replacing the shim as described in Section 11.2.2.
15. Replace the front frame assembly.

3.4 TAPE HEAD SLIDE PLATE SOLENOID

3.4.1 General

The tape head slide plate solenoid (44) is a pull-type solenoid, rated at 24 vdc. The solenoid plunger is linked to a cam which pushes the slide plate to the low position when the solenoid is energized and its plunger drawn inward.

3.4.2 Removal/Replacement

1. Remove the front panel assembly (Sec. 2.1.2.2 or 2.2.2.2).
2. Remove the read/write board (Sec. 3.17.2).
3. Disconnect the solenoid wires from pins E1 and E2 on the motor control board.
4. Remove the two hex head retaining screws, lock washers and washer plate and pull the solenoid to the right to remove it.
5. Replace in reverse order.
6. Adjust the solenoid as described in Section 11.2.2.
7. Replace the front panel assembly.

3.5 PINCH ROLLER SOLENOID

3.5.1 General

The pinch roller solenoid (12) is a push type solenoid, rated at 24 vdc. When the solenoid is energized the plunger causes the pinch roller assembly to pivot, bringing the pinch roller in contact with the magnetic tape and/or capstan shaft.

3.5.2 Removal/Replacement

1. Remove the front panel assembly (Sec. 2.1.2.2 or 2.2.2.2).
2. Disconnect solenoid wires from pins E3 and E4 on the motor control board.
3. Remove the two hex head screws, lock washers and washer

plate retaining the solenoid.
4. Replace in reverse order.
5. Adjust the solenoid assembly as described in Section 11.1.2.
6. Replace the front panel assembly.

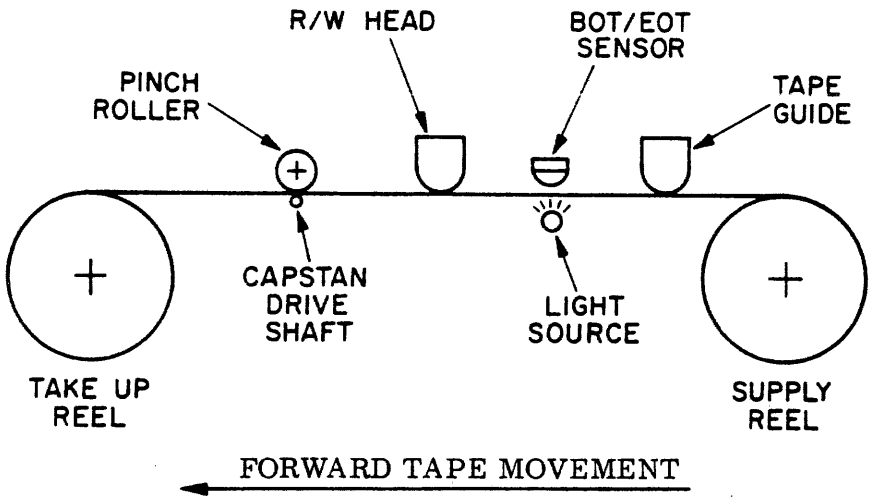


FIGURE 3-3 BASIC DRIVE LAYOUT

3.6 PINCH ROLLER ASSEMBLY

3.6.1 General

The neoprene pinch roller has a sleeve bearing and is free wheeling within its supporting arm. The arm pivots on a stud projecting from the slide plate. This arrangement allows downward pinch roller movement and engagement with the capstan when the pinch roller solenoid is energized. A spring disengages the roller when the solenoid is de-energized.

3.6.2 Removal/Replacement

1. Remove the front panel assembly (Sec. 2.1.2.2 or 2.2.2.2).
2. Place the cassette holder in the 90° position.

3. Detach the pinch roller assembly return spring (8) from its support post.
4. Remove the retaining ring (7) from the pivot post, and remove the pinch roller assembly.
5. Replace in reverse order.
6. Adjust the pinch roller assembly as described in Section 11.1.2.
7. Replace the front panel assembly.

3.7 TAPE GUIDE ASSEMBLY

3.7.1 General

The precision machined aluminum tape guide face has a hard coating on its 2-microinch finish. Two ceramic pins which project from slots in the body provide guidance for the tape as it approaches the tape head. On units with the optional vacuum tape cleaner system, holes in the tape guide face and a tubing connection fitting are used in conjunction with a vacuum pump, filter, and tubings to vacuum-clean the tape as it passes beneath the guide.

3.7.2 Removal/Replacement

Removal of the tape guide from the slide plate is not recommended. Field replacement of the tape guide is accomplished by replacing the tape head slide plate assembly (Sec. 3.3.2).

3.8 MAGNETIC TAPE HEAD

3.8.1 Read/Write Head

3.8.1.1 General

The tape head has one 0.040-inch track and one 0.080-inch track, each consisting of two coils, connected in a three-lead, center

tapped configuration. In the Write mode, the center tap of the selected track is returned to a positive potential, and the other two leads are driven in a push-pull manner. In the Read mode, the center tap is connected to a negative potential, and the read-back signal appears across both coils. The signals appearing at each lead of connector PU1P1 are as follows:

P1-2 Track B (red)	In the Write mode, positive current is returned through this lead when the WRITE DATA signal is a "0". In the Read mode, positive readback voltage (ac) appearing on this lead corresponds to a "0" to "1" transition of the WRITE DATA signal during writing.
P1-6 Track B (green)	In the Write mode, positive current is returned through this lead when the WRITE DATA signal is a "1". In the Read mode, positive readback voltage (ac) appearing on this lead corresponds to a "0" to "1" transition of the WRITE DATA signal during writing.
P1-10 Track B (White)	In the Write mode, this lead (center tap) is connected to a positive potential. In the Read mode, this lead is connected to a negative potential.
P1-1 Track A (orange)	Corresponds to Track B (red).
P1-5 Track A (blue)	Corresponds to Track B (green).
P1-9 Track A (black)	Corresponds to Track B (white).

3.8.1.2 Removal/Replacement

Removal of the magnetic tape head from the slide plate is not recommended. Field replacement of the tape head is accomplished by replacing the tape head slide plate assembly (Sec. 3.3.2).

3.9 CAPSTAN DRIVE SYSTEM (60 HZ and 50 HZ)

3.9.1 General

The synchronous capstan drive motor provides uni-directional rotation of the flywheel and capstan. The motor is secured to the deck plate with machine screws in holes sized to allow belt tension adjustment by shifting the motor position. The belt reduction drive reduces the capstan speed as required to provide the specified tape velocity in Read and Write modes.

3.10 CAPSTAN MOTOR

3.10.1 General

The capstan motor (62) is a capacitor-type, synchronous, continuous-duty motor. It is totally enclosed and has grease-lubricated ball bearings. Expected life is 10,000 hours running time with 3000 starts over a five-year period.

50 Hz operation is obtained by substitution of a larger diameter capstan drive pulley (61).

3.10.2 Removal/Replacement (Refer to Figure 3-8)

1. Remove the tape transport assembly (Sec. 3.1.1).
2. Place cassette holder in the 90° position.
3. Disconnect the motor connector from J3 on the motor control board.
4. With a 5/16" wrench, remove the two hex head screws (54) holding the capstan motor (62) to the deck casting and remove the motor assembly from the transport.
5. Carefully cut the tie wraps holding the motor leads and remove the leads from their connector. To remove the wires from the connector, depress the locking pins through the top of the plug and pull the wires out through the bottom.
6. Replace the motor in the reverse order, connecting the black motor wire to B3P1-2, the blue wire to B3P1-3 and the red wire to B3P1-4; also making certain the capstan drive belt is properly aligned on the motor pulley and flywheel assembly.
7. Adjust the capstan belt tension as described in Section 11.1.1.
8. Replace the tape transport assembly in the unit.

3.11 REEL DRIVE SYSTEM

3.11.1 General

Two identical DC motors are employed; one to drive the right hand reel of the cassette, the other to drive the left hand reel. Belts are employed in each case to link the drive spindles and motor pulley wheels. The motors provide tape movement at an average speed of 120 ips during high-speed Forward and Reverse modes. With proper voltage applications, the motors also provide tape tension and braking during tape operations. The shaft encoder on the left hand reel drive shaft has 320 vanes which interrupt the light path between the tape address (TA) lamp and TA photosensor. The transitions may be used to monitor tape movement at both speeds and in both directions.

3.11.1.1 Operation at Read/Write Speed

While tape is driven by the capstan/pinch roller drive during the read/write operations, the proper tape tension is maintained by applying "torque" current to the left hand motor and applying "drag" current to the right hand motor.

3.11.1.2 Operation at High Speed

Tape can be moved in either direction at high speed (120 ips, average). In this mode the left hand reel is held at constant speed by servo control.

3.11.1.3 Dynamic Braking

Tape motion is stopped by motor current control.

3.11.2 Motor Assembly Removal/Replacement

NOTE: The replacement motor assembly (69) consists of the motor, transistor, motor plate, pulley, and retaining rings; factory assembled and tested.

1. Remove the transport from the unit (Sec. 3.1.1.1 or 3.1.1.2).
2. Remove the three screws (56) retaining the reel motor assembly to be removed.
3. Disengage the "O" ring drive belt (58) from the motor pulley.

CAUTION: MOTOR SHAFT CAN BE EASILY BENT, RESULTING IN IRREPAIRABLE DAMAGE TO THE MOTOR. FOR THIS REASON, AND BECAUSE CRITICAL DIMENSIONS ARE INVOLVED, REMOVAL OF THE PULLEY OR MOUNTING PLATE FROM THE MOTOR SHOULD NOT BE ATTEMPTED AS A FIELD REPAIR.

4. Carefully cut tie wraps and remove the red and black motor wires from pins 1 and 2 of the motor plug. Remove wires from plug by depressing pin locks through top of plug and pulling wires out from bottom.
5. Replace motor assembly in reverse order, connecting the red lead of the motor to pin 1 and the black lead to pin 2 of the connector.

3.12 BOT/EOT SENSOR LAMP

3.12.1 General

Light from the BOT/EOT light source (17) can pass through transparent tape leader and trailer sections, but not through oxide-coated tape. The beginning of tape and end of tape are sensed as light strikes the photosensor (41) from the light source located in the right cassette locator post, which is beneath the tape.

3.12.2 Removal/Replacement of BOT/EOT Sensor

1. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the front panel (Sec. 2.1.2.2 or 2.2.2.2).
3. Remove the read/write board (Sec. 3.17.2).
4. Unscrew the retaining screw, lift the sensor assembly and free it from the deck casting.
5. Disconnect pins 7 and 9 from plug AnP1*. This is accomplished by depressing the locking tabs and pulling the wires from the plug.

*n = 2 for R.H. transport
n = 3 for L.H. transport

6. Carefully cut the necessary tie-wraps and pull the sensor wires free of the transport harness.
7. Install new assembly in reverse order, connecting the white wire to pin 9 and the black wire to pin 7.

3.12.3 Removal/Replacement of BOT/EOT Lamp

1. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the front panel (Sec. 2.1.2.2 or 2.2.2.2).
3. Remove the read/write board (Sec. 3.17.2).
4. Remove the lamp by prying the retainer plug loose and pulling the wires straight out of the right cassette locator post.
5. Disconnect pins 3 and 4 from plug AnP2*. This is accomplished by depressing locking tabs on side of plug and pulling the wires from plug.
6. When replacing the lamp, insert the wires into the retainer plug. The tip of the lamp should be approximately 1.2 inches from the inside shoulder of the retainer plug.
7. Push the lamp and the retainer plug into the right cassette locator post.
8. Replace the wires in pin 3 and 4 of AnP2 and connect the plug to the motor control board.
9. Readjust the BOT/EOT sensor circuit as described in Section 11.2.1.
10. Replace the read/write board.

3.13 CHANGE TA (TAPE ADDRESS) SENSOR AND LAMP

3.13.1 General

The Change TA signal is inititated by transitions between light from the Change TA light source and darkness caused by Change TA shaft encoder vanes interrupting the light path between the lamp and the related photosensor. The 320 vane shaft encoder is attached to the left hand reel drive spindle.

3.13.2 Removal/Replacement of TA Sensor

1. Remove the transport from the unit (Sec. 3.1.1.1 or 3.1.1.2).

*n = 2 for R.H. transport
n = 3 for L.H. transport

2. Remove the retaining screw holding the photosensor assembly to the deck casting.
3. Remove pins 3 and 5 from plug AnP1*. This is accomplished by depressing the locking tabs on the side of the plug and pulling the wires from the plug.
4. Carefully cut the necessary tie-wraps to remove the sensor wires from the deck harness.
5. Replace in reverse order, carefully re-routing the sensor wires. Connect the black wire to AnP1-5 and the white wire to AnP1-3.
6. Readjust the TA sensor circuit as described in Section 11.1.3.

3.13.3 Removal/Replacement of TA Lamp

1. Remove the transport from the unit (Sec. 3.1.1.1 or 3.1.1.2).
2. Remove the motor control board (Sec. 3.16.2).
3. Remove pins 1 and 2 from plug AnP2*. This is accomplished by depressing the locking tabs on the side of the plug and pulling the wires from the plug.
4. Pry open the wire clamp in front of the flywheel and free the lead wires.
5. Remove the capstan assembly retaining ring and slide the flywheel and capstan back; then pry the retainer plug out of the feed-through hole and pull the leads through.
6. Pry out the second retainer plug and remove the lamp assembly from the same hole.
7. Replace lamp assembly in reverse order, carefully re-routing the lamp leads, and not over-stressing the wire clamp located in front of the flywheel.
8. Replace the motor control board.
9. Replace the transport in the unit.
10. Readjust the TA sensor circuit as described in Section 11.1.3.
11. Replace the front panel assembly and the top cover.

3.14 CASSETTE-IN-PLACE SWITCH

3.14.1 General

The cassette-in-place switch (77) is a miniature switch which senses a cassette in operating position. A spring-loaded plunger

*n = 2 for R.H. transport
n = 3 for L.H. transport

(35) in the deck plate is depressed by the cassette as the holder is closed, actuating the switch.

3.14.2 Removal/Replacement

1. Remove the read/write board (Sec. 3.17.2).
2. Disconnect the two wires from the cassette-in-place switch.
3. Remove the two mounting screws.
4. Replace in reverse order. Connect the black wire to the NC terminal and the white wire to the common terminal of the switch. The contacts are identified on the bottom of the switch.

3.15 TRACK PROTECT SWITCHES

3.15.1 General

The two track protect switches (20) sense the presence of a tab or plug in the related track protect opening in the cassette. As the cassette is lowered into the holder, the switches are subject to actuation by presence of a tab or plug. Removal of the tab or plug from the track protection opening of a cassette will normally prevent writing on the related track.

3.15.2 Removal/Replacement

1. Open cassette holder to 90° position (Sec. 3.2.1).
2. Disconnect the two wires from the switch.
3. Remove the two mounting screws. (See Figure 3-7).
4. Replace in reverse order. Connect black wire to N.O. terminal and white wire to common terminal of switch.

3.16 MOTOR CONTROL ASSEMBLY

3.16.1 Description

The motor control assembly is mounted on the transport casting above the three drive motors. The motor control assembly is comprised of reel motor drivers and deck control logic.

3.16.1.1 Reel Motor Drivers

Each reel motor is controlled by a solid state power amplifier whose output stage is mounted in proximity to its respective motor.

3.16.1.2 Deck Control Logic

The deck control logic accepts as inputs five standard DTL/TTL logic signals called: (1) Run, (2) Engage Capstan, (3) Direction, (4) Engage Head, (5) Indicator. From four of these are decoded all necessary control functions. The fifth input, Indicator, is not used in the Series 3000 equipment.

The following table shows the control signal inputs required to execute the transport functions. (0 indicates 0 V; 1 indicates +5 V; x indicates either 1 or 0.)

Transport Function	Run	Engage Capstan	Direction	Engage Head
Fast Forward	0	1	1	1
Fast Reverse	0	1	0	1
Read/Write	0	0	1	0
Stop	1	1	x	x
Slow Forward	0	1	1	0
Slow Reverse	0	1	0	0

3.16.2 Removal/Replacement of the Motor Control Assembly

1. Remove the tape transport assembly from the unit (Sec. 3.1.1.1 or 3.1.1.2).
2. Remove the read/write board (Sec. 3.17.2).
3. Disconnect connectors from J1, J2, J3, J4, J5 and J7 on the motor control board (Figure 3-2).
4. Disconnect the solenoid wires from connectors E1, E2, E3 and E4 on the motor control board.
5. Remove the two mounting screws from the front brackets and carefully pull the motor control board out, to the rear.
6. Replace in reverse order.

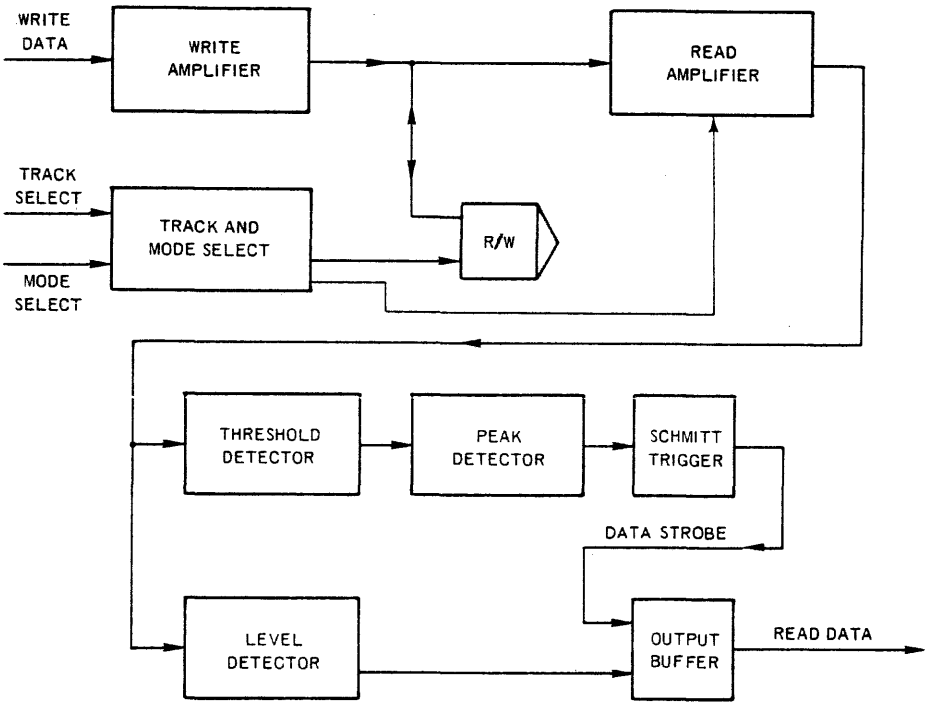


FIGURE 3-4 BLOCK DIAGRAM, READ/WRITE ASSEMBLY

3.17 READ/WRITE ASSEMBLY

3.17.1 General

The read/write assembly is capable of operation in either of two modes: Write or Read. In the Write mode, the assembly converts digital logic levels to currents which, when connected to the magnetic tape head, will produce flux patterns representative of the input data. (A "one" is represented by positive flux, and a "zero" is represented by negative flux.) In the Read mode, the assembly converts the low-level output voltage of the magnetic tape head to a digital logic level whose transitions are reflections of the flux transitions produced. The assembly also contains provisions for selecting either one of two data tracks for the read or write operation. Figure 3-4 is a block diagram of the read/write assembly.

3.17.1.1 Functional Description

The track and mode select circuit selects one (and only one) of the two tracks and determines whether data will be written on, or read from that track. If the write operation has been chosen, then the write data at the input of the write amplifier will be converted to a push-pull current in the appropriate track of the magnetic tape head. If the read operation has been chosen, then the output signal of the selected track of the tape head will be transmitted to the read amplifier. This amplifier will then amplify and band limit the signal. It should be noted that during the write operation, extraneous signals may be processed by the read circuitry due to its high gain characteristics. These signals should be ignored.

The output of the read amplifier is passed on to the threshold detector where it is rectified, amplified, and the signal components below a pre-set level are removed. The last operation removes noise at zero crossings while preserving the signal peaks. This signal is then presented to the peak detector, which produces a pulse for each signal peak. Each pulse corresponds to a flux reversal. The pulses are then shaped and simplified in a Schmitt trigger and passed on to the output buffer where they will be used to strobe the data.

In addition to knowing the point at which a transition occurs, the sense or level of the data must also be determined. This is accomplished by taking a sample of the output of the read amplifier and converting it to a two-level signal in the level detector.

This signal is then gated at data transitions in the output buffer and stored until the next transition occurs. This stored signal is the desired read data.

3.17.2 Removal/Replacement

1. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the three retaining screws near the front edge of the controller PC board and raise the hinged logic boards assembly to the vertical position (supported by catches).
3. Disconnect connectors from J1, J2 and J3 (Figure 3-2) on the read/write board.
4. Remove the four mounting screws.
5. Replace in reverse order.
6. Adjust the read/write signals as described in Section 11.2.3.
7. Secure the logic assembly and replace the top cover.

3.18 TIMING REQUIREMENTS

3.18.1 Forward-Reverse Sequence Timing

Figure 3-5 is a timing diagram of a forward-reverse sequence.

Note that transport motion should not be attempted during stopping.

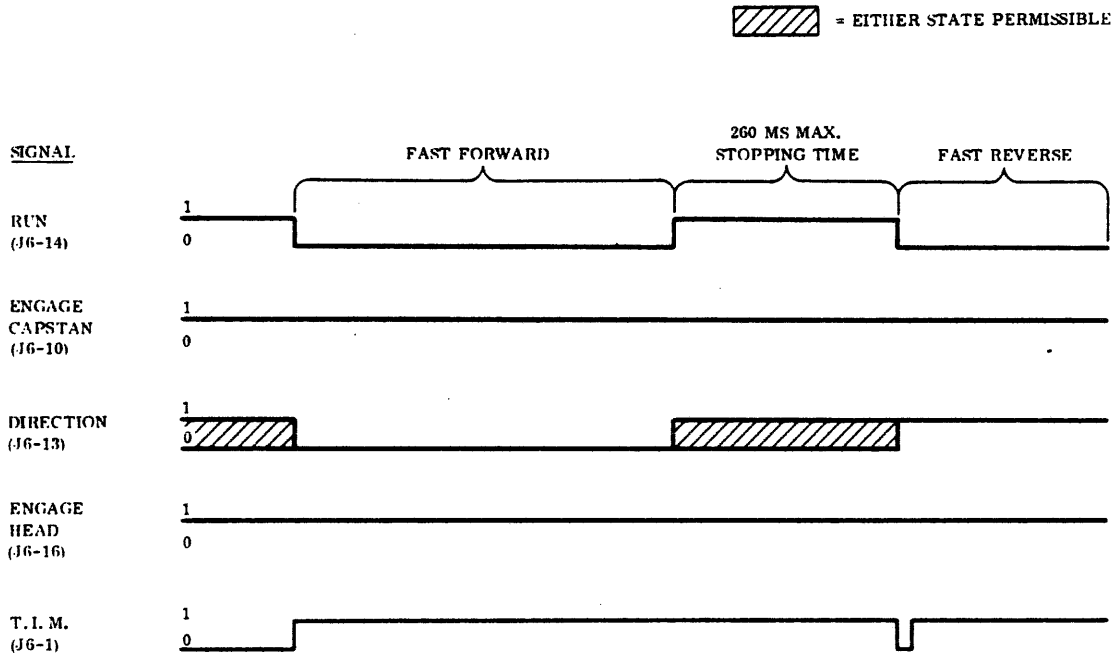


FIGURE 3-5 TIMING REQUIREMENTS FOR TYPICAL FORWARD-REVERSE SEQUENCE

3.18.2 Read/Write Sequence Timing

Figure 3-6 shows a typical read/write cycle (Write mode is selected in the example shown). Normal speed (forward) has been selected along with the Write mode. Data changes should be in-

hibited for a period after the start of the command, to allow stabilization of tape speed. This period is 20 milliseconds for a 5 ips unit, 30 milliseconds for a 12 ips unit.

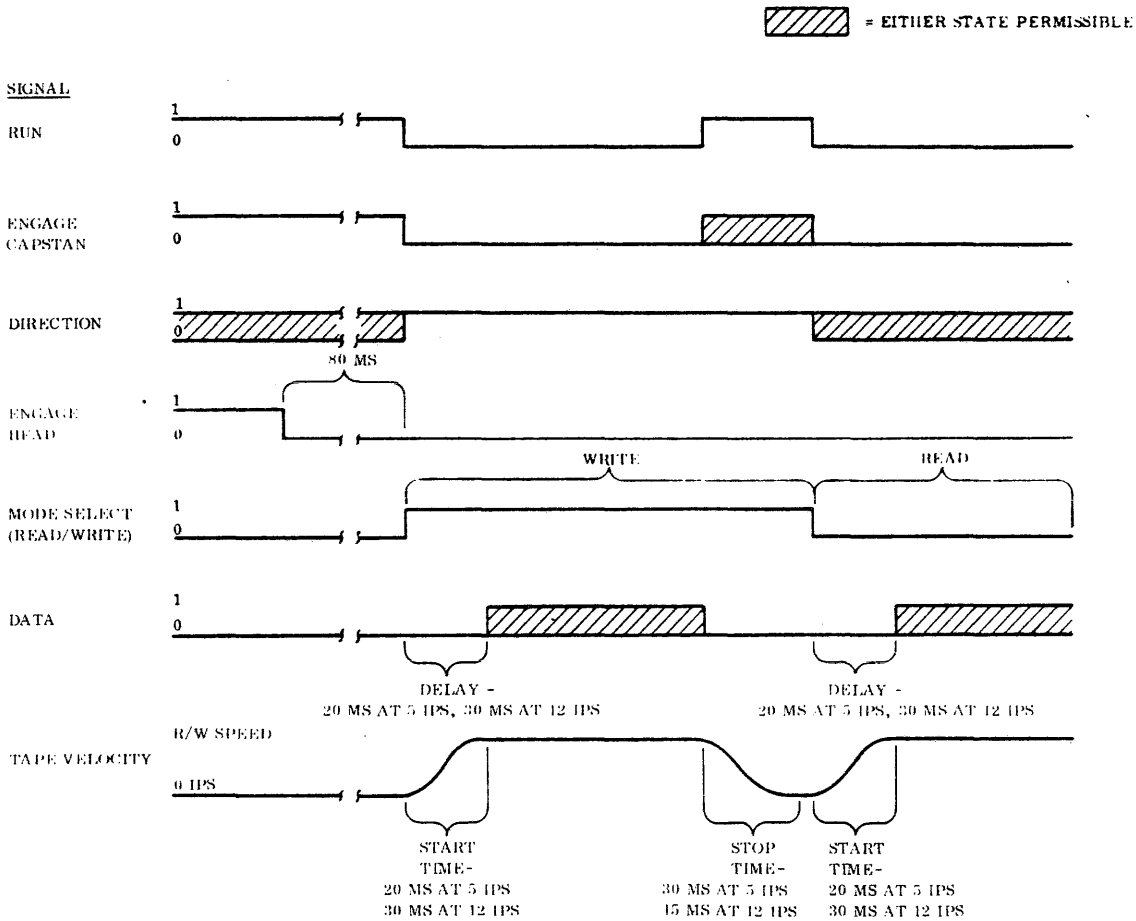


FIGURE 3-6 TIMING REQUIREMENTS FOR TYPICAL READ/WRITE SEQUENCE

3.19 OPTIONAL VACUUM TAPE CLEANING SYSTEM

Basically, the Vacuum Tape Cleaning System for a tape transport consists of a small vacuum pump, vacuum line filter, tape guide/cleaner and connecting tubings (refer to Figure 3-12, page 3-40). In dual transport Series 3000 Units, each transport is provided with such a system and the vacuum pumps are mounted in pairs.

3.19.1 Vacuum Pump Assembly

3.19.1.1 General

The vacuum pump assembly consists of a small molded-diaphragm pump and a check valve. The pump is actuated by an electromagnetic vibrator mechanism which operates on 120 vac and is controlled by the front panel power switch. The life expectancy of the pump assembly is five years.

3.19.1.2 Removal/Replacement

1. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the three retaining screws from the front edge of the controller PC board and raise the logic assembly to the vertical position (supported by catches).

   In desk top unit, disconnect the connecting tubing(s) from the vacuum filter(s); then remove the six retaining screws which attach the mounting frame and rear panel assembly to the enclosure's bottom cover (screws are accessible from beneath bottom cover). Lift the mounting frame and attached components from the bottom cover for access to the vacuum pump(s).

   In rack mountable unit, the vacuum pump(s) are now accessible (on the right side of the unit, behind the tape transport).

3. Detach the vacuum tubing from the intake fitting on the vacuum pump assembly.
4. Remove the pump assembly and its supporting bracket from the unit by removing the two retaining screws and lock washers (on desk top units, these screws are accessible from beneath the enclosure).
5. Detach the pump assembly from its supporting bracket by removing the retaining hex nuts and washers. If the pump is one of a pair in a dual transport unit, detach the pump from the upper support brace by removing the retaining screw, lock washer and hex nut.
6. Reassemble in reverse order.

   NOTE: When mounting pump on its supporting bracket, tighten hex nuts until snug, but not so tight as to restrict the vibration dampening effect of the rubber grommets.

3.19.2 Vacuum Line Filter Assembly

3.19.2.1 General

The vacuum line filter assembly consists of a cylindrical clear plastic filter body with two end cap/fittings, containing plastic foam filtering media.

3.19.2.2 Removal/Replacement of Filter Assembly

1. Remove top cover of the unit enclosure (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the three retaining screws from the front edge of the controller PC board and raise the logic board assembly to the vertical position (supported by detents).
3. Detach the vacuum lines from the two end fittings of the filter assembly.
4. Cut the tie-wrap retaining the filter assembly.
5. Replace in reverse order using a tie-wrap, wire or other fastening device to retain the filter assembly.

3.19.2.3 Cleaning Filter (See Sec. 11.3.4)

3.19.3 Tape Guide/Cleaner Assembly

The Tape Guide/Cleaner Assembly is mounted on the slide plate assembly. Field removal of this component from the slide plate is not recommended (see Sec. 3.7).

3.19.4 Vacuum Tubing

3.19.4.1 General

Latex tubing, 5/32" I.D. x 3/64" wall, is employed throughout the vacuum tape cleaning system. This latex tubing has the flexibility required for free movement of the tape head slide plate. It is important that no other type tubing be substituted for the latex tubing,

especially the section connecting the filter and tape guide/cleaner, since kinking of the tubing or restriction of slide plate movement may result.

3.19.4.2 Removal/Replacement

CAUTION: Normal movement of the tape head slide plate may be inhibited if the tubing connected to the tape guide/cleaner is improperly routed, of incorrect length, or is twisted when attached to fittings.

When ordering replacement tubing from Sykes Datatronics, Inc., specify the part No. from the parts list; also the length of tubing required (minimum order quantity 2 feet).

When installing new tubing, cut to the exact length of the section being replaced and push firmly onto the fittings.

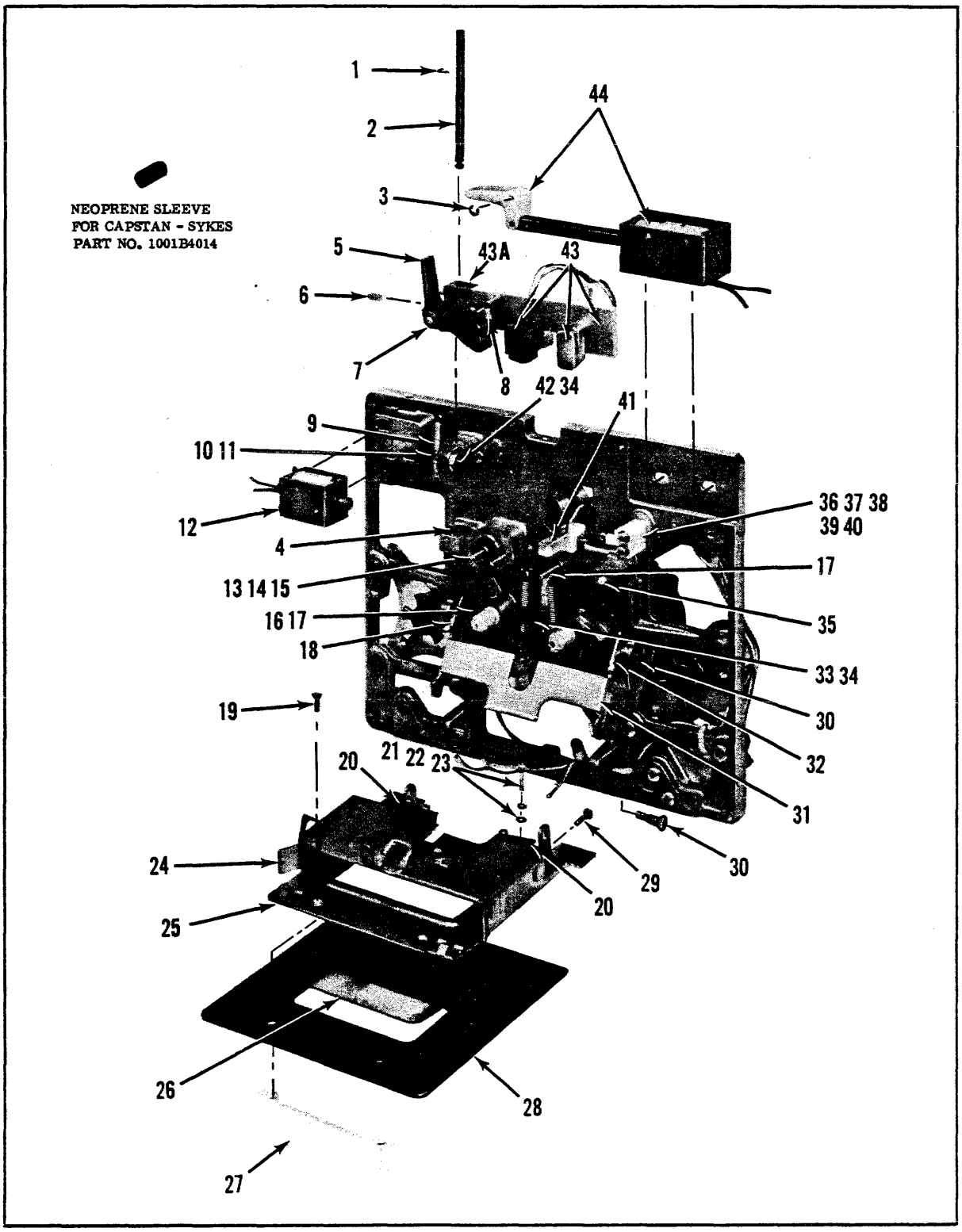


FIGURE 3-7 EXPLODED FRONT VIEW OF TT120 TRANSPORT

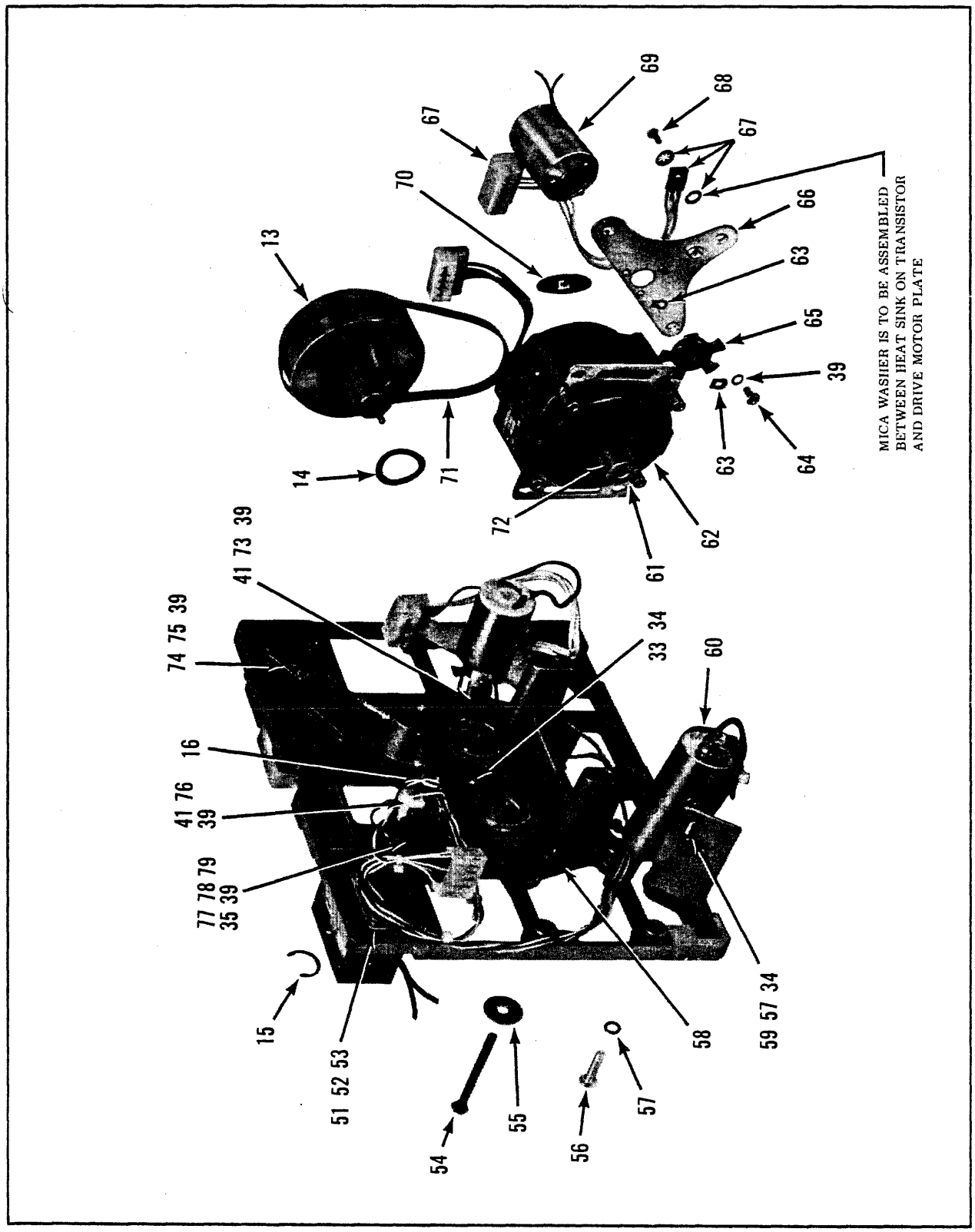


FIGURE 3-8 EXPLODED REAR VIEW OF TT120 TRANSPORT

3.20 PARTS LIST - TT120 TRANSPORT (FRONT & REAR VIEWS)

REF. NO.	SYKES NO.	DESCRIPTION
1	500H60106	RETAINING RING
2	1020B0035	SLIDE SHAFT
3	500H60103	RETAINING RING
4	1001A0072	RUBBER WASHER
5	1020A0014	PINCH ROLLER AND ARM ASSEMBLY
6	100H26100	NYLON SET SCREW, 6-32 x 1/4 WITH COMBINATION SOCKET AND SLOTTED END
7	500H70113	CIRCULAR PUSH-ON RING
8	1020B0033	EXTENSION SPRING-ARM
9	800S01104	EXTENSION SPRING
10	1020B0039	PLUNGER TIP
11	500H70002	COMPONENT RING
12	1020A4006	PINCH ROLLER SOLENOID ASSEMBLY, COMPLETE WITH "O" RING AND PLUNGER TIP
13	1001A4010	CAPSTAN ASSEMBLY, COMPLETE WITH BEARINGS AND FLYWHEEL
14	200H11001	TWO WAVE WASHER
15	500H61114	RETAINING RING
16	1001A0125	LAMP PLUG
17	1020A4008	LAMP ASSEMBLY, +5V
18	800S03014	TORSION SPRING (WOUND RIGHT)
19	100H07405	PHILLIPS FLAT HD SELF TAP SCREW, 4-40 x 5/16
20	101S01001	SUBMINIATURE SWITCH
21	100H01207	PHILLIPS PAN HD SCREW 2-56 x 7/16
22	200H02201	LOCK WASHER NO. 2
23	200H10201	PLAIN WASHER NO. 2
24	1001A0381	CASSETTE HOLDER ASSEMBLY WELDMENT
25	500H70001	SPEED CLIP
26	1001A0058	WINDOW
27	1001A0044	HANDLE
28	1001A0057	DOOR
29	100H51210	TUBULAR RIVET (PLUNGER)
30	1001B4030	HINGE SCREW
31	1001B4037	DOOR DETENT
32	800S03013	TORSION SPRING (WOUND LEFT)
33	1020A4009	CATCH ASSEMBLY COMPLETE WITH SPRINGS
34	500H10801	HEX NUT 8-32
35	1001A0126	PLUNGER, SWITCH ACTUATING
36	1001A0110	SLIDE PLATE GUIDE
37	100H01414	PHILLIPS PAN HD SCREW, 4-40 x 7/8
38	1001B0900	SLIDE GUIDE SPACER
39	200H02401	LOCK WASHER NO. 4
40	200H10401	PLAIN WASHER NO. 4
41	1020A4007	PHOTO DETECTOR ASSEMBLY
42	1020B4032	SOLENOID STOP LIMIT SCREW
*43	1020A4051	SLIDE PLATE ASSEMBLY COMPLETE WITH 80-40 HEAD, TAPE GUIDE, PINCH ROLLER ARM ASSEMBLY, SPRINGS AND GROUND WIRE
*43	1020A4056	SLIDE PLATE ASSEMBLY COMPLETE WITH 80-40 HEAD, GUIDE/CLEANER, PINCH ROLLER ARM ASSEMBLY, SPRINGS AND GROUND WIRE
43A	1020B4073	SOLENOID SETTING SHIM
44	1020A4012	SLIDE PLATE SOLENOID (COIL
44	1020A4011	CAM AND PLUNGER ASSEMBLY
51	100H03605	HEX HD CAP SCREW, 6-32 x 5/16
52	200H02601	LOCK WASHER NO. 6
53	1001B4022	WASHER PLATE
54	1001B4053	HEX HD CAP SCREW, 10-32 x 2-1/4
55	200H10103	PLAIN WASHER NO. 10
56	100H01814	PHILLIPS PAN HD SCREW 8-32 x 7/8
57	200H02801	LOCK WASHER NO. 8
58	101B02006	"O" RING BELT
59	200H10801	PLAIN WASHER NO. 8
60	1020A4005	CAPSTAN MOTOR CAPACITOR ASSEMBLY
61	1020B0049	12 IPS, 60 HZ CAPSTAN MOTOR PULLEY
61	1020B0051	12 IPS, 50 HZ CAPSTAN MOTOR PULLEY
61	1001A0035	5 IPS, 60 HZ CAPSTAN MOTOR PULLEY
61	1001A1712	5 IPS, 50 HZ CAPSTAN MOTOR PULLEY
62	1001A4063	5 IPS, 60 HZ CAPSTAN MOTOR ASSEMBLY (OPTIONAL) COMPLETE WITH BELT, PULLEY AND MOUNTING PLATE
62	1001A4064	5 IPS, 50 HZ CAPSTAN MOTOR ASSEMBLY (OPTIONAL) COMPLETE WITH BELT, AND MOUNTING PLATE

* For units equipped with special tape heads, please include head description in order for slide plate assembly.

3.20 PARTS LIST - TT120 TRANSPORT (FRONT & REAR VIEWS)

REF. NO.	SYKES NO.	DESCRIPTION
62	1001A4069	12 IPS, 60 HZ CAPSTAN MOTOR ASSEMBLY (OPTIONAL) COMPLETE WITH BELT, PULLEY AND MOUNTING PLATE
62	1001A4070	12 IPS, 50 HZ CAPSTAN MOTOR ASSEMBLY (OPTIONAL) COMPLETE WITH BELT, PULLEY AND MOUNTING PLATE
63	_____*	RETAINING RING, GRIPPING, .120" FREE DIA x .025" THICK
64	100H01404	PHILLIPS PAN HD SCREW 4-40 x 1/4
65	_____*	PULLEY (DRIVE MOTORS)
66	_____*	DRIVE MOTOR PLATE
67	1020A4004	POWER TRANSISTOR, NPN-2NS190, ASSEMBLED WITH WIRES AND CONNECTOR, MICA WASHER AND LOCK WASHER INCLUDED
68	100H01404	PHILLIPS PAN HD SCREW 4-40 x 1/4
69	1020A4003	DRIVE MOTOR ASSEMBLY, DC WITH PLATE AND PULLEY
70	500H70003	SPEED NUT 10-32
71	101B01006	FLAT BELT, CAPSTAN DRIVE
72	100H24402	SPLINE SOCKET HD SCREW 4-40 x 1/8
73	100H01404	PHILLIPS PAN HD SCREW 4-40 x 1/4
74	1020B4020	WASHER PLATE
75	100H03412	HEX HD CAP SCREW 4-40 x 3/4
76	100H01406	PHILLIPS PAN HD SCREW 4-40 x 3/8
77	102S01001	SWITCH, CASSETTE IN POSITION
78	100H01410	PHILLIPS PAN HD SCREW 4-40 x 5/8
79	500H51401	HEX NUT 4-40

* Part is available only as part of Motor Assembly (69) and is illustrated for reference purposes only.

3.21 PARTS LIST - MOTOR CONTROL ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
C1, 10	CAPACITOR, ELECTROLYTIC, TANTALUM, 22uF, ±10%, 35V	105C04103	SPRAGUE	TYPE 196D
C2, 4	CAPACITOR, DISC, .022uF, ±20%, 50V	120C03042	CENTRALAB	TYPE UK
C3, 5	CAPACITOR, ELECTROLYTIC, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C6, 7, 20	CAPACITOR, MYLAR, .068uF, ±10%, 250V	130C01023	SEACOR	TYPE P106
C8, 15, 18	CAPACITOR, DISC, .01uF, ±20%, 50V	120C03040	CENTRALAB	TYPE UK
C9	CAPACITOR, DISC, 1.0uF, 3V, NON POLAR	120C03004	CENTRALAB	TYPE UK
C11, 12	CAPACITOR, ELECTROLYTIC, TANTALUM, 1.0uF, ±10%, 35V	105C04137	SPRAGUE	TYPE 196D
C14	CAPACITOR, DISC, .05uF, ±20% 50V	120C03045	CENTRALAB	TYPE UK
C16, 17	CAPACITOR, ELECTROLYTIC, TANTALUM, 1uF, ±10%, 50V	105C04062	SPRAGUE	TYPE 196D
C19	CAPACITOR, ELECTROLYTIC, TANTALUM, 47uF, ±10%, 35V	105C04136	SPRAGUE	TYPE 196D
CR1	DIODE, ZENER, 4.7V, 1W	200C04104	MOTOROLA	IN4732
CR2-17, 20, 21, 22, 27-32	DIODE, HIGH SPEED SWITCHING	200C01001	GENERAL ELECTRIC	IN4154
CR18, 19, 23-26, 33	RECTIFIER, 750MA MOLDED SILICON	200C02001	INTERNATIONAL RECT.	IN2070
Q1, 2	TRANSISTOR, PNPN, UNIJUNCTION	203Q01001	G.E. SEMICONDUCTOR	D13T2
Q3,4,6,9,10,12,13, 14, 16, 17	TRANSISTOR, NPN ANNULAR	202Q01001	MOTOROLA	MPS6531
Q5, 7, 8	TRANSISTOR, NPN	201Q01001	MOTOROLA	MPS6534
Q11	TRANSISTOR, PNP, POWER	201Q01003	MOTOROLA	2N5193
Q15, 18	TRANSISTOR, NPN, POWER	202Q01003	MOTOROLA	2N5190
R1	RESISTOR, POWER, WIRE WOUND, 2W, ±5%, 250 OHM	102R03059	SPRAGUE	TYPE 448E
R2	RESISTOR, CARBON COMP., 1/4W ±5%, 360 OHM	100R02067		
R3, 46, 58	RESISTOR, WIRE WOUND, 5W, ±5%, 300 OHM	102R06266		
R4	RESISTOR, CARBON COMP., 1/4W, ±5%, 6.8K	100R02093		
R5	RESISTOR, CARBON COMP., 1/4W, ±5%, 5.6K	100R02091		
R6, 22	RESISTOR, CARBON COMP., 1/4 W, ±5%, 3.9K	100R02087		
R7, 42, 53, 56	RESISTOR, CARBON COMP., 1/4 W, ±5%, 4.7K	100R02089		
R8	POTENTIOMETER, CERMET TRIMMING, 1/4W, ±10%, 500 OHM	110R05006	BECKMAN-HELIPOT	SERIES 72

3.21 PARTS LIST - MOTOR CONTROL ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
R9	POTENTIOMETER, CERMET TRIMMING, 1/4W, ±10%, 5K	110R05009	BECKMAN-HELIPOT	SERIES 72
R10	RESISTOR, CARBON COMP., 1/4W, ±5%, 390 OHM	100R02063		
R11	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.7K	100R02083		
R12, 13, 20, 25, 30, 35, 36, 40, 49, 54, 57	RESISTOR, CARBON COMP., 1/4W, ±5%, 10K	100R02097		
R14, 16, 17, 18 21, 28, 33	RESISTOR, CARBON COMP., 1/4W, ±5%, 1.0K	100R02073		
R15	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.2K	100R02081		
R19, 37	RESISTOR, CARBON COMP., 1/2W, ±5%, 1K	100R03073		
R23	RESISTOR, CARBON COMP., 1/4W, ±5%, 1.0 MEG	100R02145		
R24	RESISTOR, CARBON COMP., 1/4W, ±5%, 33K	100R02109		
R26, 27	RESISTOR, CARBON COMP., 1/4W, ±5%, 22K	100R02105		
R29, 34	POTENTIOMETER, CERMET TRIMMING, 1/4W, ±10%, 25K	110R05012	BECKMAN-HELIPOT	SERIES 72
R31	RESISTOR, CARBON COMP., 1/4 W, ±5%, 68K	100R02117		
R32, 55	RESISTOR, CARBON COMP., 1/4W, ±5%, 2K	100R02080		
R38	RESISTOR, CARBON COMP., 1/2W, ±5%, 22 OHM	100R03033		
R39, 48	RESISTOR, CARBON COMP., 1/4W, ±5%, 1.2K	100R02075		
R41, 50	RESISTOR, CARBON COMP., 1/4W, ±5%, 680 OHM	100R02069		
R43, 44	RESISTOR, WIRE WOUND, 5-1/4W, ±5%, 750 OHM	102R06282		
R45	RESISTOR, WIRE WOUND, 5W, ±5%, 40 OHM	102R06243		
R47	RESISTOR, WIRE WOUND, 5W, ±5%, 30 OHM	102R06238		
R51	RESISTOR, CARBON COMP., 1/4W, ±5%, 75 OHM	100R02046		
R52	RESISTOR, CARBON COMP., 1/2W, ±5%, 1.8K	100R03079		
U1, 4	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMICONDUCTOR	U6A993659X
U2, 3	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMICONDUCTOR	U6A994659X

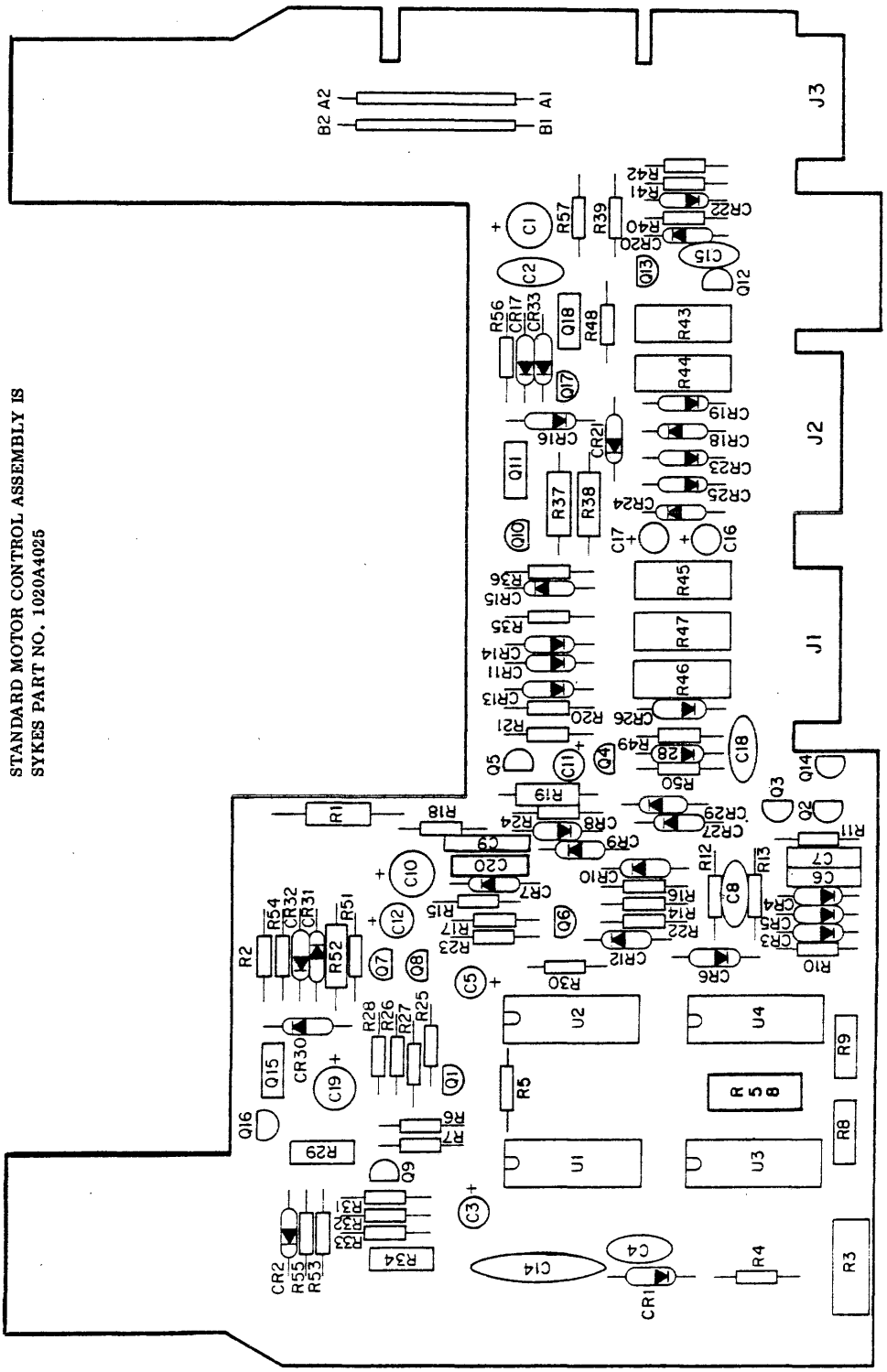


FIGURE 3-9 MOTOR CONTROL ASSEMBLY

5 IPS READ/WRITE ASSEMBLY IS SYKES PART NO. 1001A0272

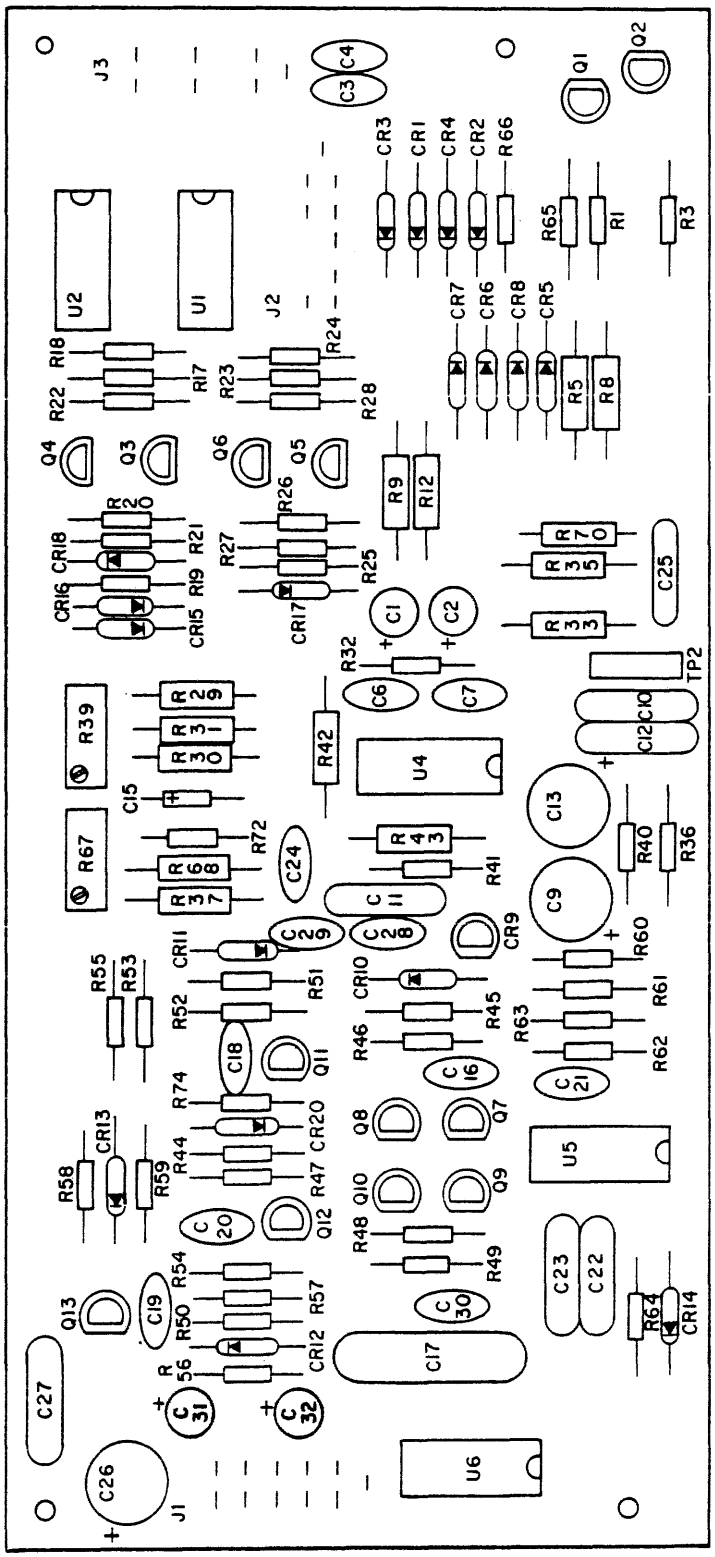


FIGURE 3-10 5 IPS READ/WRITE ASSEMBLY

3.22 PARTS LIST - 5 IPS READ/WRITE ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
C1, 2	CAPACITOR, TANTALUM, 1uF, ±10%, 35V	105C04137	SPRAGUE	TYPE 196D
C3, 4	CAPACITOR, DISC, L.V., .01uF, ±20%, 50V	120C03040	CENTRALAB	TYPE UK
C6, 7	CAPACITOR, DISC, 300PF, ±10%, 1KV	120C01037	CENTRALAB	TYPE DD
C9, 13, 26, 31, 32	CAPACITOR, TANTALUM, 22uF, ±100%, -10%, 15V	105C04105	SPRAGUE	TYPE 196D
C10, 11, 12, 22, 23, 27	CAPACITOR, DISC. L.V., .1uF, ±20%, 25V	120C03035	CENTRALAB	TYPE UK
C15	CAPACITOR, TANTALUM, 1uF, 35V	105C05137	DIXON	D1ROAE35KI
C16	CAPACITOR, DISC, 220PF, ±10% 1KV	120C01033	CENTRALAB	TYPE DD
C17	CAPACITOR METALIZED POLYESTER, .47uF, ±10%, 250V	130C01033	AMPEX	C280AE/A470K
C18, 28, 29	CAPACITOR, DISC, .001uF, GMV, 1KV	120C01061	CENTRALAB	TYPE DD
C19, 21	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
C20	CAPACITOR, DISC, 100PF, ±10%, 1KV	120C01027	CENTRALAB	TYPE DD
C24	CAPACITOR, DISC, .0018uF, ±10%, 1KV	120C01068	CENTRALAB	TYPE DD
C25	CAPACITOR, DISC, 1.0uF, 3V, NON POLAR	120C03004	CENTRALAB	TYPE UK
C30	CAPACITOR, DISC, 33PF, ±10%, 1KV	120C01017	CENTRALAB	TYPE DD
CR1-8, CR10-13, CR15-18	DIODE, SILICON SWITCHING	200C01001	GE SEMICONDUCTOR	IN4151
CR9	DIODE, DUAL SILICON	200C01002	MOTOROLA	MSD6102
CR14	DIODE, ZENER, 6V, 500MW	200C04013	INTERNATIONAL RECTIFIER	IN5233
CR20	DIODE, ZENER, 7.5V, ±5%	200C04066	INTERNATIONAL RECTIFIER	IN5236B
Q1, 2, 9, 11, 12, 13	TRANSISTOR, NPN	202Q01001	MOTOROLA	MPS6531
Q3, 4, 5, 6, 7, 8, 10	TRANSISTOR, PNP	201Q01001	MOTOROLA	MPS6534
R1, 3, 47	RESISTOR, CARBON COMP., 1/4W, ±5%, 3.3K	100R02085		
R5, 8	RESISTOR, METAL FILM, 1/8W, ±1%, 15K	101R01304		
R9, 12	RESISTOR, METAL FILM, 1/8W, ±1%, 10K	101R01287		
R17, 22, 23, 28	RESISTOR, CARBON COMP., 1/4W, ±5%, 39K	100R02111		

3.22 PARTS LIST - 5 IPS READ/WRITE ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
R18, 24	RESISTOR, CARBON COMP., 1/4W, ±5%, 15K	100R02101		
R19, 25	RESISTOR, CARBON COMP., 1/4W, ±5%, 8.2K	100R02095		
R20, 26, 46	RESISTOR, CARBON COMP., 1/4W, ±5%, 22K	100R02105		
R21, 27, 45, 56, 62, 63	RESISTOR CARBON COMP., 1/4W, ±5%, 10K	100R02097		
R24, 33, 35, 42, 43	RESISTOR, METAL FILM, 1/8W, ±1%, 110K	101R01385		
R30, 31, 37	RESISTOR, METAL FILM, 1/8W, ±1%, 54.9K	101R01356		
R32, 64	RESISTOR, CARBON COMP., 1/4W, ±5%, 470 OHM	100R02065		
R36, 40	RESISTOR, CARBON COMP., 1/4W, ±5%, 22 OHM	100R02033		
R39, 67	POTENTIOMETER, WIRE WOUND, SQ. CASE, 1W, 5K	110R02026		
R41	RESISTOR, CARBON COMP., 1/4W, ±5%, 33 OHM	100R02037		
R44	RESISTOR, CARBON COMP., 1/4W, ±5%, 75K	100R02118		
R48	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.7K	100R02083		
R49	RESISTOR, CARBON COMP., 1/4W, ±5%, 100 OHM	100R02049		
R50, 59, 70	RESISTOR, CARBON COMP., 1/4W, ±5%, 1K	100R02073		
R51, 57	RESISTOR, CARBON COMP., 1/4W, ±5%, 68K	100R02117		
R52, 54	RESISTOR, CARBON COMP., 1/4W, ±5%, 3.9K	100R02087		
R53	RESISTOR, CARBON COMP., 1/4W, ±5%, 330 OHM	100R02061		
R55, 72	RESISTOR, CARBON COMP., 1/4W, ±5%, 82K	100R02119		
R58	RESISTOR, CARBON COMP., 1/4W, ±5%, 2K	100R02080		
R60, 61	RESISTOR, CARBON COMP., 1/4W, ±5%, 47K	100R02113		
R65, 66	RESISTOR, CARBON COMP., 1/4W, ±5%, 6.8K	100R02093		
R68	RESISTOR, CARBON COMP., 1/4W, ±1%, 19.1K	101R01314		
R74	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.2K	100R02081		
TP2	TEST POINT RECEPTACLE, ORANGE	101J01006		

3.22 PARTS LIST - 5 IPS READ/WRITE ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
U1	INTEGRATED CIRCUIT, HLL DTuL HIGH VOLTAGE HEX INVERTER	100U14009	FAIRCHILD SEMI-CONDUCTOR	U6A911259X
U2	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
U4	INTEGRATED CIRCUIT, DUAL OPERATIONAL AMPLIFIER	100U14006	FAIRCHILD SEMI-CONDUCTOR	U6A7739393
U5	INTEGRATED CIRCUIT, DIFF-ERENTIAL COMPARATOR	100U14010	TEXAS INSTRUMENTS	SN72710N
U6	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMI-CONDUCTOR	U6A909359X

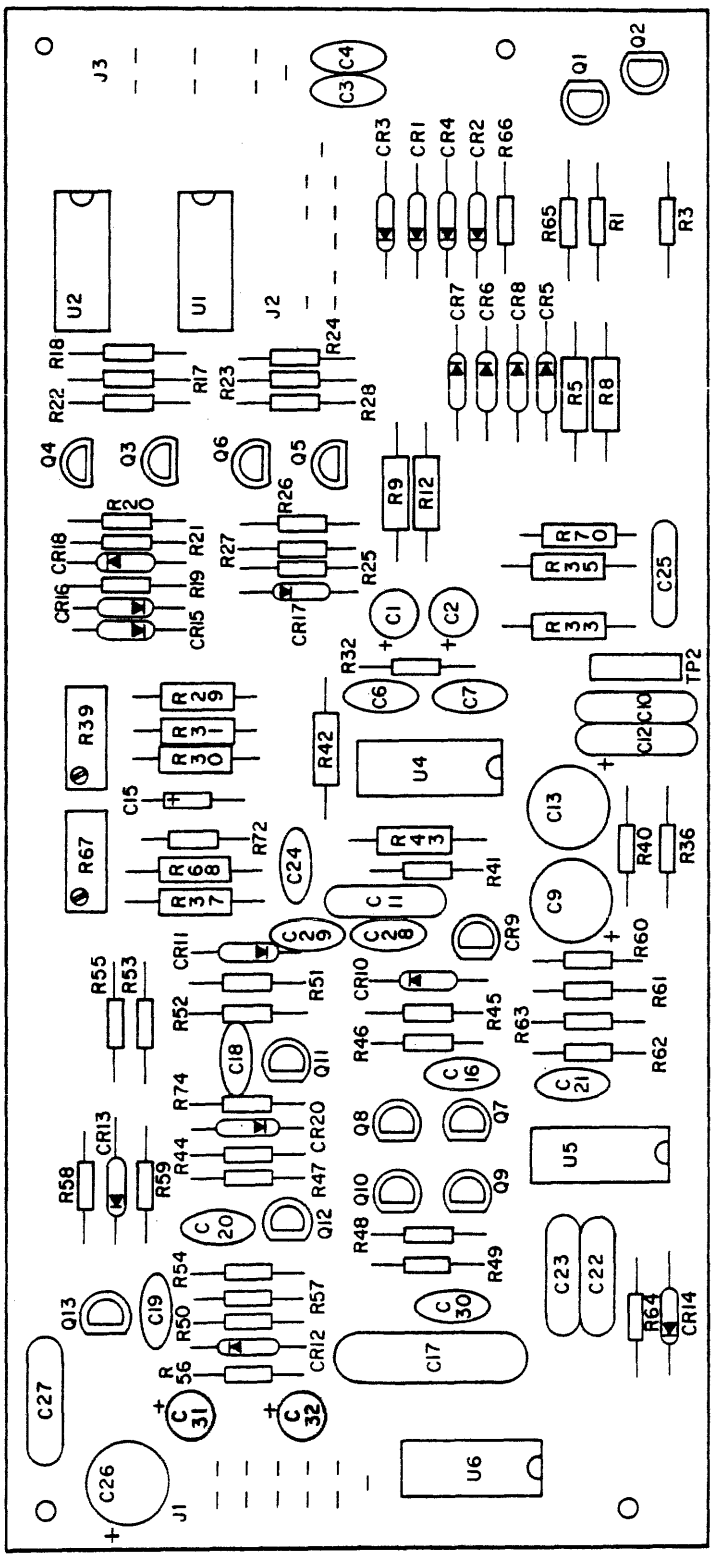


FIGURE 3-11 12 IPS READ/WRITE ASSEMBLY

3.23 PARTS LIST - 12 IPS READ/WRITE ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
C1, 2	CAPACITOR, TANTALUM 1uF, ±10%, 35V	105C04137	SPRAGUE	TYPE 196D
C3, 4	CAPACITOR, DISC, L.V., .01uF, ±20%, 50V	120C03040	CENTRALAB	TYPE UK
C6	CAPACITOR, DISC, 560PF, ±10%, 1KV	120C01047	CENTRALAB	TYPE DD
C7, 16, 20	CAPACITOR, DISC, 100PF, ±10%, 1KV	120C01027	CENTRALAB	TYPE DD
C9, 13, 26, 31, 32	CAPACITOR, ELECTROLYTIC, 22uF, ±100%, -10%, 15V	105C04105	SPRAGUE	TYPE 196D
C10, 12, 22, 23, 27	CAPACITOR, DISC, L.V., .1uF, ±20%, 25V	120C03035	CENTRALAB	TYPE UK
C11	CAPACITOR, DISC, .05uF, ±20%, 50V	120C03045	CENTRALAB	TYPE UK
C15	CAPACITOR, ELECTROLYTIC, 1uF, ±10%, 35V	105C05137	SPRAGUE	TYPE 150D
C17	CAPACITOR METALIZED POLYESTER .22uF, ±10%, 250V	130C01029	SEACOR	TYPE 106
C18, 19, 21	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
C24	CAPACITOR, DISC, 680PF, GMV, 1KV	120C01049	CENTRALAB	TYPE DD
C25	CAPACITOR, DISC, 1.0uF, 3V, NON POLAR	120C03004	CENTRALAB	TYPE UK
C28, 29	CAPACITOR, DISC, 300PF, ±10%, 1KV	120C01037	CENTRALAB	TYPE DD
C30	CAPACITOR, DISC, 33PF, ±10%, 1KV	120C01017	CENTRALAB	TYPE DD
CR1-8, CR10-13, CR15-18	DIODE, SILICON SWITCHING	200C01001	GE SEMICONDUCTOR	IN4151
CR9	DIODE, DUAL SILICON	200C01002	MOTOROLA	MSD6102
CR14	DIODE, ZENER, 6V, 500MW	200C04013	INTERNATIONAL RECTIFIER	IN5233
CR20	DIODE, ZENER, 7.5V, ±5%	200C04066	INTERNATIONAL RECTIFIER	IN5236B
Q1, 2, 9, 11, 12, 13	TRANSISTOR, NPN	202Q01001	MOTOROLA	MPS6531
Q3-8, 10	TRANSISTOR, PNP	201Q01001	MOTOROLA	MPS6534
R1, 3, 47	RESISTOR, CARBON COMP., 1/4W, ±5%, 3.3K	100R02085		
R5, 8	RESISTOR, METAL FILM, 1/8W, ±1%, 15K	101R01304		
R9, 12	RESISTOR, 1/8W, ±1%, 19.1K	101R01314		
R17, 22, 23, 28	RESISTOR, CARBON COMP., 1/4W, ±5%, 39K	100R02111		
R18, 24	RESISTOR, CARBON COMP., 1/4W, ±5%, 15K	100R02101		

3.23 PARTS LIST - 12 IPS READ/WRITE ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
R19, 25	RESISTOR, CARBON COMP., 1/4W, ±5%, 8.2K	100R02095		
R20, 26, 46	RESISTOR, CARBON COMP., 1/4W, ±5%, 22K	100R02105		
R21, 27, 45 56, 62, 63	RESISTOR, CARBON COMP., 1/4W, ±5%, 10K	100R02097		
R29, 33, 42, 43	RESISTOR, METAL FILM, 1/8W, ±5%, 110K	101R01385		
R30, 31	RESISTOR, CARBON COMP., 1/4W, ±1%, 45.3K	101R01348		
R35	RESISTOR, METAL FILM, 1/8W, ±1%, 90.9K	101R01377		
R32, 53	RESISTOR, CARBON COMP., 1/4W, ±5%, 330 OHM	100R02061		
R36, 40	RESISTOR, CARBON COMP., 1/4W, ±5%, 22 OHM	100R02033		
R37	RESISTOR, METAL FILM, 1/8W, ±1%, 54.9K	101R01356		
R39, 67	POTENTIOMETER, WIRE WOUND, SQ. CASE, 1W, 5K	110R02026		
R41	RESISTOR, CARBON COMP., 1/4W, ±5%, 33 OHM	100R02037		
R44	RESISTOR, CARBON COMP., 1/4W, ±5%, 75K	100R02118		
R48	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.7K	100R02083		
R49	RESISTOR, CARBON COMP., 1/4W, ±5%, 100 OHM	100R02049		
R50, 59, 70	RESISTOR, CARBON COMP., 1/4W, ±5%, 1K	100R02073		
R51, 57	RESISTOR, CARBON COMP., 1/4W, ±5%, 68K	100R02117		
R52, 54	RESISTOR, CARBON COMP., 1/4W, ±5%, 3.9K	100R02087		
R55, 72	RESISTOR, CARBON COMP., 1/4W, ±5%, 82K	100R02119		
R58	RESISTOR, CARBON COMP., 1/4W, ±5%, 2K	100R02080		
R60, 61	RESISTOR, CARBON COMP., 1/4W, ±5%, 47K	100R02113		
R64	RESISTOR, CARBON COMP., 1/4W, ±5%, 470 OHM	100R02065		
R65, 66	RESISTOR, CARBON COMP., 1/4W, ±5%, 6.8K	100R02093		
R68	RESISTOR, CARBON COMP., 1/4W, ±5%, 18K	100R02103		
R74	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.2K	100R02081		

3.23 PARTS LIST - 12 IPS READ/WRITE ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
TP2	TEST POINT RECEPTACLE ORANGE	101J01006		
U1	INTEGRATED CIRCUIT, HLL DTuL HIGH VOLTAGE HEX INVERTER	100U14009	FAIRCHILD SEMICONDUCTOR	U6A911259X
U2	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMICONDUCTOR	U6A993659X
U4	INTEGRATED CIRCUIT, DUAL OPERATIONAL AMPLIFIER	100U14006	FAIRCHILD SEMICONDUCTOR	U6A7739393
U5	INTEGRATED CIRCUIT, DIFFERENTIAL COMPARATOR	100U14010	TEXAS INSTRUMENTS	SN72710N
U6	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMICONDUCTOR	U6A909359X

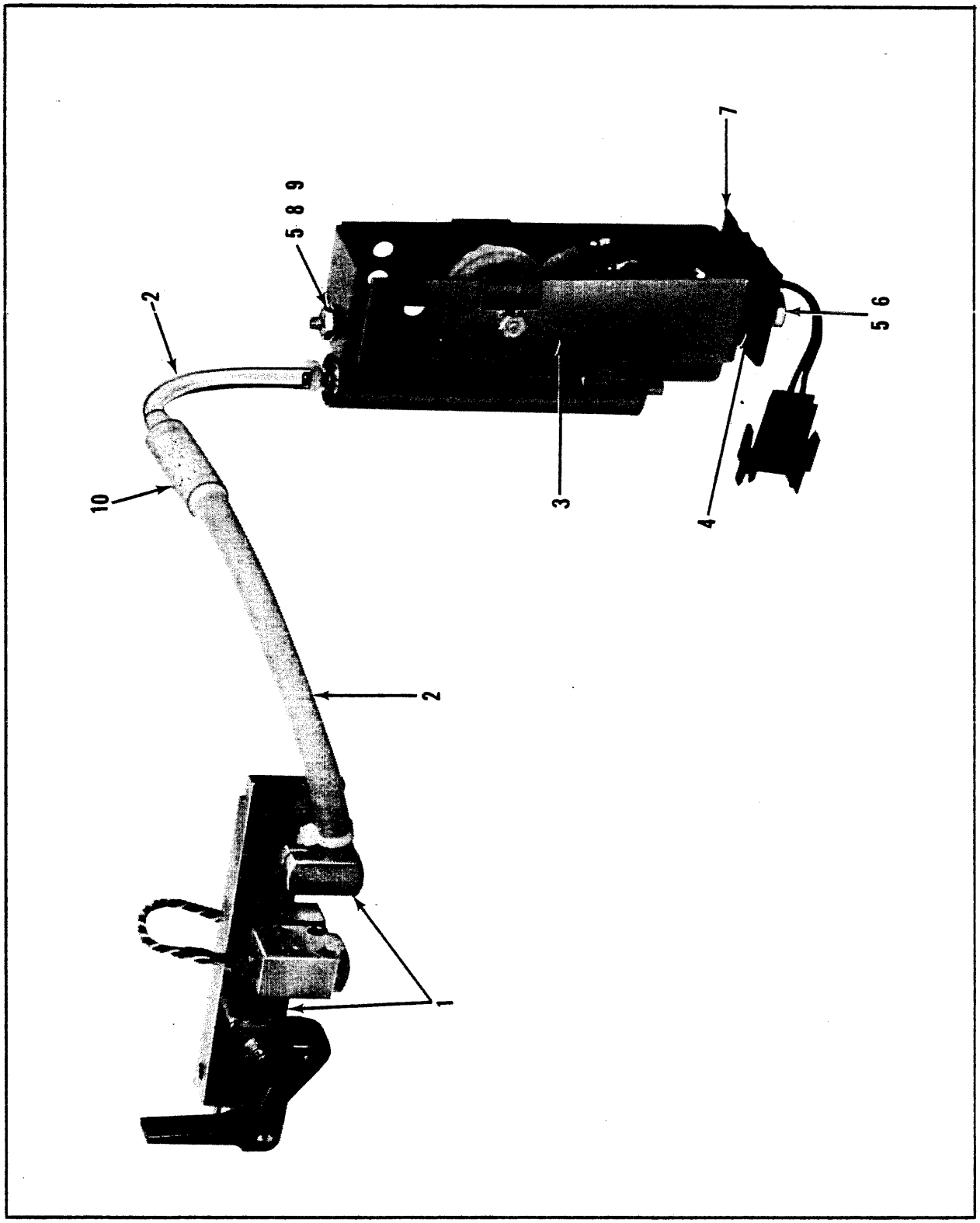


FIGURE 3-12 VACUUM TAPE-CLEANER COMPONENTS

3.24 PARTS LIST - VACUUM TAPE-CLEANER COMPONENTS

REF. NO.	SYKES NO.	DESCRIPTION
1	SEE SEC. 3	SLIDE PLATE ASSEMBLY WITH TAPE CLEANER/GUIDE
2	100A05020	LATEX TUBING
3	1001A0922	VACUUM PUMP ASSEMBLY (1 PER DECK REQUIRED)
4	100A02102	RUBBER GROMMET
5	500H10151	HEX NUT, 10-32
6	200H10102	PLAIN WASHER #10
7	1050A0832	MOUNTING BRACKET, ONE OR TWO PUMPS, DESK TOP UNIT
7	1050A0285	MOUNTING BRACKET, ONE OR TWO PUMPS, RACK MOUNTABLE UNIT
8	200H01101	LOCK WASHER #10, EXT. TOOTH
9	1050B0223	TOP SUPPORT BRACE FOR TWO PUMP ASSEMBLY, RACK MOUNTABLE UNIT
10	102M02001	FILTER ASSEMBLY, VACUUM LINE

4.0 SECTION 4 - MULTIPLE VOLTAGE POWER SUPPLY ASSEMBLY (MVPS)

4.1 General

The MVPS components are assembled on a base plate which is retained in the Series 3000 Unit by three screws. Figure 4-2 illustrates the assembly, its fuses, power-in terminal strip and power-out connector. Figure 4-1 shows connector P1, the mate for the MVPS power-out connector PS1J1, and the voltage values which can be checked at P1 (while connected).

Different jumper schemes at power-in terminal strip PS1TB1 allow the Series 3000 Unit to be operated on either 120 or 230 vac. (Refer to Sec. 4.5 for details.)

4.2 ELECTRICAL INPUTS

4.2.1 Input Power (PS1TB1, Terminal 1)

Power input (which must be in keeping with the Series 3000 Unit configuration) may be 120 ± 15 VAC or 230 ± 30 VAC, 50 or 60 ± 0.5 Hertz, single phase AC power, 400 watts maximum during normal operation. See Sec. 4.5.

4.2.2 AC Neutral (PS1TB1, Terminal 4)

AC neutral connection terminal.

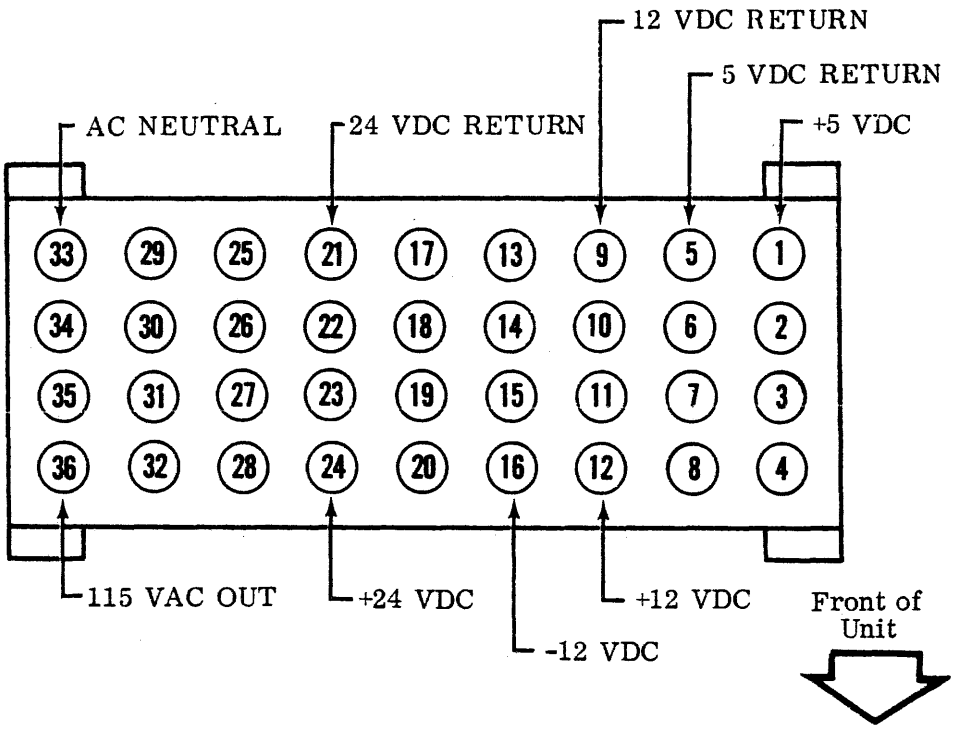


FIGURE 4-1 WIRING SIDE OF CONNECTOR P1 (PS1J1 MATE)

4.3 ELECTRICAL OUTPUTS

4.3.1 +5 VDC (PS1J1, Pin 1)

+5 vdc ± 1% at 0.3 to 6.0 amp, 25 mv p-p ripple, 50 mv p-p noise.

4.3.2 +5 VDC Return (PS1J1, Pin 5)

Return for 5 vdc power.

4.3.3 12 VDC Return (PS1J1, Pin 9)

Return for +12 vdc and -12 vdc power.

4.3.4 +12 VDC (PS1J1, Pin 12)

+12 vdc ± .5% at .04 to .4 amp, 10 mv p-p ripple, 10 mv p-p noise.

4.3.5 -12 VDC (PS1J1, Pin 16)

-12 vdc ± .5% at .04 to .650 amp, 10 mv p-p ripple, 10 mv p-p noise.

4.3.6 24 VDC Return (PS1J1, Pin 21)

Return for +24 vdc power.

4.3.7 +24 VDC (PS1J1, Pin 24)

+24 vdc ± 5% at 0.2 to 2.5 amp, 500 mv p-p ripple, 50 mv p-p noise.

4.3.8 AC Neutral (PS1J1, Pin 33)

The ac neutral connection pin.

4.3.9 115 VAC Out (PS1J1, Pin 36)

The 115 volts ac power out connection pin (maximum of 0.8 amperes at 115 vac supplied from tap on primary side of MVPS transformer).

4.4 Removal/Replacement

4.4.1 Power Supply in Desk Top Unit

1. Disconnect the Series 3000 Unit from the power source.

2. Remove the top cover from the unit (Sec. 2.1.1.1).
3. Remove the three hold-down screws from the front edge of the controller PC board and raise the PC board section to the vertical position (supported by detents).
4. Disconnect P1 from PS1J1 on the MVPS.
5. Disconnect red and gray wires from input side of PS1TB1.
6. Disconnect the MVPS ground strap from the chassis ground stud.

   CAUTION: Prevent the MVPS from sliding into and damaging other components when removing the retaining screws.

7. Remove the hex nuts from the two rearmost retaining screws for the MVPS.
8. From the underside of the unit, remove the three retaining screws for the MVPS.
9. Replace in reverse order.

4.4.2 Power Supply in Rack Mountable Unit

1. Disconnect the Series 3000 Unit from the power source.
2. Remove the top cover from the unit (Sec. 2.2.1.1).
3. Remove the front panel from the unit (Sec. 2.2.2.2).
4. Remove the three hold-down screws from the front edge of the controller PC board and raise the logic board assembly to the vertical position (supported by detents).
5. Disconnect P1 from PS1J1 on the MVPS.
6. Disconnect red and gray wires from input side of PS1TB1.
7. Remove the fan filter support and filter from the unit.
8. Remove the 4 screws which secure the bottom plate of the mounting frame to the four weld posts on the bottom cover.
9. Remove the mounting frame and rear panel assembly from the bottom cover.
10. Remove the hex nuts from the two rearmost retaining screws for the MVPS.

    CAUTION: Prevent the MVPS from sliding into and damaging other components when removing the retaining screws.

11. Remove the 3 retaining screws for the power supply (and lock washers) from the underside of the mounting frame bottom plate.
12. Replace in reverse order.

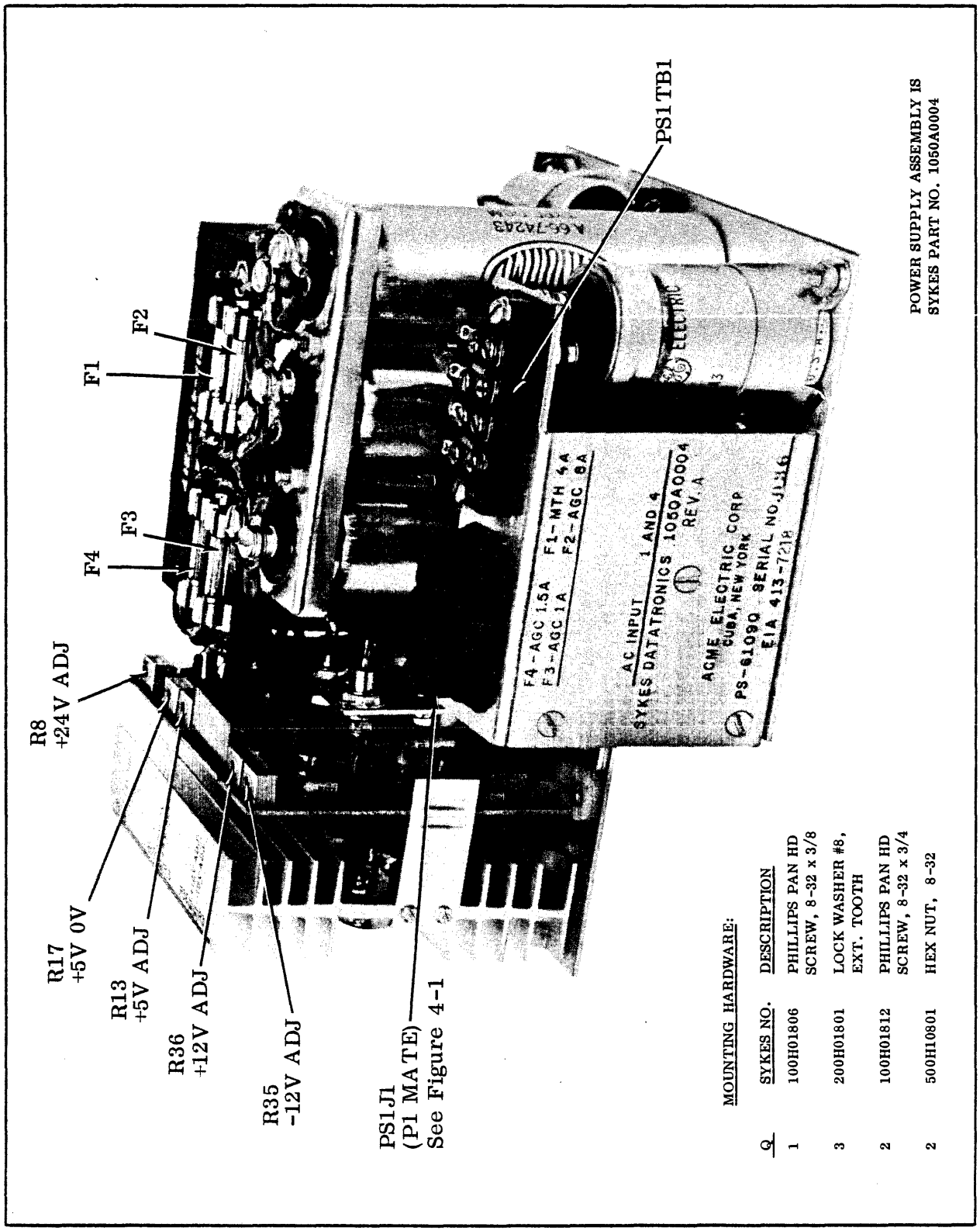
4.5 MVPS POWER INPUT CONNECTIONS - 120 VAC OR 230 VAC INPUT

4.5.1 Arrangement for 120 VAC Operation

Prior to shipment, all Series 3000 Units are wired for operation on 120 vac power source. The power-in terminal strip on the MVPS has two jumper straps, one connecting terminals 1 and 2, and one connecting terminals 3 and 4. The red and grey power input wires are connected to terminals 1 and 4 respectively.

4.5.2 Arrangment for 230 VAC Operation

For operation of the Series 3000 Unit on a 230 vac power source, one jumper strap is used. The strap is connected between terminals 2 and 3 on the power-in terminal strip and the red and grey power input wires are connected to terminals 1 and 4 respectively. (A suitable 3-wire grounding type plug cap for the power cable is required.)



POWER SUPPLY ASSEMBLY IS
SYKES PART NO. 1050A0004

MOUNTING HARDWARE:

Q	SYKES NO.	DESCRIPTION
1	100H01806	PHILLIPS PAN HD SCREW, 8-32 x 3/8
3	200H01801	LOCK WASHER #8, EXT. TOOTH
2	100H01812	PHILLIPS PAN HD SCREW, 8-32 x 3/4
2	500H10801	HEX NUT, 8-32

FIGURE 4-2 MULTIPLE VOLTAGE POWER SUPPLY

5.0 SECTION 5 - CONTROLLER BOARD ASSEMBLY

5.1 DESCRIPTION OF CONTROLLER BOARD ASSEMBLY

Figure 5-1 is a block diagram of the controller board assembly Figure 5-12 illustrates the component layout of the board. The schematic of the controller board is found in Section 13

The controller logic is on a board accessible under the top cover of the Series 3000 Unit. The controller logic is designed to interface the one or two cassette transports in the Series 3000 Cassette Tape Unit to a variety of devices such as data communication terminals and small or medium size computers.

The controller uses a record/file tape format with variable length records selected automatically by data availability. A file consists of one or more variable length records. A search feature offers the capability to backspace or skip records or files.

Although the single controller assembly is time-shared between the two transports in the Model 3220, several simultaneous operations are possible. Both transports can write the same data simultaneously, or either transport can be rewound while the other transport is performing a normal read or write operation. If one transport is under interface control, the front panel Rewind and Forward controls of the other transport are fully operational.

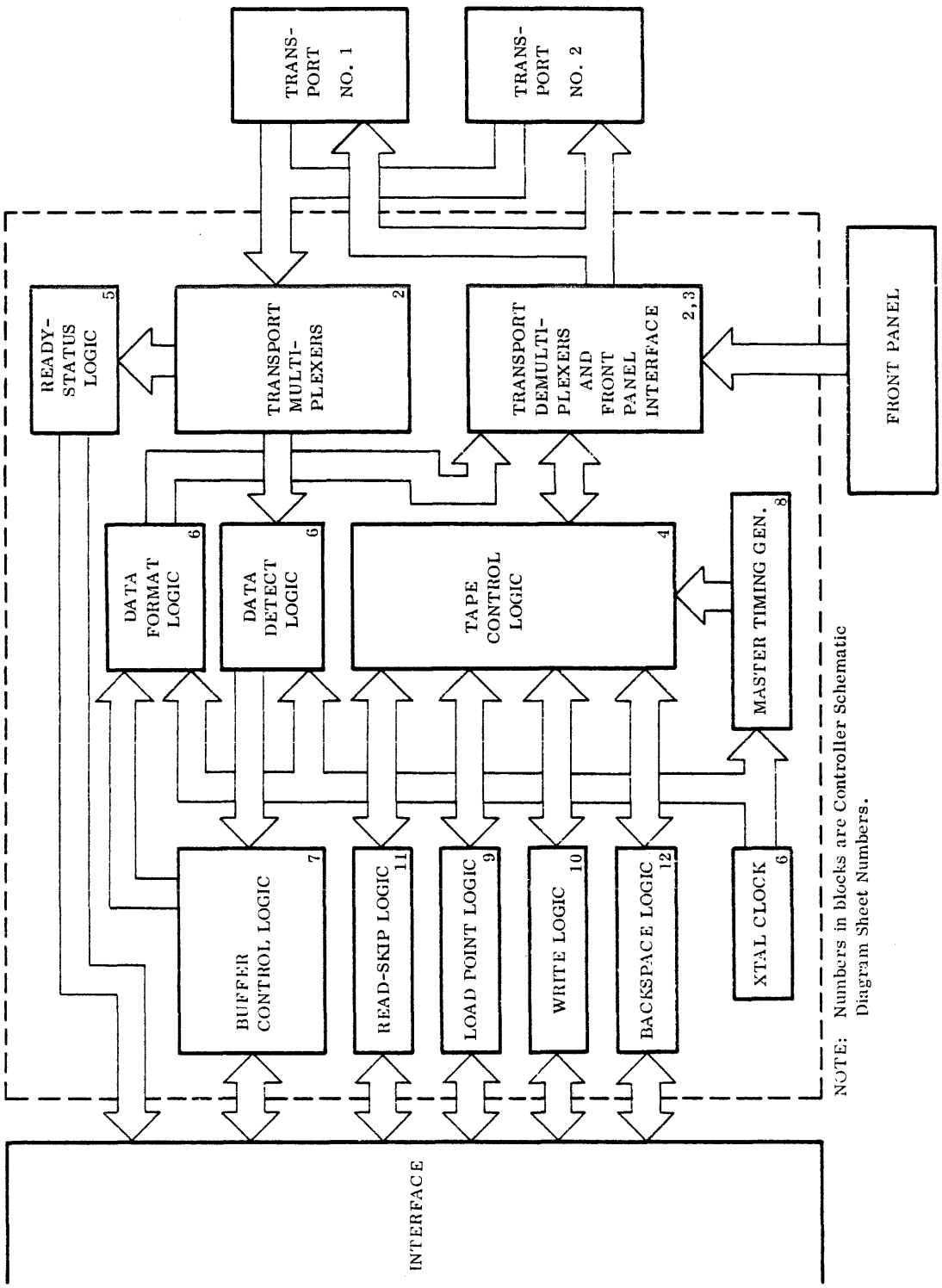


FIGURE 5-1 BLOCK DIAGRAM, CONTROLLER BOARD ASSEMBLY

The Series 3000 controller logic performs many functions in the system. The main functions are:

1. Control tape movement on one or two TT120 tape transports.
2. Interpret status signals from the transports.
3. Properly time sequences such as energize head, capstan, etc.
4. React to front panel controls and display status.
5. Convert parallel data to serial data and phase encode the serial data (write).
6. Decode the phase encoded serial data and convert this serial data to parallel data (read).
7. Perform bookkeeping for transferring records and files of data.
8. Perform sequences for going to load point, backspacing, etc.
9. Control transfer of data between interface and controller.

Figure 5-1 is a functional block diagram of the controller assembly.

5.1.1 Access to Controller Board

1. Remove the top cover from the unit (Section 2.1.2.2 or 2.2.2.2).
2. The exposed board is the controller board.

5.1.2 Removal/Replacement

1. Remove the three screws holding the top of the board to the tape deck supporting frame.
2. Remove the three screws securing the bottom of the board to the pivoting support bar.
3. Raise the board to the vertical position (supported by latches) and release the supporting pins (depress locking tabs) which tie the interface board to the controller board.
4. Carefully support the controller board while releasing the detents and returning the boards to the horizontal position; then disconnect the cable connectors from the controller board, freeing it for removal.
5. Replace in reverse order.

5.2 CONTROLLER OPERATIONS

Most of the basic operations performed by the Series 3000 controller board are sequential in nature; therefore flow charts (Figures 5-2

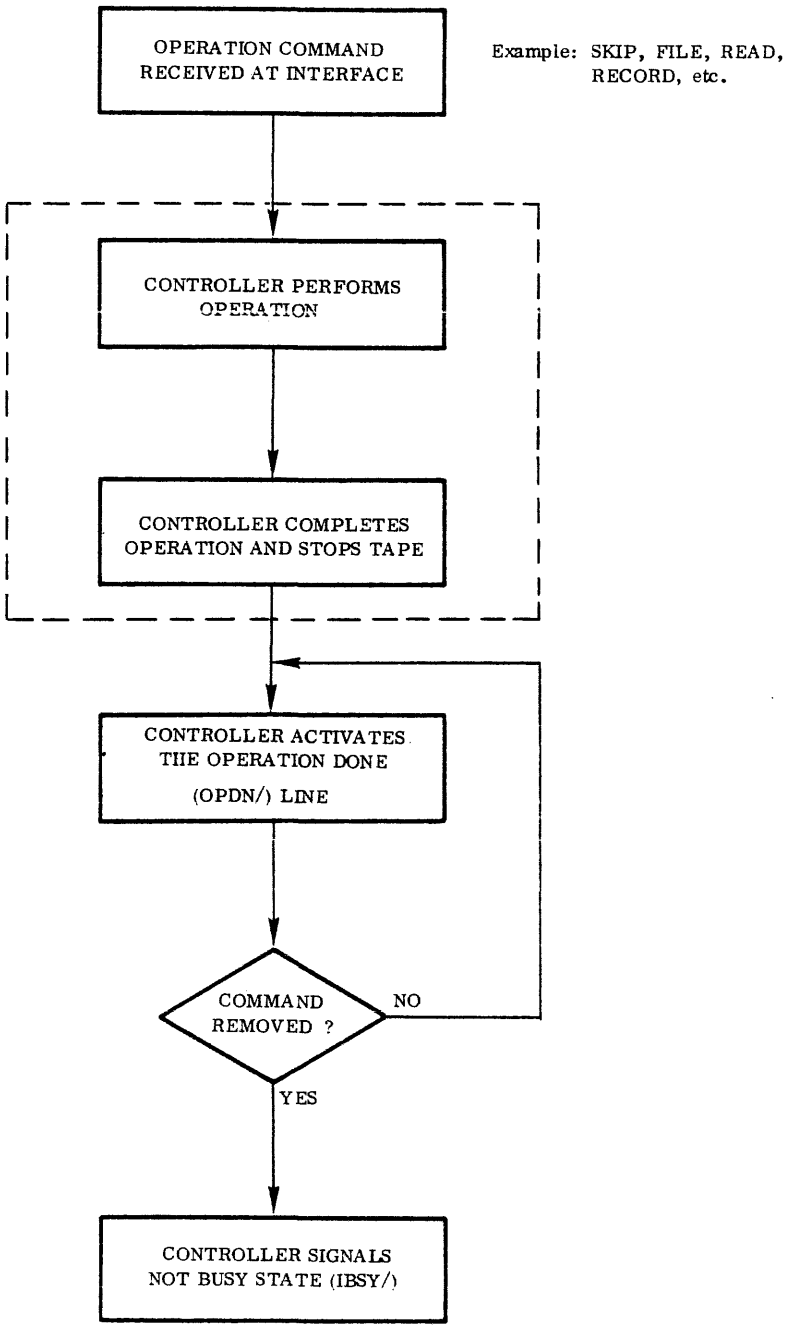


FIGURE 5-2 FLOW CHART, GENERAL OPERATION SEQUENCE

through 5-5) have been provided to illustrate the general operation sequence and also some of the more complex operations.

5.2.1 General Operation Sequence

Refer to Figure 5-2. All operations performed follow the same general sequence. Once the command is received, the designated function is executed. At completion of execution, the controller signals completion via the "operation done" (OPDN/) line. OPDN/ is asserted until the original command is removed. Once removed, the OPDN/ line returns to the false state. Note that the command for the desired function must be asserted continually during the execution and only removed after OPDN/ is detected. This architecture allows for easy interfacing because simple latches may be used to store commands at the interface. The latch can be set by the external stimuli requesting the function and reset by the OPDN/ line from the controller board. Whenever the interface is operating the controller, the IBSY/ line is true, which indicates to the interface that an operation is in progress and not to start another.

Further discussion will concern only the operations shown within the dotted lines in Figure 5-2, and the user must be conscious of the operation's place in the general operation sequence. Note that the first three function sequences discussed below are transport operation sequences which are part of the actual operation sequences which follow.

5.2.2 Engage Slide Plate Sequence

Any command which requires slow speed operation where tape is moved in contact with the tape head, will first go through this sequence. If the slide plate is not already down, the slide plate solenoid (large solenoid) is activated to lower the slide plate into position. Since the mechanical movement of the slide plate takes slightly less than 100 msec, a 102 msec delay is used to insure proper slide plate positioning before any further tape movement is attempted.

5.2.3 High Speed Stop Sequence

When tape is moving at high speed (fast forward or rewind), its

speed varies from 60 ips to 140 ips with an average speed of 120 ips. Before any other operation can occur subsequent to high speed, this sequence is used to determine that tape has halted. The TT 120 signals tape in motion until motion ceases.

5.2.4 Slow Speed Stop Sequence

Stopping tape after a slow speed operation (i.e., read, write, etc.), must be controlled in order to insure proper positioning within the inter-record gap. A specific delay of 30 msec (5 ips), or 43 msec (12 ips), is used to insure that tape is halted after any slow speed operation.

5.2.5 Generate Load Point Sequence

The load point is defined as a file mark written at the end of the first 20 inches of magnetic tape. All cassettes used in the Series 3000 equipment must have a load point to reference the beginning of the first file on a cassette. Before generating a load point, the cassette should be rewound to clear leader. This command will then erase the first 20 inches of tape after the splice and write one or more file characters. At completion of a generate load point sequence, tape is in a position to write the first record on a cassette.

5.2.6 Go To Load Point Sequence

Positioning at the load point is accomplished by use of the load point operation. Starting from any place on magnetic tape or clear leader (not trailer), the load point command will perform a high speed rewind, if necessary, and read forward until the file character is detected. The transport then stops, which places it in a position to read or write the first record on the cassette.

5.2.7 Write Data Record Sequence

Before the Write mode can be entered without faulting, the tape head slide plate must be engaged. This assures that the tape is

properly positioned in a gap between records or after a File mark. The slide plate is engaged during READ, LOAD POINT and SKIP operations and after their completion tape is properly positioned for writing. Also, the track protect plug must not be removed from the cassette in order to write data. Once a write command is received, no action is taken until the first data character is presented at the interface. The tape is then brought up to speed and the first character is written. Thereafter, characters are continuously written as long as the interface provides them. After each character is taken by the controller, the interface must prepare and present another character in less than 2000 usec (5 ips), or 833 usec (12 ips).

If the character is not presented within these timing constraints, the controller automatically terminates the record and stops the tape. The interface normally uses this facility of the controller to easily break files into separate data records on tape. Stopping data transfer after "X" characters causes an "X" character data record to be written.

5.2.8 Read and Skip Sequences

Refer to Figure 5-3. Read and Skip modes of operation are essentially identical, except that data is not transferred in the Skip mode. Read mode can be entered with the tape head slide plate up or down, but proper positioning of the tape with slide plate down is required to insure start of transfer at the beginning of a record. When data is detected, the controller reads and transfers as many characters as are present in the record. When the data gap after the record is detected, a decision of what to do is based upon what type of gap (record, file or end), and what the command is.

Through use of a pause line, the interface may cause the controller to stop indefinitely between records when reading a file or reading to end. When the pause line is released, the next record is read.

5.2.9 Backspace Record or File Sequence

Refer to Figure 5-4. The backspace sequences are completely automatic and require no outside control othen than BKSP or BKSP-FILE (BKSP-END will cause a fault condition). Once a backspace record sequence is completed, the tape is positioned in

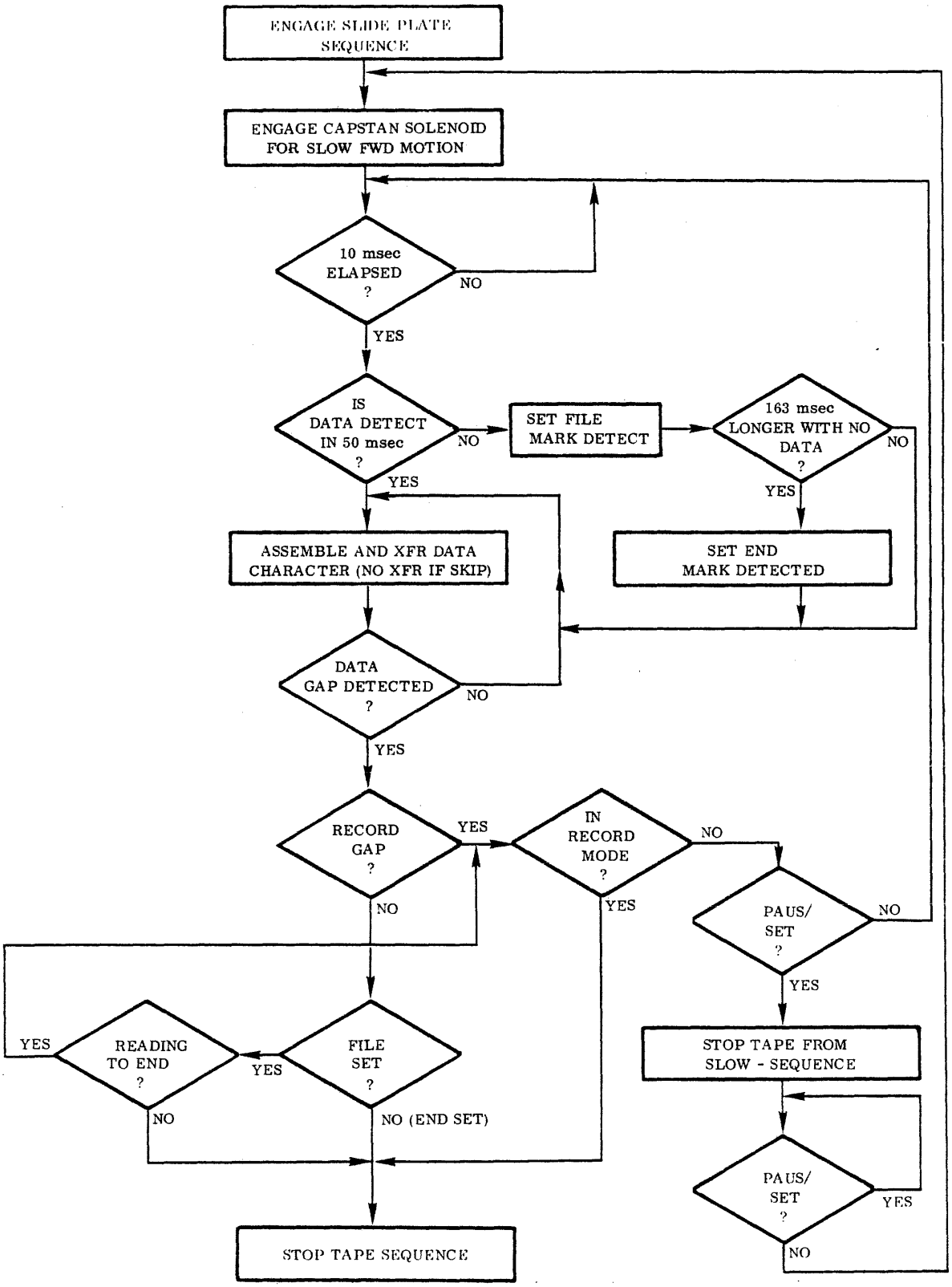


FIGURE 5-3 FLOW CHART, READ AND SKIP SEQUENCE

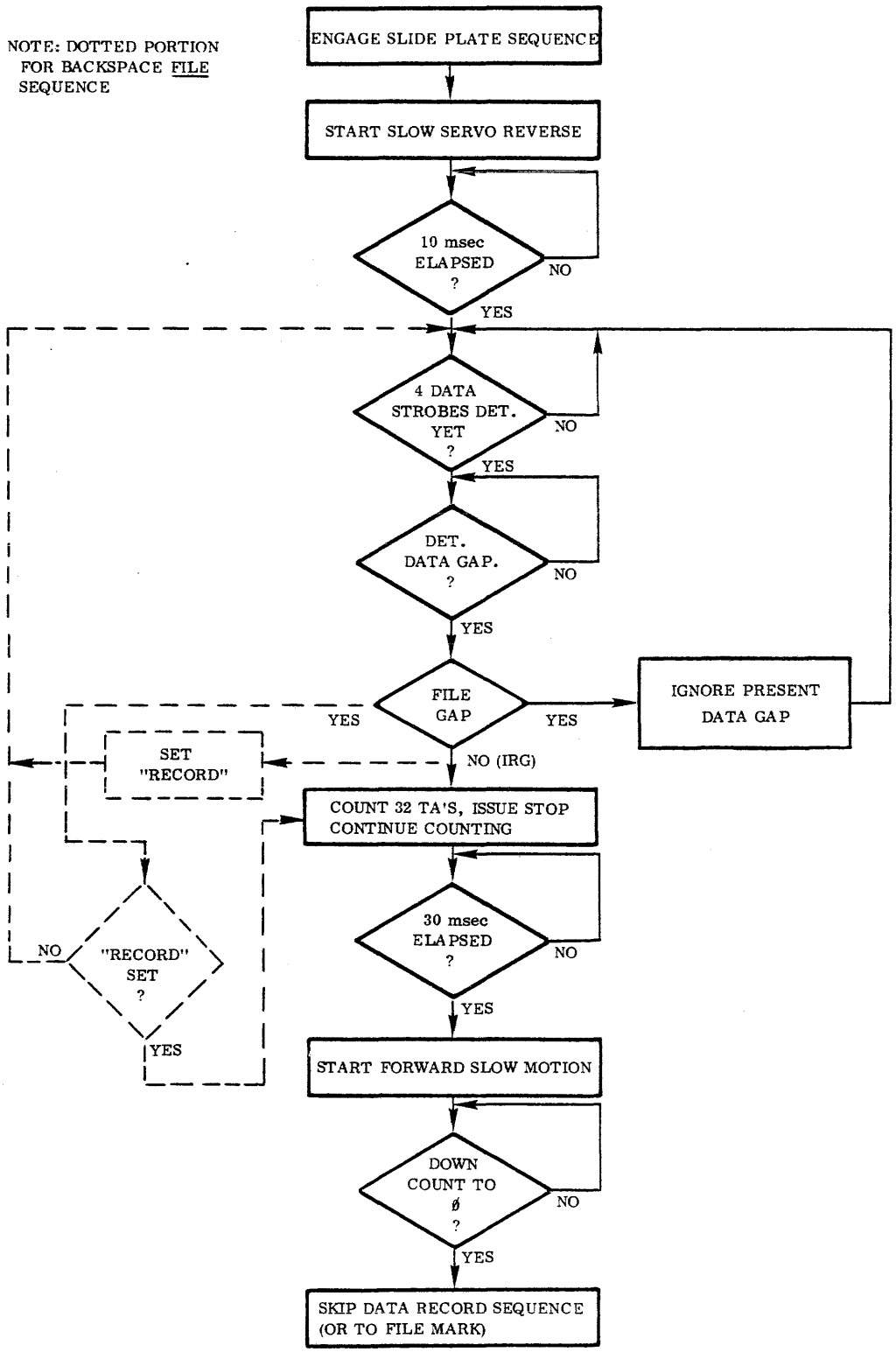


FIGURE 5-4 FLOW CHART, BACKSPACE RECORD OR FILE SEQUENCE

the IRG preceding the record which was backspaced. After a backspace file sequence is executed, the tape is positioned in the IRG in front of the first record of the file.

5.2.10 Write File or End Mark Sequence

Refer to Figure 5-5. Receipt of either of these commands causes the controller to automatically erase the correct amount of tape and then write one or more data characters. The number of characters written at the end of the erased tape is determined by the interface. After writing a File mark, tape is properly positioned to write the data into the next file.

5.3 CONTROLLER INTERFACE SIGNAL DESCRIPTIONS

5.3.1 Controller Inputs

There are 27 signal lines which carry inputs to the controller board from the interface. All inputs are ground true and so designated by a / suffix on the signal mnemonic. If a particular interface design does not use an input, it may be left open circuited to disable it (all inputs are passively "pulled up" to ±5v in the controller). All inputs are TTL/ DTL compatible. The driving signal must sink 1.6 ma minimum from the line without raising the voltage above 0.4 volts in order to activate the line. The off state of the line is defined as a voltage greater than 2.6 volts but less than 5.5 volts.

5.3.1.1 External Clear (XCLR/) - Pin J2-5

XCLR/ is a line from the interface which causes immediate termination of any mode and unconditionally resets storage elements in the controller. The XCLR/ will <u>not</u> raise the slide plate if engaged. The slide plate can only be raised by touching the FORWARD key on the front panel or executing a high-speed operation. Whenever XCLR/ is active, the OPDN/ and OCLR/ output lines from the controller are also active.

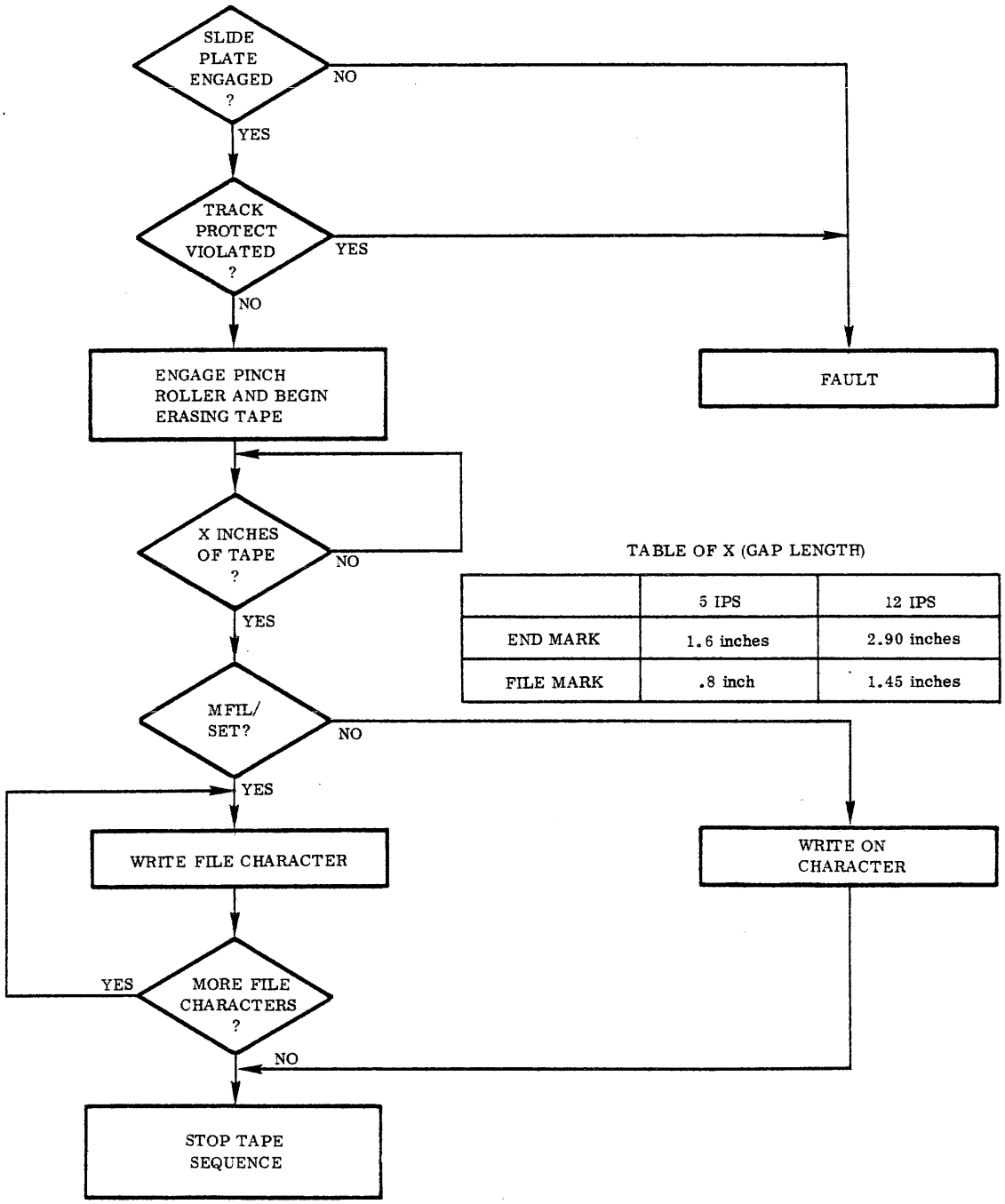


TABLE OF X (GAP LENGTH)

	5 IPS	12 IPS
END MARK	1.6 inches	2.90 inches
FILE MARK	.8 inch	1.45 inches

FIGURE 5-5 FLOW CHART, WRITE FILE OR END MARK SEQUENCE

5.3.1.2 Tape Transport #1 Select (TAP1/) - Pin J2-16

TAP1/ when true, selects tape deck #1 for normal tape functions. Tape deck #1 is the left transport in a dual transport system (3220).

5.3.1.3 Tape Transport #2 Select (TAP2/) - Pin J2-18

TAP2/, when true, selects tape deck #2 for normal tape functions. In the event that both tape deck #1 and #2 are selected simultaneously, only tape #1 will be selected by the controller. The only exception to this is in the Write Data mode when simultaneous selection will cause the data to be written on both cassettes.

5.3.1.4 High Speed Forward (HSFD/) - Pin J2-15

HSFD/, when true, causes the selected transport to move tape forward at high speed. If the slide plate is engaged, it will be disengaged as tape movement begins.

5.3.1.5 Rewind Cassette #1 (REW1/) - Pin J2-14

If magnetic tape is sensed, REW1/ causes the slide plate to be raised (if engaged), and the tape is moved at high speed to the clear leader. Tape deck #1 need not be selected.

5.3.1.6 Rewind Cassette #2 (REW2/) - Pin J2-12

REW2/ is the same as REW1/ except for tape deck #2. The rewind function may occur simultaneously with other rewinds or with normal tape functions occuring on the other transport.

5.3.1.7 Track A Select (TKST/) - Pin J2-8

TKST/, when true, will cause track A to be selected for all read and write operations. Thus, when no connection is made to this line, the data will be written and read on track B.

5.3.1.8 File Mode Select (FILE/) - Pin J1-32

FILE/, when true, will cause the controller to operate in a File mode. In File mode:

1. A File mark will be written when WRIT/ is true.
2. A file will be read when READ/ is true.
3. A File mark will be skipped to when SKIP/ is true.
4. A File mark will be backspaced to when BKSP/ is true.

5.3.1.9 End Mode Select (ENDM/) - Pin J1-36

ENDM/, when true, will cause the controller to operate in an End mode. In End mode:

1. An End mark will be written when WRIT/ is true.
2. All data up to detection of an End mark will be read when READ/ is true.
3. All data will be skipped, up to the detection of an End mark, when SKIP/ is true.
4. A fault condition will occur if BKSP/ is brought true.

5.3.1.10 Generate Load Point (GLDP/) - Pin J1-28

GLDP/, when true, will cause the generate load point sequence to be executed. The number of characters written at the load point is dependent upon the state of MFIL/ and data availability at the interface.

5.3.1.11 Go To Load Point (LDPT/) - Pin J2-29

LDPT/, when true, will cause the go to load point sequence to be executed.

5.3.1.12 Write Mode Select (WRIT/) - Pin J1-30

WRIT/, when true, can cause one of three possible functions to occur:

1. If FILE/ is true, a File mark is written.
2. If ENDM/ is true, an End of Data mark is written.
3. If neither FILE/ or ENDM/ is true, a Write Data mode is entered. In this case the controller will stand-by for data availability, write the data presented and terminate the Write mode when no more data is presented.

5.3.1.13 Write Data Bits (WDB1/ - WDB8/)

The output data to be written on magnetic tape is presented on these eight lines for which controller board pin numbers are listed in the table below. The eight bits together comprise the write data character where WDB1/ is the LSB and WDB8/ is the MSB when written on tape. In the Write Data mode, these carry the data characters. In the Write File or End Mark modes they carry the character(s) to be written in the mark.

PIN DESIGNATIONS - WRITE DATA BITS LINES

SIGNAL	PIN NO.
WDB1/ (LSB)	J1-17
WDB2/	J1-18
WDB3/	J1-16
WDB4/	J1-14
WDB5/	J1-13
WDB6/	J1-11
WDB7/	J1-9
WDB8/ (MSB)	J1-7

5.3.1.14 Write Data Ready (WDRY/) - Pin J1-25

When true, WDRY/ signifies that a character to be written on tape is present on the WRITE DATA BIT lines. Failure to activate WDRY/ within the timing constraints mentioned in Sec. 5.2.7 will cause the Write mode to be terminated. The WDRY/ line may be true no earlier than 400 nanoseconds prior to data validity on the WDB lines. Data on the WDB lines is sampled no sooner than 500 nanoseconds after high to ground transition of WDRY/.

5.3.1.15 Multiple File Characters (MFIL/) - Pin J1-34

MFIL/, when true, will cause the controller to transfer the characters to be written in a Load Point, File mark, or End mark in the same manner data (using WDRY/), is transferred. Thus, multiple file characters can be written and will consist of the data present on the WDB lines at the time of writing.

5.3.1.16 Read Mode (READ/) - Pin J1-31

When READ/ is true, the selected tape is commanded to read a record if neither FILE/ or ENDM/ is true. If FILE/ is true, all data up to detection of a File mark will be read and transferred. If ENDM/ is true, all data up to the End of Data mark will be read.

5.3.1.17 Read Data Accepted (RDAC/) - Pin J1-27

RDAC/ is the interface response to the read data ready output from the controller. RDAC/ signifies to the controller that the data has been accepted and that RDRY/ may be removed.

5.3.1.18 Pause (PAUS/) - Pin J2-28

PAUS/ is used to stop tape at the end of a record during read file or read to end sequences. PAUS/ can be used to give external equipment time to process data. It can go true any time during the reading of a record, but will have no effect until the end of the record is reached. If PAUS/ is not asserted, tape motion will continue through the IRG and the next record will be read without stopping tape.

5.3.1.19 Skip Mode (SKIP/) - Pin J1-29

When true, SKIP/ causes the selected tape to skip a record, file, or to the End mark. No data is transferred during the Skip mode, although it does appear on the data lines.

5.3.1.20 Backspace Mode (BKSP/) - Pin J1-33

When true, the BKSP/ line causes the selected tape to backspace a record or a file. The selection of BKSP/ and ENDM/ will cause a fault condition.

5.3.2 Controller Outputs

There are 34 output signals available from the controller for use in the interface. All outputs are ground true and designated so by a / suffix on the signal mnemonic. All outputs are TTL/DTL compatible. Each output will sink up to 12 ma without its low level rising above .4 volts and the minimum output high voltage will be 2.6 volts.

The outputs, their pin numbers and their descriptions are as follows:

5.3.2.1 Output Clear (OCLR/) - Pin J2-3

OCLR/ goes true when the reset key on the front panel is depressed, when the XCLR/ input is true, and for about 20 ms at power-on time.

5.3.2.2 Operation Done (OPDN/) - Pin J2-7

OPDN/ goes true to signal the interface that the command it has given it (SKIP/, BKSP/, READ/, WRIT/, LDPT/, or GLPT/) is completed and the tape is stopped. The interface should then remove the command until the OPDN/ signal goes high. OPDN/ also goes true whenever OCLR/ goes true.

5.3.2.3 Interface Busy (IBSY/) - Pin J2-13

A true state on IBSY/ indicates that the interface is commanding the controller to do some operation (BKSP/, READ/, SKIP/, GLPT/, LDPT/, HSFD/ or WRIT/), and that no other operation is permitted. It may be used by the interface to allow further operations.

Logically: IBSY/ = READ/ + SKIP/ + GLPT/ + LDPT/ + WRIT/ + BKSP/ + HSFD/

5.3.2.4 Tape Transport #1 Ready (TP1R/) - Pin J2-21

When true, TP1R/ indicates that tape 1 is ready for a normal operation or a high speed forward or rewind operation. TP1R/ is true provided:

1. A cassette is loaded and
2. The interface is not requesting tape usage and
3. The transport is not stalled and
4. The transport is stopped.

5.3.2.5 Tape Unit #2 Ready (TP2R/) - Pin J2-23

Same as TP1R/, except from tape deck #2.

5.3.2.6 Fault (FALT/) - Pin J2-24

FALT/ goes true to indicate either an operator error or tape error other than character error. The conditions for assertion of the FALT/ line are any of the following:

1. Command issued when cassette is not properly in holder.
2. Write command given when slide plate not engaged (head up).
3. Write command given on protected track.
4. A stall condition exists on the selected tape.
5. A BKSP/ command given with ENDM/ or when on clear leader.
6. A far end of tape condition exists. i.e., tape has moved forward into clear trailer.

5.3.2.7 Clock (CLOK/) - Pin J2-33

CLOK/ is a buffered output of the 400 kHz (5 ips), or 960 kHz (12 ips), crystal oscillator.

5.3.2.8 End of Tape on Transport #1 (EOT1/) - Pin J2-20

EOT1/ is true when transparent tape leader is positioned over the

EOT sensor of tape 1. A cassette must be loaded for EOT1/ to be true.

5.3.2.9 End of Tape on Transport #2 (EOT2/) - Pin J2-22

Same as EOT1/ except from tape deck #2.

5.3.2.10 Stall on Tape Transport #1 (STL1/) - Pin J2-19

STL1/ goes true when transport #1 has been commanded to move tape and no TAMS/ have been detected for 160 msec. STL1/ remains true until cleared by opening the cassette receiver.

5.3.2.11 Stall on Tape Transport #2 (STL2/) - Pin J2-17

Same as STL1/ except from tape deck #2.

5.3.2.12 Cassette #1 Ready (CSR1/) - Pin J2-9

CSR1/ goes true to indicate that a cassette is properly loaded in transport #1.

5.3.2.13 Cassette #2 Ready (CSR2/) - Pin J2-11

Same as CSR1/ except from transport #2.

5.3.2.14 Deck #2 Present (DK2P/) - Pin J2-10

DK2P/ is true to indicate to the interface that a second transport is in the system (3220).

5.3.2.15 Track Protect Violated (TKPV/) - Pin J2-26

TKPV/ goes true whenever an attempt is made to write on a protected track and stays true until the command is removed.

5.3.2.16 Tape Address Monitor Signal (TAMS/) - Pin J2-6

The TAMS/ line goes true 320 times per revolution of the left reel of the tape cassette. This signal is used as an access signal during high speed search and to monitor tape movement.

5.3.2.17 Rewind of Tape 1 Done (RW1D/) - Pin J2-2

RW1D/ goes true to indicate that the rewind operation on deck #1 commanded by the REW1/ is completed. It goes false when REW1/ is removed.

5.3.2.18 Rewind of Tape 2 Done (RW2D/) - Pin J2-1

Same as RW1D/ except from deck #2.

5.3.2.19 Write Data Accepted (WDAC/) - Pin J1-19

WDAC/ goes true to indicate that the write data has been accepted from the interface. WDAC/ goes true when WDRY/ is true and the controller has strobed in the character on the WDB lines. The interface should then remove WDRY/ until the next character is set up on the WDB lines.

5.3.2.20 Read Data Bits (RDB1/ - RDB8/)

The input data is presented on these eight lines, for which controller board pin numbers are listed below:

PIN DESIGNATIONS, READ DATA BITS LINES

SIGNAL	PIN NO.
RDB1/	J1-15
RDB2/	J1-26
RDB3/	J1-24
RDB4/	J1-22
RDB5/	J1-20
RDB6/	J1-12
RDB7/	J1-3
RDB8/	J1-5

5.3.2.21 Read Data Ready (RDRY/) - Pin J1-21

RDRY/ goes true 500 nanoseconds after the RDB lines are valid. This line is true only during Read Record, Read File and Read to End modes. Once asserted, RDRY/ is reset by the interface signaling it has taken the data character by asserting the RDAC/ line.

5.3.2.22 Character Error Detected (CERD/) - Pin J1-23

CERD/ goes true to indicate that the character presently on the RDB lines has been determined in error by the controller error detection circuits. CERD/ is reset to the false state by a true condition on the RDAC/ line.

5.3.2.23 End of Record Detected (EORD/) - Pin J1-35

EORD/ strobes true for approximately 1/2 clock cycle as soon as the end of a record is detected (as the IRG is entered). It is used to signal the interface that the entire record has been transferred. If PAUS/ is set at this point, the tape will stop; otherwise, it will continue on to the next record without stopping.

5.3.2.24 End of File Character (EOFC/) - Pin J2-25

EOFC/ strobes true for approximately 1/2 clock cycle to strobe the load point and File mark characters to the interface. During this strobe, the file characters are valid on the RDB lines.

5.3.2.25 *Serial Data (SERD/) - Pin J2-4

SERD/ is the serial phase encoded data directly from the read and write board of a transport.

*NOTE: SERD/, CHCK/ and SECK/ are intended for use in an interface which makes use of the optional read-after-write configuration of the TT120 transport. It is not necessary to use them in normal read and write applications.

5.3.2.26 *Character Clock (CHCK/) - Pin J2-27

CHCK/ strobe is used to frame serial data and occurs once each character.

5.3.2.27 *Serial Clock (SECK/) - Pin J2-31

SECK/ goes true once each bit time and signifies to the interface the presence of a valid bit on the SERD/ line. The SECK/ line goes true 9 times for each character (8 data bits and parity).

*NOTE: SERD/, CHCK/ and SECK/ are intended for use in an interface which makes use of the optional read-after-write configuration of the TT120 transport. It is not necessary to use them in normal read and write applications.

5.4 INTERFACE SIGNAL TIMING

5.4.1 Command Execution Timing

Figure 5-6 is the timing diagram which corresponds to the general operation sequence shown in Figure 5-2. This is the complete diagram for operations which require no data transfer such as skip, backspace, and go to load point.

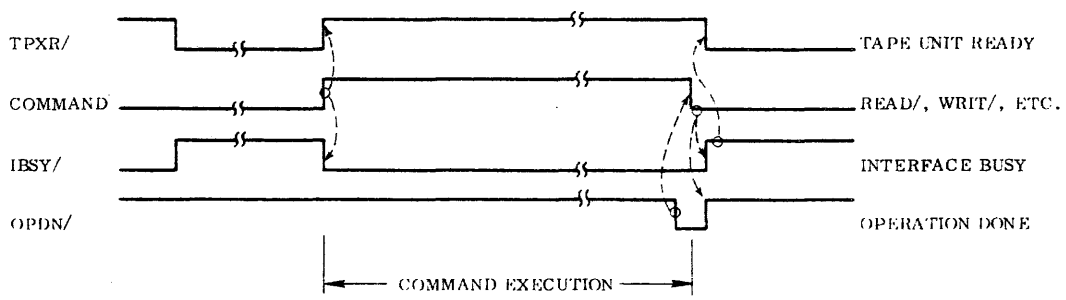


FIGURE 5-6 COMMAND EXECUTION SIGNAL TIMING

5.4.2 Rewind Timing

Refer to Figure 5-7. Rewind timing is similar to command timing, except that IBSY/ is not activated by the interface and rewind done signals (RWXD/) are used to signal completion instead of OPDN/. At completion, tape is positioned on clear leader.

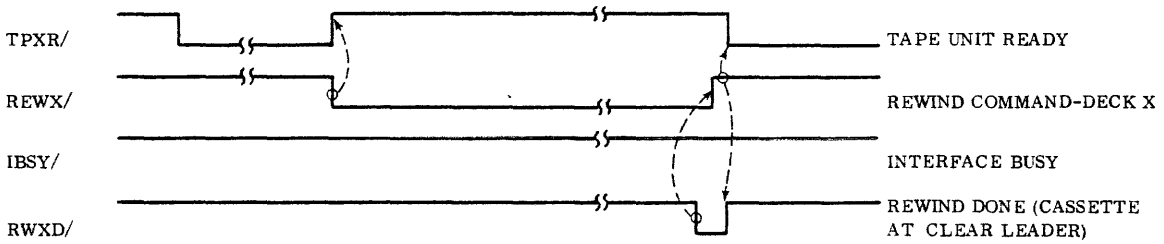
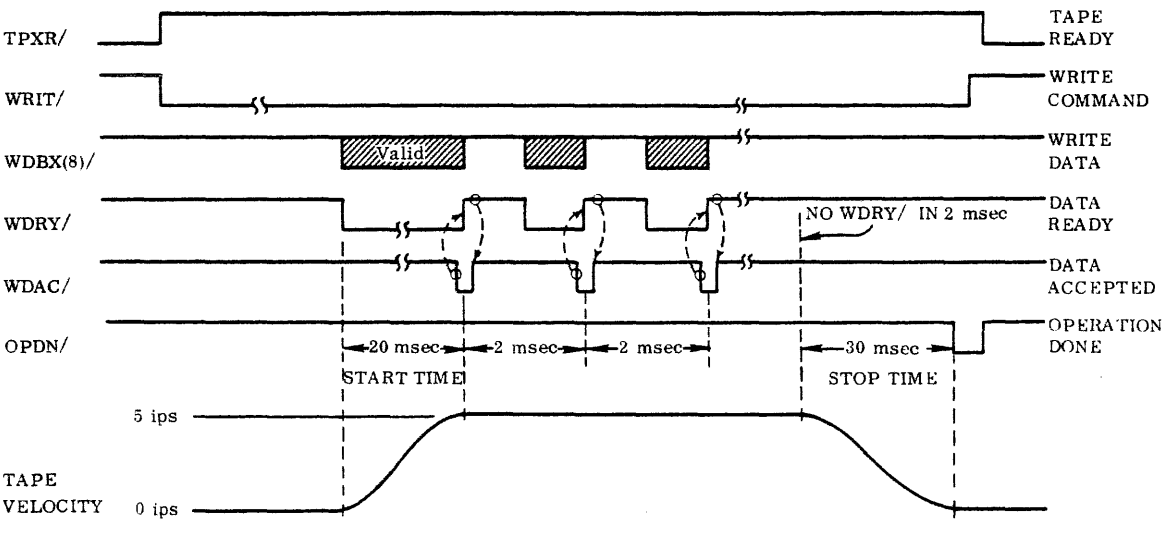


FIGURE 5-7 REWIND TIMING

5.4.3 Write Data Timing

Refer to Figure 5-8; also Sec. 5.2.7. Note that when WRIT/ command is given, nothing happens until the first data character is presented by the interface, lowering WDRY/. Thereafter, WDRY/ must present the next character in less than one character time (2 msec for 5 ips). If WDRY/ is not true by one character time, a stop sequence is initiated and the write mode terminated.

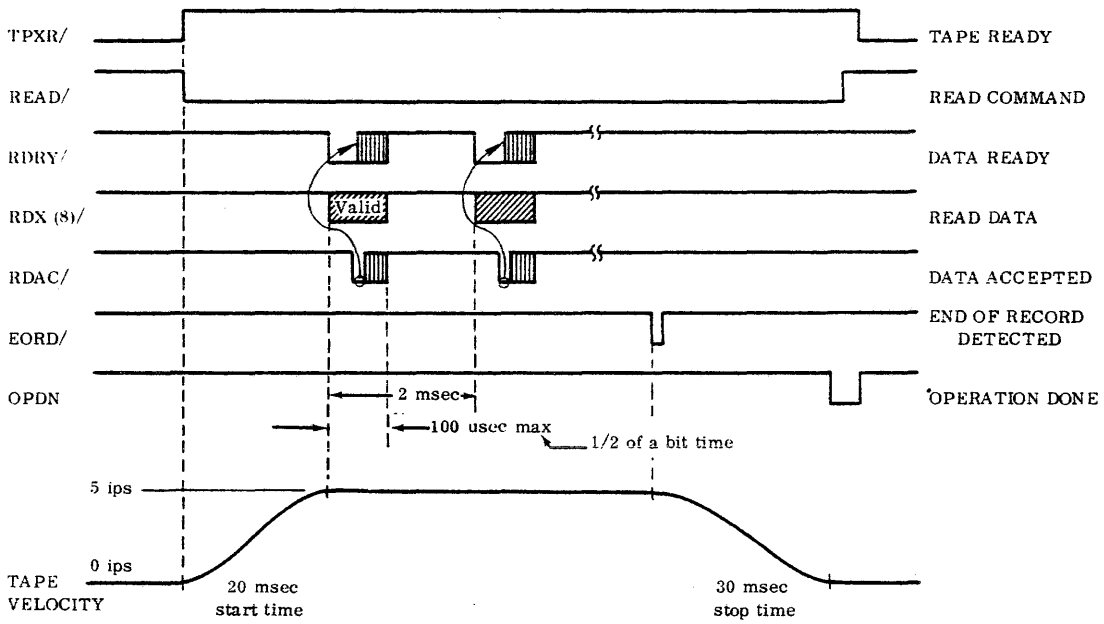


NOTE: All times and speeds are for 5 ips.

FIGURE 5-8 WRITE DATA TIMING

5.4.4 Read Data Timing

Refer to Figure 5-9, and also refer to Sec. 5.2.8 for read data sequence information. The first data character is presented to the interface as soon as the tape is up to speed and the first character of the record has been assembled. Note that the data is valid on the RDBX/ lines for only 1/2 of a bit time. The interface must take the character then or it is lost. Data is valid for the full time that RDRY/ is true. When no data transitions are detected for 3 bit times, the controller signals that no more data will be sent from that record via the EORD/ signal.



NOTE: All times and speeds are for 5 ips.

FIGURE 5-9 READ DATA TIMING

5.4.5 Write File Mark Timing

Refer to Figure 5-10; also Sec. 5.2.5 and 5.2.10. If MFIL/ is true during a GLPT/ or WRIT/, FILE/, Figure 5-10 shows how the interface transfers the characters to be written in the mark. If MFIL/ is false, only one character is written and it is the character on the WDBX/ lines. Also, the WDRY/ line is ignored and WDAC/ is not activated if MFIL/ is false during a mark sequence.

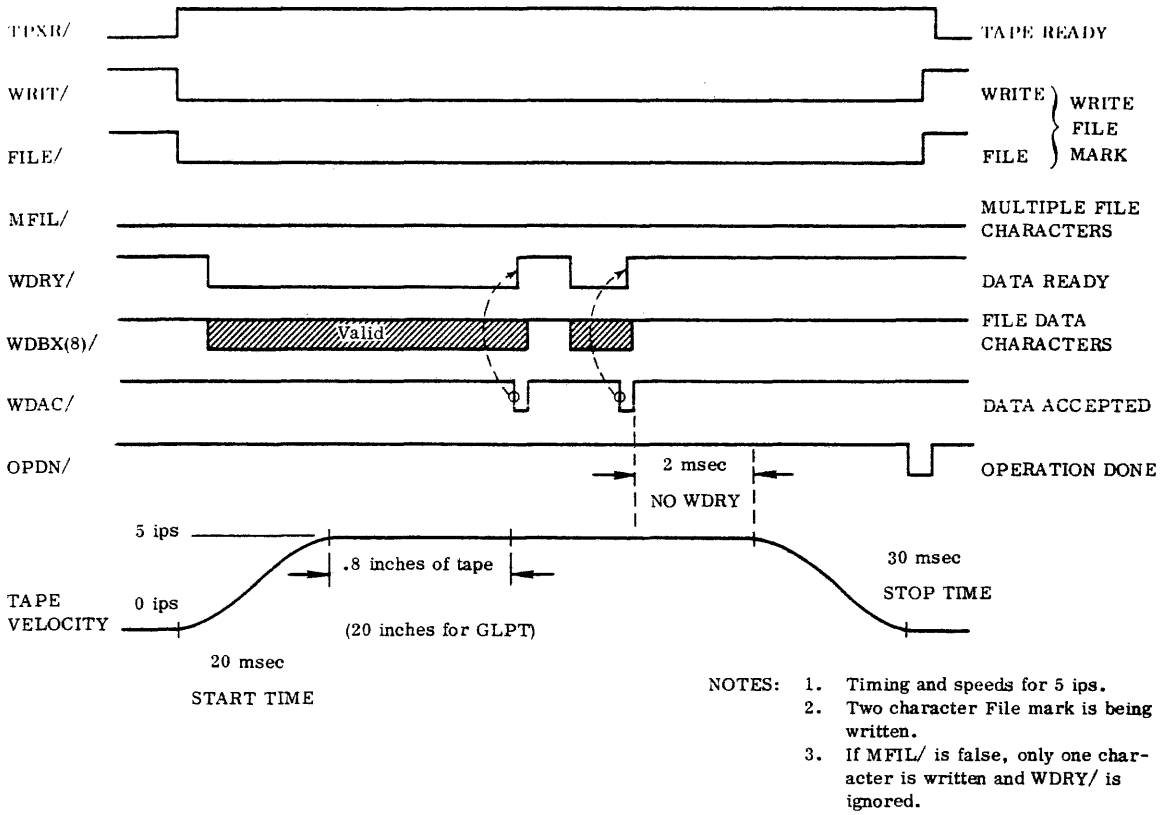
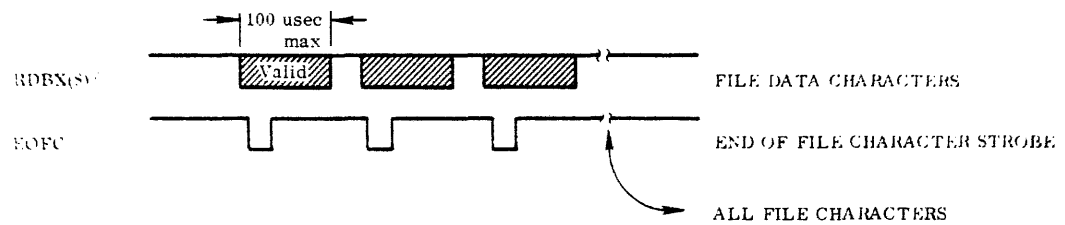


FIGURE 5-10 WRITE FILE MARK TIMING

5.4.6 File Mark Data Transfer Timing

Figure 5-11 shows how the characters in a File or Load mark are transferred to the interface. They are valid on the data lines for 1/2 of a bit time after EOFC/ strobes true for 1/2 of a clock cycle.



The above occurs when a FILE MARK is encountered:

1. In LOAD POINT OPERATION.
2. In reading through FILE MARKS or to FILE MARKS.
3. In skipping " " " " " " "
4. In backspacing to " " " " " " "

FIGURE 5-11 FILE MARK DATA TRANSFER TIMING

5.5 MISCELLANEOUS CONTROLLER NOTES

5.5.1 Simultaneous Operations

A Series 3000 controller equipped with two tape transports (Model 3220), is capable of performing the following simultaneous operations with the two transports:

1. Either transport may be rewound via its REWX/ line while the other transport is performing any operation other than simultaneous write.
2. Either transport may be rewound or driven high speed forward via its respective front panel controls while the other transport is performing any operations other than simultaneous write.
3. If both TAP1/ and TAP2/ are true during a WRITE operation (Write Data, Load Point, File or End marks), the same information will be written by both transports. In this mode of operation, the track protect signal from transport #2 is ignored; therefore the user must take care to use unprotected cassettes in transport #2 during simultaneous WRITE operations.

5.5.2 Far End of Tape Detection

Whenever tape is moving forward (HSFC, WRITE, SKIP, etc.) on magnetic tape and clear trailer is sensed, tape is stopped, and the FALT/ line is brought true. The operator may then recover from this condition by depressing the REWIND key for the deck on which it occurred. The tape will then move in reverse to magnetic tape and continue in a normal Rewind mode.

5.5.3 Data Packing Density

The standard controller board writes data on tape with a bit density of 1000 bits/inch (bpi). Thus, each bit occupies .001 inch of tape and each character (consisting of eight data bits and double width parity bit) occupies .01 inch (or 100 characters per inch). The controller board is capable of operating at 800 bpi where 80 characters are written per inch. If it is desired to operate at 800 bpi, the user must solder a jumper between the designated points on

the controller board between the integrated circuits located at coordinates G-4 and H-4. Cassettes recorded at 1000 bpi are not interchangeable with 800 bpi cassettes.

FIGURE 5-12 CONTROLLER BOARD - PART NO. 1050A0201

5.6 ELECTRICAL PARTS LIST - CONTROLLER BOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
1	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FARICHILD SEMI-CONDUCTOR	U6A909359X
2	INTEGRATED CIRCUIT, TTuL/ MSI 9305, VARIABLE MODULE COUNTER	100U16014	FAIRCHILD SEMI-CONDUCTOR	U7A930559X
3	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A994659X
4	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
5	INTEGRATED CIRCUIT, DTuL TRIPLE 3 INPUT NAND GATE	100U14002	FAIRCHILD SEMI-CONDUCTOR	U6A996259X
6	INTEGRATED CIRCUIT, RETRIG-GERABLE MONOSTABLE MULTI-VIBRATOR	100U14007	FAIRCHILD SEMI-CONDUCTOR	U6A960159X
7	INTEGRATED CIRCUIT, LPTTuL/ MSI 93L22, LOW POWER QUAD 2 INPUT MULTIPLEXER	100U16017	FAIRCHILD SEMI-CONDUCTOR	V7B93L2259X
8	INTEGRATED CIRCUIT, DTuL DUAL 4 INPUT NAND BUFFER	100U14001	FAIRCHILD SEMI-CONDUCTOR	U6A994459X
9	INTEGRATED CIRCUIT, TTuL 4-BIT SHIFT REGISTER	100U16001	FAIRCHILD SEMI-CONDUCTOR	U7B930059X
10	INTEGRATED CIRCUIT, SYNCHRO-NOUS 4-BIT UP/DOWN COUNTERS (DUAL CLOCK WITH GEAR)	100U16018	TEXAS INSTRUMENTS	SN74193
11	INTEGRATED CIRCUIT, LPTTuL/ MSI 93L11, LOW POWER ONE-OF-SIXTEEN DECODER	100U16016	FAIRCHILD SEMI-CONDUCTOR	U6N93L1159X
C1, 7, 16, 46, 48	CAPACITOR, TANTALUM, 100uF, ±10%, 10V	105C04127	SPRAGUE	TYPE 196D
C2, 34-41	CAPACITOR, DISC, .1uF, +80 -20%, 10V	120C03011	CENTRALAB	TYPE UK
C3, 5, 12, 15	CAPACITOR, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C8-11, 14, 17, 18	CAPACITOR, DISC, 220PF, ±10%, 1KV	120C01033	CENTRALAB	TYPE DD
C13	CAPACITOR, TANTALUM, 1.0uF, ±10%, 50V	105C04062	SPRAGUE	TYPE 196D
C19	CAPACITOR, DISC, .01uF, ±20%, 50V	120C03040	CENTRALAB	TYPE UK
C20	CAPACITOR, DISC, 330PF, ±10%, 1KV	120C01038	CENTRALAB	TYPE DD
C21,24-31, 33,42,44, 45,47,49,50	CAPACITOR, DISC, 300PF, ±10%, 1KV	120C01037	CENTRALAB	TYPE DD
C22	CAPACITOR, MYLAR, .22uF, ±10%, 250V	130C01029	SEACOR, INC.	106
C23, 43	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
CR1	SWITCHING DIODE, HIGH SPEED SILICON	200C01001	G.E. SEMICONDUCTOR	IN4151

5.6 ELECTRICAL PARTS LIST - CONTROLLER BOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
L1, 2	INDUCTOR, TUBULAR MOLDED R.F. CHOKE, 10uH, ±10%	300K01001	J.W. MILLER	9320-30
R1, 3, 22	RESISTOR, CARBON COMP., 1/4W, ±5%, 33K	100R02109		
R2	RESISTOR, CARBON COMP., 1/4W, ±5%, 10K	100R02097		
R4-7, 12, 13	RESISTOR, CARBON COMP., 1/4W, ±5%, 160 OHM	100R02054		
R9, 10	RESISTOR, CARBON COMP., 1/4W, ±5%, 24K	100R02106		
R14, 15, 17, 19	RESISTOR, CARBON COMP., 1/4W, ±5%, 1.0K	100R02073		
R16, 18	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.0K	100R02080		
R20	R20 ON 1050A0201 BOARD FOR 5 IPS UNIT:			
	RESISTOR, CARBON COMP., 1/4W, ±5%, 8.2 K	100R02095		
	R20 ON 1050A0202 BOARD FOR 12 IPS UNIT:			
	RESISTOR, CARBON COMP., 1/4W, ±5%, 5.6K	100R02091		
R23, 24	RESISTOR, CARBON COMP., 1/4W, ±5%, 15K	100R02101		
Y1	Y1 ON 1050A0201 BOARD FOR 5 IPS UNIT:			
	CRYSTAL CLOCK, 400KHZ	100Y01001	TEDFORD CRYSTAL LABS	
	Y1 ON 1050A0202 BOARD FOR 12 IPS UNIT:			
	CRYSTAL CLOCK, 960KHZ	100Y01002	TEDFORD CRYSTAL LABS	

6.0 SECTION 6 - HIGH SPEED SEARCH OPTION BOARD (HSSO)

6.1 DESCRIPTION OF HIGH SPEED SEARCH OPTION

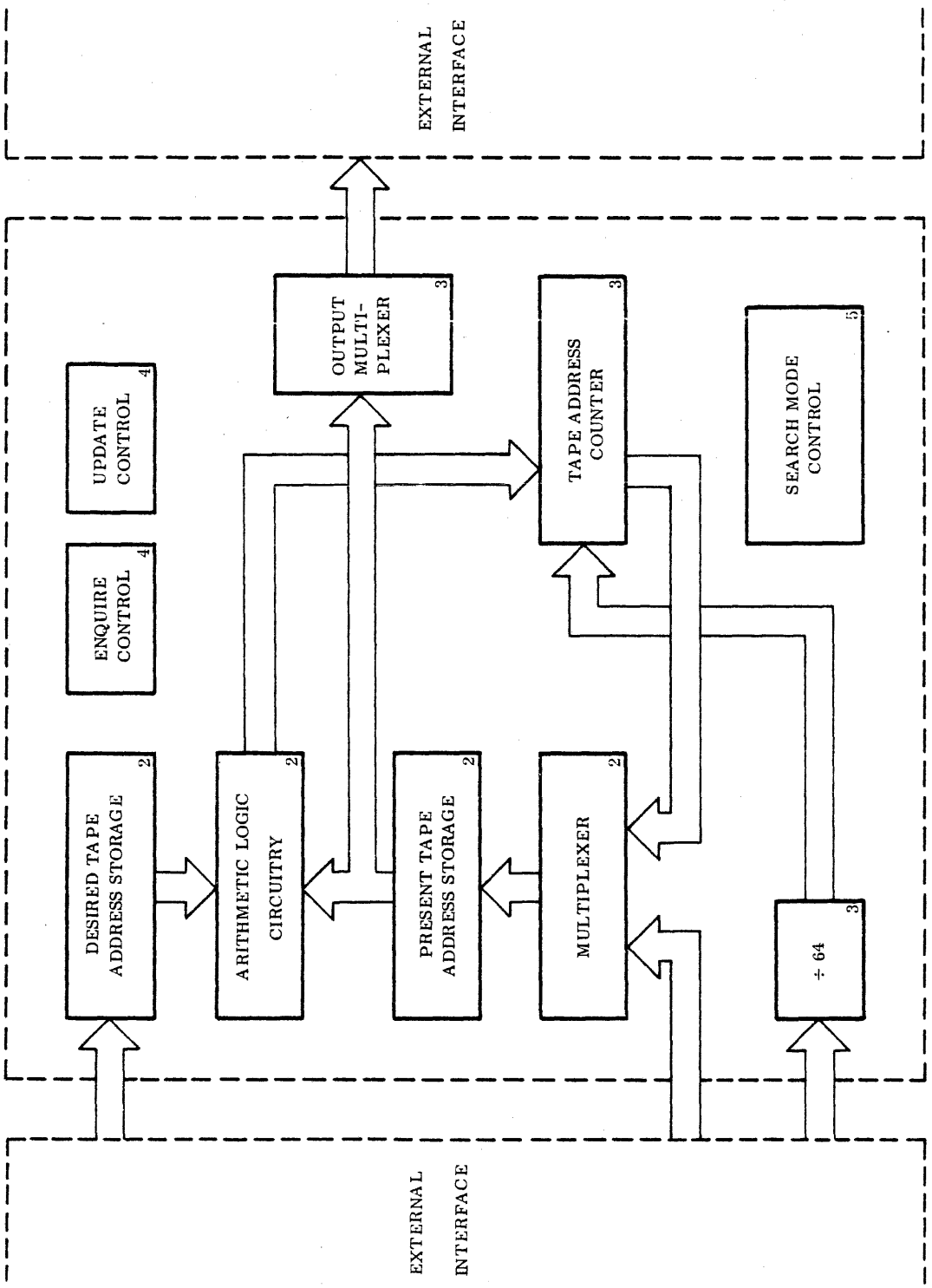
Figure 6-1 is a block diagram of the HSSO assembly. Figure 6-11 illustrates the component layout of the board assembly. The schematics of the HSSO are found in Section 13.

The HSSO consists of one PC board which is located in the lower left hand side of the Series 3000 Unit (below other boards) and is connected to the interface board via a flat cable.

The HSSO board was designed specifically to enable the Sykes EIA compatible interface to execute direct file access operations, locating previously written files of data at an average speed of 120 ips. It is a plug-in option to Series 3000 EIA Systems. However, a general controller assembly interface can include the interface to the HSSO board. The purpose of this section is to explain how the HSSO operates.

The main functions of the HSSO in the system are as follows:

1. Force tape address 0001_8 to be written whenever a load point is generated.
2. Keep track of tape position when tape is moving forward.
3. Update itself as to exact position whenever a File mark is read by the controller.



NOTE: Numbers in blocks are HSSO schematic sheet numbers.

FIGURE 6-1 BLOCK DIAGRAM, HIGH SPEED SEARCH OPTION

4. Respond to an Enquire command by sending out four digits which correspond to its present tape address.
5. Transfer its present position to the controller for writing on tape when a file mark is written.
6. Control all calculations and tape movement necessary to search out a desired file.

6.1.1 Access to HSSO Board

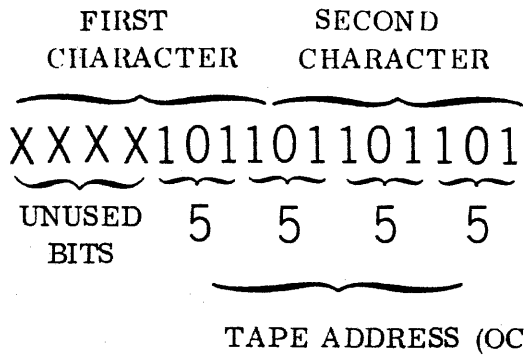
1. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
2. With power removed from the unit, remove the three screws holding the top of the board to the tape deck supporting frame.
3. Raise the logic boards to the vertical position (supported by detents).
4. The HSSO board is mounted in the lower left hand side of the unit enclosure.

6.1.2 Removal/Replacement

1. Remove the pivoting logic board support bar and attached boards by supporting the boards while removing one pivot screw; then disconnecting the necessary cables.
2. Disconnect the cables from J1, J2 and J3 on the HSSO board.
3. Release the locking tabs on the supporting pins near the rear corners of the HSSO board and free the board from the pins.
   If the unit is the rack mountable type, also release the supporting pins in the other 2 corners of the board, freeing the board from the deck tie bar.
   If the unit is the desk top type, raise the upper end of the HSSO board and slip the lower end from under its retaining clip.
4. Remove the HSSO board from the unit.
5. Replace in reverse order.

6.2 THEORY OF OPERATION

The basis of the HSSO operation is the information written in File marks as they are put on tape. Two characters are written under HSSO control. The information contained in these two characters is:



Thus, the two characters (16 bits) contain 4 octal digits (12 bits) which correspond to tape addresses. Since 7777_8 octal addresses are possible, 4096 unique addresses could be written on a cassette (this number is limited to about 3700 due to the physical length of the tape in a cassette). The load point is tape address 0001_8.

When data is being written, the TAMS/ line from the controller is counted by a tape address counter to maintain constant knowledge of tape position. When a subsequent File mark is written, the HSSO causes the current tape position to be written in the File mark characters in the form shown above. This is done automatically without operator intervention. The operator may, however, ask for the present file address and the HSSO sends this information out for an operator (or computer), to log in a directory. Any cassette which has been formatted as described above during writing can be used for SEARCH operations. The operator (or computer), enters the address to be searched for and, once it has received the last digit, the HSSO starts the SEARCH operation. a calculation is made of present position relative to desired position and proper action automatically taken (high speed forward, rewind, skip or backspace), to locate the desired file. During high speed operations the TAMS line is monitored and counted to keep track of distance moved and to decide when to stop. When the HSSO has positively identified the desired file, it stops at that File mark and responds by either sending out the four digits of that address or by commanding the interface to read the subsequent file.

6.3 HSSO OPERATIONS

The operations performed by the HSSO can best be depicted through the use of flow charts, since most of its operations are sequential

in nature. Figures 6-2 through 6-6 contain the flow charts which map the following operations.

6.3.1 General Search Sequence

Refer to Figure 6-2. The HSSO will enter a search sequence subsequent to a search and respond, or search and read file strobe. It then waits for the interface to strobe in the four digits of the file to be searched for. A full four digits are required (leading zeros required). After the 4th digit is strobed in, the HSSO locates the desired file. After it has located the file, the HSSO signals completion of search in the previously requested manner. Through the use of the rocker switch module on the HSSO board, the enquire response may be disabled. (See Sec. 6.6.1.1 for switch setting instructions.) In this case, the mode is terminated with no response, despite use of search and respond command.

6.3.2 Search for Desired Address Sequence

Refer to Figure 6-3 which is the search algorithm used by the HSSO logic to directly access the requested file. The point of algorithm entry is determined by the setting of the skip switch (see Sec. 6.6.1.3 for setting instructions). If set for "SKIP", the HSSO will immediately skip to the next File mark to update its present tape address before doing any calculations. Otherwise, it will take its present value of tape address for the calculation. The HSSO first performs a subtraction to see if the present address is greater, less or equal to the desired address and follows a different path for each result. If not at the address, a magnitude check is made and a decision made of whether to go at high or slow speed. The actual value used in the magnitude check can be varied by an adjustment on the HSSO board (see Sec. 6.6.2 for setting instructions). If high speed forward motion is required, the actual distance required is biased slightly to prevent overshot (see Sec. 6.6.3 for setting instructions). During the ensuing high speed motion, the tape address counter is counted to zero by the TAMS/ signals received from the transport. When zero count is reached, the tape is stopped and a SKIP FILE executed to update the present tape address. The search process is then repeated as shown. When rewind is required no bias is used; but if clear leader is encountered, a SKIP FILE is executed to bring the cassette to Load Point to update the tape address. Note that if the position is

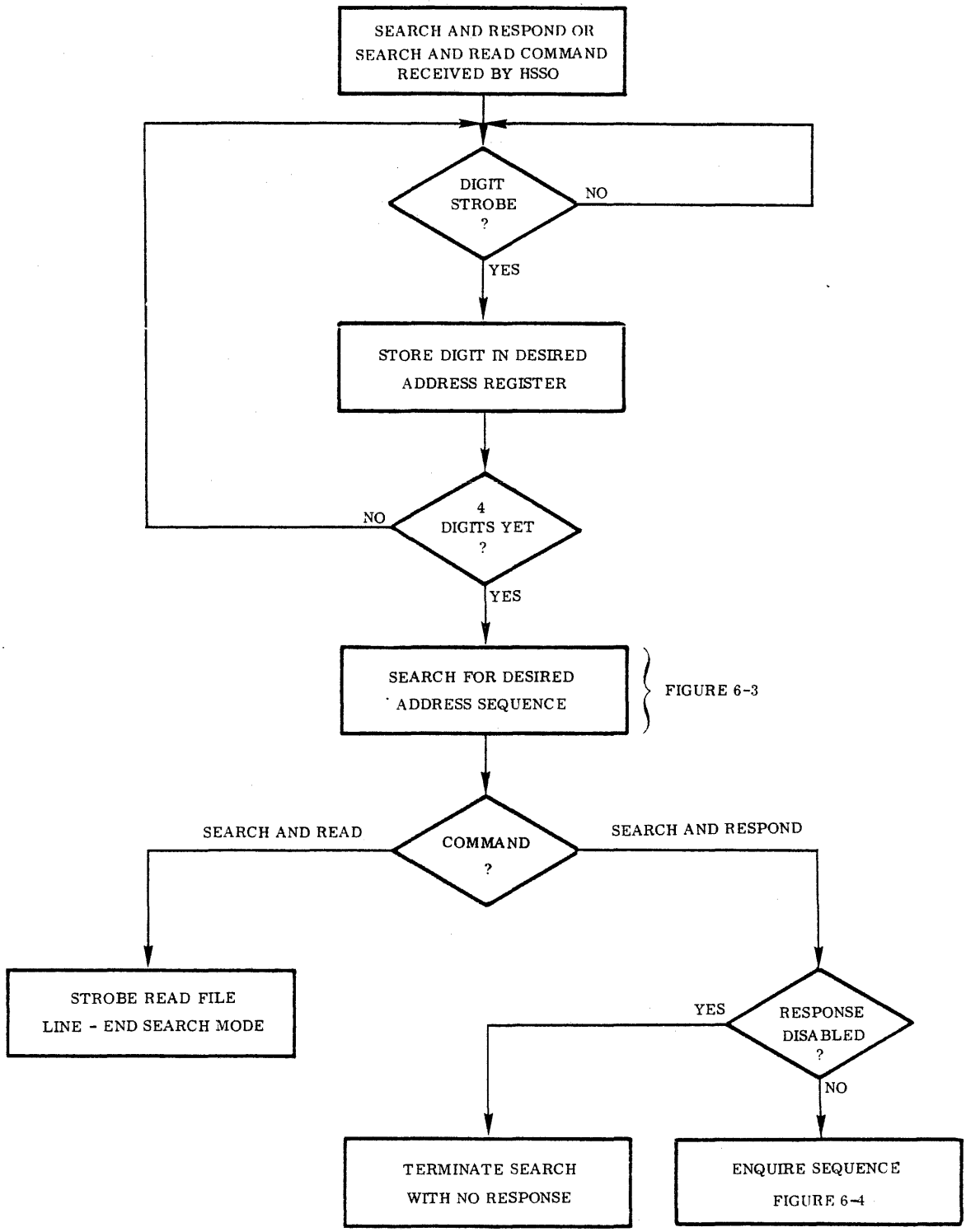


FIGURE 6-2 FLOW CHART, HSSO GENERAL SEARCH SEQUENCE

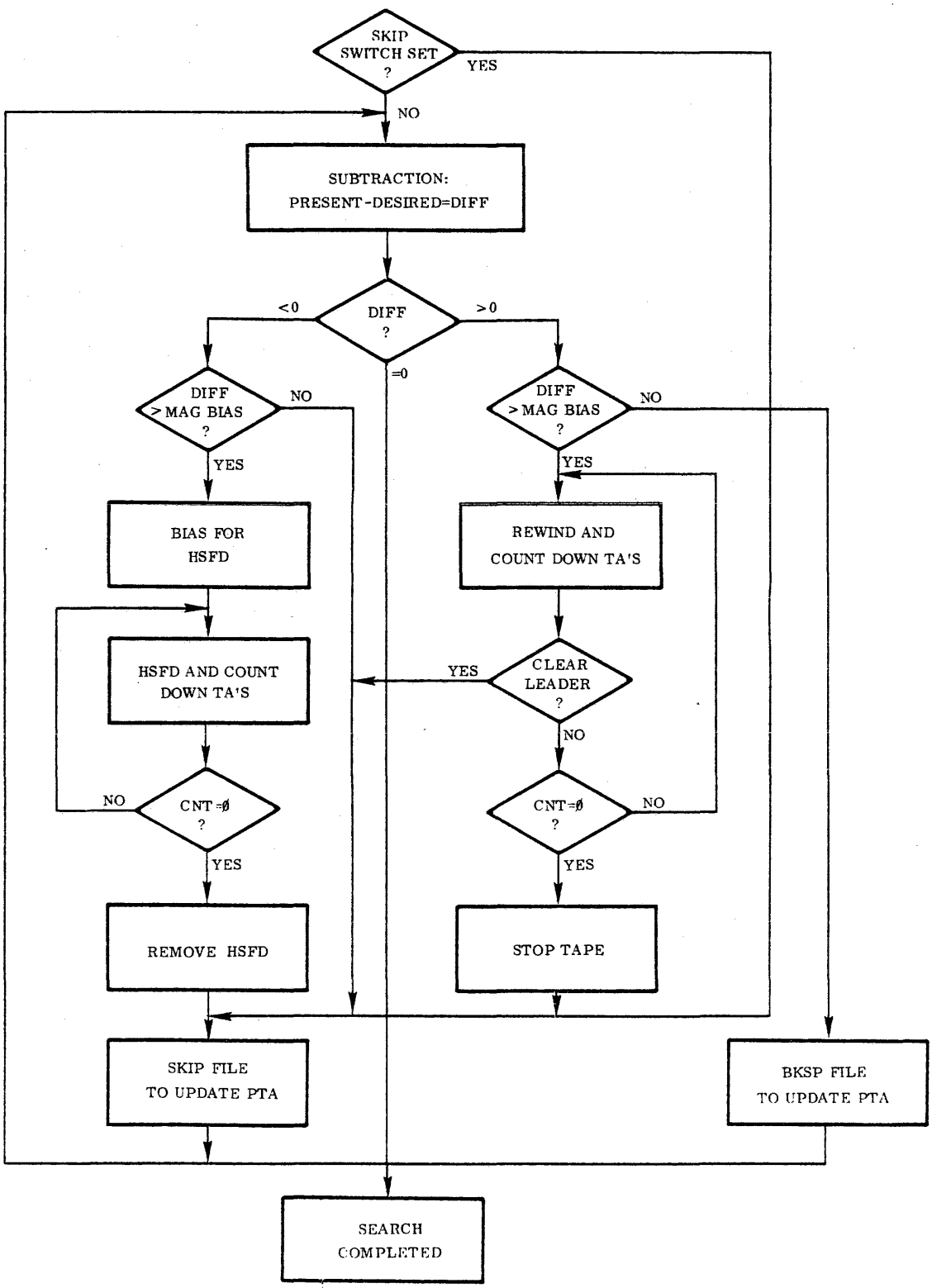


FIGURE 6-3 FLOW CHART, SEARCH FOR DESIRED TAPE ADDRESS

within the magnitude bias past the desired address, a BACKSPACE FILE is executed to update the tape address and get closer to the requested file.

6.3.3 Enquire Sequence

Refer to Figure 6-4. After receipt of an enquiry strobe, the HSSO strobes the four octal digits of the present tape address to the interface. Nothing is sent until the interface indicates it is ready to accept the digits. If no operation, other than WRITE DATA , has occurred since the last File mark was encountered (read or written), the tape address sent is the contents of that previous File mark and it represents the address of the present file.

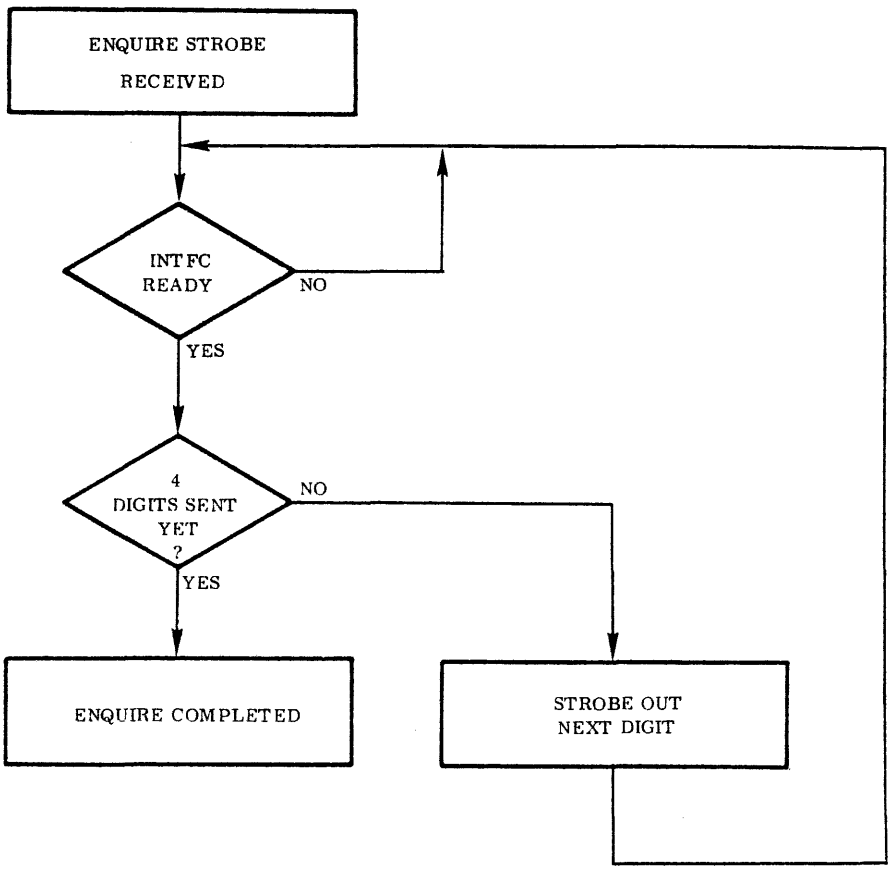


FIGURE 6-4 FLOW CHART, ENQUIRE SEQUENCE

6.3.4 Mark Write Sequence

Refer to Figure 6-5. This sequence applies whenever a Load Point or File mark is written. The HSSO multiplexes the proper bits onto the data lines for writing onto tape. Note that only two characters are written in the File and Load marks.

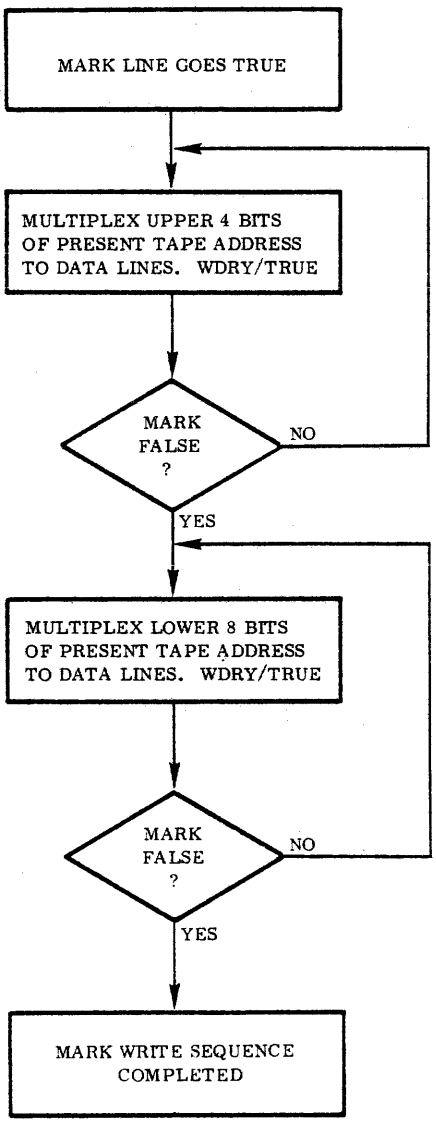


FIGURE 6-5 FLOW CHART, MARK WRITE SEQUENCE

6.3.5 File Mark Tape Address Update Sequence

Refer to Figure 6-6. This sequence occurs whenever a File mark is encountered during LOAD POINT, SKIP, BACKSPACE, and READ operations. Since two file characters are always written by the HSSO, a set of two EOFC/ strobes occur whenever a File mark is encountered. The first EOFC/ strobes in the upper 4 bits and the second strobes in the lower 8 bits. The new address is then transferred to the tape address counter. Thus, the present address in the HSSO is continually updated by File marks when a SKIP, BACKSPACE, READ, or LOAD POINT operation is executed.

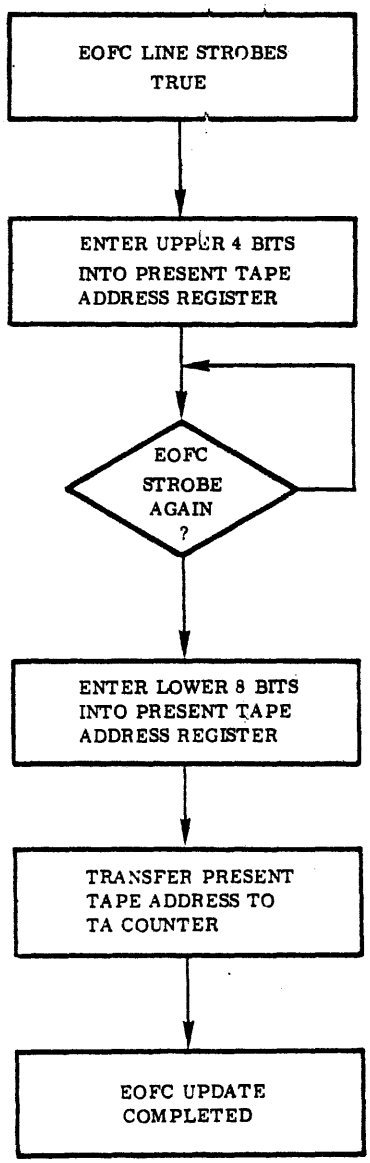


FIGURE 6-6 FLOW CHART, FILE MARK TAPE ADDRESS UPDATE SEQUENCE

6.4 HSSO INTERFACE SIGNAL DESCRIPTIONS

6.4.1 HSSO Inputs

There are 20 inputs to the HSSO board. Nine of these are ground true and the others are +5 volts true. All inputs are TTL/DTL compatible. The driving signal must sink 1.6 ma minimum from the line without raising the voltage above 0.4 volts in order to activate the line. The off state of the line is defined as a voltage greater than 2.6 volts but less than 5.5 volts.

The inputs, their HSSO board pin numbers, and functions are as follows:

6.4.1.1 Search and Read File (SARF) - Pin J3-9

SARF is a positive going strobe which can be of any duration (500 usec minimum). On its trailing edge, the HSSO enters a Search mode and prepares to accept the four octal tape address digits of the file to be searched for. Upon completion of the search operation, the HSSO sends out a clock width strobe on the HREF/ line.

6.4.1.2 Search and Respond (SRCH) - Pin J3-11

The purpose of SRCH is identical to SARF except that at the completion of search an enquiry sequence is entered (unless disabled) and the new address is sent out as if an enquire code has been received.

6.4.1.3 Address Enquiry (ADEN) - Pin J3-7

A positive strobe on ADEN will cause the HSSO to execute the sequence described in Figure 6-4.

6.4.1.4 Output Clear (OCLR/) - Pin J3-35

This signal is the OCLR/ output from the controller board (see Sec. 5.3.2.1).

6.4.1.5 Tape Address Monitor Signal (TAMS/) - Pin J3-38

The TAMS/ output of the controller board (see Sec. 5.3.2.16).

6.4.1.6 End of File Character (EOFC/) - Pin J3-28

The EOFC/ output of the control board (see Sec. 5.3.2.24).

6.4.1.7 Clock (HCLK/) - Pin J3-24

The HCLK/ signal is idential to the CLOK/ output of the controller board except that it must be 180° out of phase (inverted) with CLOK/.

6.4.1.8 Generate Address 1 (GEN1/) - Pin J3-3

GEN1/ must go true whenever a GENERATE LOAD POINT operation is occuring (GLPT/). It commands the HSSO to cause a tape address of 0001_8 to be set into the present tape address register.

6.4.1.9 Mark (MARK/) - Pin J3-34

MARK/ tells the HSSO that a Load Point or File mark is being written so that it can perform the sequence shown in Figure 6-5 to get the proper data onto the CNTX/ lines. MARK/ must go true when:

1. A File mark is being written.
2. A Load Point is being generated.
3. An End mark is being written; but, in any case, it must go false when WDAC/ is true.

6.4.1.10 Advance Sequence (ASEQ/) - Pin J3-40

ASEQ/ is used by the HSSO to cause resetting and sequence advance and must go true according to the following:

ASEQ/ = OPDN/ + RWID/ + RW2D/

6.4.1.11 Data Available Strobe (UDA/) - Pin J2-26

UDA/ is the strobe which goes true to enter the 4 search address digits into the HSSO. It must be at least 500 nsec wide and the data input lines (DI1-DI3), must be true 500 nsec before the trailing edge. It must be false at the trailing edge of SRCH or SARF.

6.4.1.12 Transfer Character (TCHAR/) - Pin J3-10

TCHAR/ must go true to enable the HSSO to send a digit in the enquire sequence. Once the character is strobed out via the SUDS/ line, TCHAR/ must go false for at least 500 nsec prior to requesting the next digit.

6.4.1.13 Data Input Lines (DI1-DI8)

These lines carry two types of information:

1. Whenever URDS/ is true the three lines DI1, DI2, and DI3 must contain the octal value of the search digit being entered. In this case +5 volts is true.
2. Whenever URDS/ is false they must contain the same information as is on the RDB1/-RDB8/ lines out of the controller. In this case they contain ground true data. RDB1/ corresponds to DI1, etc.

PIN DESIGNATIONS - DATA INPUT LINES

SIGNAL	PIN NO.
DI1	J3-4
DI2	J3-20
DI3	J3-2
DI4	J3-5
DI5	J3-17
DI6	J3-19
DI7	J3-15
DI8	J3-13

6.4.2 HSSO Outputs

There are 18 output lines from the HSSO board to the interface. All outputs are ground true and so designated by a / suffix on the signal mnemonic. All outputs are TTL/DTL compatible. Each output will sink up to 12 ma without its low level rising above .4 volts and the minimum output high voltage will be 2.6 volts.

The outputs, their pin numbers and their descriptions are as follows:

6.4.2.1 Multiple File Characters (MFIL/) - Pin J3-36

The function of MFIL/ is to cause the controller to write multiple file characters at the Load Point, in File marks, and in End of Data marks. See Sec. 5.3.1.15. This line is always a ground and must cause MFIL/ to the controller to be a ground whenever HSSO is used.

6.4.2.2 Skip File (SKPF/) - Pin J3-33

When true, SKPF/ must set both the SKIP/ and FILE/ latches in the interface. It is used during Search modes to cause Skip File to update the present tape address.

6.4.2.3 Backspace File (HBAK/) - Pin J3-27

When true, HBAK/ will cause BKSP/ and FILE/ to be set on the interface board, causing a Backspace File to be executed by the controller. Backspace File is used in the Search mode as shown in Figure 6-3.

6.4.2.4 High Speed Forward (HSFD/) - Pin J3-39

When true, this line will cause the HSFD/ input to the controller board to go true. It is also used in the Search mode to cause high speed forward motion.

6.4.2.5 Rewind Selected Tape (SREW/) - Pin J3-25

When true, SREW/ will cause the REWX/ line to go true for the transport which is presently selected by the TAP1/ or TAP2/ lines.

6.4.2.6 Read File Strobe (HREF/) - Pin J3-1

HREF/ will strobe true for one clock cycle at the completion of a search and read sequence. It is intended that it cause the interface to command a Read File mode.

6.4.2.7 Write Data Ready (WDRY/) - Pin J3-37

When true, WDRY/ will cause the WDRY/ line into the controller to go true. It is used whenever File marks are being written to indicate data availability.

6.4.2.8 Enquire Mode (ENQR/) - Pin J3-22

The ENQR/ line goes true whenever the HSSO enters an Enquiry mode and stays true until TCHAR/ goes true again <u>after</u> transmission of the fourth digit.

6.4.2.9 Search Data Strobe (SUDS/) - Pin J3-6

The SUDS/ line strobes true for a period of 1/2 clock cycle during an Enquiry mode when the data is valid on the DO1 - DO8 lines. Thus, four SUDS/ strobes occur during an enquiry to strobe the four digits to the interface.

6.4.2.10 Search Digit Select (URDS/) - Pin J3-23

The URDS/ line is used by the interface to cause the search digits to be multiplexed onto the DI1-3 lines when the desired address is being entered.

6.4.2.11 Data Output Lines (DO1 - DO8)

These lines are used by the HSSO to transmit two types of information to the interface:

1. When MARK/ is active, indicating a File mark is being written, they carry the data bits to be written on tape by the controller. Thus, the data on the DO1 - DO8 lines must get through to the WDB1/ - WDB8/ lines and with the same polarity.
2. When in an Enquire mode, they contain the full 8-bit digits of the address one at a time. the first 3 bits actually contain the address information (0-7) and the upper five bits are constants which may be selected via a rocker switch to operate under any desired code scheme. In this case, the DO1 - DO8 lines carry true data (1 = +5 volts).

These lines are driven by open collector gates, which are never active except as indicated in the above two cases.

PIN DESIGNATION DATA OUTPUT LINES

SIGNAL	PIN NO.
DO1	J3-12
DO2	J3-14
DO3	J3-18
DO4	J3-16
DO5	J3-32
DO6	J3-30
DO7	J3-31
DO8	J3-29

6.5 INTERFACE SIGNAL TIMING

Proper operation of the HSSO can be realized only if signal timing is carried out properly. This section describes the timing considerations.

6.5.1 Search and Read File Signal Timing

Refer to Figure 6-7. After receipt of a SARF/ or SRCH/ strobe, the HSSO requires the four digits (octal) of the address to be

searched for. After the 4th digit (LSD) is strobed into the HSSO, the search is executed and upon completion HREF/ is strobed if SARF/ was strobed originally. This is the timing diagram for the sequence shown in Figure 6-2.

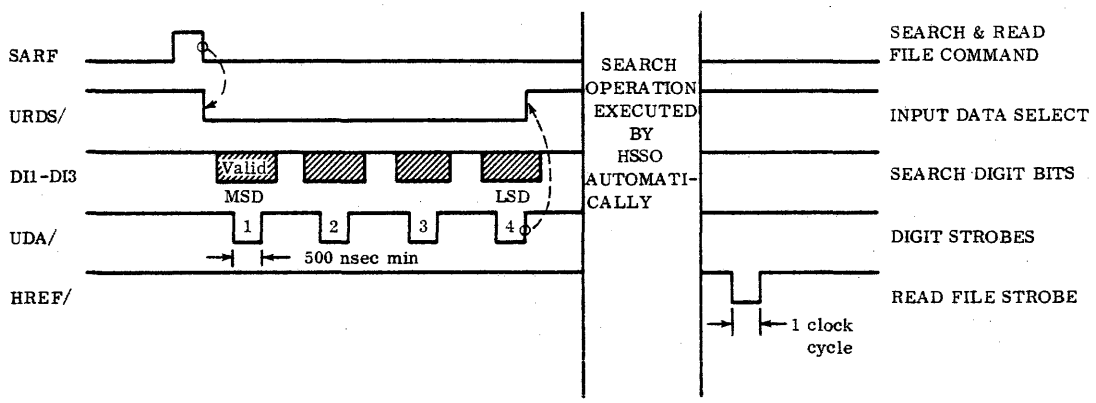
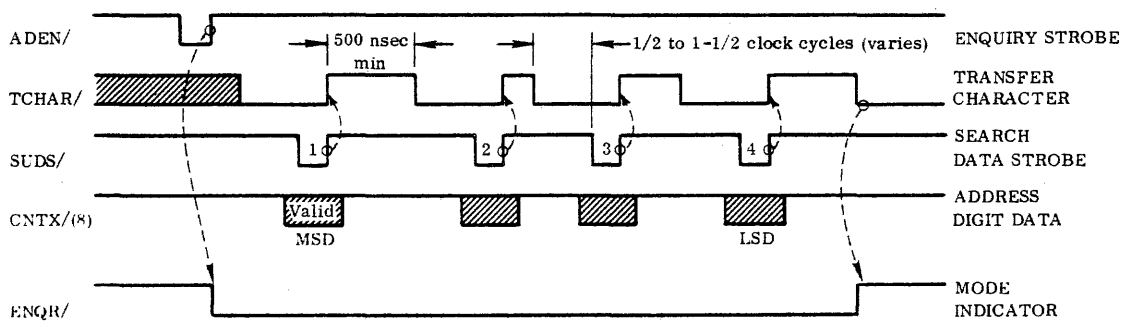


FIGURE 6-7 SEARCH AND READ FILE SIGNAL SEQUENCE TIMING

6.5.2 Address Enquiry Signal Timing

Figure 6-8 is the timing diagram for the sequence shown in Figure 6-4. Note that the mode indicator (ENQR/) stays true until TCHAR/ returns to the ready state after the transfer of the LSD.

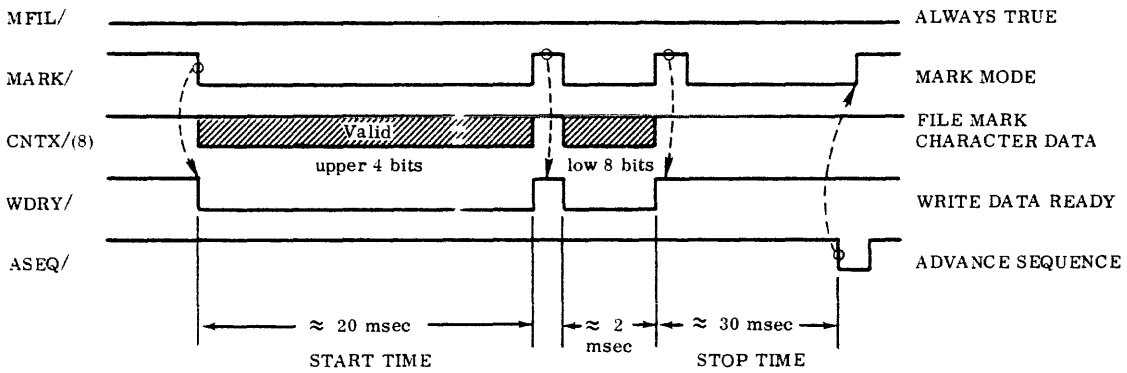


NOTES: 1. SUDS/ = 1/2 clock cycle in width.

FIGURE 6-8 ADDRESS ENQUIRY SIGNAL TIMING

6.5.3 Writing File and Load Marks Signal Timing

Figure 6-9 depicts the signal relationships which occur during a Write File Mark or generate Load Point sequence (also see Figure 6-5). The HSSO causes MFIL/ always to be true, thus, the controller writes as many characters as are supplied.



NOTE: Times are for 5 ips.

FIGURE 6-9 WRITING FILE AND LOAD MARK SIGNALS TIMING

6.5.4 End of File Character (EOFC) Update Timing

Figure 6-10 indicates the timing sequence which occurs whenever a File mark is encountered. The interface should always present the RDB1/ - RDB8/ data on the DI1 - DI8 lines except when inputing a search address. This will insure that when an EOFC/ strobe occurs, the HSSO has the proper information for update.

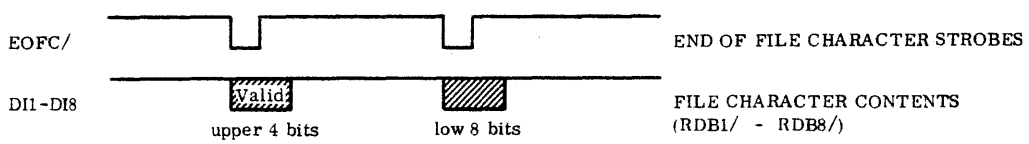


FIGURE 6-10 END OF FILE CHARACTER (EOFC) UPDATE SIGNAL TIMING

6.6 HSSO SETTINGS

6.6.1 HSSO Rocker Switch Settings

The HSSO board has a 7-switch dual-in-line package in IC location G3. The seven switches are used to set the HSSO to operate in the manner desired by the user.* The functions of the switches are as follows:

6.6.1.1 Switch #1 - Response Enable

If this switch is ON, an Enquiry sequence is entered at completion of a Search operation subsequent to a SRCH/ strobe. When OFF, the Enquiry sequence is not executed at completion of a search and respond; however, the Enquiry mode operates normally.

6.6.1.2 Switches #2 to 6 - Bit Selectors

These 5 switches are used to select the desired upper 5 bit configuration which will be sent out by the HSSO during an Enquire sequence. The low 3 bits of the 8 bits define the digit being sent, and through these switches a user can configure the upper 5 bits to his system. The switch numbers and enquire state caused are as follows:

BIT NO.	SWITCH #	SWITCH ON BIT STATE	SWITCH OFF BIT STATE
BIT #4 (CNT4/)	6	1	Ø
BIT #5 (CNT5/)	5	1	Ø
BIT #6 (CNT6/)	4	1	Ø
BIT #7 (CNT7/)	3	1	Ø
BIT #8 (CNT8/)	2	1	Ø

*A switch is ON when the end nearest the "ON" indication is depressed.

6.6.1.3 Switch #7 - Skip Enable

If this switch is ON, a skip file sequence will be executed at the beginning of a Search operation to update the present tape address, prior to doing the search calculations. If the switch is OFF, the Search operation takes the contents of the present tape address register as the location of the tape and proceeds with the search calculations.

6.6.2 Setting The Magnitude Check Value

In the search algorithm, a check is made to determine whether to go at high or low speed to the desired tape address (see Figure 6-3). If the number of tape addresses to the desired address is less than the magnitude value, a skip or backspace is used. If the number is greater than the magnitude value, a high speed forward or rewind is used. The magnitude value is set at the factory to be about 30_8 tape addresses (TA's). 30_8 TA's is the approximate point where it takes the same amount of time for either a low or high speed access. However, the user may wish to vary the magnitude check to tailor it to his own system. A simple method of setting this value is:

1. Format a cassette by writing just File marks for about 100_8 addresses on a cassette, starting at the load point.
2. From the load point, search for an address which is one more than the desired magnitude value.
3. Vary the pot marked MAG on the HSSO board until the pot position is determined which is on the boarder between high and low speed, while repeating step 2.
4. The value is set properly when searching for the address equal to the magnitude value results in high speed, and searching for one address less causes slow speed search (SKIP).

The magnitude setting is not critical and a setting of one tape address greater or less than the desired value will make little difference in the search time.

6.6.3 Setting The Bias Value

Whenever high speed forward is required in the search process, the number of TA's to be counted prior to stopping is biased

slightly in order to compensate for coasting during stopping. The amount of bias is determined by the setting of the bias pot on the HSSO board. By doing high-speed forward searches, the operator can observe the amount of undershoot and adjust it by varying the bias pot. In general it is best to set up the bias to slightly undershoot when the search distance covers a distance of about 1000_8 tape addresses.

6.7 DUAL TAPE OPERATION NOTES

The HSSO cannot keep track of the tape positions of two transports simultaneously. however, it can operate on either one individually . The deck selected by the interface, via the TAP1/ and TAP2/ lines, determines which deck the HSSO is operating on. Caution must be used in switching tape selection because the HSSO has no way of knowing that this has occurred. When tape selection is changed, the HSSO must be updated via a Skip File, Backspace File or Load Point in order to insure proper operation. The SKIP ENABLE rocker switch can be used to advantage in a two deck system. If ON, the changing of tape selection will not impair the ability of the HSSO to search properly because it will always update itself prior to searching. If the simultaneous write feature of the controller is used, the information written in File marks will be identical for both tapes, but is derived by use of the TAMS/ line from tape deck #1. The duplicate cassette made in tape deck #2 may exhibit different search characteristics than the tape written in tape deck #1. This is due to minute tolerance differences between cassettes in such parameters as tape thickness and tightness of wrap. Compounded over the length of a cassette, these differences can cause small differences in the relationship between tape position and number of TAMS/ signals from the TT120 transport shaft encoder.

6.8 PIN NUMBER LIST - SIGNALS BETWEEN HSSO BOARD AND EIA OR WIRE WRAP INTERFACE BOARD

HSSO SIGNAL	HSSO BOARD	EIA INTFC. BOARD	WIRE WRAP INTFC. BD.
ASEQ/	J3 - 40	J3 - 1	J3 - 20
HSFD/	39	2	40
TAMS/	38	3	19
WDRY/	37	4	39
MFIL/	36	5	18
OCLR/	35	6	38
MARK/	34	7	17
SKPF/	33	8	37
DO5	32	9	16
DO7	31	10	36
DO6	30	11	15
DO8	29	12	35
EOFC/	28	13	14
HBAK/	27	14	34
UDA/	26	15	13
SREW/	25	16	33
HCLK/	24	17	12
URDS/	23	18	32
ENQR/	22	19	11
	21	20	31
$\overline{\text{DI2}}$	20	21	10
DI6	19	22	30
DO3	18	23	9
DI5	17	24	29
DO4	16	25	8
DI7	15	26	28
DO2	14	27	7
DI8	13	28	27
DO1	12	29	6
SRCH	11	30	26
TCHAR	10	31	5
SARF	9	32	25
	8	33	4
$\overline{\text{ADEN}}$	7	34	24
SUDS/	6	35	3
DI4	5	36	23
DI1	4	37	2
GEN1	3	38	22
DI3	2	39	1
HREF/	1	40	21

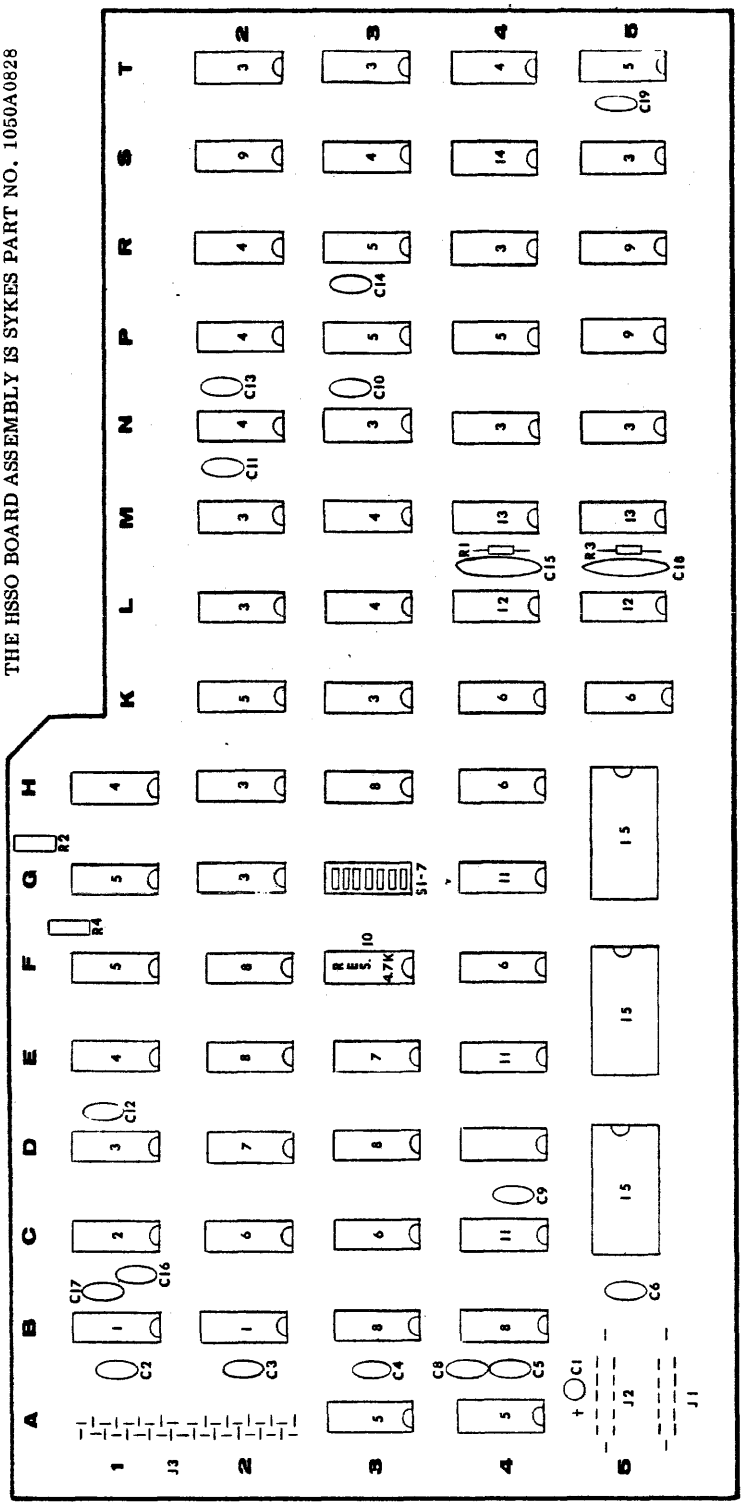


FIGURE 6-11 HIGH SPEED SEARCH OPTION (HSSO) BOARD

6.9 ELECTRICAL PARTS LIST - HSSO BOARD

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
1	INTEGRATED CIRCUIT, HEX INVERTER	100U16033	FAIRCHILD SEMI-CONDUCTOR	9N05XC
2	INTEGRATED CIRCUIT, BINARY COUNTER	100U16013	FAIRCHILD SEMI-CONDUCTOR	9393
3	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A994659X
4	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMI-CONDUCTOR	U6A909359X
5	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
6	INTEGRATED CIRCUIT, 4-BIT LATCH	100U16012	FAIRCHILD SEMI-CONDUCTOR	9375
7	INTEGRATED CIRCUIT, TTuL DUAL 4 INPUT MULTIPLEXER	100U16009	FAIRCHILD SEMI-CONDUCTOR	U6B930959X
8	INTEGRATED CIRCUIT, MULTI-PLEXER, MONOLITHIC, MEDIUM SPEED, QUAD TWO INPUT DIGITAL	100U16017	FAIRCHILD SEMI-CONDUCTOR	U7B93L2259X
9	INTEGRATED CIRCUIT, DTuL TRIPLE 3 INPUT NAND GATE	100U14002	FAIRCHILD SEMI-CONDUCTOR	U6A996259X
10	DIP RESISTOR PKG, ±2%, 4.7K	103R01012	BECKMAN-HELIPOT	SERIES 899-1
11	INTEGRATED CIRCUIT, BINARY COUNTER, UP-DOWN, 4-BIT, (DUAL CLOCK WITH CLEAR)	100U16018	FAIRCHILD SEMI-CONDUCTOR	SN74193
12	INTEGRATED CIRCUIT, TRIPLE 3 INPUT POSITIVE NOR GATES	100U16031	TEXAS INST.	SN7427
13	INTEGRATED CIRCUIT, RETRIG-GERABLE MONOSTABLE MULTI-VIBRATOR	100U14007	FAIRCHILD SEMI-CONDUCTOR	U6A960159X
14	INTEGRATED CIRCUIT, TTuL 4-BIT SHIFT REGISTER	100U16001	FAIRCHILD SEMI-CONDUCTOR	U7B930059X
15	INTEGRATED CIRCUIT, LOGIC UNIT, 4-BIT ARITHMETIC	100U16032	FAIRCHILD SEMI-CONDUCTOR	93L41
C1	CAPACITOR, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C2-6	CAPACITOR, DISC, .1uF, 10VDC, +80 -20%	120C03011	CENTRALAB	TYPE UK
C8, 10-13, 16, 17, 19	CAPACITOR, DISC, GENERAL PURPOSE 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
C9, 14	CAPACITOR, DISC, 220PF, ±10%, 1KV	120C01033	CENTRALAB	TYPE DD
C15, 18	CAPACITOR, DISC, .0033uF, GMV, 1KV	120C01074	CENTRALAB	TYPE DD
R1, 3	RESISTOR, CARBON COMP., 1/4W, ±5%, 10K	100R02097		
R2, 4	POTENTIOMETER, SINGLE TURN CERMET TRIMMING, 0.5W @ 70° C, ±10%, 50K	110R05013	BECKMAN-HELIPOT	SERIES 72
S1-7	SWITCH, 7-POSITION, ROCKER	106S01004	AMP	435166-1

7.0 SECTION 7 - EIA INTERFACE BOARD AND I/O PANELS

7.1 DESCRIPTION OF EIA INTERFACE

The Sykes 3000 EIA interface is actually two interfaces. Each has a selectable baud rate, and both are plug-to-plug compatible with equipment interfaced in accordance with EIA Standard RS-232-C. One interface is for direct connection to operator oriented I/O (Input/Output) devices such as teleprinters, CRT display terminals and high speed tape devices; the second is for connection to the communications line through a modem. A 20 ma current loop interface, which is available as an option, utilizes the terminal interface I/O connector.

7.2 EIA INTERFACE BOARD

7.2.1 General

Figure 7-1 is a block diagram of the EIA interface board and its interconnection with other Series 3000 components and options. The number in the lower right hand corner of each block refers to the sheet of the EIA Interface Board Schematic Diagram (Sec. 13) which contains the circuitry for that function. The J1, J2, etc. refer to the connector number on the EIA board through which the indicated connections are made. The plug-in options to the EIA interface are shown connected to the places with which they func-

tionally interact in actual operation. Removal or insertion of any option does not affect the normal operations or require any modifications of the EIA board. Figure 7-3 illustrates the EIA board components layout. Figure 7-4 illustrates the EIA I/O panel assembly.

The Series 3000 EIA Interface Board is mounted under the controller board on the same pivoting support. The interface board is connected to the controller board via two flat cables (J1 and J2); to the integral control keyboard assembly by a flat cable (J5); and to the rear I/O panel by a wire harness assembly (J4). The optional HSSO board is also connected to the interface board by a flat cable (J3), if included in the system.

7.2.2 Functional Description of Block Diagram

The following is a description of the actual functions performed by each of the blocks of Figure 7-1. Each block is numbered in the upper left hand corner.

7.2.2.1 Block 1 - Dual 128 x 8 Buffers and Memory Control

The data buffers are the heart of the EIA interface. Eight 1 x 256 static random access MOS memories are configured to form two 128 character (8 bits/character) buffers for data. Included here is all the circuitry necessary to read, write, cancel or backspace characters in the correct buffer as required by data flow to the controller board (TAPE) or EIA interfaces (MODEM or TERMINAL).

7.2.2.2 Block 2 - Buffer and Data Transfer Control

This circuitry is the control center for all data flow operations into and out of the dual buffers. It controls data flow for both Receive and Send modes of operation. Whenever a character is to be retrieved or deposited in the buffers for the EIA port or controller, a flag is set in this block; then, when the buffer is free, the operation is completed and the flag reset. Thus, this circuitry handles all buffer access, including possible simultaneous requests by both the controller and EIA port.

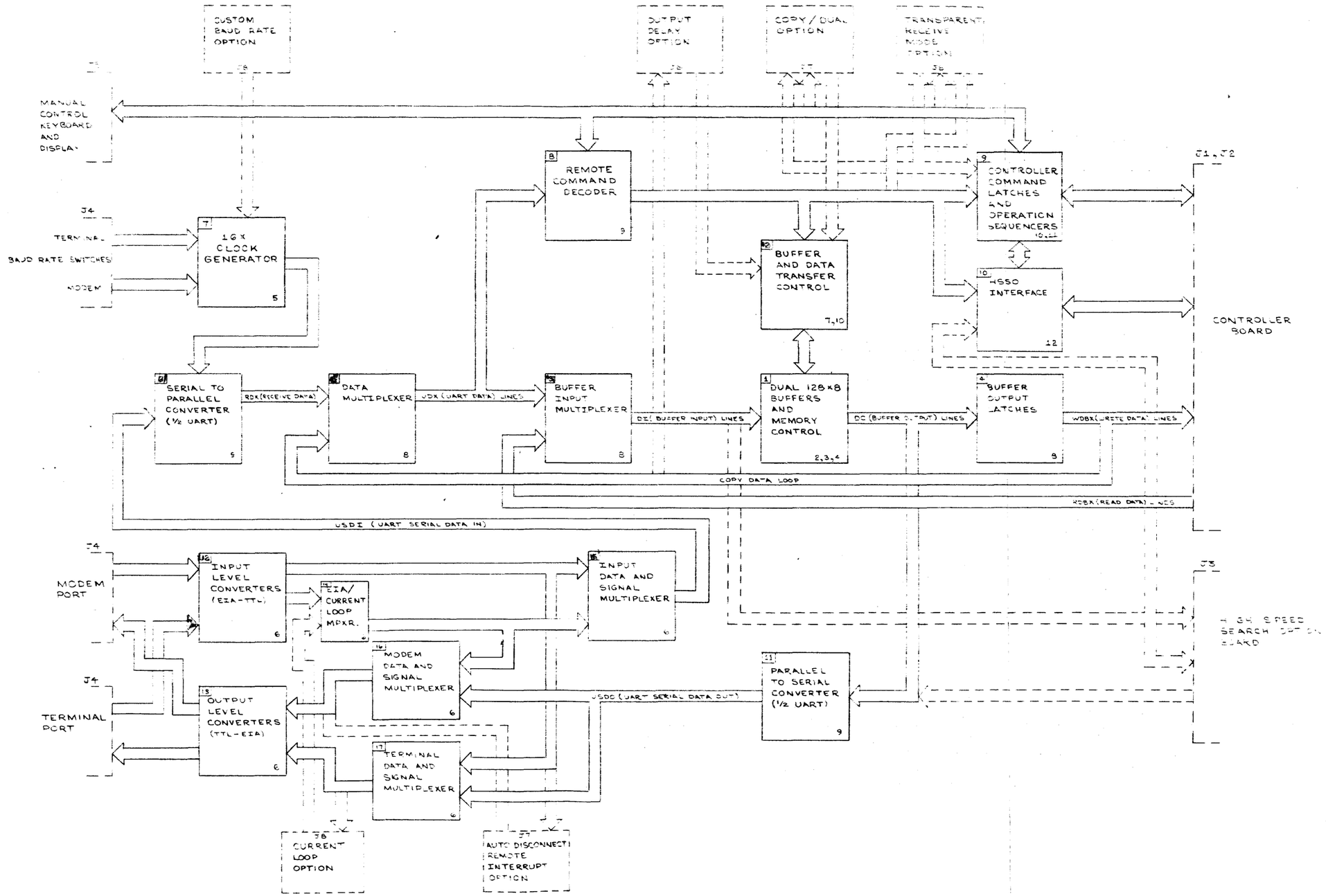


FIGURE 7-1 BLOCK DIAGRAM - SERIES 3000 EIA INTERFACE

7.2.2.3 Block 3 - Buffer Input Multiplexer

The purpose of this circuitry is to select the proper data lines to write a character into the RAM buffers. If in the Send mode, the read data lines from the controller are selected for deposit into the buffers. When in the Receive mode, the data entering from the EIA port (from UART*) is multiplexed to the buffers.

7.2.2.4 Block 4 - Buffer Output Latches

This 8-bit storage register holds the data character, after removal from the buffer, when waiting for the controller to take the character for writing on tape. Note that the other output data path from the buffers does not require use of this output latch. When in the Send mode, data is sent directly from the buffers to the UART for transmission, and is not stored in the buffer output latches.

7.2.2.5 Block 5 - Data Multiplexer

This circuitry selects either the UART output or buffer latch output for feeding towards the buffers. The main purpose of this multiplexer is to allow buffer swap during the COPY operation.

7.2.2.6 Block 6 - Serial to Parallel Converter

The serial to parallel converter is 1/2 of a Universal Asynchronous Receiver/Transmitter (UART) integrated circuit. It takes serial data (asynchronous start/stop format) and converts it to 8-bit characters which are then either written on tape or decoded as commands for the 3000 EIA System.

7.2.2.7 Block 7 - 16X Clock Generator

This circuitry generates the clock which the UART requires to execute the serial-parallel and parallel-serial conversions with the proper timing. The output of this block is a square wave whose ratio is 16 times the baud rate of the data on which the UART is to operate. (The baud rate is selected by switches on the rear I/O

*Universal Asynchronous Receiver/Transmitter

panel.) The on-line and off-line baud rates may be the same or may differ. If the custom baud rate option is installed, it connects to this block to enable special baud rates.

7.2.2.8 Block 8 - Remote Command Decoder

The remote commands for the system are programmed by a plug-in connector having jumpers or by a plug-in PC board which is connected on the left hand side of the EIA board. The input data from the UART is decoded and examined for control codes in this block. If a control code is decoded, the proper line is activated to cause occurance of the desired function or action. In any case, the busy-ready status of the system is examined before allowing a function to occur. If the system is already busy, the decoded command will be ignored.

7.2.2.9 Block 9 - Controller Command Latches and Operation Sequencers

The command latches hold such commands as load point, backspace, read, write, etc., and directly command the controller to execute the function. When the function is completed, the latch is reset by the controller. Also included here are the sequencer circuits required to perform retransmit-file and load point-send to end functions. The controller configuration control storage, such as tape select, file, end, etc. are also stored in latches here.

7.2.2.10 Block 10 - HSSO Interface

These are some minor circuits which enable proper tape operations (such as rewind, high speed forward, backspace, etc.) to be performed by the High Speed Search Option.

7.2.2.11 Block 11 - Parallel to Serial Converter

This half of the UART* takes 8 bit-parallel characters from the buffers or HSSO and formats them into asynchronous serial data with start and stop bits. The baud rate of the generated serial data is determined by the baud rate settings of the switches on the rear I/O panel. The number of bits per character and status of parity are controlled by DIP switch H7.

*Universal Asynchronous Receiver/Transmitter

7.2.2.12 Block 12 - Input Level Converters

The input level converters change the EIA voltage levels (RS-232-C) to 0-5 volt levels. This is done to data and control signal inputs from the terminal and modem.

7.2.2.13 Block 13 - Output Level Converters

These components take the 0-5 volt level data and control signal outputs from the EIA board and convert them to EIA voltage levels.

7.2.2.14 Block 14 - EIA/Current Loop Multiplexer

This multiplexer selects the data to be used as "terminal" data in the system. If the EIA/CL switch is in the EIA position, the EIA terminal port is selected. If the current loop option is installed and the switch is in the CL position, the current loop device (TTY) will be the terminal device.

7.2.2.15 Block 15 - Input Data and Signal Multiplexer

These random gates select the connection to the tape unit of data and signals from either the terminal or modem. Which device is connected is determined by the operator, using the DEVICE key on the 3000 EIA System keyboard or by the remote device select codes.

7.2.2.16 Block 16 - Modem Data and Signal Multiplexer

This multiplexer selects the on-line device when the EIA system is ON LINE. The tape unit is connected to the modem if the on-line device is TAPE or the terminal is connected to the modem if the on-line device is TERMINAL. Which one is connected is determined by the operator, using the DEVICE key on the 3000 EIA System keyboard.

7.2.2.17 Block 17 - Terminal Data and Signal Multiplexer

This multiplexer determines which signals are connected to the terminal. If a terminal on-line condition exists, the modem data

is fed to the terminal. If an off-line condition exists, the tape unit is connected to the terminal by this multiplexer.

7.2.3 Access to EIA Interface Board

1. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the three hold-down screws from the front edge of the controller PC board.
3. Raise the logic boards to the vertical position (supported by latches).
4. Remove the option board, if necessary (Sec. 8.1.2).

7.2.4 Removal/Replacement

1. Remove the three screws securing the bottom of the board to the pivoting support bar.
2. Remove the option board, if any (Sec. 8.1.2).
3. Carefully support the board while releasing the supporting pins between the controller board and interface board (depress locking tabs on pins).
4. Detach all cable connectors from the board.
5. Replace in reverse order.

7.3 EIA I/O PANEL ASSEMBLY

7.3.1 General

The I/O panel is located at the rear of the cabinet of the Series 3000 EIA System. It includes two independent baud rate selector switches which provide rate selection as required by associated equipment.

The I/O panel has two RS-232-C compatible connectors (one for terminal and one for modem); and, on systems with the Peripheral Control Keyboard option, a connector for the keyboard cable.

If the Series 3000 EIA System is equipped with the Current Loop to RS-232 Converter option, a CL-EIA selector switch is provided on the rear I/O panel. The switch will be set to CL if the

connected terminal is a current loop device, or to EIA for all EIA type terminals.

The standard baud rates selectable at the panel are:

- 110 baud
- 150 baud
- 300 baud

Optional additional rates selectable at the panel are:

- 600 baud
- 1200 baud
- 1800 baud
- 2400 baud
- 3600 baud
- Custom (see Sec. 8.6)

7.3.2 Removal/Replacement

The I/O panel is retained on the unit enclosure by two screws and lock washers. To gain access to various components on the panel assembly, procede as follows:

1. Turn OFF the power switch (indicator not illuminated).
2. Remove the top cover from the unit (Sec. 2.1.1.1 or 2.2.1.1).
3. Remove the three hold-down screws from the front edge of the controller PC board and raise the logic assembly to vertical; then remove the HSSO board, if any.
4. Disconnect the cable connector from J1 of the I/O panel PC board.
5. Disconnect the terminal (or current loop) and modem I/O cable connectors from the EIA board.
6. Remove the 2 screws and lock washers which retain the I/O panel on the unit.
7. Replace in reverse order.

7.4 TERMINAL AND MODEM I/O CONNECTOR PIN ASSIGNMENTS

The terminal and modem I/O pin assignments are listed in Tables 7A and 7B which follow:

TABLE 7A - TERMINAL I/O PIN ASSIGNMENTS

REQUIRED INPUT	PIN NUMBER
Transmitted Data	2
Received Data	3
Request to Send	4
Clear to Send	5
Data Set Ready	6
Signal Ground	7
Carrier Detect (Received Line Signal Detector)	8
Secondary Receive Line Signal Detect (from Modem)	12
Data Terminal Ready	20

OPTIONAL CURRENT LOOP CONNECTIONS

Distributor/Transmitter	Positive	10
Distributor/Transmitter	Negative	11
Selector/Receiver	Positive	18
Selector/Receiver	Negative	25

TABLE 7B - MODEM I/O PIN ASSIGNMENTS

REQUIRED INPUT	PIN NUMBER
Transmitted Data	2
Received Data	3
Request to Send	4
Clear to Send	5
Data Set Ready	6
Signal Ground	7
Received Line Signal Detector (Carrier Detect)	8
Secondary Received Line Signal Detector (Reverse Channel Control)	12
Data Terminal Ready	20

• Driver output logic levels with 3K to 7K load	15 volts > V_{OH} > 5 volts -5 volts > V_{OL} > -15 volts
• Driver output voltage with open circuit	$\|V_o\| < 25$ volts
• Driver output impedance with power off	$Z_o > 300$ ohms
• Output short circuit current	$\|I_o\| < .5$ amps
• Driver slew rate	$\frac{dv}{dt} < 30$ Volts / μsec
• Receiver input impedance	7K ohms > R_{in} > 3K ohms
• Receiver input voltage	±25 volts compatible with driver
• Receiver output with open circuit input	mark
• Receiver output with 300 ohms to ground on input	mark
• Receiver output with +3 volt input	space
• Receiver output with -3 volt input	mark

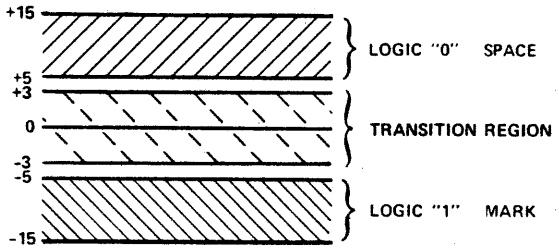


FIGURE 7-2 RS-232-C ELECTRICAL SPECIFICATIONS AND VOLTAGE LEVELS

RS-232-C INTERFACE SPECIFICATIONS

7.5 This section will define the operation of the RS-232-C interface control lines. A summary of the RS-232-C electrical specifications is given in Figure 7-2.

Modem signals are described as they exist when the Series 3000 EIA System is in the On-Line to Tape mode. When the Series 3000 EIA System is in the On-Line to Terminal mode, signals are passed directly through the System. Terminal signals are described as they exist when the Series 3000 EIA System is in the Off-Line mode.

7.5.1 Modem Port Signals (On-Line to Tape Mode)

7.5.1.1 Transmitted Data - Pin 2

Serial data output from Series 3000 EIA System.

7.5.1.2 Receive Data - Pin 3

Serial data input from modem.

7.5.1.3 Request to Send - Pin 4

This signal is an output from the Series 3000 EIA System. Request to Send is positive when the Series 3000 EIA System is in the Send mode and for 2 milliseconds after completion of the Send mode.

7.5.1.4 Clear to Send - Pin 5

This input signal from the modem must be positive in order for the Series 3000 EIA System to transmit data.

7.5.1.5 Data Set Ready - Pin 6

This input signal from the modem must be positive in order for the Series 3000 EIA System to transmit data. If the Auto Disconnect option is provided and a time out has occurred, Data Set Ready must go negative to reset Data Terminal Ready to the positive state.

The On-Line indicator will flash if Data Set Ready is negative and the system is in the On-Line mode.

7.5.1.6 Signal Ground - Pin 7

7.5.1.7 Carrier Detect (Also Called Receive Line Signal Detect) - Pin 8

This input signal from the modem is used in the Monitor mode to determine whether the monitoring device should receive data from the modem or the on-line device. If the carrier signal is positive, the monitoring device will receive data from the modem.

7.5.1.8 Secondary Receive Line Signal Detect (Reverse Channel Control) - Pin 12

This signal is used in 202 type modems for circuit assurance and start-stop transmission control. When the signal is positive the Series 3000 EIA System will send data if it is in the Send mode.

When the signal goes from positive to negative, a maximum of two more characters are transmitted; then transmission is held up indefinitely until the signal goes positive again.

NOTE: A mark condition on this line (pin 12) will cause the 3000 EIA System to stop or inhibit sending until the line goes to a space condition. For modems that do not have this signal, a switch provides the signal required to permit transmission.

The System is supplied with the Reverse Channel Control inhibited (switch 2 in section E4 is ON).

7.5.1.9 Data Terminal Ready - Pin 20

The Series 3000 EIA System will normally keep this line positive whenever power is on.

If the Series 3000 EIA System is equipped with the Auto Disconnect option, the Data Terminal Ready signal will go negative after a time-out period of no activity (provided a call has been established). Data Terminal Ready will stay negative until Data Set Ready (Pin 6) goes negative.

7.5.2 Terminal Port Signals (Off-Line Mode)

7.5.2.1 Transmitted Data - Pin 2

Serial data input from terminal.

7.5.2.2 Received Data - Pin 3

Serial data output from Series 3000 EIA System.

7.5.2.3 Request to Send - Pin 4

Input signal from terminal.

7.5.2.4 Clear to Send - Pin 5

The Terminal Clear to Send signal output from Series 3000 EIA System has three possible definitions depending upon the setting of the TCTS jumper wire near H1 on the EIA interface board. If the TCTS jumper wire is placed in the NORM position, Pin 5 will be positive whenever Request to Send (Pin 4) is positive. If the TCTS jumper wire is in the DEF (defeat) position it will be on (space) whenever the Series 3000 EIA System is off-line. If the TCTS jumper wire is placed in the BUSY position then Clear to Send will act as a busy signal and will be positive whenever:

a. the Series 3000 EIA System is idle
b. no fault condition exists
c. the Series 3000 EIA System is in the Send mode
d. the Series 3000 EIA System is in the Receive mode but has not received the Exit Receive character

7.5.2.5 Data Set Ready - Pin 6

This output signal from the Series 3000 EIA System is positive whenever power is applied to the System and the terminal is selected as an output or input device.

7.5.2.6 Signal Ground - Pin 7

7.5.2.7 Carrier Detect - Pin 8

This output signal from the Series 3000 EIA System is positive during an address enquiry sequence or whenever the System is sending data. This signal will go positive a minimum of 20 milliseconds prior to the first character of a Send mode or an Enquiry sequence.

NOTE: In some terminals the time between on condition of the CARRIER DETECT signal RS-232 pin 8 and the first character must be in the order of several milliseconds. If this is the case and the unit is equipped with the High Speed Search Option, placement of switch 1 in position E4 in the OFF position provides a constant CARRIER DETECT signal.

7.5.2.8 Data Terminal Ready - Pin 20

This input signal from the terminal enables the Series 3000 EIA System to transmit data. Data Terminal Ready must be held positive to allow sending of data.

7.5.3 Optional Current Loop Interface

The Optional Current Loop Interface is designed to interface to neutral devices (those devices that do not generate current or voltage). The optional interface will operate with 20 ma full duplex devices. To actuate the current loop interface, move the slide switch on the rear panel to the CL position. This will cause all outputs of the EIA terminal interface to go to the mark state. The four signals which comprise the current loop interface appear on unused pins of the terminal connector.

7.5.3.1 Transmitter Positive (TTY Distributor) - Pin 10

20 ma of current will flow into this pin when the transmitter is sending a mark signal.

7.5.3.2 Transmitter Negative - Pin 11

7.5.3.3 Receiver Positive (TTY Selector) - Pin 18

Positive current will flow into this pin when the Series 3000 EIA System or modem is sending a mark signal.

7.5.3.4 Receive Negative - Pin 25

7.6 INSTALLATION

Refer to the Technical Operation Manual for the unit for installation and check-out information.

PROGRAM (DAISY-CHAIN) CONNECTOR KIT IS SYKES PART NO. 1050A0865.

TO ORDER REPLACEMENT PROGRAM CARD - SPECIFY PART NO. PRINTED ON ORIGINAL CARD.

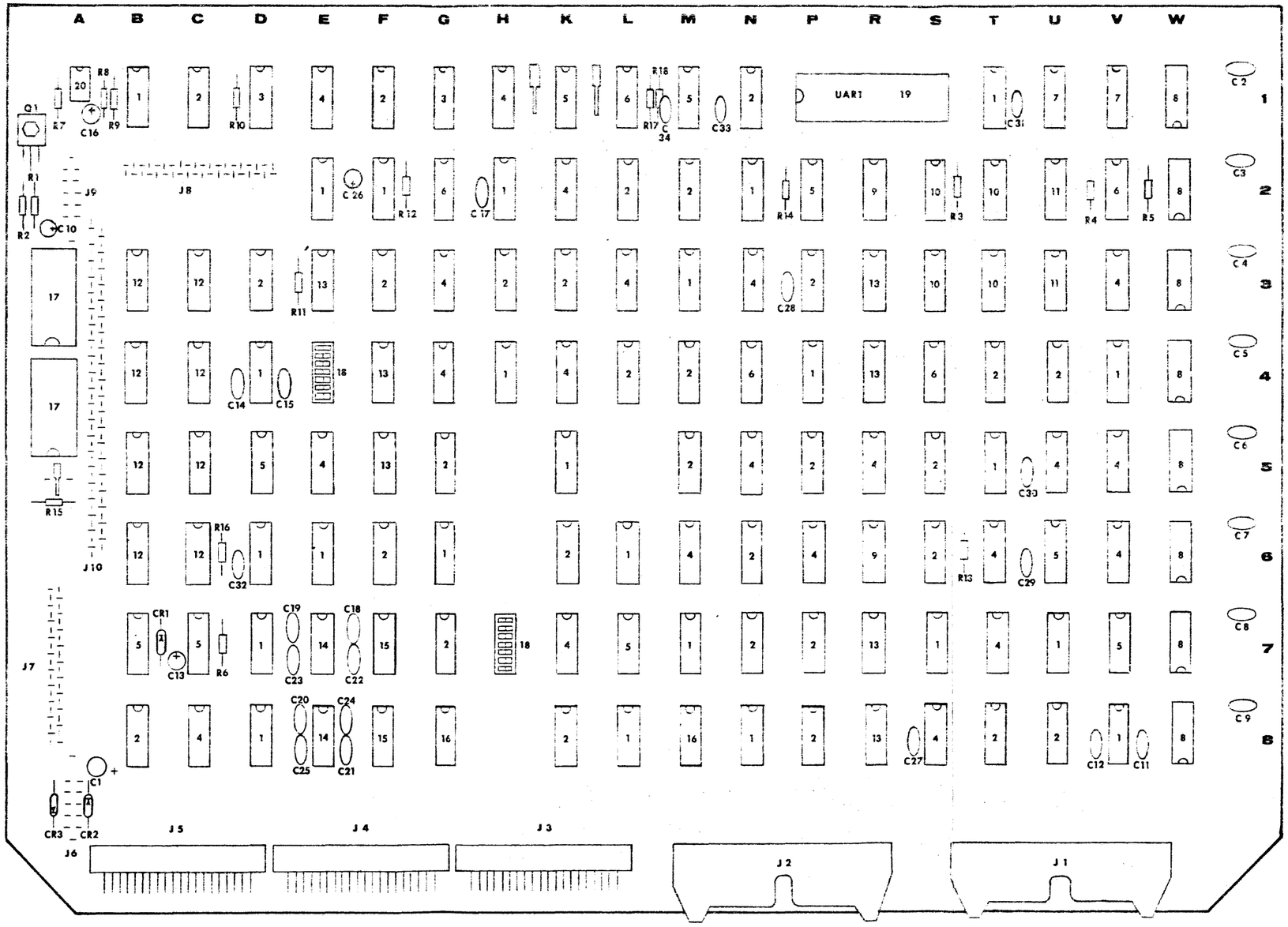


FIGURE 7-3 EIA INTERFACE BOARD - PART NO. 1050A0840

7.7 ELECTRICAL PARTS LIST - EIA INTERFACE BOARD

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
1	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
2	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A994659X
3	INTEGRATED CIRCUIT, TTuL/ MSI 9305, VARIABLE MUDULO COUNTER	100U16014	FAIRCHILD SEMI-CONDUCTOR	U7A930559X
4	INTEGRATED CIRCUIT, DTuL TRIPLE 3 INPUT NAND GATE	100U14002	FAIRCHILD SEMI-CONDUCTOR	U6A996259X
5	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMI-CONDUCTOR	U6A909359X
6	INTEGRATED CIRCUIT, DTuL DUAL 4 INPUT NAND BUFFER	100U14001	FAIRCHILD SEMI-CONDUCTOR	U6A994459X
7	INTEGRATED CIRCUIT, TTuL HEX INVERTER	100U16006	FAIRCHILD SEMI-CONDUCTOR	U6A901659X
8	INTEGRATED CIRCUIT, BIT MEMORY, FULLY DECODED RANDOM ACCESS	100U18001	MICROSYSTEMS	ML1101A
9	INTEGRATED CIRCUIT, 4-BIT LATCH	100U16012	FAIRCHILD SEMI-CONDUCTOR	9375
10	INTEGRATED CIRCUIT, TTuL 4-BIT SHIFT REGISTER	100U16001	FAIRCHILD SEMI-CONDUCTOR	U7B930059X
11	INTEGRATED CIRCUIT, SYNCHRONOUS 4-BIT UP/DOWN COUNTERS (DUAL CLOCK WITH GEAR)	100U16018	TEXAS INSTRUMENTS	SN74193
12	INTEGRATED CIRCUIT, TRIPLE GATE	100U16031	FAIRCHILD SEMI-CONDUCTOR	7427
13	INTEGRATED CIRCUIT, LPTTuL/ MSI 93L22, LOW POWER QUAD 2 INPUT MULTIPLEXER	100U16017	FAIRCHILD SEMI-CONDUCTOR	U7B93L2259X
14	INTEGRATED CIRCUIT, QUAD LINE RECEIVER	100U18004	MOTOROLA	RS-232-C
15	INTEGRATED CIRCUIT, QUAD LINE DRIVER	100U18003	MOTOROLA	RS-232-C
16	DIP RESISTOR PACKAGE, ±2%, 4.7K	103R01012	BECKMAN-HELIPOT	SERIES 899-1
17	INTEGRATED CIRCUIT, DECODER, ONE-OF-SIXTEEN, LOW POWER	100U16016	FAIRCHILD SEMI-CONDUCTOR	U6N93L1159X
18	SWITCH, 7-POSITION ROCKER	106S01004	AMP	435166-1
19	INTEGRATED CIRCUIT, RECEIVER/ TRANSMITTER, ASYNCHRONOUS	100U18002	GENERAL INSTRUMENT	AY-5-1012
20	INTEGRATED CIRCUIT, TIMER	100U17004	SIGNETICS	NE/SE 555
C1	CAPACITOR, TANTALUM, 100MFD, ±10%, 10V	105C04127	SPRAGUE	TYPE 196D
C2-9	CAPACITOR, DISC, 0.1uF, +80 -20%, 10V	120C03011	CENTRALAB	TYPE UK
C10, 13	CAPACITOR, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C11, 14, 15	CAPACITOR, DISC, 100PF, ±10%, 1KV	120C01027	CENTRALAB	TYPE DD

7.7 ELECTRICAL PARTS LIST - EIA INTERFACE BOARD

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
C12, 18-25, 27-30, 32	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
C16	CAPACITOR, TANTALUM, 1.0uF, ±10%, 35V	105C04137	SPRAGUE	TYPE 196D
C17	CAPACITOR, DISC, 220PF, ±10%, 1KV	120C01033	CENTRALAB	TYPE DD
C26	CAPACITOR, TANTALUM, 4.7uF, ±10%, 50V	105C04077	SPRAGUE	TYPE 196D
C31, 33, 34	CAPACITOR, DISC, .001uF, GMV, 1KV	120C01061	CENTRALAB	TYPE DD
CR1-3	DIODE, HIGH SPEED SILICON, SWITCHING	200C01001	G.E. SEMICONDUCTOR	IN4151
Q1	TRANSISTOR, POWER, PNP, SILICON	201Q01003	MOTOROLA	2N5193
R1	RESISTOR, CARBON COMP., 1/4W, ±5%, 47 OHM	100R02041		
R2	RESISTOR, CARBON COMP., 1/4W, ±5%, 200 OHM	100R02056		
R3-5, 7, 10, 11, 13-18	RESISTOR, CARBON COMP., 1/4W, ±5%, 4.7K	100R02089		
R6, 8	RESISTOR, CARBON COMP., 1/4W, ±5%, 10K	100R02097		
R9	RESISTOR, CARBON COMP., 1/4W, ±5%, 430K	100R02137		
R12	RESISTOR, CARBON COMP.,1/4W, ±5%, 22 OHM	100R02033		

I/O PANEL ASSEMBLY WITH PERIPHERAL KEYBOARD CONNECTOR (ILLUSTRATED) IS SYKES PART NO. 1050A0846

I/O PANEL ASSEMBLY WITHOUT PERIPHERAL KEYBOARD CONNECTOR IS SYKES PART NO. 1050A0845

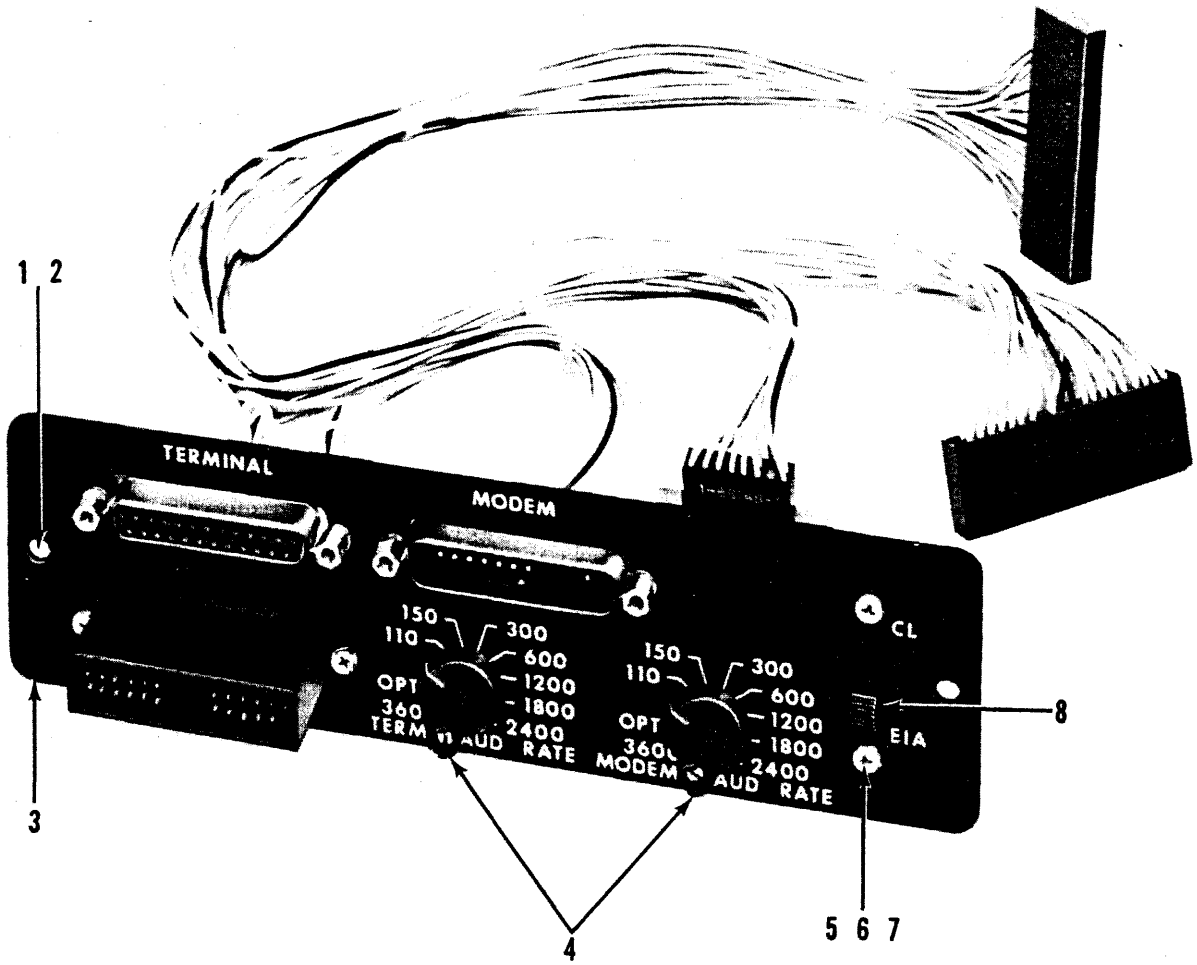
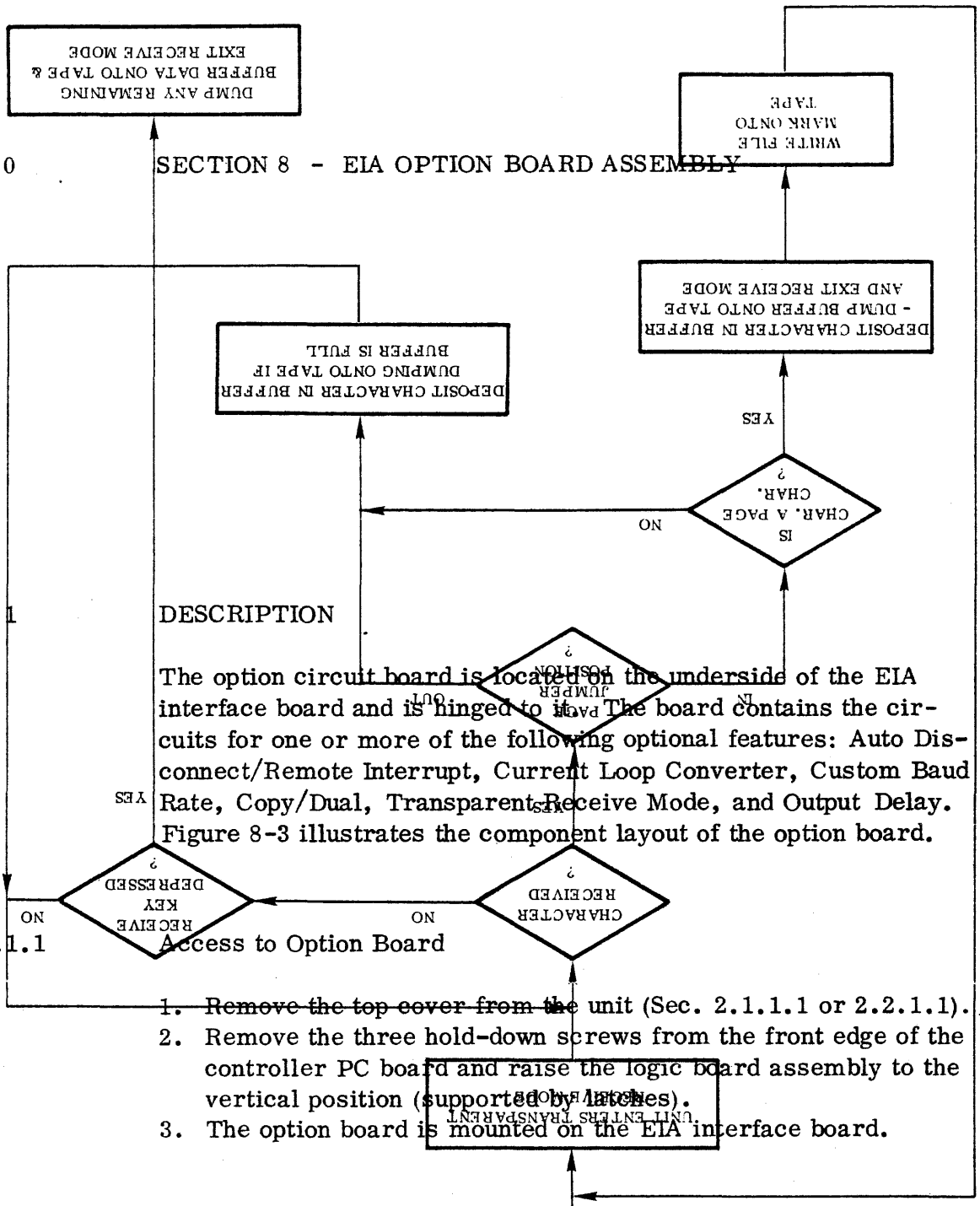


FIGURE 7-4 EIA INTERFACE I/O PANEL ASSEMBLY

7.8 PARTS LIST - EIA INTERFACE I/O PANEL ASSEMBLIES

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
1	PHILLIPS PAN HD SCREW, 6-32 x 3/8	100H01606		
2	LOCK WASHER #6, INT. TOOTH	200H03060		
3	PANEL ONLY	1050B0530		
4	ASSEMBLY, BAUD RATE SWITCHES ON PC BOARD	1050A0834		
5	PHILLIPS PAN HD SCREW, 4-40 x 1/4	100H01404		
6	LOCK WASHER #4, EXT. TOOTH	200H01401		
7	HEX NUT 4-40	500H10401		
8	SLIDER SWITCH, MINIATURE SNAP ACTION	103S01001	MICRO SWITCH	X42891-V3

FIGURE 8-1 FLOW CHART OF KEYBOARD CONTROLLED TRANSPARENT RECEIVE MODE



8.0 SECTION 8 - EIA OPTION BOARD ASSEMBLY

8.1 DESCRIPTION

The option circuit board is located on the underside of the EIA interface board and is hinged to it. The board contains the circuits for one or more of the following optional features: Auto Disconnect/Remote Interrupt, Current Loop Converter, Custom Baud Rate, Copy/Dual, Transparent Receive Mode, and Output Delay. Figure 8-3 illustrates the component layout of the option board.

8.1.1 Access to Option Board

1. ~~Remove the top cover from the~~ unit (Sec. 2.1.1.1 or 2.2.1.1).
2. Remove the three hold-down screws from the front edge of the controller PC board and raise the logic board assembly to the vertical position (supported by latches).
3. The option board is mounted on the EIA interface board.

8.1.2 Removal/Replacement

1. Disconnect the option board cables from J7, J8 and J9 on the EIA interface board.
2. Support the option board while removing the hex nuts from the two metal supporting posts.

3. Release the option board from the plastic supporting post (depress locking tab, freeing the board).
4. Replace in reverse order.

8.2 TRANSPARENT RECEIVE MODE OPTION

The circuitry for this option is located in Section A1 on the option board. Refer to the Flow Chart, Figure 8-1, and to the Schematic Diagram, "A1 - Transparent Mode Option" in Section 13.

The Transparent Receive Mode option allows the 3000 EIA System to operate in a Receive mode in which all control codes are recognized only as data and written on tape. The Transparent Receive Mode option may be used in two separate ways:

8.2.1 Keyboard Controlled Transparent Receive

By pressing the RECEIVE key on the control keyboard, a transparent Receive mode is entered during which all information received is written on tape and no control characters are decoded. This mode may be terminated by again pressing the RECEIVE key. Refer to Figure 8-1.

With the system in the Transparent Receive mode, one remote command (called PAGE) can be coded and recognized; provided such operation was previously enabled by means of a jumper connection in section A1 on the option circuit board. Select either the PAGE mode of operation, or a fully Transparent mode, by placing the PAGE jumper located in section A1 of the option board on the IN or OUT pin respectively. If the PAGE jumper is connected to IN, the receipt of a PAGE character will cause the present data buffer content including the PAGE character, to be written on tape. A File mark will then be written and the Transparent Receive mode re-entered to receive the next "page" of data.

After receipt of a PAGE character, there is a mandatory 500 msec delay before further data can be received. During this 500 msec, the data buffer is dumped onto tape and the File mark is written.

8.2.2 Remote Controlled Transparent Receive

Through use of a remote command "START TRANSPARENT RECEIVE" from the terminal or modem interface, a totally Transparent Receive mode is entered and all received information is put on tape with no command decoding. (Either of the two following methods for termination of the Remote Transparent Receive mode may be pre-selected by means of a jumper on the option board.

a. Timeout (T) - If the jumper wire at location A1 on the option board is connected to the "T" pin, the Transparent Receive mode will be terminated after a time interval during which no data has been received. This interval is selectable from 100 msec to 120 sec. by means of selector switches in section A1 on the option board (see table below). Switch 1, when ON, selects high range. If no characters are received for the selected interval, the data buffer content is written on tape and the Transparent Receive mode is terminated.

Delay Time	Switch 1	Switch 2	Switch 3	Switch 4
100 ms	OFF	OFF	OFF	ON
475 ms	OFF	OFF	ON	OFF
1 sec	OFF	ON	OFF	OFF
11 sec	ON	OFF	OFF	ON
52 sec	ON	OFF	ON	OFF
120 sec	ON	ON	OFF	OFF

b. Carrier Detect Drop (CD) - If the jumper wire at location A1 on the option board is connected to the "CD" pin, the Transparent Receive mode will be terminated when the carrier detect signal from the modem port goes negative (carrier off).

If entered via a remote START TRANSPARENT RECEIVE command, the Transparent Receive mode will normally be terminated only as described under a. or b. above; not by pressing the RECEIVE key on the control keyboard.

8.3 CURRENT LOOP TO RS-232 CONVERTER OPTION

The circuitry for this option is located in section A2 on the option board. Refer to the Schematic Diagram "A2 - Current Loop Option"

in Section 13. This option converts the 20 ma current loop output of a full-duplex TTY or other current loop terminal to RS-232-C levels. The terminal then operates in a conventional manner. The current loop interface operates full-duplex only.

The current loop interface is designed to provide an echo character whenever the terminal transmits a character. The echo is always active in the Off-Line mode. In the On-Line mode, the current loop terminal may or may not need an echo character depending on whether the modem or computer supplies one. In this case, the user has the option of strapping the echo feature IN or OUT for the On-Line mode. The ECHO jumper is located near section A2 of the option board.

8.4 COPY/DUAL OPTION (Dual Transport Systems Only)

The circuitry for the Copy/Dual option is located in Section A3 of the option board. Refer to the Option Board Schematic Diagram, "A3 - Copy/Dual Option" in Section 13. See Figure 8-2 for a flow chart of the Copy File sequence.

The Copy portion of this option allows any record, file, or all recorded information on a cassette to be duplicated exactly on a second cassette (see Figure 8-2). When this is done, information is copied from a cassette placed on the left transport (tape 1) onto a cassette on the right transport (tape 2). The information written on tape 2 is an exact replica of that on tape 1; including all tape marks and High Speed Search address information. For this reason, the new tape must be searched with the same addresses as the original tape.

The Dual portion of this option allows the Series 3000 EIA System to write received information on two cassettes simultaneously. When the Dual mode is entered, information received by the 3000 EIA System will be written simultaneously on the cassettes in both transports. The Dual mode will be maintained until cleared by a reset code or by pressing the CLEAR key on the control keyboard.

8.5 OUTPUT DELAY OPTION

The Output Delay option circuitry is located in section A4 of the option board. Refer to the Option Board Schematic Diagram, "A4 - Output Delay Option" in Section 13.

The option is primarily used to provide a delay after a carriage return or line feed character to allow a electromechanical device, such as a 30 character per second printer, time to perform line feeds or carriage returns before the next printable character is transmitted.

The option is also required when it is desired to send from one Sykes 3000 EIA unit to another.

Seven automatic time delays, from 165 milliseconds to 1 second, for up to three characters are provided. The rocker switches located in section A4 of the option board can be set to the specific delay interval required as shown in the table below. These switches are closed when the end nearest the ON indication is depressed. Switch 1, when ON, activates the delay.

Delay Time	Switch 2	Switch 3	Switch 4
165 ms	ON	ON	ON
200 ms	ON	ON	OFF
230 ms	ON	OFF	ON
300 ms	ON	OFF	OFF
380 ms	OFF	ON	ON
615 ms	OFF	ON	OFF
1 sec	OFF	OFF	ON

The specific characters which cause the delay are programmed by a removable 40 pin connector. (See Technical Operation Manual for programming information.)

8.6 CUSTOM BAUD RATE OPTION

The circuitry for this option is located in section A5 on the option board. Refer to the Schematic Diagram, "A5 - Custom Baud Rate Option" in Section 13. This option provides a variable baud rate in the 50 to 4000 baud range. When the baud rate switch on the back panel of the System cabinet is in the OPT (optional) position, the System operates at the custom baud rate.

The custom baud rate is adjusted using the coarse and fine potentiometers (R3 and R4) located in section A5 of the option board.

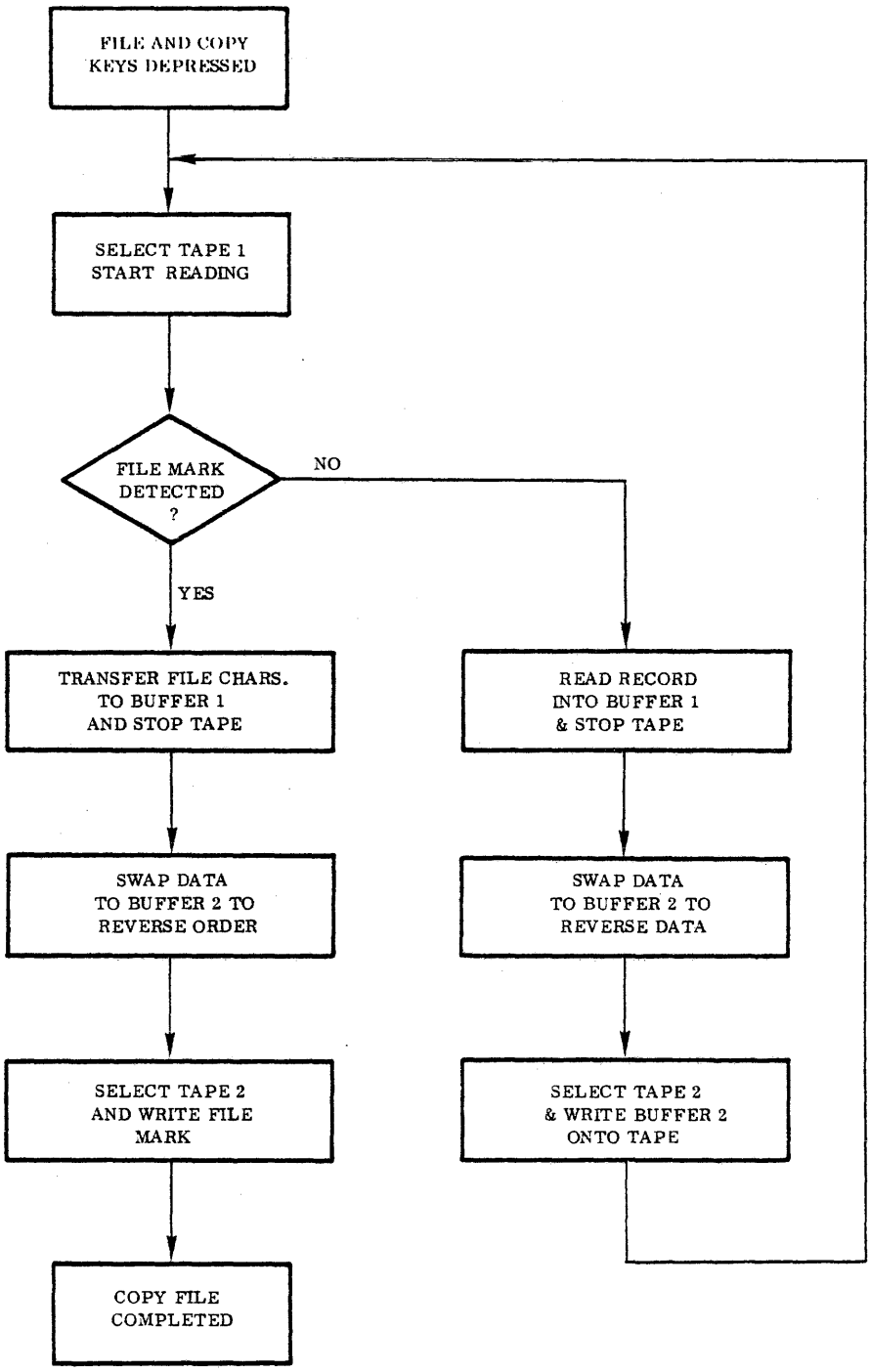


FIGURE 8-2 FLOW CHART OF COPY FILE SEQUENCE

Monitor the square wave output at D1-12 on the EIA Board with a frequency meter or oscilliscope. The frequency of the square wave at D1-12 must be exactly 16 times the desired baud rate. For example, if the optional baud rate is to be set for 1000 baud operation:

Frequency at test point = 16 x 1000 Hz = 16 kHz

Adjust R3 and R4 to obtain the desired frequency.

8.7 AUTO DISCONNECT/REMOTE INTERRUPT OPTION

Refer to the Schematic Diagram, "A6 - Auto Disconnect/Remote Interrupt Option" in Section 13. The circuitry for this option is located in section A6 of the option board. It provides two features:

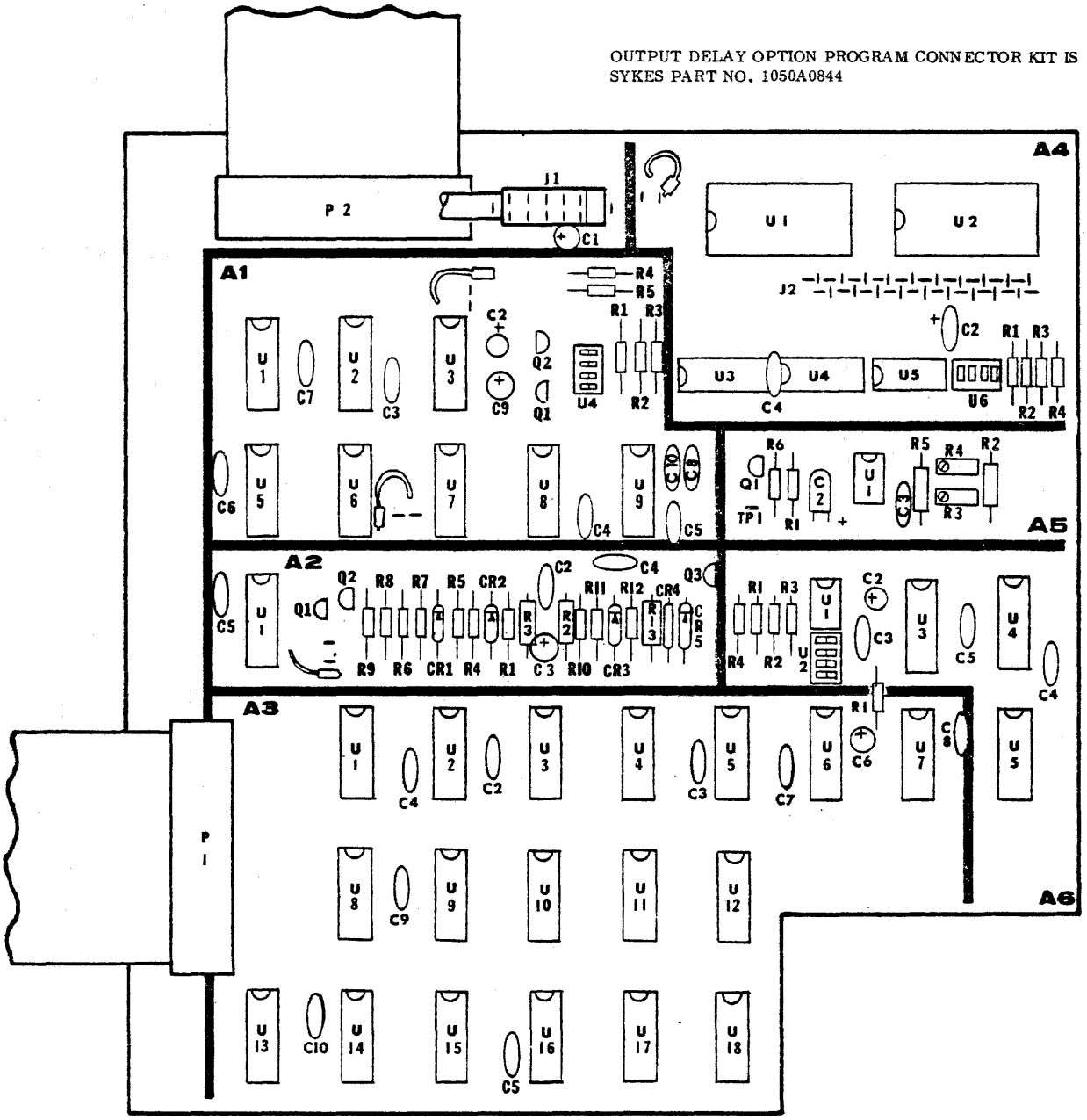
The Auto Disconnect feature is operational when the 3000 EIA System is operating On-Line to a remote station and is controlled by that station (i.e., local station unattended). The modem is caused to disconnect from the remote station whenever a pre-set adjustable period of inactivity is detected. (No Carrier Detect or Request to Send). The delay interval can be set by the user by means of rocker switches in section A6 of the option board as shown in the table below. (These switches are closed when the end nearest the ON indication is depressed.)

Delay Time	Switch 1	Switch 2
10 sec	ON	ON
15 sec	ON	OFF
50 sec	OFF	ON

Switch 3, when ON, allows auto-disconnect after specific delay. When switch 3 is OFF, Data Terminal Ready (modem port is always ON).

The Remote Interrupt feature provides the capability of interrupting an Off-Line mode, clearing the current operation (if any), and placing the Series 3000 EIA System on-line. At the time when the circuit would normally disconnect from the modem, the System will return to the Off-Line state. (The On-Line/Device Select option is a prerequisite for this option.)

Rocker switch 4 located in section A6 of the option board , when ON, enables the off-line interrupt.



TO ORDER REPLACEMENT OPTION BOARD ASSEMBLY
SPECIFY THE OPTIONS INCLUDED ON ORIGINAL BOARD,
ALSO PART NO. 1050A0826

FIGURE 8-3 EIA OPTION BOARD

8.8 ELECTRICAL PARTS LIST - EIA OPTION BOARD

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
	PARTS COMMON TO ALL OPTIONS ON BOARD A1:			
C1	CAPACITOR, TANTALUM, 22uF, 15V	105C04105	SPRAGUE	TYPE 196D
	PARTS IN SECTION A1 OF BOARD A1 - TRANSPARENT MODE OPTION:			
C2	CAPACITOR, TANTALUM, 1.0uF, 50VDC, ±10%	105C04062	SPRAGUE	TYPE 196D
C3-5	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
C6, 7	CAPACITOR, DISC, .1uF, 10V, +80 -20%	120C03011	CENTRALAB	TYPE UK
C8	CAPACITOR, DISC, 220PF, ±10%, 1KV	120C01033	CENTRALAB	TYPE DD
C9	CAPACITOR, TANTALUM, 100uF, ±10%, 10V	105C04127	SPRAGUE	TYPE 196D
C10	CAPACITOR, DISC, .001uF, 1KV, GMV	120C01061	CENTRALAB	TYPE DD
Q1, 2	TRANSISTOR, PNPN	203Q01001	G.E. SEMICONDUCTOR	2N6028 (D13T2)
R1	RESISTOR, CARBON COMP., 1/4W, ±5%, 75K	100R02118		
R2	RESISTOR, CARBON COMP., 1/4W, ±5%, 360K	100R02134		
R3	RESISTOR, CARBON COMP., 1/4W, ±5%, 820K	100R02143		
R4	RESISTOR, CARBON COMP., 1/4W, ±5%, 30K	100R02108		
R5	RESISTOR, CARBON COMP., 1/4W, ±5%, 47K	100R02113		
U1, 2, 6, 8	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMI-CONDUCTOR	U6A909359X
U3, 9	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
U4	SWITCH, ROCKER, 4 POSITION	106S01001	AMP	435166-2
U5	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A994659X
U7	INTEGRATED CURCUIT, DTuL TRIPLE 3 INPUT NAND GATE	100U14002	FAIRCHILD SEMI-CONDUCTOR	U6A996259X
	PARTS IN SECTION A2 OF BOARD A1 - CURRENT LOOP OPTION			
C2	CAPACITOR, DISC, .01uF, ±20%, 50V	120C03040	CENTRALAB	TYPE UK
C3	CAPACITOR, TANTALUM, 1.0uF, ±10%, 50V	105C04062	SPRAGUE	TYPE 196D

8.8 ELECTRICAL PARTS LIST - EIA OPTION BOARD

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
C4	CAPACITOR, DISC, 100PF, ±10%, 1KV	120C01027	CENTRALAB	TYPE DD
C5	CAPACITOR, DISC, .1uF, +80 -20%, 10V	120C03011	CENTRALAB	TYPE UK
CR1-5	RECTIFIER, MOLDED SILICON, 750MA	200C02001	INTERNATIONAL RECT.	IN2070
R1, 11	RESISTOR, CARBON COMP., 1/4W, 100 OHMS, ±5%	100R02049		
R2, 13	RESISTOR, CARBON COMP., 1/2W, 470 OHMS, ±5%	100R03065		
R3	RESISTOR, CARBON COMP., 1/2W, 680 OHMS, ±5%	100R03069		
R4	RESISTOR, CARBON COMP., 1/4W, ±5%, 1K	100R02073		
R5	RESISTOR, CARBON COMP., 1/4W, ±5%, 6.8K	100R02093		
R6	RESISTOR, CARBON COMP., 1/4W, ±5%, 9.1K	100R02096		
R7	RESISTOR, CARBON COMP., 1/4W, ±5%, 5.6K	100R02091		
R8	RESISTOR, CARBON COMP., 1/4W, ±5%, 33K	100R02109		
R9, 10, 12	RESISTOR, CARBON COMP., 1/4W, ±5%, 1.5K	100R02077		
U1	INTEGRATED CIRCUIT, DTuL DUAL 4 INPUT NAND BUFFER	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A994459X
	PARTS IN SECTION A3 OF BOARD A1 - COPY/DUAL OPTION			
C2, 3, 5, 7	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
C4	CAPACITOR, DISC, .001uF, 1KV, GMV	120C01061	CENTRALAB	TYPE DD
C6	CAPACITOR, TANTALUM, 1.0uF, ±10%, 50V	105C04062	SPRAGUE	TYPE 196D
C8, 9, 10	CAPACITOR, DISC, .1uF, +80 -20%, 10V	120C03011	CENTRALAB	TYPE UK
R1	RESISTOR, CARBON COMP., 1/4W, ±5%, 12K	100R02099		
U1-4, 7, 16	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMI-CONDUCTOR	U6A909359X
U5, 9, 13, 15	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
U6	INTEGRATED CIRCUIT, RETRIG-GERABLE MONOSTABLE MULTI-VIBRATOR	100U14007	FAIRCHILD SEMI-CONDUCTOR	U6A960159X
U8, 11, 14	INTEGRATED CIRCUIT, DTuL TRIPLE 3 INPUT NAND GATE	100U14002	FAIRCHILD SEMI-CONDUCTOR	U6A996259X
U10, 12, 17, 18	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A996259X

8.8 ELECTRICAL PARTS LIST - EIA OPTION BOARD

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
	PARTS IN SECTION A4 ON BOARD A1 - OUTPUT DELAY OPTION			
C2	CAPACITOR, TANTALUM, 100uF, ±10%, 10V	105C04127	SPRAGUE	TYPE 196D
C4	CAPACITOR, DISC, .1uF, +80 -20%, 10V	120C03011	CENTRALAB	TYPE UK
R1	RESISTOR, CARBON COMP., 1/4W, ±5%, 4.7K	100R02089		
R2	RESISTOR, CARBON COMP., 1/4W, ±5%, 9.1K	100R02096		
R3	RESISTOR, CARBON COMP., 1/4W, ±5%, 18K	100R02103		
R4	RESISTOR, CARBON COMP., 1/4W, ±5%, 30K	100R02108		
U1, 2	INTEGRATED CIRCUIT, MULTI-PURPOSE DECODER	100U16016	FAIRCHILD SEMI-CONDUCTOR	U6N93L1159X
U3	INTEGRATED CIRCUIT, TRIPLE GATE	100U16031	FAIRCHILD SEMI-CONDUCTOR	SN7427
U4	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
U5	INTEGRATED CIRCUIT, RETRIG-GERABLE MONOSTABLE MULTI-VIBRATOR	100U14007	FAIRCHILD SEMI-CONDUCTOR	U6A960159X
U6	ROCKER SWITCH, 4 POSITION	106S01001	AMP	435166-2
	PARTS IN SECTION A5 ON BOARD A1 - CUSTOM BAUD RATE OPTION			
C2	CAPACITOR, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C3	CAPACITOR, GLASS DISC, 620PF, ±5%, 300V	120C05061	CORNING ELECTRONICS	STYLE TYO7
Q1	TRANSISTOR, NPN, ANNULAR HIGH SPEED SWITCHING	202Q01002	MOTOROLA	2N4264
R1	RESISTOR, CARBON COMP, 1/4W, ±5%, 10K	100R02097		
R2	RESISTOR, METAL FILM, 1/8W, ±1%, 1.0K	101R01193		
R3	POTENTIOMETER, 250K, 66W SERIES	110R03048	ALLEN BRADLEY	SERIES 66W
R4	POTENTIOMETER, 500 OHMS, 66W, SERIES	110R03018	ALLEN BRADLEY	SERIES 66W
R5	RESISTOR, METAL FILM, 1/8W, ±1%, 499 OHMS	101R01164		
R6	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.2K	100R02081		
U1	INTEGRATED CIRCUIT, MONO-LITHIC TIMING CIRCUIT	100U17004	SIGNETICS	NE/SE555

8.8 ELECTRICAL PARTS LIST - EIA OPTION BOARD

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
	PARTS IN SECTION A6 OF BOARD A1 - AUTO DISCONNECT/REMOTE INTERRUPT OPTION			
C2	CAPACITOR, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C3	CAPACITOR, DISC, .01uF, ±20%, 50V	120C03040	CENTRALAB	TYPE UK
C4	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
C5	CAPACITOR, DISC, .1uF, 10V	120C03011	CENTRALAB	UK10-104
R1	RESISTOR, CARBON COMP., 1/4W, ±5%, 630K	100R02140		
R2	RESISTOR, CARBON COMP., 1/4W, ±5%, 2.2M	100R02152		
R3, 4	RESISTOR, CARBON COMP., 1/4W, ±5%, 4.7K	100R02089		
U1	INTEGRATED CIRCUIT, MONOLITHIC TIMING CIRCUIT	100U17004	SIGNETICS	NE/SE555
U2	SWITCH, ROCKER, 4 POSITION	106S01001	AMP	435166-2
U3	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMICONDUCTOR	U6A994659X
U4	INTEGRATED CIRCUIT, DTuL DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMICONDUCTOR	U6A909359X
U5	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMICONDUCTOR	U6A993659X

9.0 SECTION 9 - BREADBOARD INTERFACE, SERIES 3000 CTC UNITS

9.1 BREADBOARD INTERFACE KIT

9.1.1 General

This kit includes a wire wrap breadboard upon which the interface may be constructed. The breadboard mounts onto the controller board inside the Series 3000 Unit enclosure. A cable to the rear I/O panel is also provided. Specifically, the wire wrap breadboard kit consists of:

1. A printed circuit board with:
   - one hundred dual-in-line IC sockets (14-16 pin)
   - three 24 or 28 pin dual-in-line IC sockets
   - one 36 or 40 pin dual-in-line IC socket
   - one tantalum and seven disc ceramic capacitors on power bus
   - wire wrap terminals, capable of 2 wraps; one connected to each pin of the I/O connectors, one to each pin of every IC socket, and one to both ground and +5 volts at every IC socket
2. Two flat cables which connect the wire wrap breadboard to the controller board.
3. Cables and plugs which carry 78 signal lines between the interface and the back panel connector.
4. A 106 pin plug which mates with the back panel connector, also pins necessary to connect it.
5. All hardware to secure the interface board to the controller board.

The wire list for the rear panel connector is in Section 9.3. Note that a separate connector (J3) is provided on the interface board to facilitate connection of the HSSO if used. A pin number list for this connector is found in Section 9.4.

For interface design information, refer to Sykes Manual No. 9991C3001, "Interface Specification - Series 3000 Cassette Tape Controller and High Speed Search Option".

9.1.2 Access to Interface Board in Unit

1. Remove the top cover from the unit (Sec. 2.1.2.2 or 2.2.2.2).
2. Remove the three retaining screws near the front edge of the controller PC board and raise the hinged logic boards assembly to the vertical position (supported by catches).
3. Raise the logic boards to the vertical position (supported by catches).

9.1.3 Removal/Replacement

1. Remove the three screws securing the bottom of the board to the pivoting support bar.
2. Carefully support the board while releasing the supporting pins between the controller board and interface board (depress locking tabs on pins).
3. Detach all cable connectors from the board.
4. Replace in reverse order.

9.2 PIN NUMBER LIST - SIGNALS BETWEEN CONTROLLER BOARD AND WIRE WRAP BREADBOARD INTERFACE BOARD

Because of the flat cables and right angle headers used to interconnect the controller board and interface board, the pin numbers differ for the same signal at each board. The connector pin assignments are as follows:

J1 HEADERS			J2 HEADERS		
CONTROLLER	INTFC BD	SIGNAL	CONTROLLER	INTFC BD	SIGNAL
J1 - 1	J1 -40		J2 - 1	J2 - 40	RW2D/
2	39		2	39	RW1D/
3	38	RDB7/	3	38	OCLR/
4	37		4	37	SERD/
5	36	RDB8/	5	36	XCLR/
6	35		6	35	TAMS/
7	34	WDB8/	7	34	OPDN/
8	33		8	33	TKST/
9	32	WDB7/	9	32	CSR1/
10	31		10	31	DK2P/
11	30	WDB6/	11	30	CSR2/
12	29	RDB6/	12	29	REW2/
13	28	WDB5/	13	28	IBSY/
14	27	WDB4/	14	27	REW1/
15	26	RDB1/	15	26	HSFD/
16	25	WDB3/	16	25	TAP1/
17	24	WDB1/	17	24	STL2/
18	23	WDB2/	18	23	TAP2/
19	22	WDAC/	19	22	STL1/
20	21	RDB5/	20	21	EOT1/
21	20	RDRY/	21	20	TP1R/
22	19	RDB4/	22	19	EOT2/
23	18	CERD/	23	18	TP2R/
24	17	RDB3/	24	17	FALT/
25	16	WDRY/	25	16	EOFC/
26	15	RDB2/	26	15	TKPV/
27	14	RDAC/	27	14	CHCK/
28	13	GLDP/	28	13	PAUS/
29	12	SKIP/	29	12	LDPT/
30	11	WRIT/	30	11	
31	10	READ/	31	10	SECK/
32	9	FILE/	32	9	
33	8	BKSP/	33	8	CLOK/
34	7	MFIL/	34	7	
35	6	EORD/	35	6	
36	5	ENDM/	36	5	
37	4		37	4	
38	3		38	3	
39	2		39	2	
40	1		40	1	

9.3 WIRE LIST - CABLE FROM WIRE WRAP BREADBOARD TO REAR I/O PANEL

The cable connector assembly which interconnects the wire wrap breadboard and rear I/O panel assembly consists of a 106 pin jack (J1) on the rear panel and two 40 pin plugs, P1 and P2 (which mate with J4 and J5 respectively, on the interface board). The connector pin assignments are as follows:

J1 TO P1		
Wire No.	Position in J1	Position in P1
1	A5	1
2	A6	2
3	A7	3
4	B5	4
5	B6	5
6	B7	6
7	C5	7
8	C6	8
9	C7	9
KEY	-	10
10	D1	11
11	D2	12
12	D3	13
13	D4	14
14	D5	15
15	D6	16
16	D7	17
17	E1	18
18	E2	19
19	E3	20
20	E4	21
21	E5	22
22	E6	23
23	E7	24
24	F1	25
25	F2	26
26	F3	27
27	F4	28
28	F5	29
29	F6	30
30	F7	31
31	G5	32
32	G6	33
33	G7	34
34	H5	35
35	H6	36
36	H7	37
37	J5	38
38	J6	39
39	J7	40

J1 TO P2		
Wire No.	Position in J1	Position in P2
40	A12	1
41	A13	2
42	A14	3
43	B12	4
44	B13	5
45	B14	6
46	C12	7
47	C13	8
48	C14	9
49	D12	10
KEY	-	11
50	D13	12
51	D14	13
52	D15	14
53	D16	15
54	D17	16
55	D18	17
56	E12	18
57	E13	19
58	E14	20
59	E15	21
60	E16	22
61	E17	23
62	E18	24
63	F12	25
64	F13	26
65	F14	27
66	F15	28
67	F16	29
68	F17	30
69	F18	31
70	G12	32
71	G13	33
72	G14	34
73	H12	35
74	H13	36
75	H14	37
76	J12	38
77	J13	39
78	J14	40

9.4 PIN NUMBER LIST - SIGNALS BETWEEN HIGH SPEED SEARCH OPTION BOARD AND WIRE WRAP INTERFACE BOARD

HSSO SIGNAL MNEMONIC	WIRE WRAP INTFC BD	HSSO BOARD
ASEQ/	J3 - 20	J3 - 40
HSFD/	40	39
TAMS/	19	38
WDRY/	39	37
MFIL/	18	36
OCLR/	38	35
MARK/	17	34
SKPF/	37	33
DO5	16	32
DO7	36	31
DO6	15	30
DO8	35	29
EOFC/	14	28
HBAK/	34	27
UDA/	13	26
SREW/	33	25
HCLK/	12	24
URDS/	32	23
ENQR/	11	22
	31	21
DI2	10	20
DI6	30	19
DO3	9	18
DI5	29	17
DO4	8	16
DI7	28	15
DO2	7	14
DI8	27	13
DO1	6	12
SRCH	26	11
TCHAR	5	10
SARF	25	9
	4	8
ADEN	24	7
SUDS/	3	6
DI4	23	5
DI1	2	4
GEN1	22	3
DI3	1	2
HREF/	21	1

NOTES:

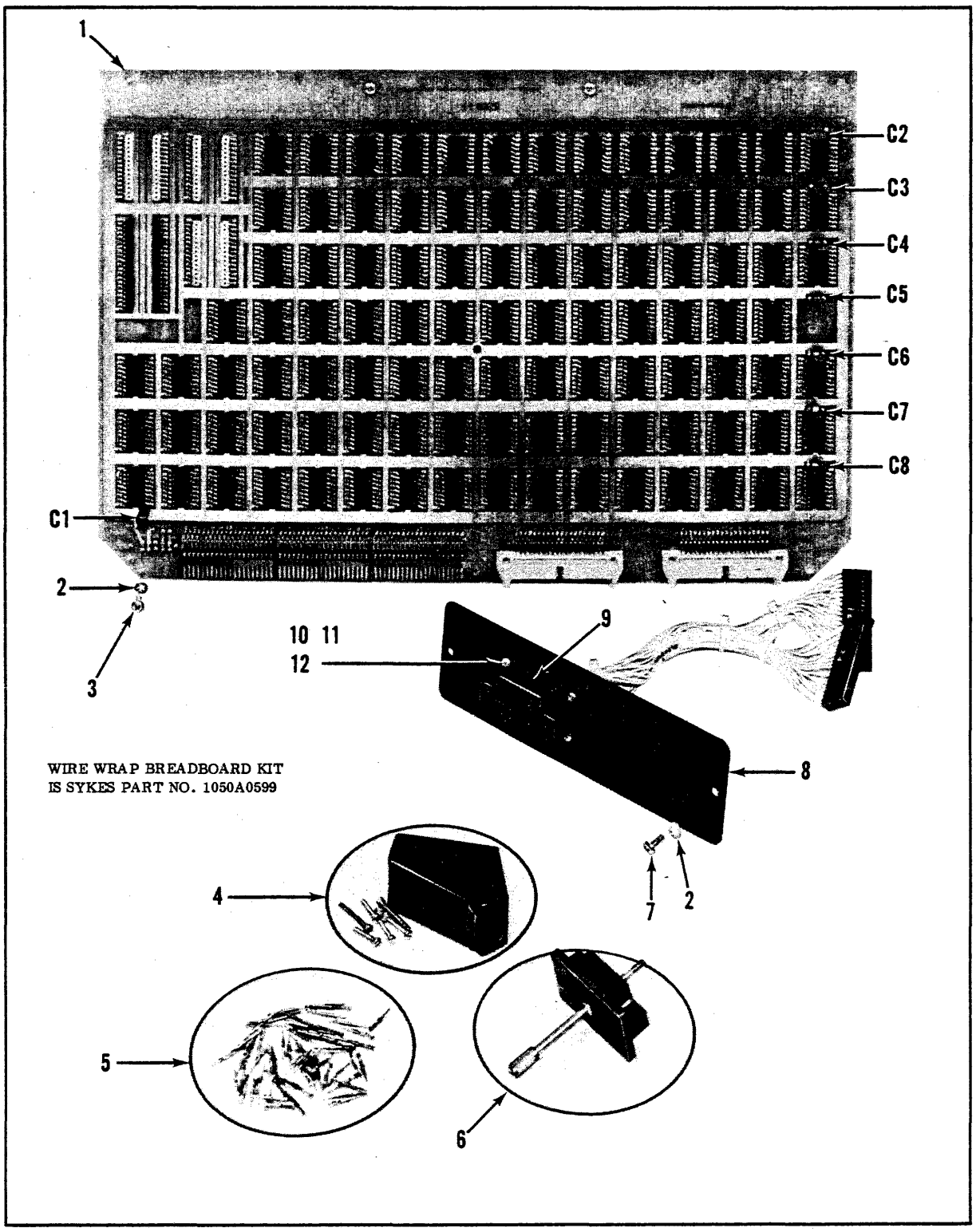


FIGURE 9-1 WIRE WRAP BREADBOARD KIT

9.5 PARTS LIST - WIRE WRAP BREADBOARD INTERFACE COMPONENTS

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
1	WIRE WRAP INTERFACE BREADBOARD ASSEMBLY	1050B0595		
2	LOCK WASHER #6, INTERNAL TOOTH	200H03060		
3	PHILLIPS PAN HD SCREW, 6-32 x 5/16	100H01605		
4	CONNECTOR HOOD ASSEMBLY. 106 POSITION	100J11326		
5	CONNECTOR SOCKET CONTACTS (PKG. OF 90)	100J11333	AMP INC.	
6	CONNECTOR, SOCKET HOUSING, 106 POSITION	100J11306		
7	PHILLIPS PAN HEAD SCREW, 6-32 x 3/8	100H01606		
8	I/O CONNECTOR PANEL AND HARNESS ASSEMBLY, BREAD BOARD INTERFACE KIT	1050A0598		
8	I/O CONNECTOR PANEL	1050B0597		
9	CONNECTOR, 106 POSITION HEADER	100J11316		
10	PHILLIPS PAN HD SCREW, 4-40 x 7/16	100H01407		
11	LOCK WASHER #4, EXT. TOOTH	200H01401		
12	HEX NUT 4-40	500H10401		
C1	CAPACITOR, TANTALUM, 100uF, ±10%, 10V	105C04127	SPRAGUE	TYPE 196D
C2-8	CAPACITOR, DISC, 0.1uF, +80 -20%, 10V	120C03011	CENTRALAB	TYPE UK

10.0 SECTION 10 - CONTROL SWITCH & PC BOARD ASSEMBLIES FOR FRONT PANEL & FOR PERIPHERAL KEYBOARD

NOTE: In this Section, the numbers in parenthesis following part names in the text are for the purpose of parts identification. They are reference numbers which appear in the appropriate Parts Illustration and Parts List at the end of this Section.

10.1 General

The integral and peripheral EIA keyboard switch modules (12, 24, 25) and the left and right hand front panel switch modules (8, 9, 13) are similar in construction. Each of these modules consists of a molded bezel with "key" and indicator lens openings, plus the following components contained within the bezel (in the following order, front to back): (a) a mylar* legend sheet imprinted with the key designations; (b) a flexible conductive plastic contactor sheet; (c) a mylar insulation sheet with openings corresponding with the key openings in the bezel; (d) a PC board with switch contacts, traces and connection posts for each key position. The switch modules are attached to a printed wire board which contains the light-emitting diode (LED) indicators, additional control circuitry (if any), and connector posts for cabling. The connector posts of the switch modules are soldered to the supporting wire board. The indicator lenses (4) are retained by ring clips.

Depending upon the options selected at time of purchase, certain keys may be permanently covered with plastic caps. In this case, some unused circuitry may be included in the unit.

CAUTION: The legend sheets of the key switches are flexible mylar plastic. With the intended fingertip operation, the mylar will withstand years of normal use; however, pressing the keys with sharp, hard objects can damage the mylar sheets and impair switch action.

*Mylar is a registered trademark of E.I. Dupont de Nemours and Co., Inc.

10.2 LEFT AND RIGHT HAND CONTROL SWITCH MODULES

10.2.1 General

Refer to Figure 10-1. Essentially, the controls and indicators contained in these modules (8,9,13) are associated with manual operations requiring the operator to be at the unit.

The switch modules located at the right and left ends of the control panel of the dual transport units (or at right end only on single transport units) control transports #1 and #2 respectively. Both of these switch modules have keys which can initiate high speed forward tape movement or a high speed rewind of the associated tape. The module on the right end also includes a CLEAR key which clears all logic in the controller. On dual transport 3220 EIA Systems, the switch module on the left may contain DUAL and COPY option keys. All other switch positions in these modules are normally unused; however, spare switches are provided in the two unused positions of the right hand module on Series 3000 CTC Units.

In all Series 3000 Units, the right and left hand switch modules are mounted on a common printed wire board. (On Series 3000 EIA Systems, the same printed wire board also supports the center keyboard module.)

10.2.2 Removal/Replacement - Desk Top Units

1. Detach the front panel from the Series 3000 Unit enclosure (Sec. 2.1.2.2).
2. Disconnect the cabling from the printed wire board assembly on which the two switch modules are mounted.
3. Remove the four hex nuts which retain the printed wire board assembly.
4. The switch module(s) may be unsoldered and removed from the printed wire board assembly to allow replacement of the light emitting diodes or other components.
5. Replace in reverse order, making certain that the chassis ground wire is connected under the hex nut on the stud nearest the power switch/indicator.

10.2.3 Removal/Replacement - Rack Mountable Units

1. Detach the front panel from the unit enclosure (Sec. 2.2.2.2).
2. Disconnect the cabling from the printed wire board assembly which supports the switch modules.
3. Remove the three screws which retain the switch modules cover on the front panel and remove the cover. (Do not lose the molded fastener for the center screw.)
4. Remove the four screws and lock washers which fasten the keyboard printed wire board assembly to the front panel.
5. The switch module(s) may be unsoldered and removed from the printed wire board assembly to allow replacement of the light-emitting diodes or other components.
6. Replace in reverse order, making certain that the chasis ground wire is connected under the keyboard retaining screw nearest the power switch/indicator.

10.3 INTEGRAL CONTROL KEYBOARD - SERIES 3000 EIA SYSTEMS

10.3.1 General

For descriptions of the various keyboard controlled functions, refer to the Technical Operation Manual for the system.

Refer to Figure 10-1. The integral keyboard assembly includes control switch module(s) (Sec. 10.2) assembled with the keyboard switch module (12) on a common printed wire board.

In Desk Top Systems, a metal brace (11) and spacer bushings attached to the PC board provide support for the center area of the keyboard switch module, and the keyboard wire board assembly is secured, by means of four hex nuts, to studs on the inner surface of the front panel of the system enclosure.

In Rack Mountable Systems, the keyboard assembly is mounted to the front panel with four screws and is enclosed by the switch modules cover which is retained by three screws.

10.3.2 Removal/Replacement - Desk Top Systems

1. Detach the front panel from the system enclosure (Sec. 2.1.2.2).

2. Disconnect the cabling from the keyboard assembly PC board.
3. Remove the four hex nuts (3), lock washers, and spacers (1) which retain the keyboard assembly.
4. The switch modules may be unsoldered and removed from the keyboard wire board assembly to allow replacement of the light emitting diodes or other compenents.
5. Replace in reverse order, making certain that the chassis ground wire is connected under the hex nut on the stud nearest the power switch/indicator.

10.3.3 Removal/Replacement - Rack Mountable Systems

1. Detach the front panel from the system enclosure (Sec. 2.2.2.2).
2. Disconnect the cabling from the keyboard printed wire board assembly.
3. Remove the three screws which retain the switch modules cover on the front panel and remove the cover. (Do not lose the molded fastener for the center screw.)
4. Remove the four screws (7) and lock washers which fasten the keyboard printed wire board assembly to the front panel.
5. The switch module(s) may be unsoldered and removed from the printed wire board assembly to allow replacement of light-emitting diodes or other components.
6. Replace in reverse order, making certain that the chassis ground wire is connected under the keyboard retaining screw nearest the power switch/indicator.

10.4 PERIPHERAL CONTROL KEYBOARD OPTION - SERIES 3000 EIA SYSTEMS

10.4.1 General

The peripheral control keyboard is a factory installed option for Series 3000 EIA Systems. The keyboard, which is connected to the system by a 10 foot long, 35 conductor shielded cable; can contain all control keys and indicators found on integral keyboard center modules, plus DUAL and COPY keys. (As with integral keyboards, optional functions are controlled by many of the keys; therefore some keys may be capped on systems not equipped with all options.)

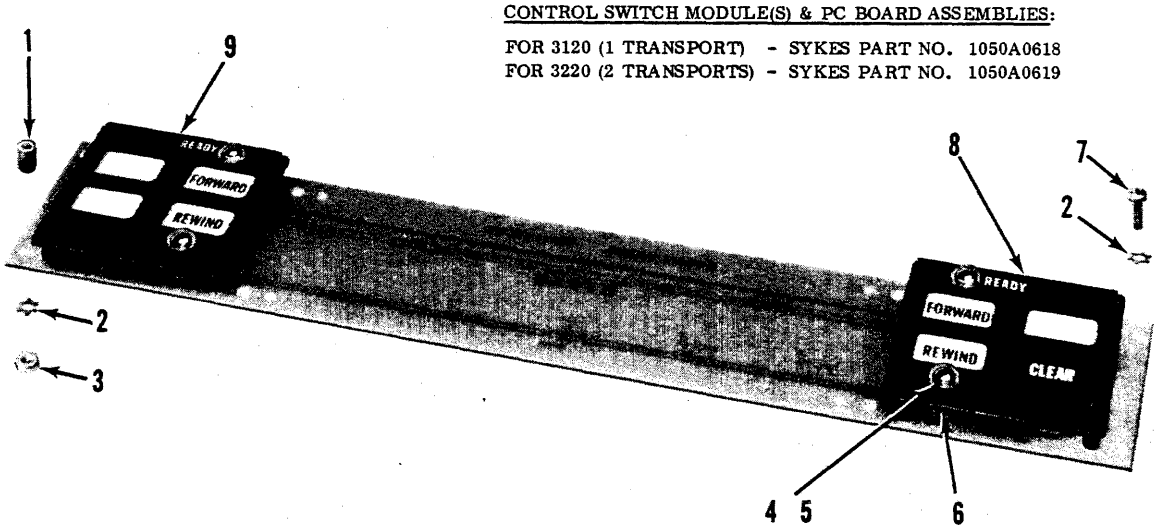
10.4.2 Removal/Replacement of Keyboard Components

1. Refer to Figure 10-2. Remove the screws (20) which retain the four rubber feet and the base of the keyboard assembly.
2. Remove the four screws (18) and lock washers retaining the PC board assembly and PC board brackets.
3. Slip the brackets out of the keyboard cover.
4. Push inward on the two switch modules to free the keyboard PC board assembly from the keyboard cover.
5. Slip the cable strain relief grommet free of the slot in the cover.
6. Cut the tie-wrap which retains the connector on J1.
7. The switch modules may be unsoldered and removed from the keyboard printed circuit board assembly to allow replacement of various components on the board.
8. Replace in reverse order, installing a tie-wrap (or equivalent) to retain the connector on J1 before assembling the PC board and brackets in the keyboard cover.

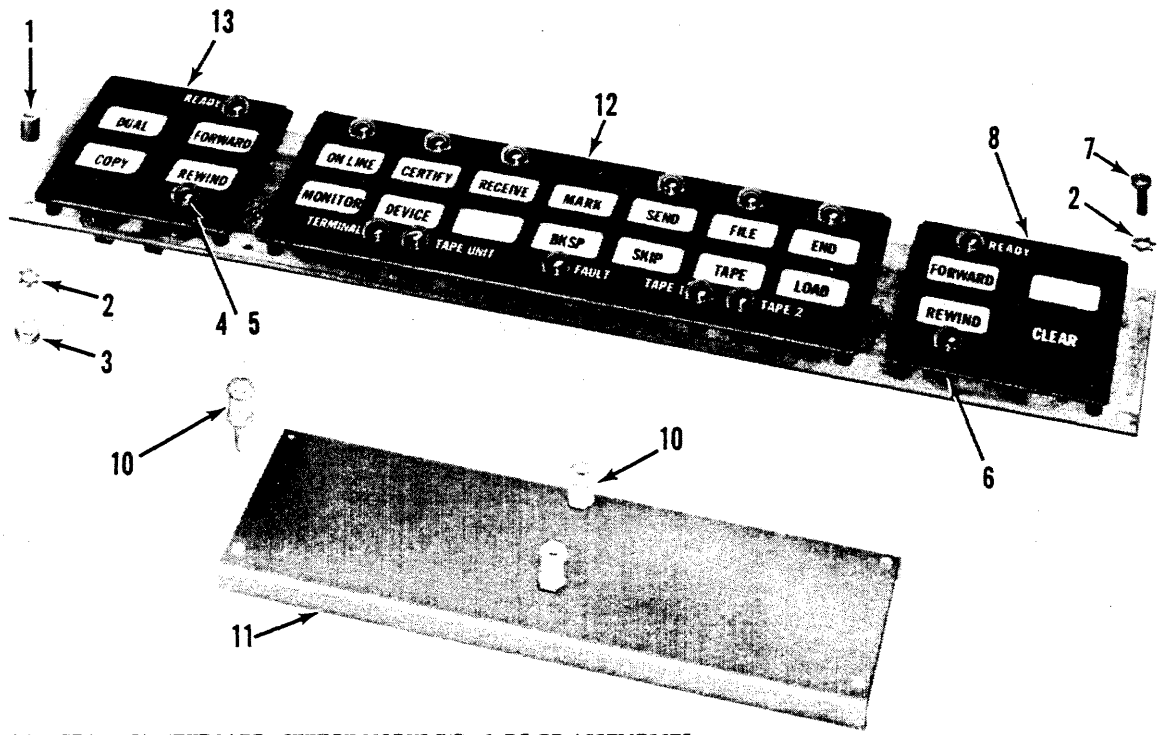
NOTES:

CONTROL SWITCH MODULE(S) & PC BOARD ASSEMBLIES:

FOR 3120 (1 TRANSPORT) - SYKES PART NO. 1050A0618
FOR 3220 (2 TRANSPORTS) - SYKES PART NO. 1050A0619



SEE FIGURE 10-3 FOR PC BOARD COMPONENTS



INTEGRAL EIA KEYBOARD, SWITCH MODULE(S) & PC BD ASSEMBLIES:

FOR 3120 (1 TRANSPORT) - SYKES PART NO. 1050A0614
FOR 3220 (2 TRANSPORTS) - SYKES PART NO. 1050A0613

FIGURE 10-1 CONTROL SWITCH AND INTEGRAL KEYBOARD ASSEMBLIES

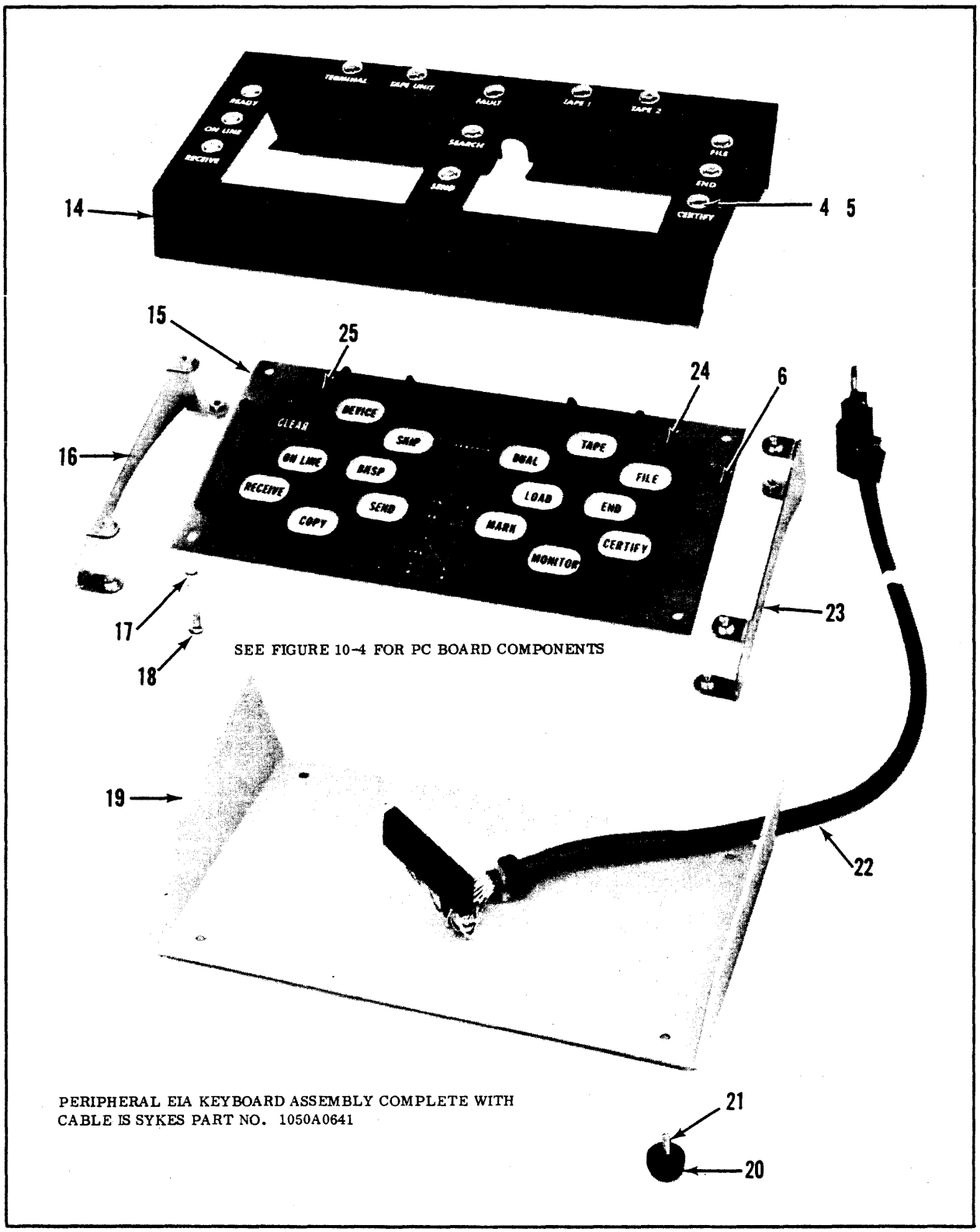
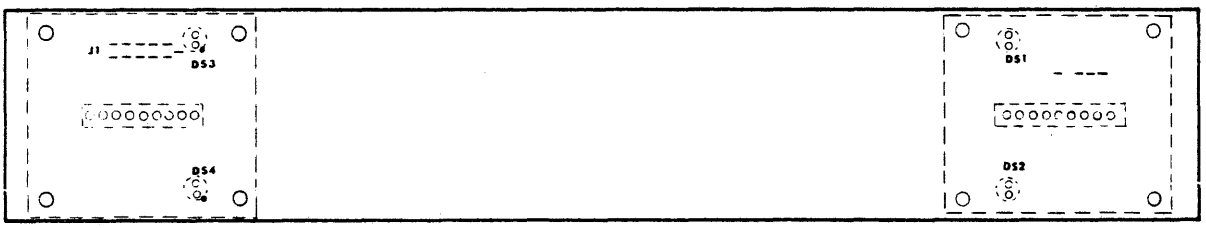


FIGURE 10-2 PERIPHERAL KEYBOARD ASSEMBLY

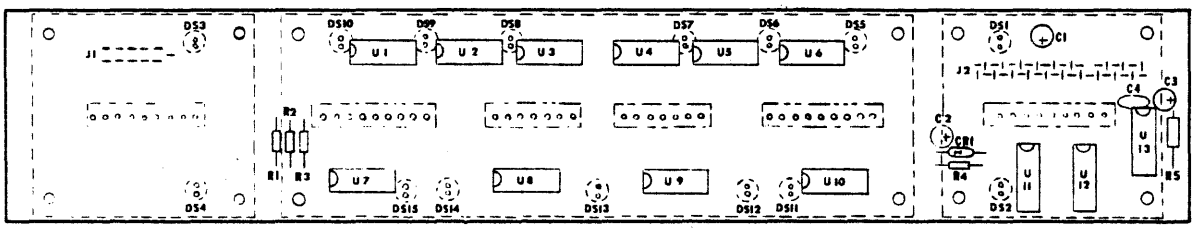
10.5 MECHANICAL PARTS LIST - CONTROL SWITCH & KEYBOARD ASSEMBLIES

REF. NO.	SYKES NO.	DESCRIPTION
1	1050B0616	SPACER
2	200H01601	LOCK WASHER NO. 6, EXT. TOOTH
3	500H01601	HEX NUT, 6-32
4	1050B0516	INDICATOR LENS
5	500H70118	RING CLIP
6	1050B0523	SPACER WAFER (FOR LEDS)
7	100H01606	PHILLIPS PAN HD SCREW, 6-32 x 3/8
8	1050A0055	SWITCH MODULE, RIGHT HAND
9	1050A0221	SWITCH MODULE, LEFT HAND
10	100A07042	STAND-OFF
11	1050B0210	KEYBOARD BRACE
12	1050A0053	SWITCH MODULE, CENTER
13	1050B0056	SWITCH MODULE, LEFT HAND
14	1050B0601	KEYBOARD COVER (LESS LENSES & RING CLIPS)
15	1050A0812	PERIPHERAL KEYBOARD PC BOARD ASSEMBLY (WITH KEY-SWITCH MODULES)
16	1050A0518	KEYBOARD BRACKET, LEFT HAND
17	200H02601	LOCK WASHER, EXT. TOOTH NO. 6
18	100H01605	PHILLIPS PAN HD SCREW, 6-32 x 5/16
19	1050B0519	PERIPHERAL KEYBOARD BASE
20	100A03107	RECESSED BUMPER
21	100H01608	PHILLIPS PAN HD SCREW, 6-32 x 1/2
22	1050A0585	CABLE ASSEMBLY
23	1050A0517	KEYBOARD BRACKET, RIGHT HAND
24	1050A0547	KEYSWITCH MODULE, RIGHT HAND
25	1050A0546	KEYSWITCH MODULE, LEFT HAND



CONTROL SWITCH MODULE(S) & PC BOARD ASSEMBLIES:

FOR 3120 (1 TRANSPORT) - SYKES PART NO. 1050A0618
FOR 3220 (2 TRANSPORTS) - SYKES PART NO. 1050A0619



INTEGRAL EIA KEYBOARD, SWITCH MODULE(S) & PC BD ASSEMBLIES:

FOR 3120 (1 TRANSPORT) - SYKES PART NO. 1050A0614
FOR 3220 (2 TRANSPORTS) - SYKES PART NO. 1050A0613

FIGURE 10-3 PC BOARDS FOR CONTROL SWITCH AND INTEGRAL KEYBOARD ASSEMBLIES

10.6 ELECTRICAL PARTS LIST - PC BOARDS FOR CONTROL SWITCH AND INTEGRAL KEYBOARD ASSEMBLIES

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
C1, 2, 3	CAPACITOR, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C4	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
CR1	DIODE, ZENER, SILICON, 1W, ±10%	200C01001	G.E. SEMICONDUCTOR	IN4151
DS1-15	LIGHT EMITTING DIODE (LED), SOLID STATE	100D02001	HEWLETT-PACKARD	5082-4440
R1, 2	RESISTOR, CARBON COMP., 1/4W, ±5%, 4.7K	100R02089		
R3	RESISTOR, CARBON COMP., 1/4W, ±5%, 330 OHM	100R02061		
R4, 5	RESISTOR, CARBON COMP., 1/4W, ±5%, 10K	100R02097		
U1, 2, 3, 4	INTEGRATED CIRCUIT, 9946 QUAD GATE	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A994659X
U5	RESISTOR PKG, 100 OHM	103R01001	BECKMAN-HELIPOT	899-1(100-OHM)
U6, 7, 9, 10, 11	INTEGRATED CIRCUIT, 9936 INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
U8	RESISTOR PKG, 330 OHM	103R01004	BECKMAN-HELIPOT	899-1(150-OHM)
U12	INTEGRATED CIRCUIT, 9093 FLIP-FLOP	100U14005	FAIRCHILD SEMI-CONDUCTOR	U6A909359X
U13	INTEGRATED CIRCUIT, 9601 ONE SHOT	100U14007	FAIRCHILD SEMI-CONDUCTOR	U6A960159X

PERIPHERAL KEYBOARD PC BOARD ASSEMBLY IS SYKES
PART NO. 1050A0812

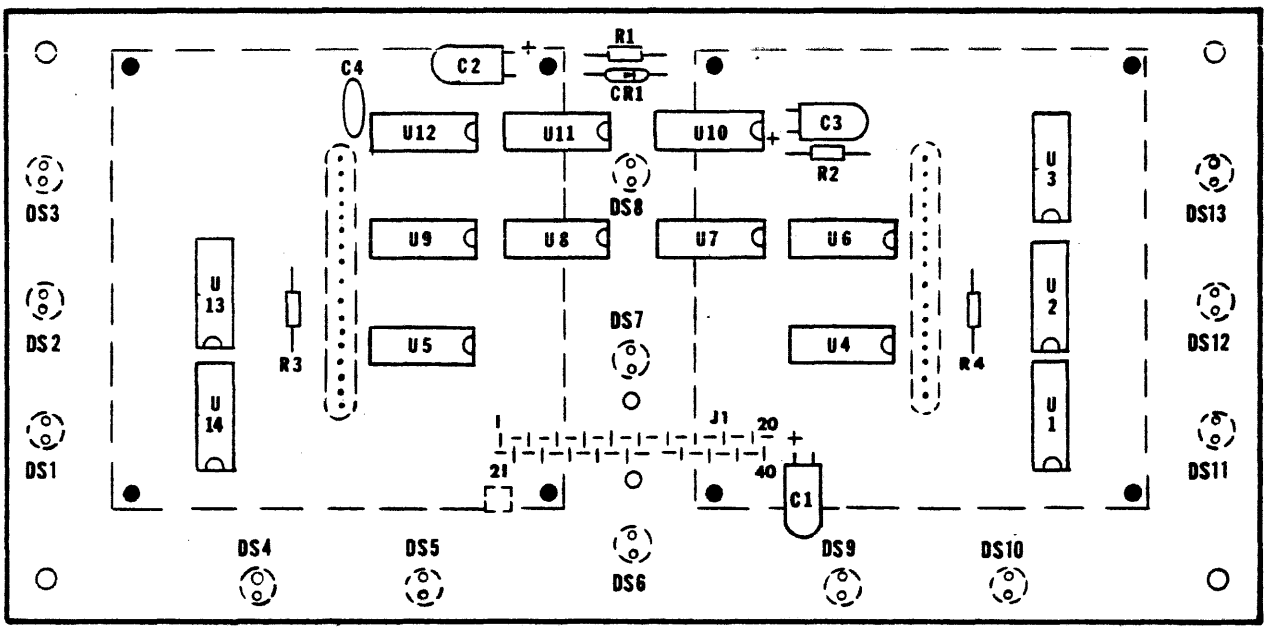


FIGURE 10-4 PC BOARD FOR EIA PERIPHERAL KEYBOARD

10.7 ELECTRICAL PARTS LIST - PC BOARD FOR EIA PERIPHERAL KEYBOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	SYKES NO.	MANUFACTURER	MANUFACTURER PART NO.
C1, 2, 3	CAPACITOR, TANTALUM, 22uF, ±10%, 15V	105C04105	SPRAGUE	TYPE 196D
C4	CAPACITOR, DISC, 470PF, GMV, 1KV	120C01044	CENTRALAB	TYPE DD
CR1	DIODE, HIGH SPEED SILICON SWITCHING	200C01001	G.E. SEMICONDUCTOR	IN4151
DS1-13	LIGHT EMITTING DIODE (LED), SOLID STATE	100D02001	HEWLETT-PACKARD	5082-4440
R1, 2	RESISTOR, 1/4W, ±5%, 10K	100R02097		
R3, 4	RESISTOR, 1/4W, ±5%, 62 OHM	100R02044		
U1, 7, 8, 12, 13	INTEGRATED CIRCUIT, DTuL HEX INVERTER	100U14004	FAIRCHILD SEMI-CONDUCTOR	U6A993659X
U2	RESISTOR PACKAGE, 100 OHM	103R01001	BECKMAN-HELIPOT	899-1(100-OHM)
U3, 14	RESISTOR PACKAGE, 150 OHM	103R01002	BECKMAN-HELIPOT	899-1(150-OHM)
U4, 5, 6, 9	INTEGRATED CIRCUIT, DTuL QUAD 2 INPUT NAND GATE	100U14003	FAIRCHILD SEMI-CONDUCTOR	U6A994659X
U10	INTEGRATED CIRCUIT, RETRIG-GERABLE MONOSTABLE MULTI-VIBRATOR	100U14007	FAIRCHILD SEMI-CONDUCTOR	U6A960159X
U11	INTEGRATED CIRCUIT, DTuL, DUAL FLIP-FLOP	100U14005	FAIRCHILD SEMI-CONDUCTOR	U6A909359X

10.8 PARTS LIST - OPTIONAL I/O CABLE ASSEMBLIES FOR 3000 EIA SYSTEM

CONNECTORS	LENGTH	PART NO.
MALE TO FEMALE	5.0 FT	1050A0535
MALE TO FEMALE	10.0 FT	1050A0536
MALE TO FEMALE	15.0 FT	1050A0537
MALE TO FEMALE	20.0 FT	1050A0538
MALE TO FEMALE	35.0 FT	1050A0539
MALE TO FEMALE	50.0 FT	1050A0540
FEMALE TO FEMALE	5.0 FT	1050A0652
FEMALE TO FEMALE	10.0 FT	1050A0653
FEMALE TO FEMALE	15.0 FT	1050A0654
FEMALE TO FEMALE	20.0 FT	1050A0655
FEMALE TO FEMALE	35.0 FT	1050A0656
FEMALE TO FEMALE	50.0 FT	1050A0657
MALE TO MALE	5.0 FT	1050A0661
MALE TO MALE	10.0 FT	1050A0662
MALE TO MALE	15.0 FT	1050A0663
MALE TO MALE	20.0 FT	1050A0664
MALE TO MALE	35.0 FT	1050A0665
MALE TO MALE	50.0 FT	1050A0666

11.0 SECTION 11 - ALIGNMENT AND MAINTENANCE PROCEDURES

11.1 ROUTINE CHECKS AND ADJUSTMENTS

All the adjustments discussed in this section should be checked at least once every six months. Some of these adjustments must also be made when related parts are replaced.

11.1.1 Capstan Drive Belt

The drive belt tension should be no more than is required to drive the capstan flywheel without slippage. If this is not the case, proceed as follows:

1. Detach the front panel assembly from the unit (Sec. 2.1.2.2 or 2.2.2.2).
2. Loosen the two capstan drive motor mounting screws.
3. Reposition capstan drive motor until the conditions stated above are met.
4. Tighten the screws securely.
5. Replace the front panel assembly and unit cover.

11.1.2 Pinch Roller and Pinch Roller Solenoid

The pinch roller and solenoid adjustments are satisfactory when the pinch roller is caused to rotate with a .013" gauge positioned as shown in Figure 11-1, but will not rotate with a .015" gauge in the same position. To check the adjustments, proceed as described in steps 1, 2, 11, 13 and 14 on pages 11-2 and 11-3.

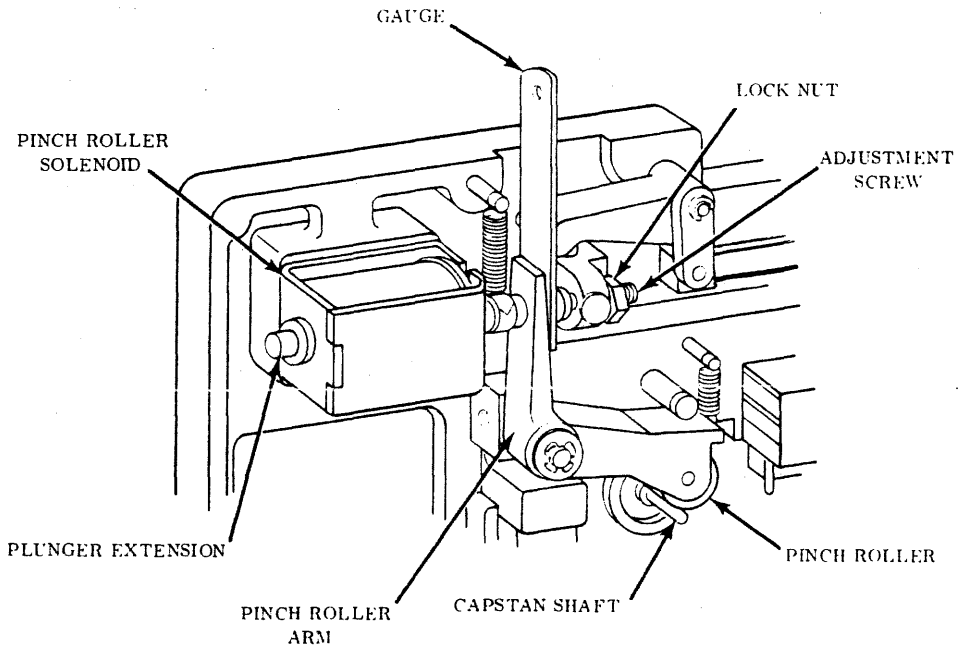


FIGURE 11-1 PINCH ROLLER ADJUSTMENTS

If adjustments are to be changed, .013", .015" and .017" gauges, an 11/32" open-end wrench and a 5/64" Allen wrench are required. Proceed as follows, referring to Figure 11-1 for identification of parts:

1. Detach the front panel assembly from the unit (Sec. 2.1.2.2 or 2.2.2.2).
2. Disconnect the forward (take-up) drive motor at J2 (Figure 3-2) on the motor control board, place the cassette holder in the head cleaning position, place a cover over the BOT/EOT light source and depress the cassette ready switch (place tape over the switch).
3. Adjust the slide plate solenoid in the standard manner (refer to Sec. 11.2.2).
4. Loosen the pinch roller solenoid mounting screws.
5. Loosen the lock nut for the pinch roller adjustment screw (11/32" open end wrench).
6. Turn on the POWER switch to apply power to capstan drive motor; also energize* the slide plate solenoid.
7. Insert a .017" gauge (shim) between the vertical pinch roller arm and the adjustment screw stop tip as shown in Figure 11-1. While pushing the solenoid plunger extension inward, set the

*Slide plate solenoid may be energized by removing solenoid wire from pin E2 on motor control board and grounding it on deck plate casting.

adjustment screw (using 5/64" Allen wrench) so the pinch roller is just rotated by the capstan shaft; then lightly tighten the adjustment screw lock nut while holding the screw in position.

8. Remove the .017" gauge, energize* the pinch roller solenoid, and move the solenoid to the right until all clearance between the plunger tip, pinch roller arm and stop is removed and the pinch roller is firmly pressed against the capstan shaft. (Do not press on solenoid plunger extension while positioning solenoid.)
9. Tighten the solenoid mounting screws.
10. Insert a .015" gauge between the pinch roller arm and adjustment screw stop tip and energize* the pinch roller solenoid. Loosen the adjustment screw lock nut, turn the adjustment screw clockwise until the pinch roller is no longer caused to rotate by the capstan shaft and maintain the position of the adjustment screw while tightening the lock nut; then de-energize the pinch roller solenoid.
11. Insert the .013" gauge as shown in Figure 11-1, and energize* the pinch roller solenoid. The adjustment is satisfactory when the pinch roller is caused to rotate with the .013" gauge in place but will not rotate with a .015" gauge used in the same manner. Switch power alternately with each gauge; testing the adjustment and, if necessary, correcting as described in steps 1-10 above.
12. The pinch roller solenoid adjustment and pinch roller adjustment are now complete. Make certain the lock nut on the adjustment screw and the solenoid mounting screws are securely tightened.
13. Reconnect the forward (take-up) drive motor to J2 on the motor control board; also remove the tape from the cassette ready switch and remove the cover from the BOT/EOT light source.
14. Replace the front panel assembly.

11.1.3 TA Sensitivity

If the unit is equipped with the High Speed Search Option, the TA (Tape Address) Sensitivity Circuit should be adjusted every 6 months; or when either the TA lamp or the sensor is replaced.

1. Place a cassette in the holder and operate the transport in the fast Forward mode using the FORWARD key.
2. Adjust R28 on the motor control board until the TA phototransistor voltage output (at AnP1** pin 3 on the motor control board), is a greater than 0.8 volt p-p sine wave centered on a 3.0 vdc reference.

*Pinch roller solenoid may be energized by pulling solenoid wire from pin E4 and grounding it on deck plate casting.

**n = 2 for R.H. transport, n = 3 for L.H. transport.

11.2 CORRECTIVE ADJUSTMENTS

The adjustments described in this section will be required either when associated components are replaced or when indicated by problems in operation of the equipment.

11.2.1 BOT/EOT Sensitivity

The BOT/EOT Sensing Circuit should be adjusted when either the BOT/EOT lamp or the sensor is replaced. Instructions in Section 3.12.2 for sensor replacement, or Section 3.12.3 for lamp replacement must be carefully followed.

1. If the lamp was replaced, adjust the lamp depth until the output of the phototransistor is at a minimum (less than 500 mv). Secure the lamp.
2. On the motor control board, turn R34 clockwise fully.
3. Cover the BOT/EOT light source completely.
4. Turn R34 counterclockwise until the signal at J6 pin 8 switches, or the end of the adjustment range is reached. NOTE THIS AS POSITION "A".
5. Uncover the BOT/EOT light source.
6. Turn R34 clockwise until the signal at J6-8 switches, or the end of the adjustment range is reached. NOTE THIS AS POSITION "B".
7. Turn R34 to the point half-way between positions "A" and "B".
8. Replace the read/write board.

11.2.2 Slide Plate Solenoid

Adjustment of the solenoid mounting position will be required after a new solenoid, slide plate assembly or associated parts are installed. A need for adjustment may be indicated by: (1) sluggish slide plate action (provided moving parts are clean); (2) slide plate bouncing up during Read and Write operations. To adjust, refer to Figure 11-2 and proceed as follows:

1. Remove the front panel assembly (Sec. 2.1.2.2 or 2.2.2.2).
2. Remove the read/write board.
3. Loosen the slide plate solenoid mounting screws and slide shaft set screw.

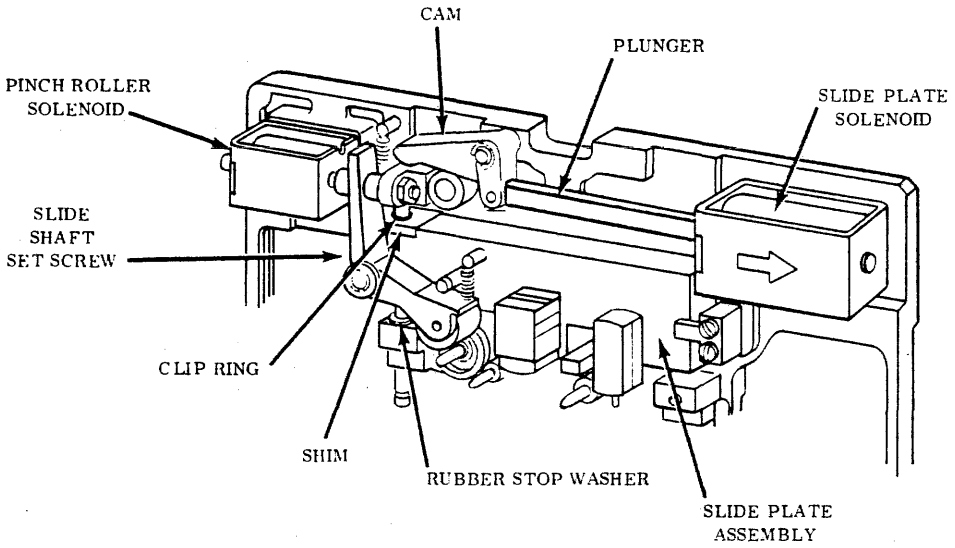


FIGURE 11-2 TAPE HEAD SLIDE PLATE SOLENOID ADJUSTMENT

4. Move the slide plate by hand to its low (tape head engaged) position; while holding the slide plate down, push upward on the slide shaft, remove and retain the brass adjustment shim which straddles the top of the slide plate.
5. Energize the slide plate solenoid; then grasp the solenoid by its frame and move the solenoid to the right so that the cam forces the slide plate assembly to bear firmly on the rubber stop washer. Tighten the solenoid mounting screws while this solenoid position is maintained.
6. While repeatedly applying power to the solenoid, test to see that the solenoid plunger is aligned concentrically with the solenoid (for free movement) and that no visible gap exists between the slide plate and rubber stop washer.
7. With power off, again hold the slide plate in its low position, push upward on the slide plate shaft and insert the brass adjustment shim above the slide plate, straddling the slide shaft and under the clip ring.
8. Energize the solenoid and lock the slide shaft set screw, completing the adjustment.
9. Replace the read/write board.
10. Replace the front panel assembly and unit cover.

11.2.3 Tape Head and Read/Write Assembly

The following procedure must be followed when either a tape head and slide plate assembly or read/write assembly is installed:

1. Permanently mount and connect the read/write board. This includes connecting the head leads and the connectors mating with J1 and J2. With the exception of the front panel and top cover, the Series 3000 Unit should be complete, the final mechanical alignment of the slide plate solenoid should have been made, and the +12V and -12V outputs of the MVPS must be correctly adjusted. Any alterations to either of these items will necessitate readjustments.
2. Clean the head and tape path as described in Section 11.3.2.
3. Place a blank tape cassette into the cassette holder.
4. Using the appropriate remote command (or LOAD key on EIA Unit) program, position the tape at the Load Point mark. This step should be performed before any write or read operation in this adjustment procedure.
5. Record a series of characters on tape Track B. (EIA Units record only on Track B.)
6. With an oscilloscope connected to TP2, read Track B and adjust R67 for a 16 volt peak to peak signal.
7. If the unit is a Series 3000 CTC which employs Track A, repeat step 5, recording on Track A; then with the oscilloscope connected to TP2, read Track A and adjust R39 until the 16 volt peak to peak signal is observed.
8. Seal the adjustment screw(s) with a sealant.

11.2.4 Power Supply

The voltage adjustments should be as close as possible to the specified voltages as shown in Figure 4-1. Potentiometers are identified in Figure 4-2.

11.2.5 Fast and Slow Speed Servo Adjustments

1. Connect an oscilloscope probe to pin 7 of J6 on the motor control board.
2. With a degaussed cassette in the transport cassette holder, press the BACKSPACE key (if any) or send a Retransmit File command, and adjust R9 on the motor control board for a full cycle frequency of 1600 usec on the oscilloscope.

3. Press the REWIND key and adjust R8 on the motor control board for a full cycle frequency of 125 usec on the oscilloscope.

NOTE: Adjust in above order only (slow servo first).

11.3 PREVENTIVE MAINTENANCE PROCEDURES

11.3.1 Cleaning Control Keys

To clean the keys, use a soft cloth or tissue slightly dampened with a household detergent, "409" or equivalent. Do not apply water, which might cause electrical problems. Do not use solvents such as keytones, esters or chlorinated hydrocarbons which might attack the plastic bezels, the mylar legend sheets, or painted surfaces on the unit.

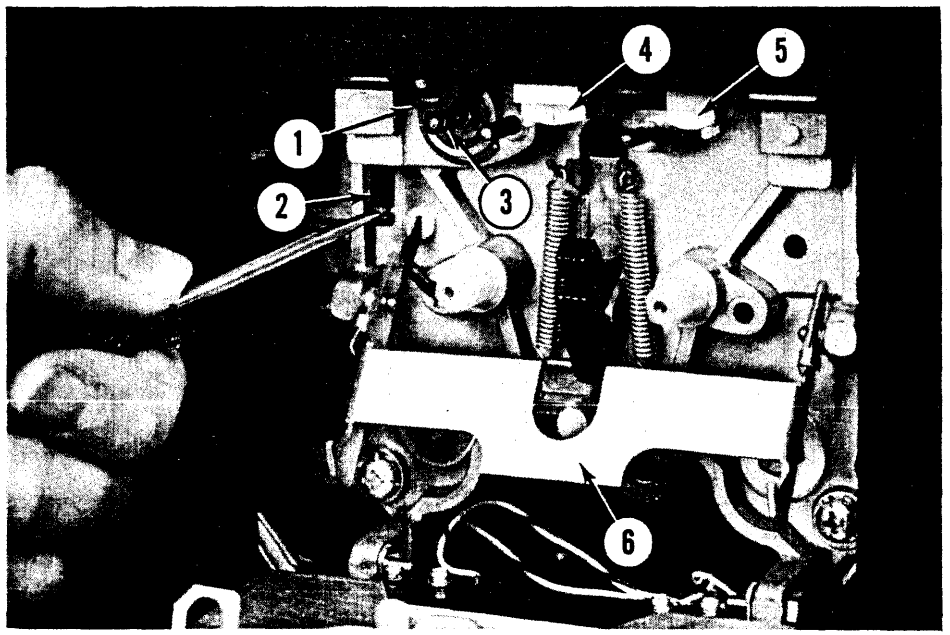
CAUTION: The legend sheets of the key switches are flexible mylar plastic. With the intended fingertip operation the mylar will withstand years of normal use; however, pressing the keys with pointed or sharp, hard objects can damage the mylar sheets and possibly impair the action of the switches.

11.3.2 Cleaning Tape Head, Tape Guide, and Pinch Roller

The tape head, tape guide, and pinch roller of each transport should be cleaned once a day, or after eight hours of operation, whichever comes first.

11.3.2.1 Recommended Cleaning Materials

The parts should be wiped clean with a foam or cotton swab (such as a "Q-tip") or a lint-free cloth or tissue (such as a "Kimwipe") saturated with a quality cleaner for magnetic tape heads (such as MS-200 Magnetic Tape Head Cleaner, manufactured by Miller-Stephenson Chemical Company). DO NOT FLOOD THE PRESSURE ROLLER AND CAPSTAN WITH CLEANER. KEEP SHARP OBJECTS AWAY FROM THE TAPE PATH; PERMANENT DAMAGE MAY RESULT.



1. PINCH ROLLER
2. SLIDE PLATE SHAFT
3. CAPSTAN & SLEEVE
4. TAPE HEAD
5. TAPE GUIDE
6. DETENT

FIGURE 11-3 CLEANING TAPE HEAD, GUIDE, PINCH ROLLER

11.3.2.2 Access to Parts for Cleaning

With the Series 3000 Unit power switch OFF, the cassette holder empty and fully open (as described in Sec. 3.2.1), pull the slide plate to the low position by inserting a small screwdriver in the groove provided in the slide shaft (Figure 11-3).

11.3.2.3 Power Pinch Roller Rotation for Cleaning

With the Series 3000 Unit power switch OFF, push the 5/8" long neoprene sleeve* onto the capstan. (MAKE CERTAIN THE SLEEVE IS CLEAN BEFORE ATTACHING TO AVOID SCRATCHING OF THE CAPSTAN SURFACE.) Now with the power switch ON, pulling the slide shaft to the low position will cause pinch roller rotation; allowing thorough cleaning of the roller.

11.3.3 Cleaning the Cooling Fan Filter

The Series 3000 Unit must not be operated without the filter which

*The neoprene sleeve, Sykes Part No. 1001B4014, is supplied with the transport initially; in position on the capstan.

provides protection against entry of air-borne dust and lint through the cooling fan. Routine cleaning of the filter is recommended every six months. Clean the filter as follows:

1. Make certain the Series 3000 Unit power switch is OFF.
2. a. To remove the filter from a desk-top unit, lift the front of the unit for access to the underside; then slide the filter and its guard towards the front of the unit until freed from the holder.
   b. To remove the filter from a rack mountable unit, pull the unit outward as far as the slides permit, place one hand under the filter so it can't fall and release the filter holder by turning the quarter-turn fastener which retains it. The holder will drop down, allowing removal of the filter.
3. Wash the filter in a detergent solution, rinse it, shake out the water and dry thoroughly.
4. Coat the filter with a dust collecting adhesive (RP Super Filter Coat Adhesive No. 418* or equivalent).
5. Replace the filter in the Series 3000 Unit.

NOTE: The filter guard found on desk top units must be returned to its original position. It prevents papers from being drawn up against the filter, thereby obstructing air circulation.

11.3.4 Cleaning Vacuum Filter (Units with Tape Cleaner Option)

The media in the filter cartridge(s) of the vacuum tape cleaner system should be cleaned periodically. Cleaning every 3 months is recommended; however, under some conditions, more frequent cleaning may be required.

CAUTION: If you detach the latex tubing from the filter assembly, the tubing (and its attached fitting) must be reattached without twisting. Such twisting can cause kinking and constriction of the tubing, or possible restriction of proper tape head slide plate action.

1. To remove the filter media, pull the tubing fittings from the ends of the filter assembly; then push or withdraw the plastic foam media from the filter body cylinder.
2. Wash the media in a detergent solution, rinse in clear water,

*RP Super Filter Coat Adhesive is marketed by the filter manufacturer - Research Products Corporation, Madison, Wisconsin.

dry thoroughly and replace in the filter body cylinder.
3. Without twisting the attached tubing, push the tubing fitting into the body cylinder.

11.3.5 Handling and Storing Tape Cassettes

Care must be taken to protect magnetic tapes from dust and lint contamination or physical damage, since these can prevent proper contact of tape with the read/write head, thus reducing signal strength or obliterating information. Accidental exposure to any external magnetic field can produce similar results.

Cassettes should be rewound to expose transparent leader before removal from the transport. In this way, the possibility of physical damage to oxide-coated tape will be minimized; however, both transparent leader and oxide-coated tape must be given equal protection from fingerprints, dust and dirt, since these can be transferred between wraps of tape on the reels.

The following is a list of universally recognized practices for proper handling of magnetic tape as they may be applied to Sykes Tape Cassettes:

1. Keep cassettes in the protective containers provided until actually placed in the Series 3000 Unit cassette receiver; then return them to the containers immediately after use.
2. Avoid touching magnetic tape or tape leader with fingers; oily fingerprint residue holds dust.
3. Maintain cleanliness of the cassette container, closing its cover while the cassette is removed for use.
4. Unless in protective containers, cassettes should not be placed in pockets of clothing or on dusty surfaces.
5. Magnetized tools should not be placed near cassettes, nor should cassettes be placed on or against large transformers or motors.
6. Before prolonged storage, cassettes should be sealed in a plastic bag.
7. Cassettes shipped during extreme cold weather conditions should be given approximately 8 hours to reach normal environmental temperature before use. (Magnetic tape exposed to extremely low temperatures may become distorted if immediately subjected to start/stop conditions.)
8. Clean the magnetic tape head(s) regularly, as described in Section 11.3.2.

To expedite its delivery, this manual has been shipped less the Troubleshooting Guide which is currently in preparation. Section 12 will be forwarded to you as soon as completed.

→ Jim CenTAMNI

T GREIR →

B MULLIGAN CUSTOM Service

716 458-8000

Ron Borgess

13.0 SECTION 13 - SCHEMATIC AND INTERCONNECTING DIAGRAMS

NOTE: In all diagrams the equipment is shown in the following state:

Power OFF
Cassette holder empty

13.1 DESIGNATION CODES FOR EQUIPMENT AREAS, COMPONENTS AND CONNECTORS - MAIN UNIT

13.1.1 Area Designations

All designations shall be understood to be prefixed by Unit #1, Series 3000

- A1 Front Panel Assembly
- A2 Right Transport
- A3 Left Transport
- A4 Logic Module
- A5 Rear Panel Assembly
- A6 Interface Assembly
- A7 High Speed Search Option

13.1.2 Printed Circuit Identification

Area	Ref. Designation	Description
A1	A1	Front Panel Switchboards and Keyboard
A2 or A3	A1	Motor Control Board
A2 or A3	A2	Read and Write Board
A4	A1	Controller Board
A4	A2	Interface Board
A4	A2, A1	Option Board (EIA)
A6	A1	Baud Rate Switches PC Board
A7	___	HSSO Board

13.1.3 Motor Identification

Area	Ref. Desination	Description
___	B1	Intake Fan
___	B2	Vac. Pump, R.H. Deck
___	B3	Vac. Pump, L.H. Deck
A2 or A3	B1	Reverse Drive - DC
A2 or A3	B2	Forward Drive - DC
A2 or A3	B3	Capstan Drive - AC

13.1.4 Lamp Identification

Area	Ref. Designation	Description
A1	DS1	Main Power
A1	A1DS1	Left Deck Ready (RDY1)
A1	A1DS2	Left Deck Rewind (REW1)
A1	A1DS3	Right Deck Ready (RDY2)
A1	A1DS4	Right Deck Rewind (REW2)
A1	A1DS5	On-Line Indicator LED
A1	A1DS6	Certify Indicator LED
A1	A1DS7	Receive Indicator LED
A1	A1DS8	Send Indicator LED
A1	A1DS9	File Indicator LED
A1	A1DS10	End Indicator LED
A1	A1DS11	Terminal Indicator LED
A1	A1DS12	Tape Unit Indicator LED
A1	A1DS13	Fault Indicator LED
A1	A1DS14	Tape 1 Indicator LED
A1	A1DS15	Tape 2 Indicator LED

13.1.5 Switch Identification

Area	Ref. Designation	Description
A1	SDS1	Main Power
A6	S1	Term. Baud, Off-Line
A6	S2	Modem Baud, On-Line
A6	S3	CL-EIA Select

13.1.6 Connector Identification

13.1.6.1 High/Low Level Harness Connectors

P1	Power Supply Mate
P2	Power Cable-Neutral Conductor
P3	Power Cable Neutral Mate
P4	Line Filter Mate
P5	Fan Mate
P6	Deck Power Harness Mate
P7	Distribution High Level Power
P8	Main Power Switch/Indicator Mate
P9	High Level Power - Right Deck
P10	High Level Power - Left Deck
P11	Front Panel Mate
P12	Power & Fr. Panel Signals to Controller
P13	Power to Interface or HSSO

13.1.6.2 Low Level Control Harness Connectors

P16	Control Signals & Power, Rt. Deck from Controller
P17	Motor Control Low Level Mate - Right Deck
P18	Read and Write Signals In-Right Deck
P19	Read and Write Power and Output - Right Deck
P20	Control Signals & Power + Left Deck from Controller
P21	Motor Control Low Level Mate - Left Deck
P22	Read and Write Signals In - Left Deck
P23	Read and Write Power and Output - Left Deck

13.1.7 Connector Mating

13.1.7.1 High/Low Level Harness Connector Mates

Connector	Mates With	Identification
P1	PS1J1	Power Supply
P2	P3	Line Cable Neutral
P4	FL1P1	Line Filter
P5	B1P1	Fan
P6	P7	Deck High Level Power
P8	A1SDS1P1	Main Power Switch/Indicator
P9	A2A1J4	Right Transport
P10	A3A1J4	Left Transport
P11	A1A1J1	Front Panel
P12	A4A1J5	Controller Board
P13	A4A2J6*	Interface Board

13.1.7.2 Low Level Control Harness Connector Mates

Connector	Mates With	Identification
P16	A4A1J4 (3120)	Controller Board
	A4A1J3 (3220)	Controller Board
P17	A2A1J6	Motor Control, Right Deck
P18	A2A2J2	Read and Write, Right Deck
P19	A2A2J1	Read and Write, Right Deck
P20	A4A1J4	Controller Board
P21	A3A1J6	Motor Control, Left Deck
P22	A3A2J2	Read and Write, Left Deck
P23	A3A2J1	Read and Write, Left Deck

13.2 DESIGNATION CODES FOR COMPONENTS AND CONNECTORS - PERIPHERAL KEYBOARD ASSEMBLY

13.2.1 Reference Designations

All designations shall be understood to be prefixed by Unit #2, Series 3000

*A7J1 on unit with HSSO

13.2.2 Circuit Board Identification

Area	Ref. Designation	Description
—	A1	Peripheral Keyboard Controller

13.2.3 Lamp Identification

Area	Ref. Designation	Description
—	A1DS1	Ready Indicator LED
—	A1DS2	On-Line Indicator LED
—	A1DS3	Receive Indicator LED
—	A1DS4	Terminal Indicator LED
—	A1DS5	Tape Unit Indicator LED
—	A1DS6	Fault Indicator LED
—	A1DS7	Search Indicator LED
—	A1DS8	Send Indicator LED
—	A1DS9	Tape 1 Indicator LED
—	A1DS10	Tape 2 Indicator LED
—	A1DS11	File Indicator LED
—	A1DS12	End Indicator LED
—	A1DS13	Certify Indicator LED

13.2.4 Connector Identification

P1	3000 Controller Mate
P2	Keyboard Mate

13.2.5 Connector Mating

Connector	Mates With	Identification
P1	1A6J3	3000 EIA I/O Conn. Panel
P2	2A1J1	Keyboard Controller PC Board

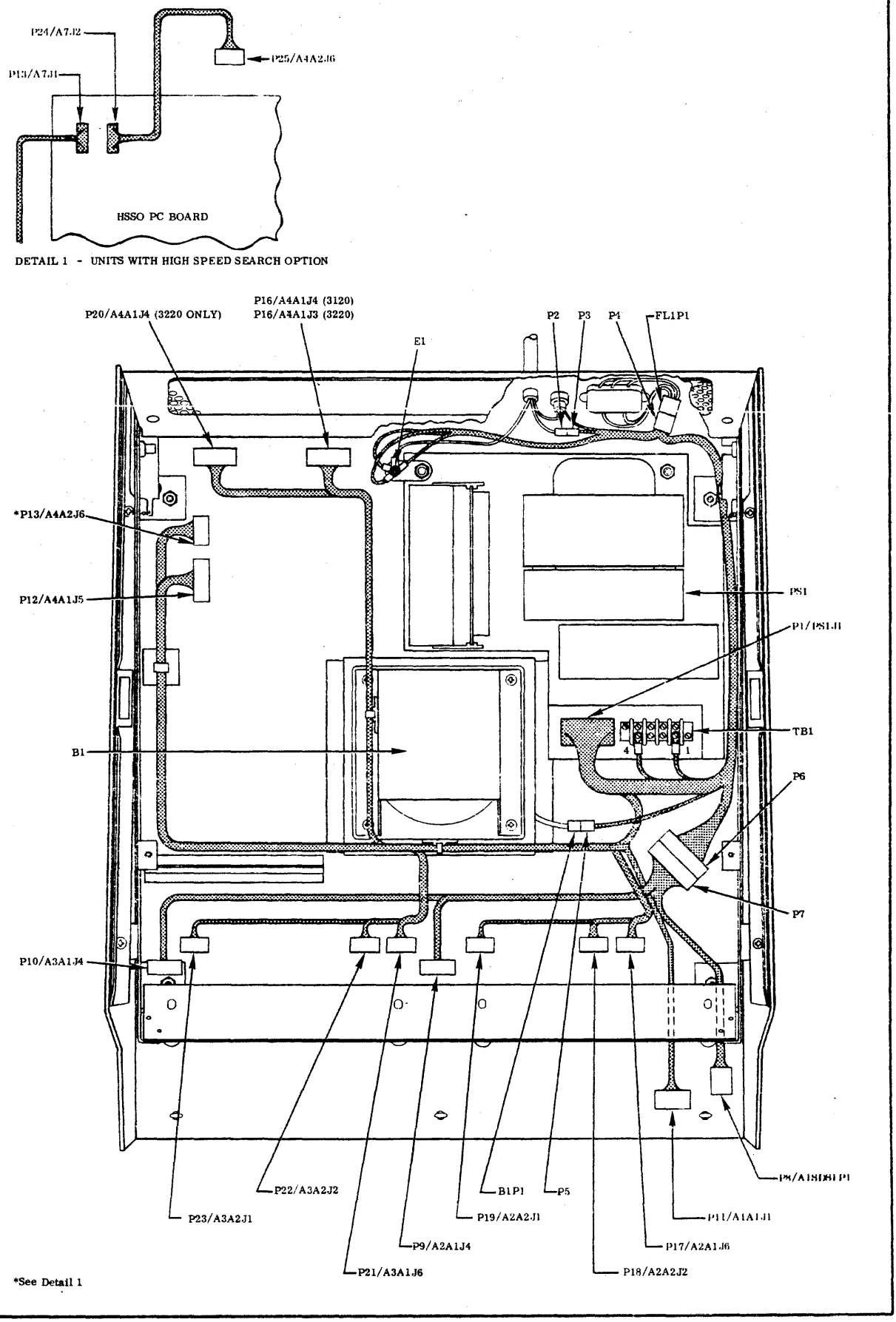
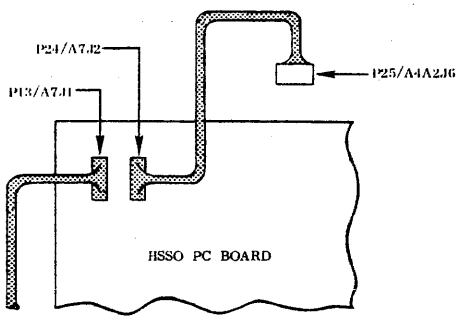
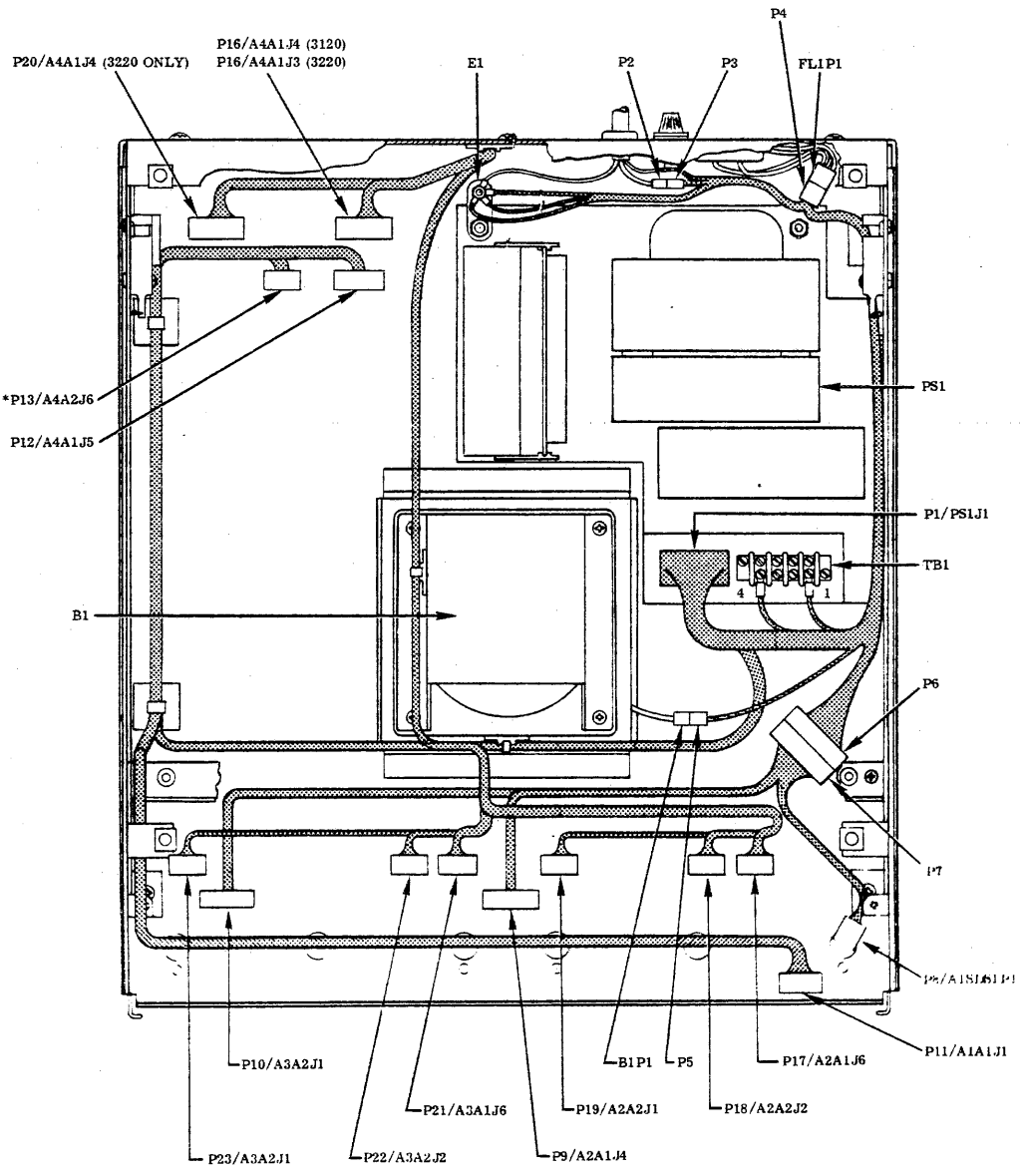


FIGURE 13-1 HARNESS LAYOUT - DESK TOP SERIES 3000 UNIT



DETAIL 1 - UNITS WITH HIGH SPEED SEARCH OPTION



*See Detail 1

FIGURE 13-2 HARNESS LAYOUT - RACK MOUNTABLE SERIES 3000 UNIT

NOTES:

NOTE:
UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE IN OHMS ¼ W ± 5%
ALL CAPACITOR VALUES ARE IN MICROFARADS
ALL DIODES ARE IN4151
ALL TRANSISTORS ARE MPS6534

WRITE AMPLIFIER

READ AMPLIFIER

PEAK DETECTOR

DATA RECOVERY

TRACK SELECT

PWR DISTRIBUTION to INTERGRATED CIRCUITS, UNLESS OTHERWISE SPECIFIED.

COMP	+5VDC	+12VDC	GRD
J1	——	14	7
U2	14		7
U6	14		7

DWG. NO. 1001A027
SHEET 1 of 1

SCHEMATIC - 5 IPS READ & WRITE BOARD

NOTE:
UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUES ARE IN OHMS, ¼W ± 5%
ALL CAPACITOR VALUES ARE IN MICROFARADS
ALL DIODES ARE 1N4151
ALL TRANSISTORS ARE MPS6534

WRITE AMPLIFIER

READ AMPLIFIER

POWER DISTRIBUTION

PEAK DETECTOR

DATA RECOVERY

TRACK SELECT

PWR DISTRIBUTION to INTERGRATED CIRCUITS, UNLESS OTHERWISE SPECIFIED.

COMP	+5VDC	+12VDC	GRD
U1	—	14	7
U2	14		7
U6	14		7

DWG. NO. 1020B0059
SHEET 1 of 1

SCHEMATIC - 12 IPS READ & WRITE BOARD

NOTES
1. C14 NOT USED ON ECMA DECK

LOGIC CONTROL

J6
DIR 13
ENGAGE HEAD 16
ENGAGE CAP/ 15
RUN 14
TIM 1
SLOW SERVO/2
ND/ 12
TURNS COUNT 7
BOT-EOT/ 8

FORWARD
REVERSE
FROM SW.1 *
SERVO ENABLE
BRAKE
SOL 1
SOL 2
MOTION
TA PRESENT
RESET

FREQ. DET.
INTEGRATOR
SQUR

J5
5 TC COLLECTOR
5 TC EMITTOR
9 BOT/EOT COLLECTOR
7 BOT/EOT EMITTER

(FROM SW.1) +24VDC

DYNAMIC BRAKE
FOR SERVO
TAPE TENSION
REVERSE SERVO
SOL 1 DRIVER
MOTION LAMP DRIVER
SOL 2 DRIVER

J2
2 MOT-FOR (BLK) B2
5 Q2-E
1 MOT-FOR (RED) B2
4 Q2-B
3 Q2-C

J1
1 MOT-REV (RED) B1
2 MOT REV (BLK) B1
3 Q1-C
5 Q1-E
4 Q1-B
E1 L1-1 SOLENOID
E2 L1-2 SOLENOID
E3 L2-1 SOLENOID, PINCH ROLLER
E4 L2-2 SOLENOID, PINCH ROLLER

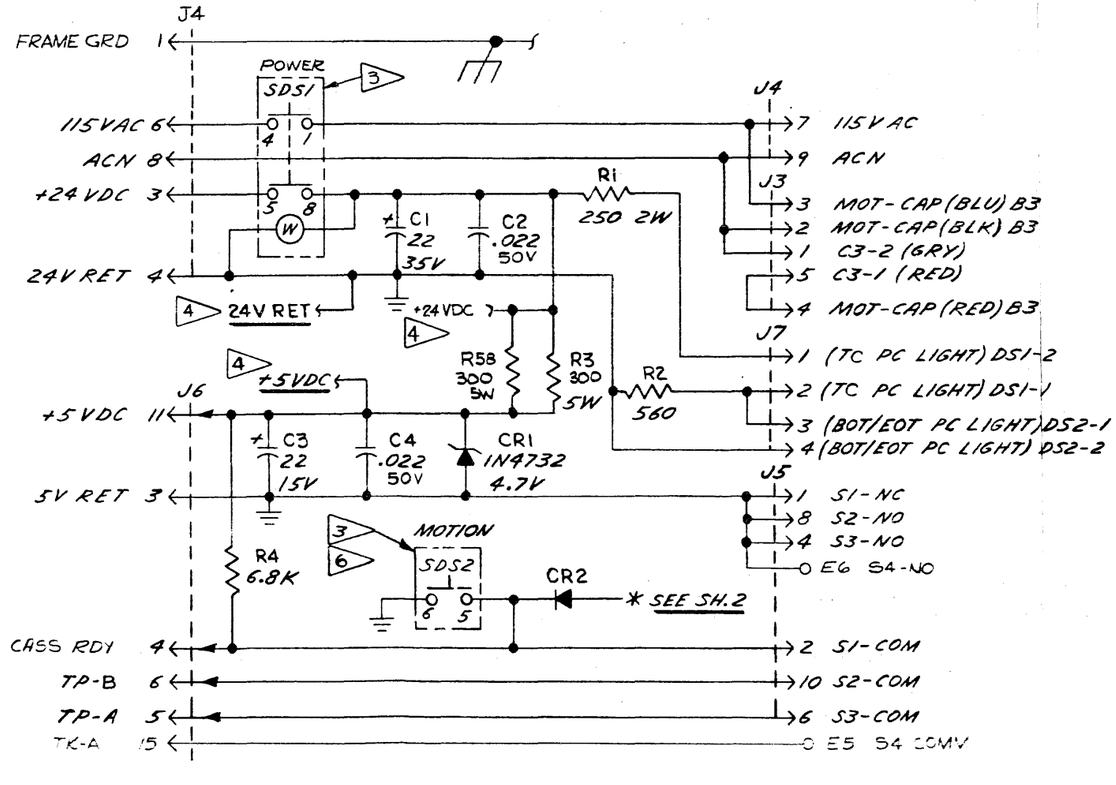
SCHEMATIC - MOTOR CONTROL BOARD

DWG. NO. 10209402
SHEET 1 of 2

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE VALUES ARE IN OHMS, 1/4 W, 5%
   CAPACITANCE VALUES ARE IN MICROFARADS
   DIODES ARE IN4151
   TRANSISTORS ARE MPS 6531
2. 5V RET. & 24V RET. ARE COMMON
3. POWER & MOTION INDICATOR SWITCHES SDS1 & SDS2 ARE OPTIONAL. WHEN NOT USED JUMPER POSITIONS 4 TO 1 & 5 TO 8 ON THE SDS1 POWER SWITCH AREA.
4. SEE SHEET 2 FOR ADDITIONAL POWER DISTRIBUTION
5. POWER DISTRIBUTION TO INTEGRATED CIRCUITS

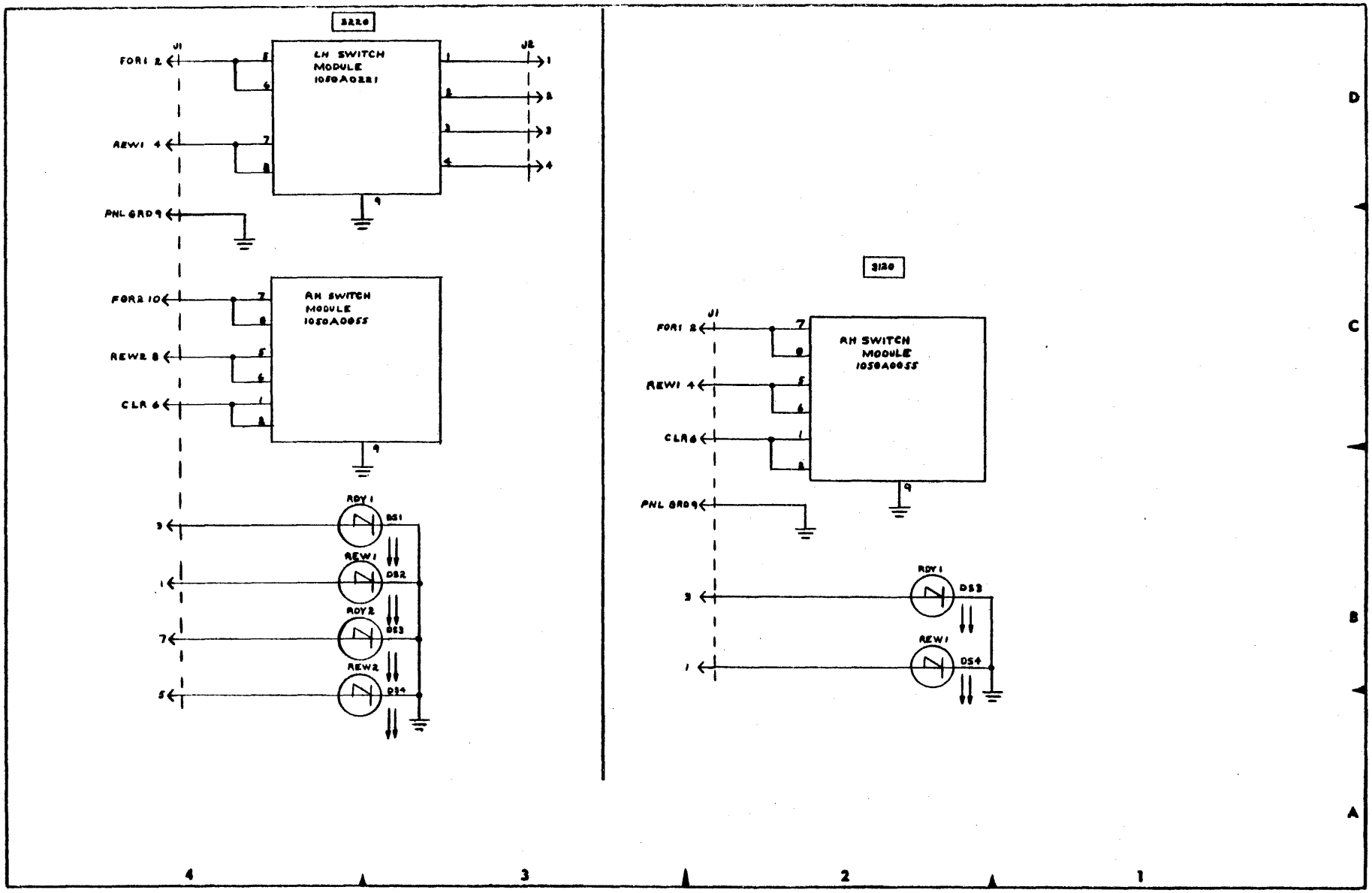
COMP	+5VDC	GRD
U1-4	14	7

6. SDS2 SHOWN IN THE 'ON' POSITION
7. SEE SHT 2



DWG. NO. 1020B4C
SHEET 2 of

SCHEMATIC - MOTOR CONTROL BOARD



SCHEMATIC - FRONT PANEL SWITCH BOARD, 3120/3220

DWG. NO. 1050B0620
SHEET 1 of 1

NOTES:

1. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS, 1/4 W, 5%

   DIODES ARE 1N4151

2. POWER DISTRIBUTION TO INT CKTS

DESIGNATION	+5VDC	GRD
	PIN	PIN
936, 944, 946	14	7
962, 9093, 9601		
9305		
9300, 9366	16	8
93L22		
93L11	24	12

3. SEE PAGE 6

4. SEE PAGES 8 & 12

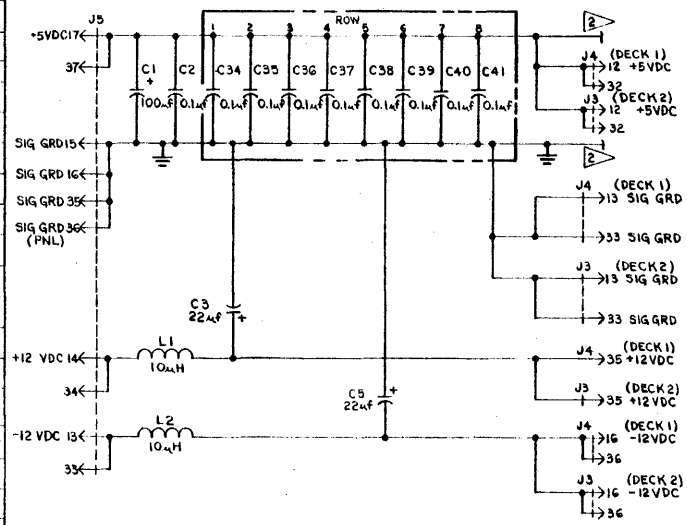
5. SEE PAGE 10

6. ORIGINS & DESTINATIONS ARE SHOWN AS SH NO. & ZONE; EXAMPLE 2C5 IS FOUND IN ZONE C5 ON SH 2

M	OUT	M	OUT
L	OUT	L	IN
K	STRAP IN	K	STRAP OUT
J	OUT	J	IN
H	1	H	1
G	3	G	4
F	4	F	6
E	5	E	7
D	6	D	17
C	6	C	8
B	12	B	14
A	17	A	17
JUMPER	CONNECT TO	JUMPER	CONNECT TO
8 IPS		12 IPS	

JUMPER CHART

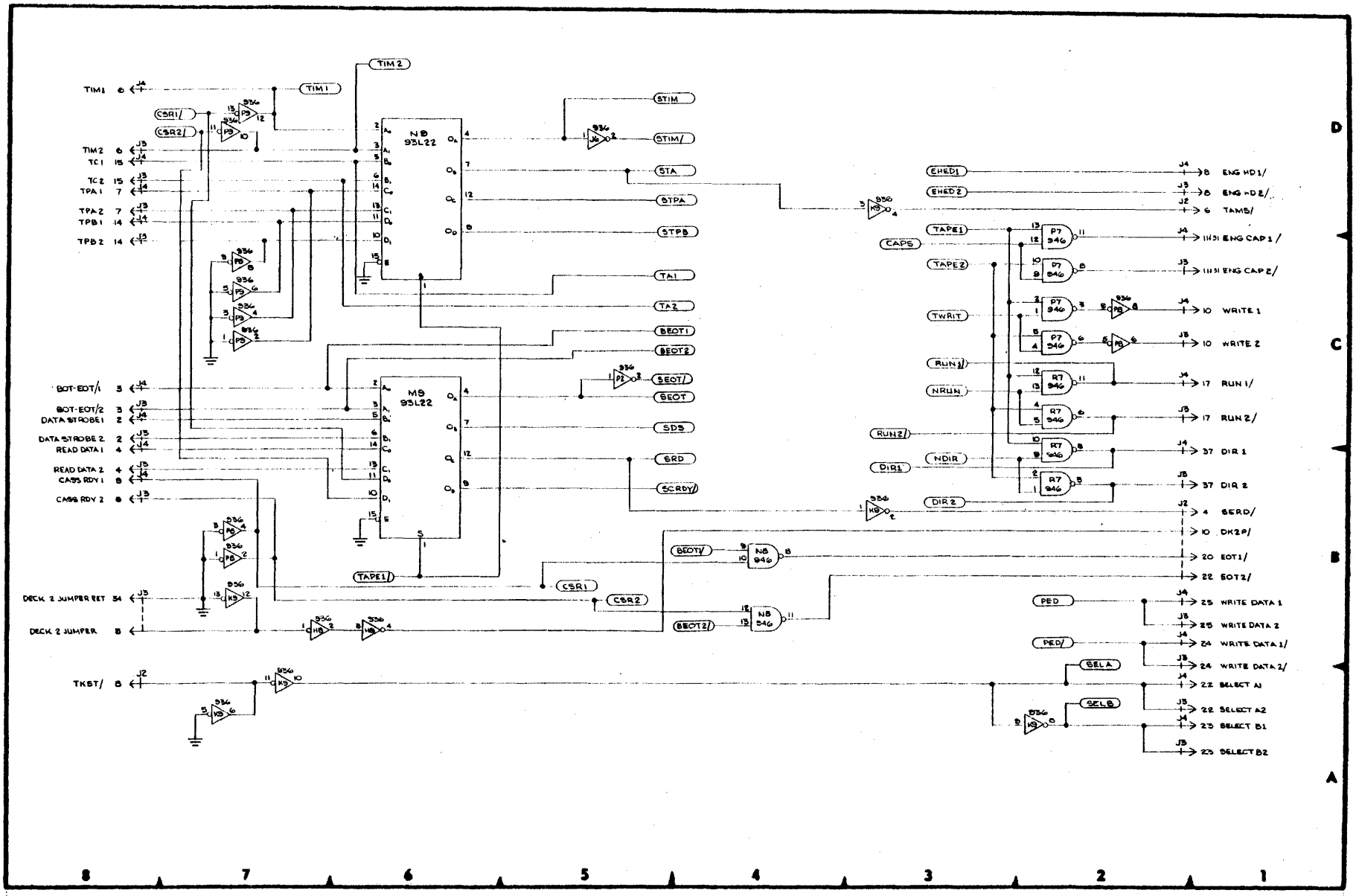
NET NAME	FULL NAME	ORIGIN	DESTINATION
BEOT1	BEGINNING - END OF TAPE 1	2C8	9B4
BEOT2	BEGINNING - END OF TAPE 2	2C8	9A4
BCLK	READ BIT CLOCK	6B2	7B8
BCLK/	READ BIT CLOCK NOT	6B3	7A8
BC9	BIT COUNT NINE	7B4	6D6
BEOT1/	BEGINNING - END OF TAPE 1 NOT	9C8	2B4
BEOT2/	BEGINNING - END OF TAPE 2 NOT	9A5	2B4
BMOD/	BACKSPACE MODE NOT	12D8	4B6
BKSP	BACKSPACE COMMAND	12D7	4B8
BACK/	READ REVERSE COMMAND	12A1	4B8
BFMG	BACKSPACE FILE MARK GAP	8C1	12B5
CBR1	CASSETTE READY 1	9B5	4C4, 8D4, 9B3
CBR2	CASSETTE READY 2	2B5	4C4, 8B4, 9B3
CAPS	CAPSTAN	4B6	2C3
CMDE	COMMAND ENABLE	4A8	9D7, 10D7, 11D7, 12D7
CBR1/	CASSETTE READY 1 NOT	4C8	2D7
CBR2/	CASSETTE READY 2 NOT	4C8	2D7
CLOK	XTAL CLOCK	6A6	8B6
CCLK	CHARACTER CLOCK	6B1	7B6
CINT	MASTER COUNTER INITIALIZE	8D8	10D5, 11D4
CLOK/	XTAL CLOCK NOT	6B6	8A4
CHLP	CHARACTER STOP	6B4	7B6
DIR1	DIRECTION 1	3C8	2B3, 8D4
DIR2	DIRECTION 2	3B8	2B3, 8A4
DENB	DATA ENABLE	8B4	4B6, 7A6
DDET	DATA DETECTED	6B3	11C3, 12C3
DDET/	DATA DETECTED NOT	6B3	11B3
DBTO	DATA STROBE TIME OUT	8A1	10C8, 11B7
EHED1	ENGAGE HEAD 1	4D6	2D3
EHED2	ENGAGE HEAD 2	4C8	2D3
ESTP/	ENABLE STOP TIMER NOT	6B3 12B6	8D6
EGLT/	ENABLE GEN LOAD PT TIMER NOT	9C3 12D8	8D8
ESKP/	INTERNAL SKIP NOT	9B4	11C1, 12A5
EREW1	ENABLE REWIND 1	8C8	3C4, 4D4
EREW2	ENABLE REWIND 2	8A2	3B4, 4D4
ENDM	END MARK SELECTED	9B2?	12D7
ERTW/	ENABLE READ OR WRITE TO SPEED NOT	10D3 11C5	4C7, 8D8
ERQT/	ENABLE READ QUIT NOT	10C3 11C8	8D8
EFMW	ENABLE FILE MARK WRITE	10D3	8D8
EFMD/	ENABLE FILE MARK DETECT NOT	11C8 12C8	8D8
ERQT	ENABLE READ QUIT	11C5	10C6
ERTS	ENABLE READ TO SPEED	11C4	10D6
EOFE	END OF FILE CHAR. ENABLE	11B3	8B3
EOFE/	END OF FILE CHAR.ENABLE NOT	11D5	4B3, 7B8
EROD/	ENABLE RECORD GAP DETECTION NOT	12C8	8D8
FET1/	FAR END OF TAPE ON 1 NOT	9B2	2C8, 4C4
FET2/	FAR END OF TAPE ON 2 NOT	9A2	2C8, 4C4
FILE	FILE MARK SELECTED	9C7	11B4, 11B3
FINI	TAPE STOPPED	6A3	11A4
GLPT/	GENERATE LOAD PT TIMER NOT	8B1	8C7
GLDD/	GENERATE LOAD PT NOT	8D1	8C7
GLMO/	GENERATE LOAD MODE NOT	8D4	7B8
GGAP/	GENERATE ERASED TAPE NOT	9D5	4B6
GLFM/	GENERATE LOAD PT FILE MARK NOT	9C3	10B6
HLA1/	HEAD LATCH 1 SET NOT	4D6	8C4
HLA2/	HEAD LATCH 2 SET NOT	4C8	8B4
HDLA	HEAD DELAY	8D1	8C7
IBSY	INTERFACE BUSY	4B4	8D4
IRGD	INTER RECORD GAP DETECTED	6B4	9C8
ISTP/	READ OR WRITE STOP NOT	10C5 11B3	4B5
LMOD/	LOAD POINT MODE NOT	9B6	4D6
LREW/	LOAD POINT REWIND NOT	9B6	4C8
LFWD/	LOAD POINT FORWARD NOT	9A8	4C8
MRUN	INTERFACE RUN SIGNAL	4C6	2C3
MDIR	INTERFACE DIRECTION SIGNAL	4B6	2B3
OCLR/	OUTPUT CLEAR NOT	3A4	6A7, 7C8
OCLR	OUTPUT CLEAR	3B2	6A8, 8D4
POR	POWER ON RESET	3A6	4C3
PULP	PULL-UP GATE (UNUSED INPUTS)	4D8	7D7, 8C8, 8C9, 12C7
PED	PHASE ENCODED DATA	7C2	2B2
PED/	PHASE ENCODED DATA NOT	7C2	2B8
PSE1	PAUSE CONTROL SET NOT	11A2	4B2
POR/	POWER ON RESET NOT	3A6	9B3
RHL1	RESET HEAD LATCH 1	3D3	4C8, 8C4
RHL2	RESET HEAD LATCH 2	3D3	4C8, 8B4
RUN2	TRANSPORT RUN - LINE 2 NOT	3C2	4B3, 2C3
RUN1/	TRANSPORT RUN - LINE 1 NOT	3C3	2C3, 4C5
RUN1	TRANSPORT RUN LINE 1	4B4	9D3
RUN2	TRANSPORT RUN LINE 2	4B3	9A3
RDY1	READY TAPE 1	8D3	3C8
RDY2	READY TAPE 2	8C3	2C8
RFMG	READ FILE MARK GAP	8C1	11B7
RUTS	READ UP TO SPEED	8C1	11C7, 12C8
RECS	RECORD SELECTED	10C8	11B8, 12B5
RITE	WRITE COMMAND PRESENT	10C8	3C7
RMOD	READ MODE	11D5	7B8
ROSM	READ OR SKIP MODE	11D4	4B8
RENB/	READ ENABLE NOT	11C2 10C5	8C8
SLTM	SELECTED TAPE IN MOTION	8D8	4A7
SLTM/	SELECTED TAPE IN MOTION NOT	8D8	9A7
SLA	SELECTED TAPE ADDRESS	8D8	12B8
STPA	SELECTED TRACK PROTECT A	8D8	10C7
STPB	SELECTED TRACK PROTECT B	8D8	10C7
SLOT/	SELECTED END OF TAPE NOT	8C8	4B8, 9A7
SEOT	SELECTED END OF TAPE	8C8	9A7
SDS	SELECTED DATA STROBE	8C8	6B8, 8C8, 12C8
SRD	SELECTED READ DATA	8C8	7C8
SCRDY/	SELECTED CASSETTE READY NOT	8D8	4D3
STOP	READ/WRITE STOP LATCH	4A6	11A6
SFRW	SELECTED REWIND ENABLE	8C8	9A7
SHLA/	SELECTED HEAD LATCH SET NOT	8C8	9D6, 10D7, 11C8, 12D7
SHLA	SELECTED HEAD LATCH SET	4D6	10D7
SSTP	SET STOP FLIP FLOP	8C1	4A3, 12A7
SLAT/	SET SELECTED HEAD LATCH NOT	9D6	4D8, 8D8
STAL1/	TRANSPORT STALL - TAPE 1 NOT	4C3	8B4
STAL2/	TRANSPORT STALL - TAPE 2 NOT	4B8	8B4
SEL4	SELECT TRACK A	8A8	8C7
SEL5	SELECT TRACK B	8A8	9C7
SREN/	SET READ ENABLE NOT	12A5	11C7
TIM1	TAPE IN MOTION 1	2D7	8C4
TIM2	TAPE IN MOTION 2	2D8	8B4
TA1	TAPE ADDRESS 1	8C8	4C4
TA2	TAPE ADDRESS 2	8C8	4B4
TAPE1	TAPE 1 SELECTED	8D4	8C8, 4D8, 8D4
TAPE1/	TAPE 1 SELECTED NOT	8D6	2B6, 4D8
TAPE2	TAPE 2 SELECTED	8D6	8C8, 4D8, 8C4
TWRT	TAPE READY SIGNAL TO R/W	4B6	8C8
TPR1	TAPE 1 READY	8D8	8A3
TPR2	TAPE 2 READY	8C8	8A8
TPV/	TRACK PROTECT VIOLATION NOT	10C6	4A8
TMRK/	TAPE MARK NOT	10B3	4B6, 12A8
WO1	WRITE CLOCK PHASE 1	6B3	7D4, 10C6
WO2	WRITE CLOCK PHASE 2	6C8	7C8
WO2/	WRITE CLOCK PHASE 2 NOT	6C8	7D4
WENB	WRITE ENABLE	7A1	4C6, 10D3
WENB/	WRITE ENABLE NOT	7A3	8C8
WDRY	WRITE DATA READY	7A4	10D8
WFMG	WRITE FILE MARK GAP	8D1	10B6, 11B7
WUTS	WRITE UP TO SPEED	8C1	10D8
WMOD	WRITE MODE	10D4	7A8
WMOD/	WRITE MODE NOT	10D4	4B6
WREC/	WRITE RECORD NOT	10D4	7A8
WFM8	WRITE FILE MARK STROBE	10B2	7C8
WFM8/	WRITE FILE MARK STROBE NOT	10B2	7A8
WFTL/	WRITE MULTIPLE FILE CHAR. NOT	10A8	7A8
ZERO	BIT COUNT ZERO	7B1	10D6



SCHEMATIC - 3000 CONTROLLER BOARD, POWER DISTRIBUTION

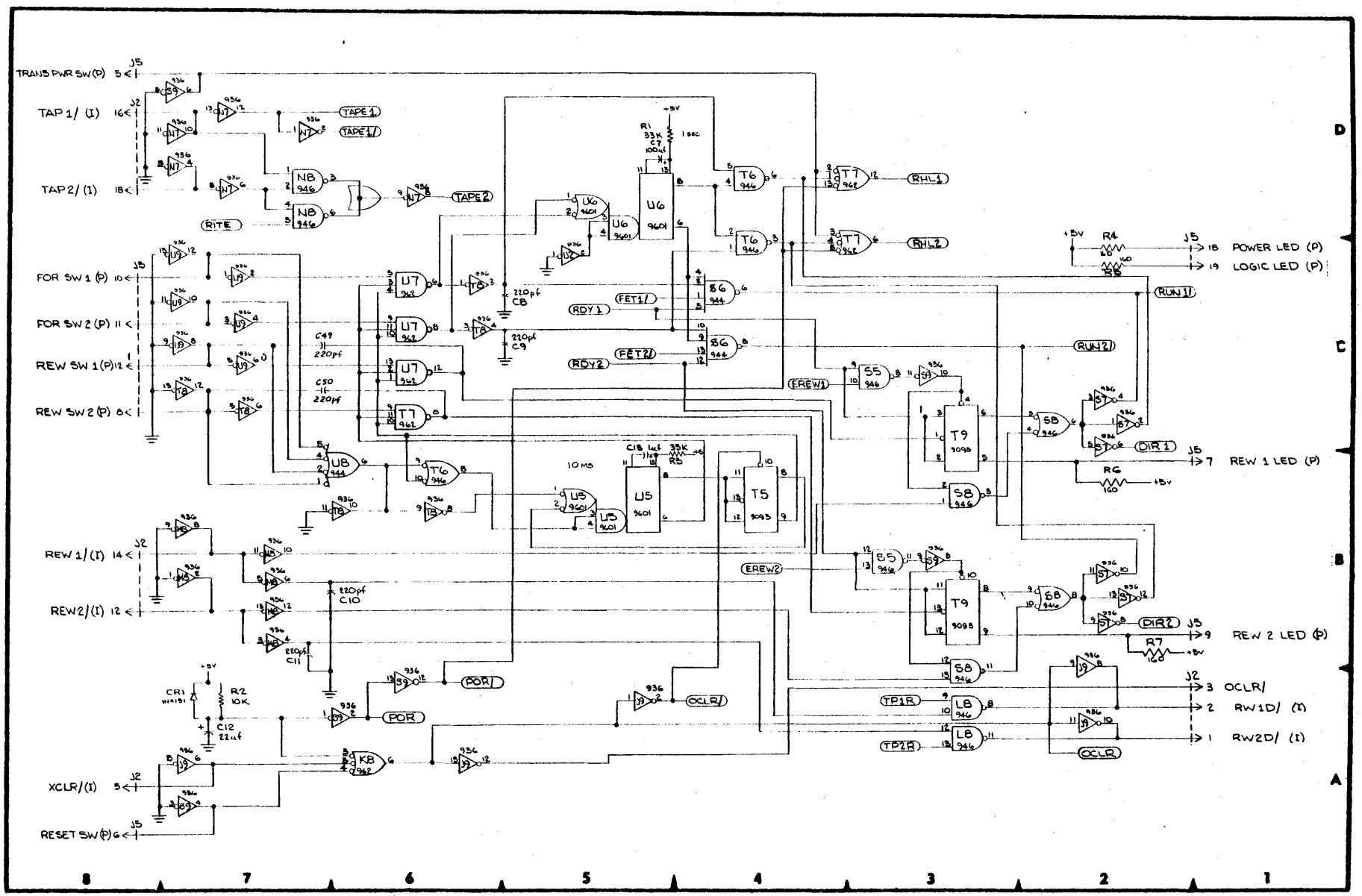
DWG. NO. 1050B0224

SHEET 1 of 12



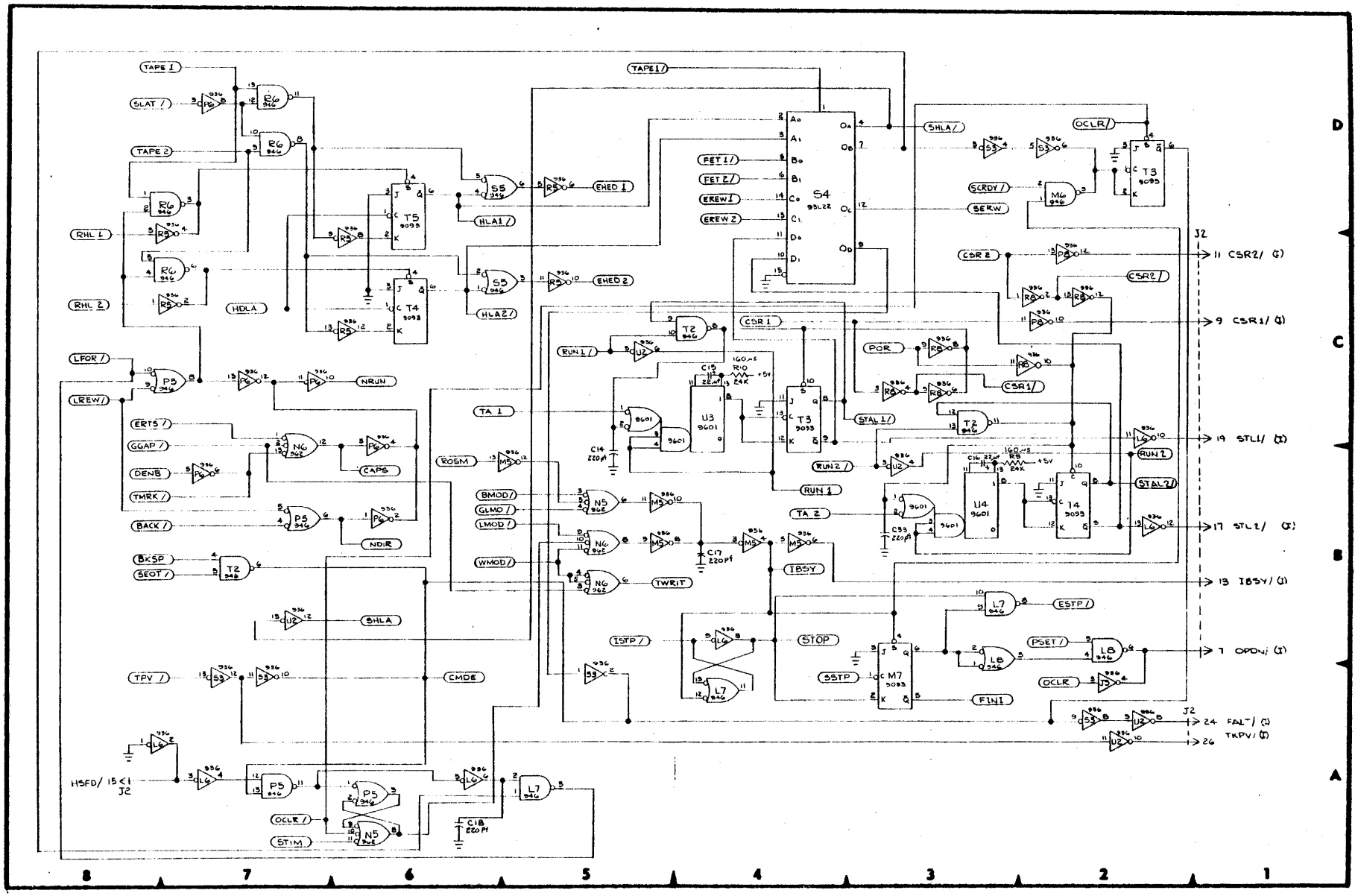
SCHEMATIC - 3000 CONTROLLER BOARD, TRANSPORT SWITCH LOGIC

DWG. NO. 1050A0224
SHEET 2 of 12



SCHEMATIC - 3000 CONTROLLER BOARD, FRONT PANEL INTERFACE

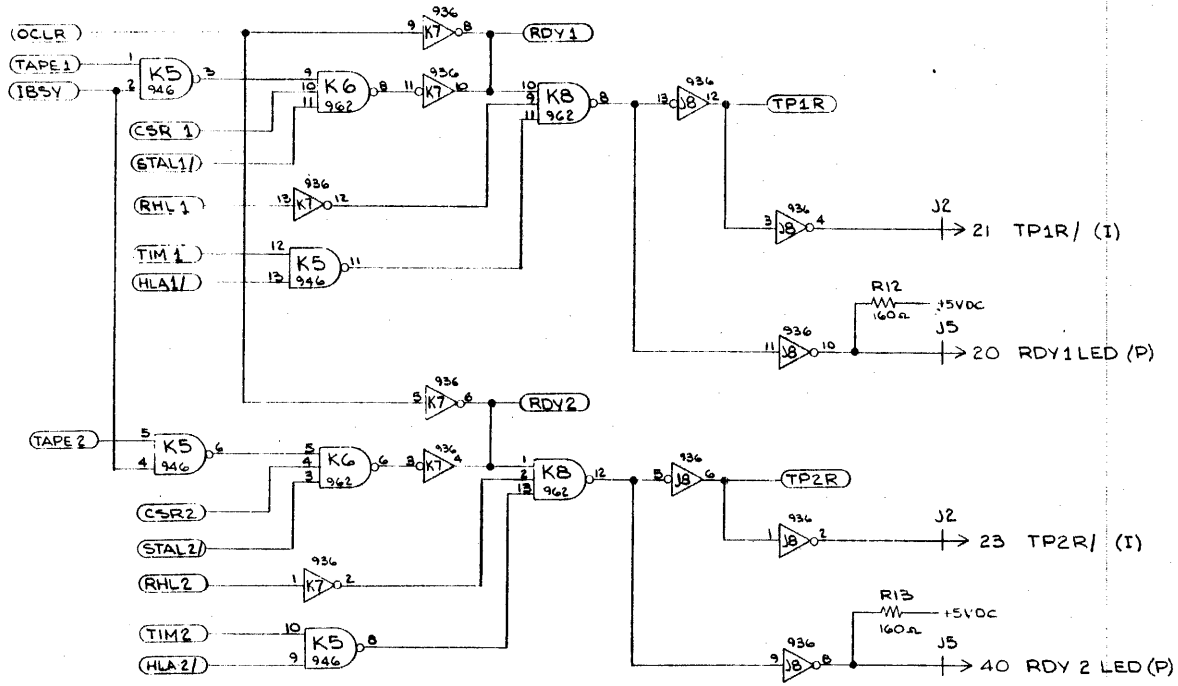
DWG. NO. 1050B0224
SHEET 3 of 12



SCHEMATIC - 3000 CONTROLLER BOARD, TAPE CONTROL LOGIC

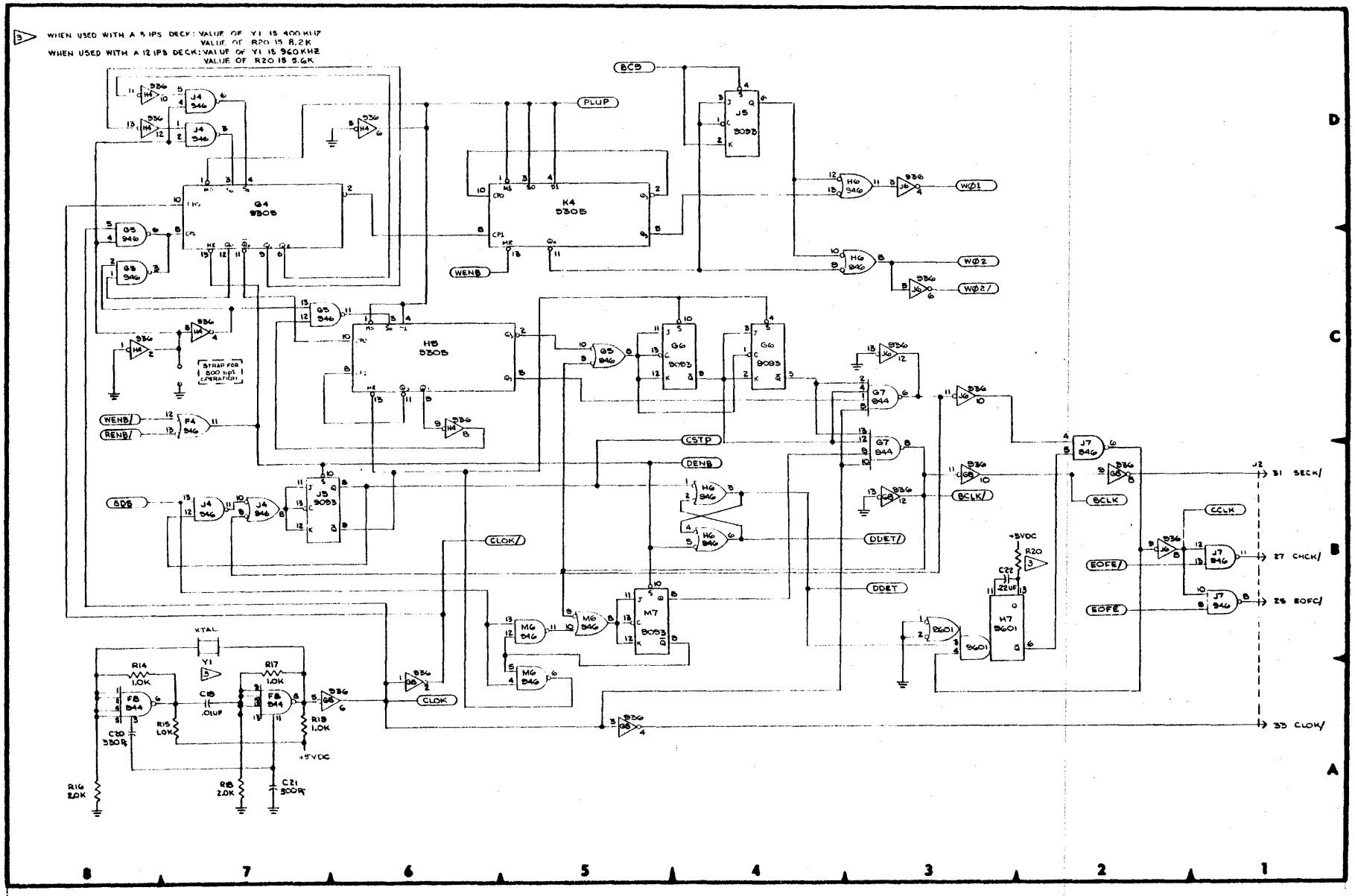
DWG. NO. 1050B0224

SHEET 4 of 12



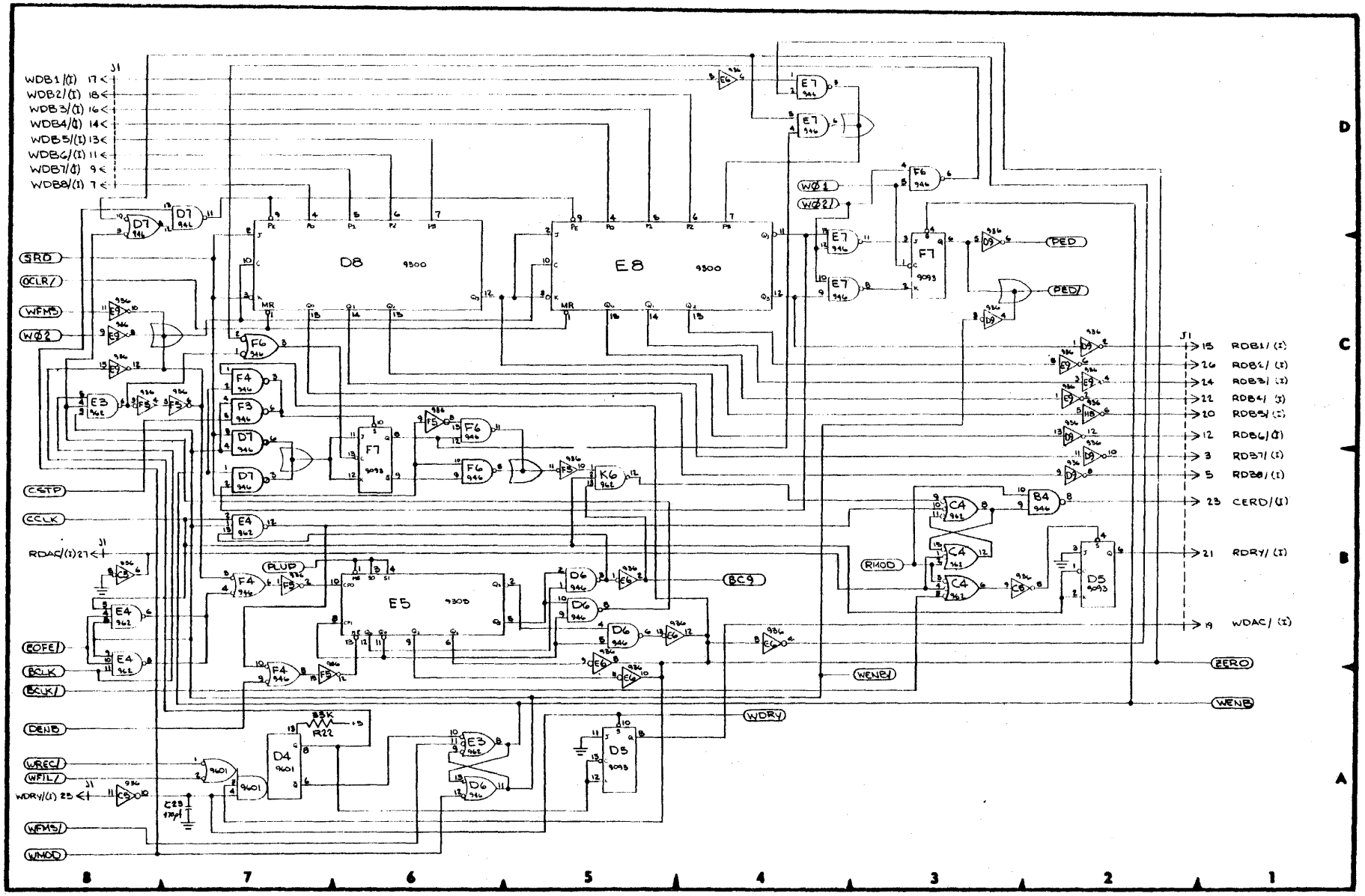
SCHEMATIC - 3000 CONTROLLER BOARD, READY STATUS LOGIC

DWG. NO. 1050B0224
SHEET 5 of 12



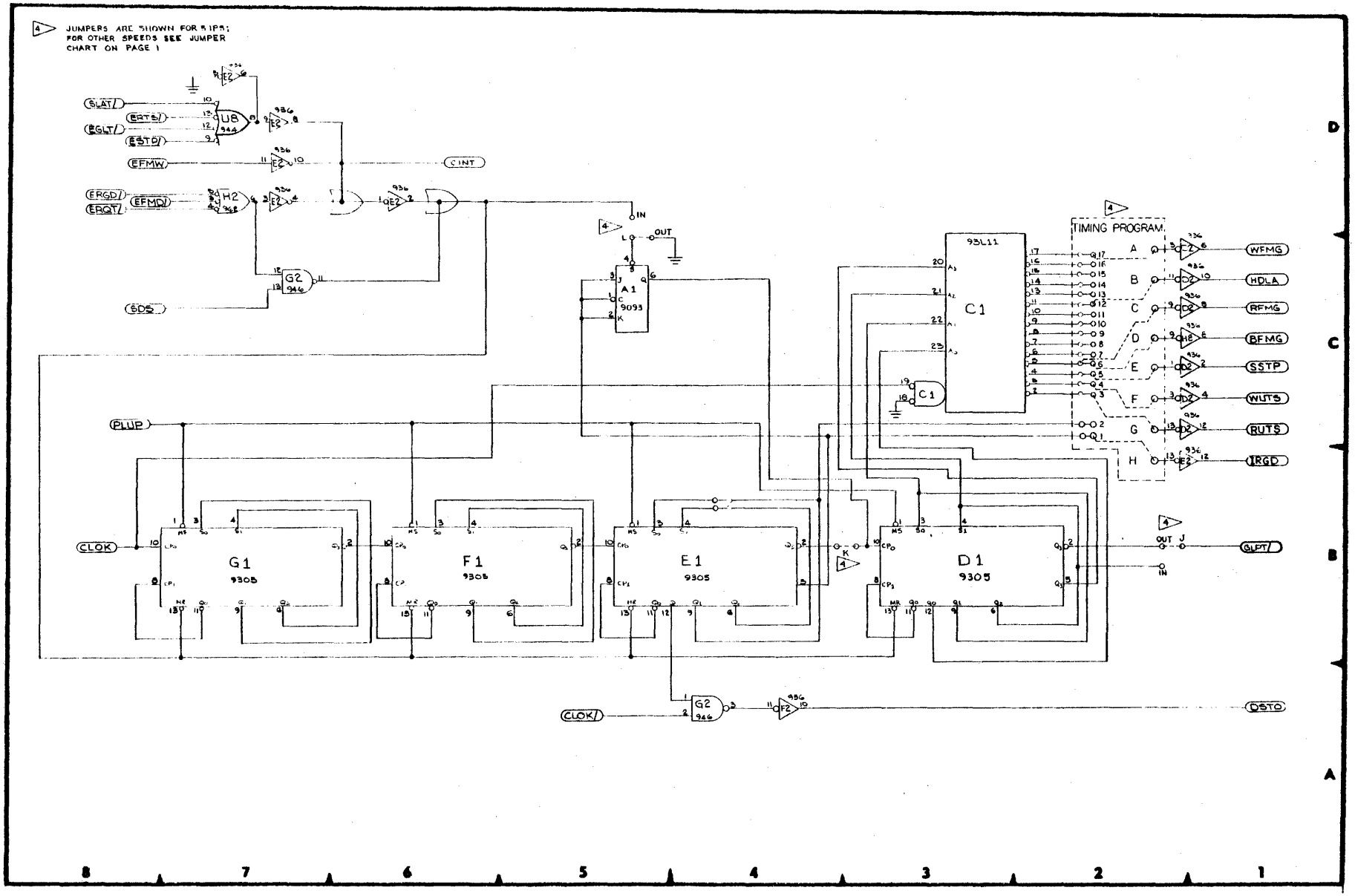
SCHEMATIC - 3000 CONTROLLER BOARD, DATA FORMAT & DETECTION LOGIC

DWG. NO. 1050B0224
SHEET 6 of 12



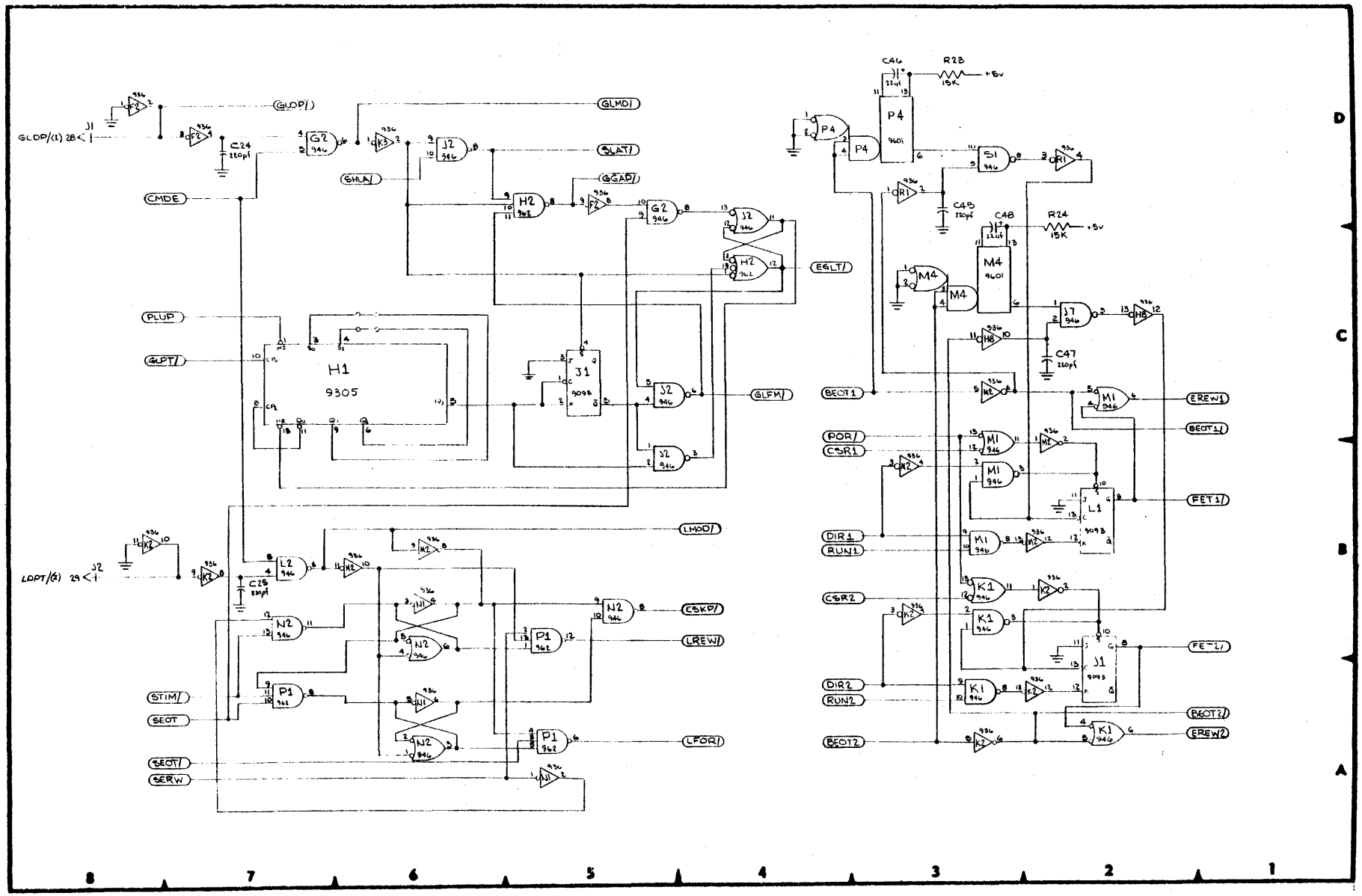
SCHEMATIC - 3000 CONTROLLER BOARD, BUFFER CONTROL LOGIC

DWG. NO. 1050B0224
SHEET 7 of 12



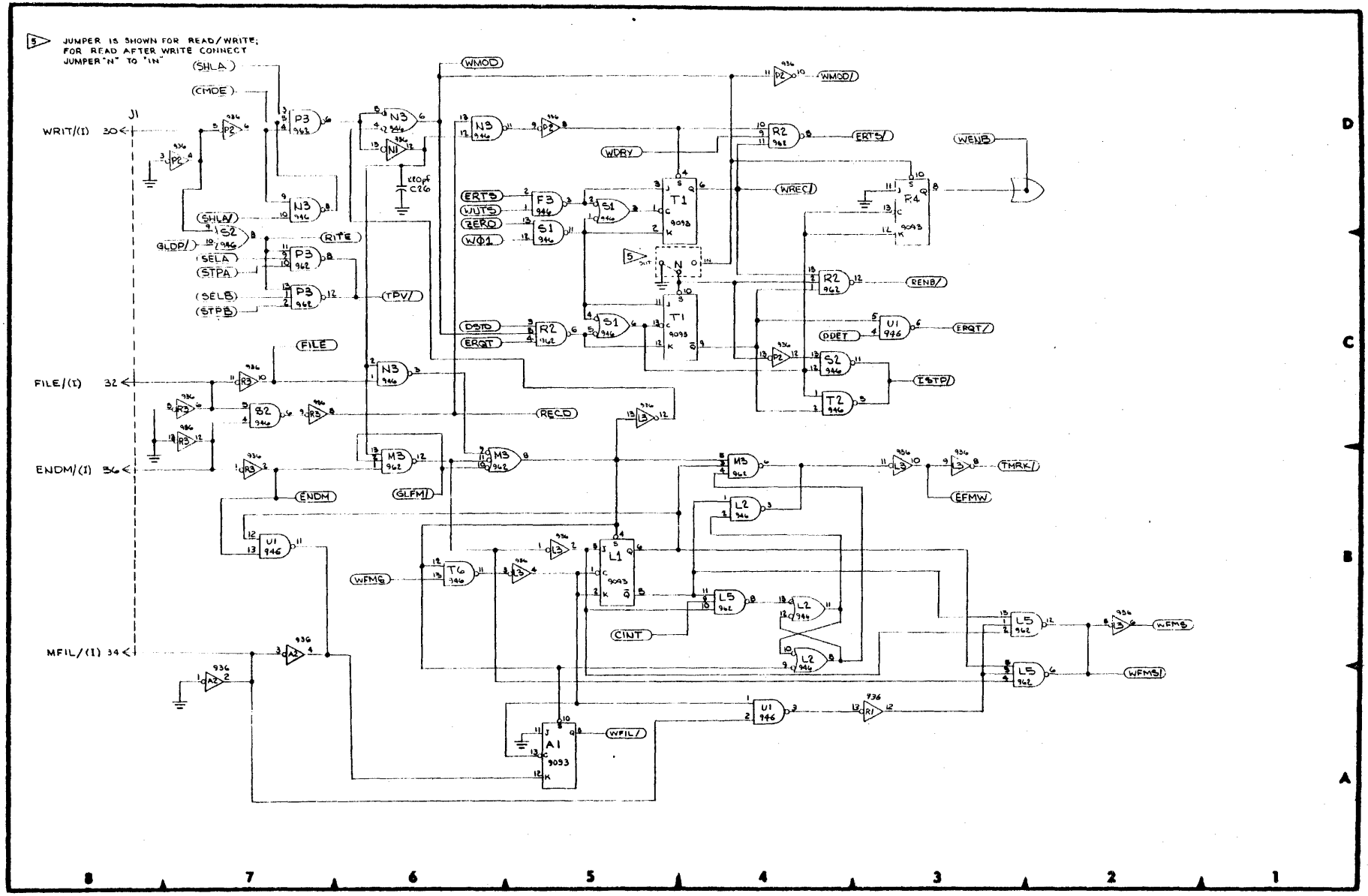
SCHEMATIC - 3000 CONTROLLER BOARD, MASTER TIMING LOGIC

DWG. NO. 1050B0224
SHEET 8 of 12



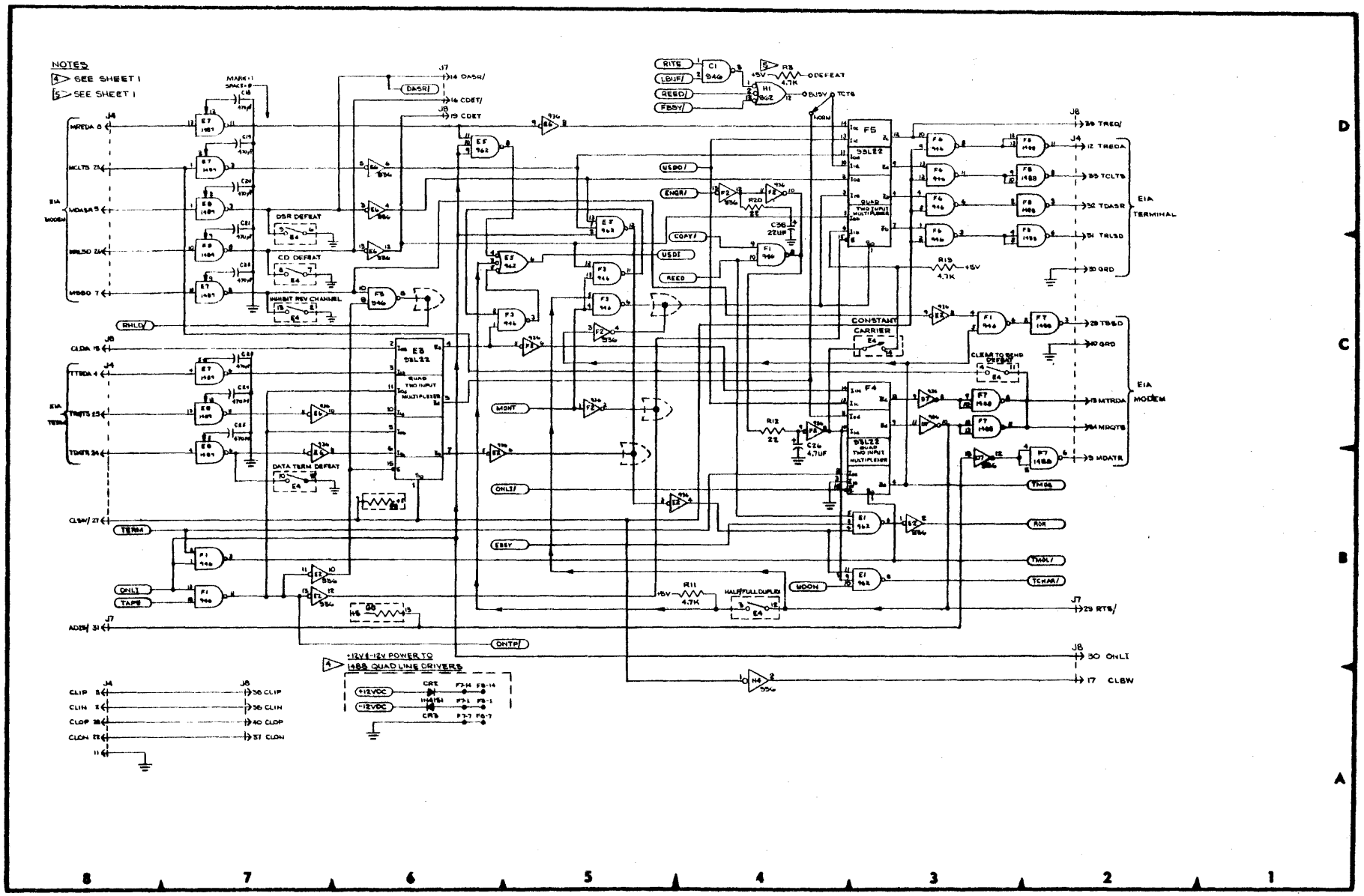
SCHEMATIC - 3000 CONTROLLER BOARD, LOAD POINT LOGIC

DWG. NO. 1050B0224
SHEET 9 of 12



SCHEMATIC - 3000 CONTROLLER BOARD, WRITE SEQUENCE LOGIC

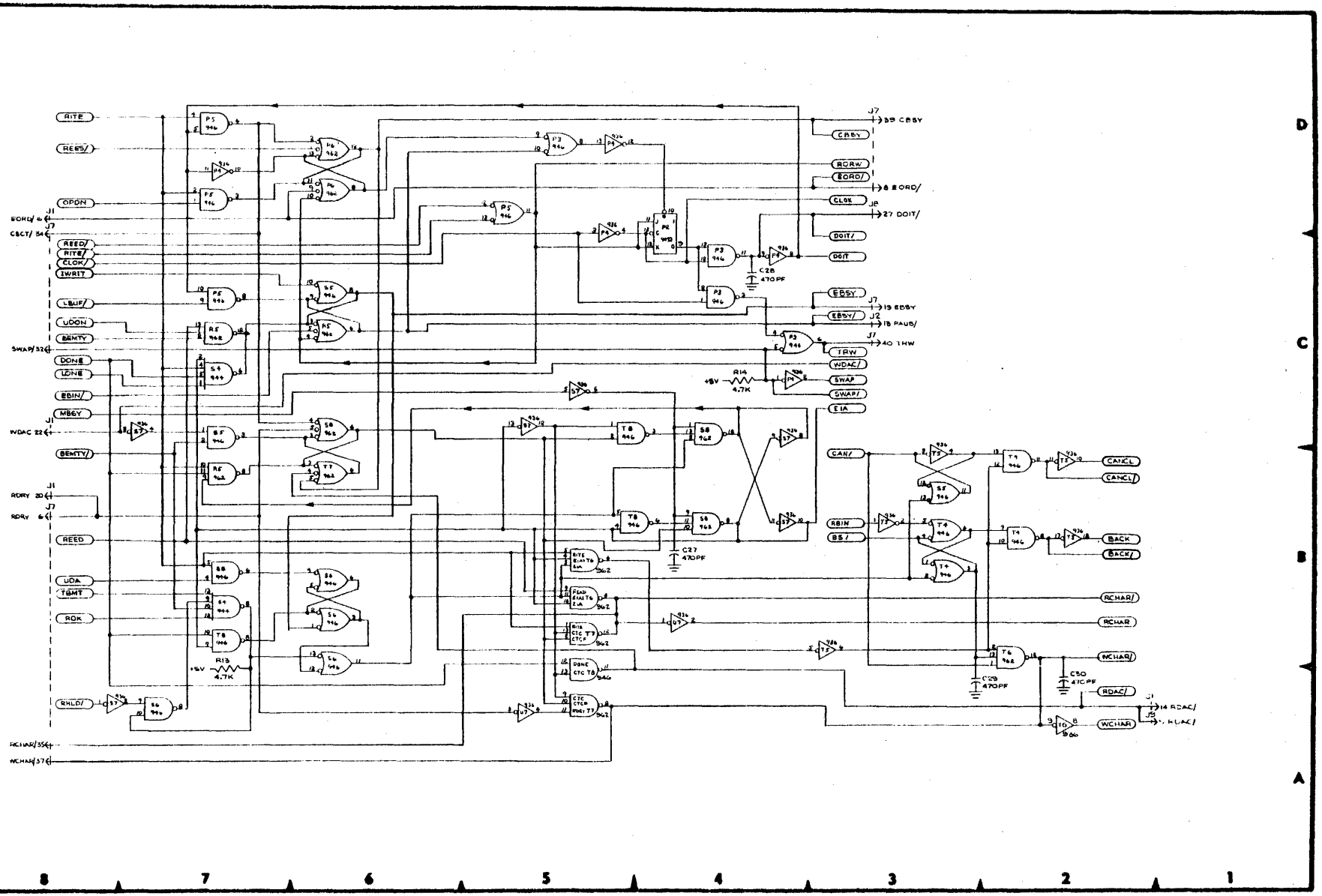
DWG. NO. 1050B0224
SHEET 10 of 12



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, MODEM - TERMINAL INTERFACE

DWG. NO. 1050B0841

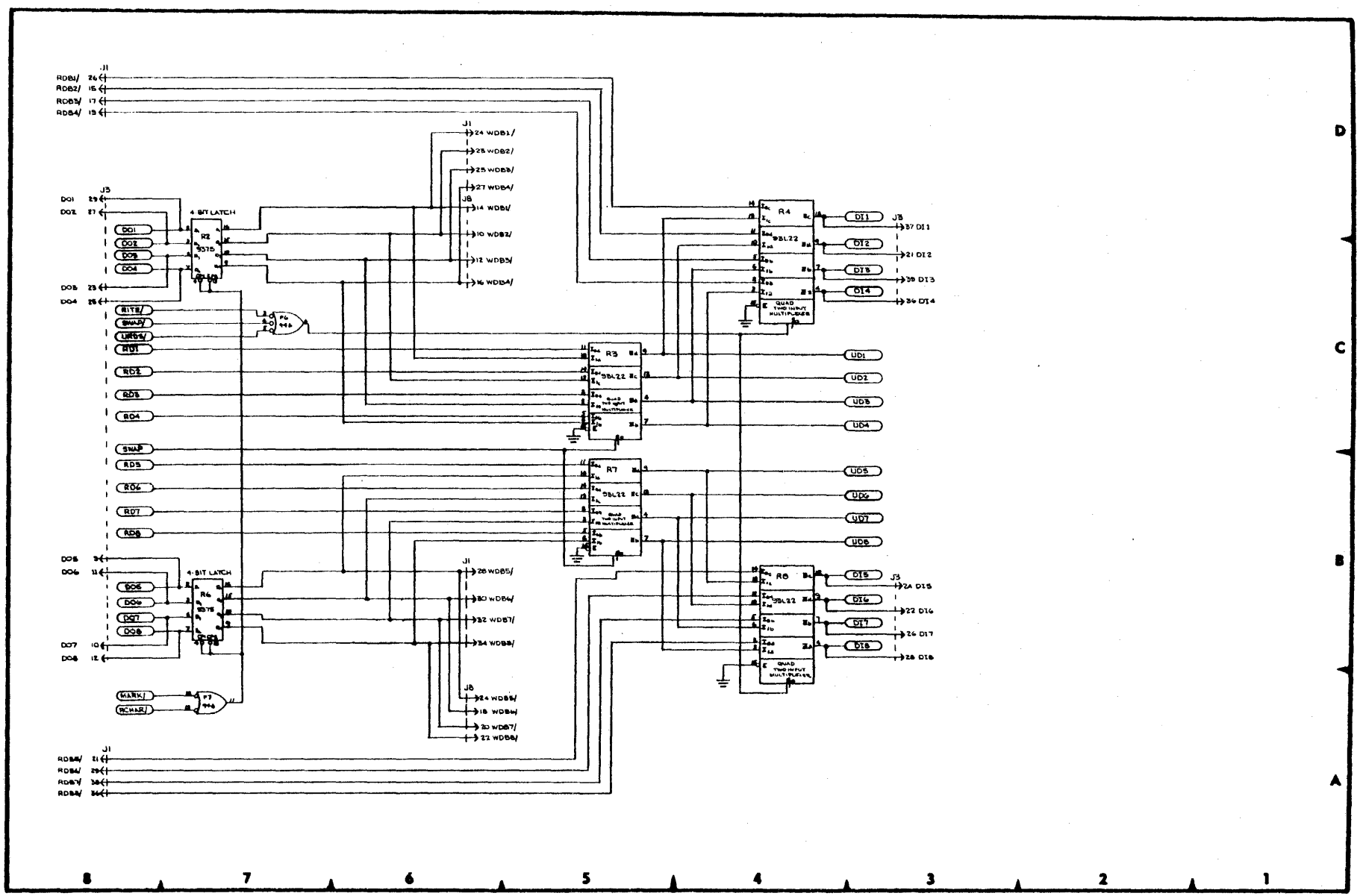
Sheet 6 of 12



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, INTERFACE CONTROL #1

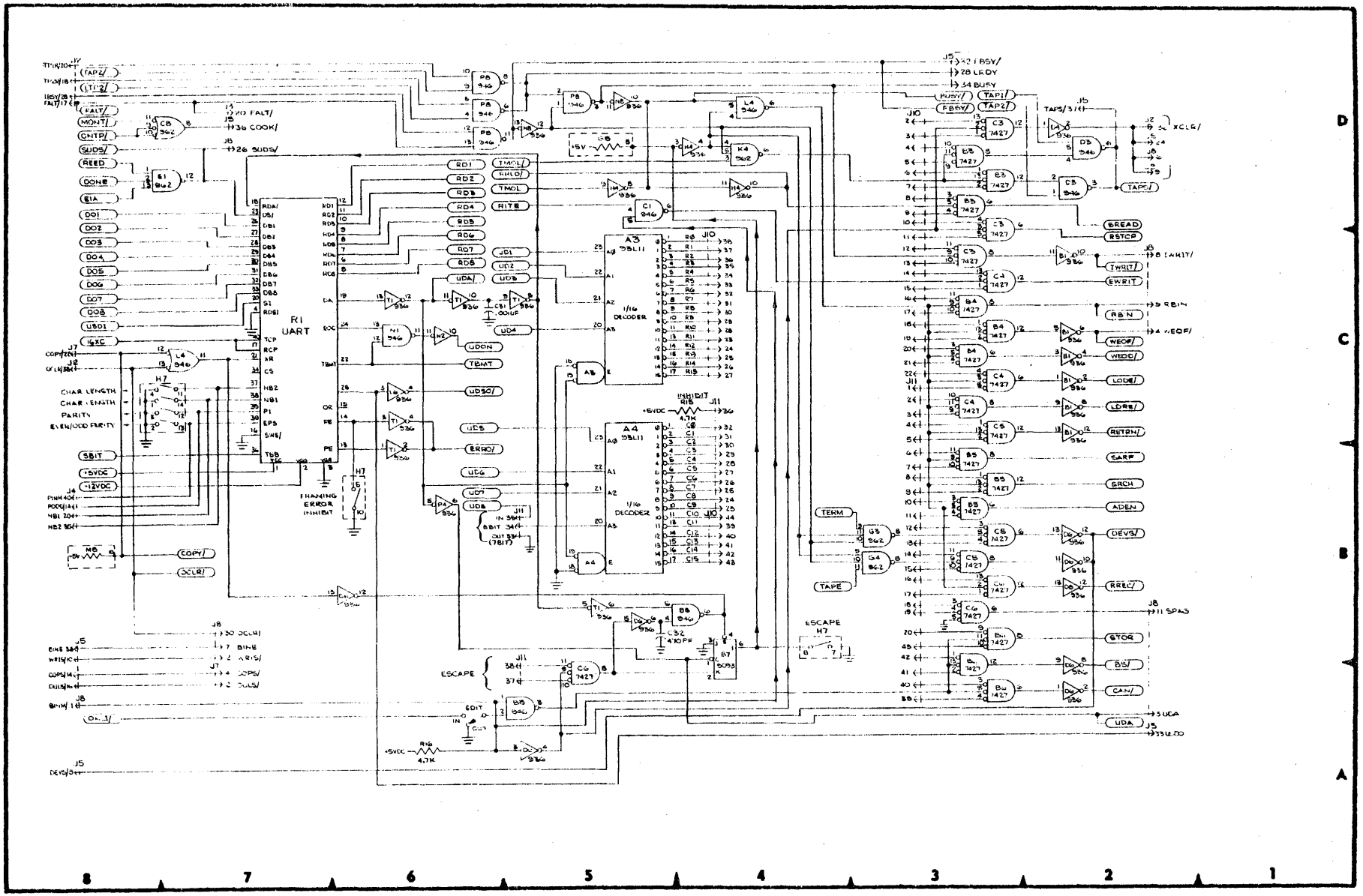
DWG. NO. 1050B0841

Sheet 7 of 12



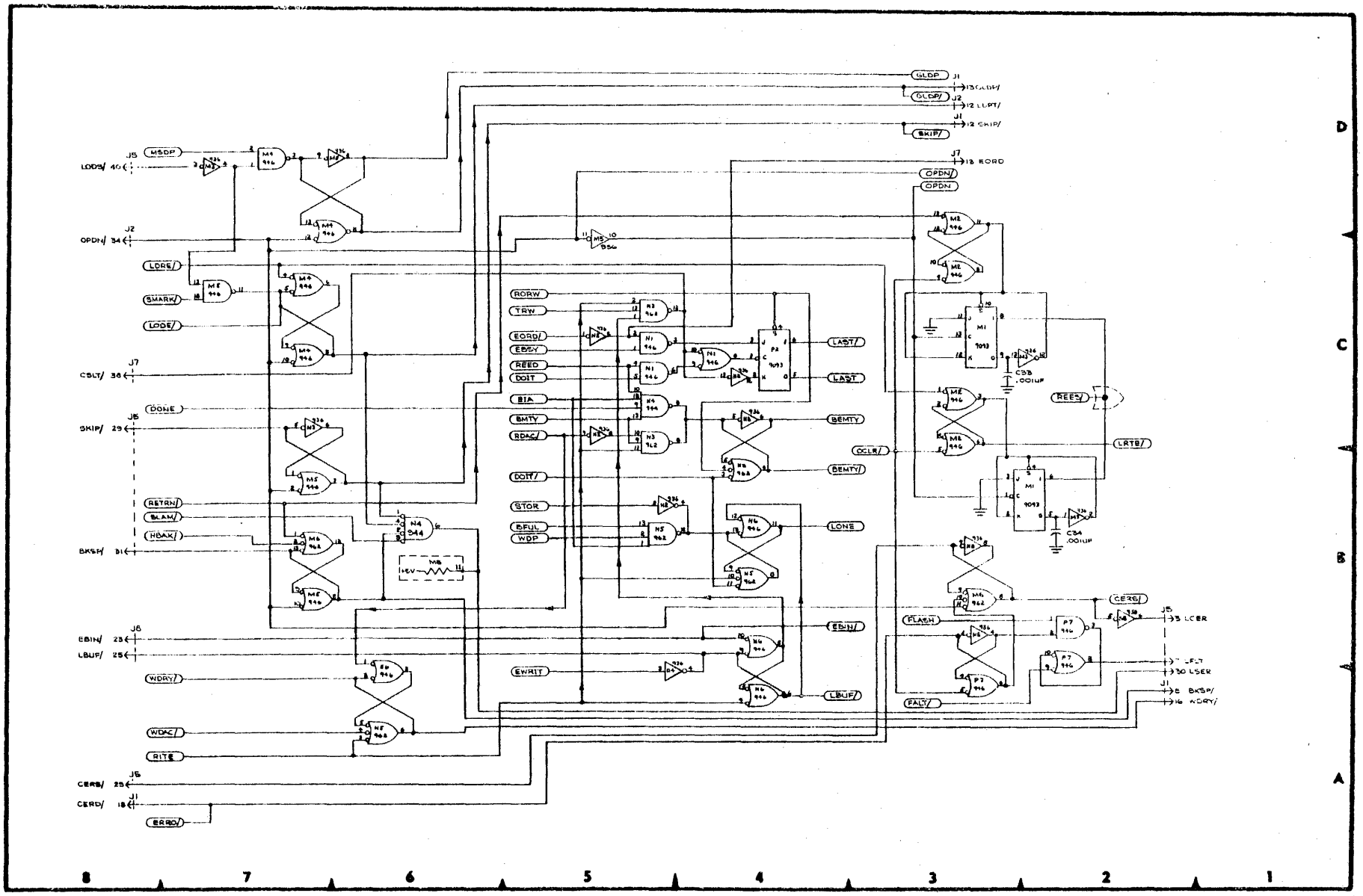
SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, DATA MULTIPLEXER & PATH CONTROL

DWG. NO. 1050B0841
Sheet 8 of 12



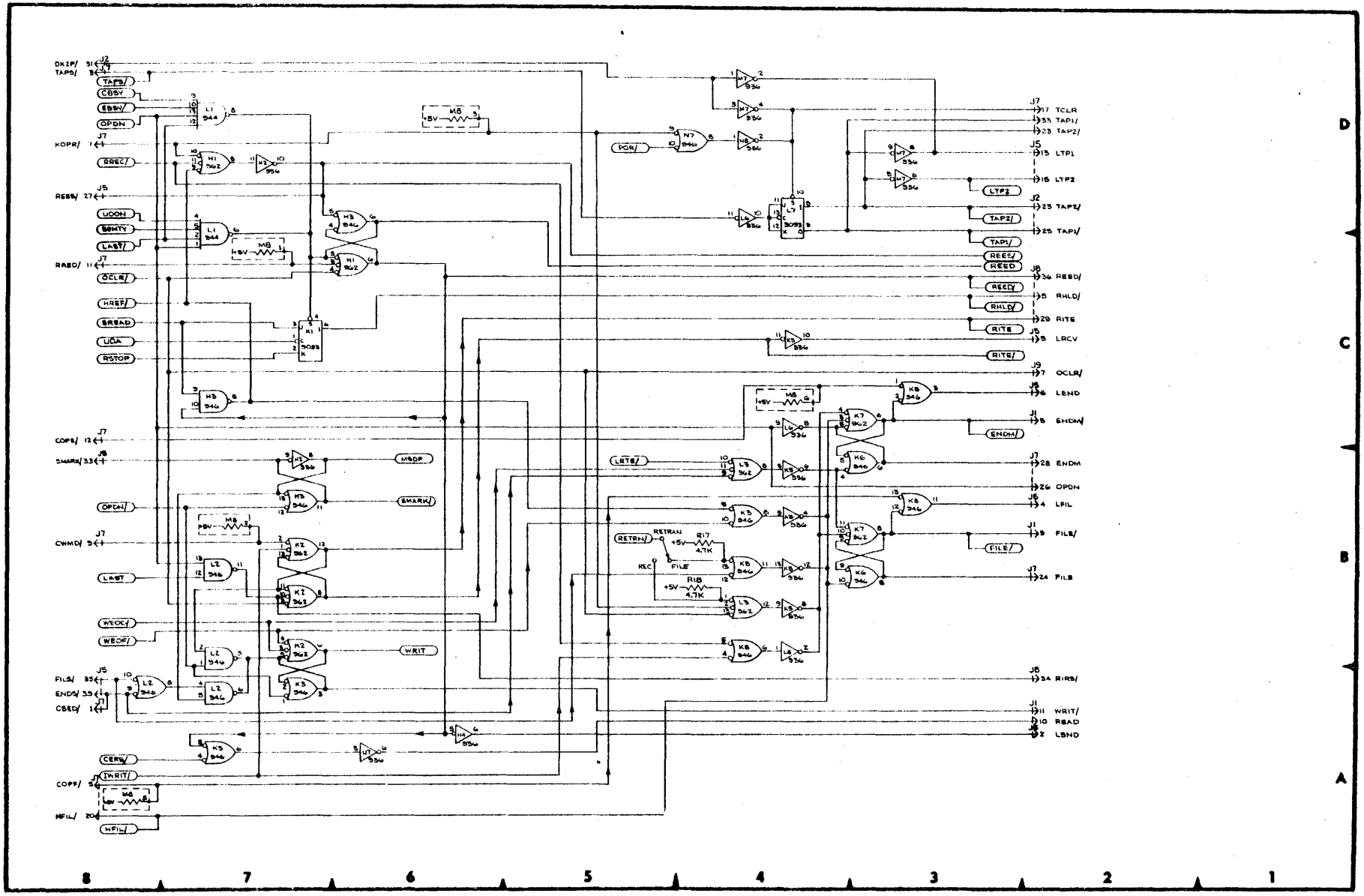
SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, UART & REMOTE FUNCTION DECODERS

DWG. NO. 1050B0841
Sheet 9 of 12



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, INTERFACE CONTROL #2

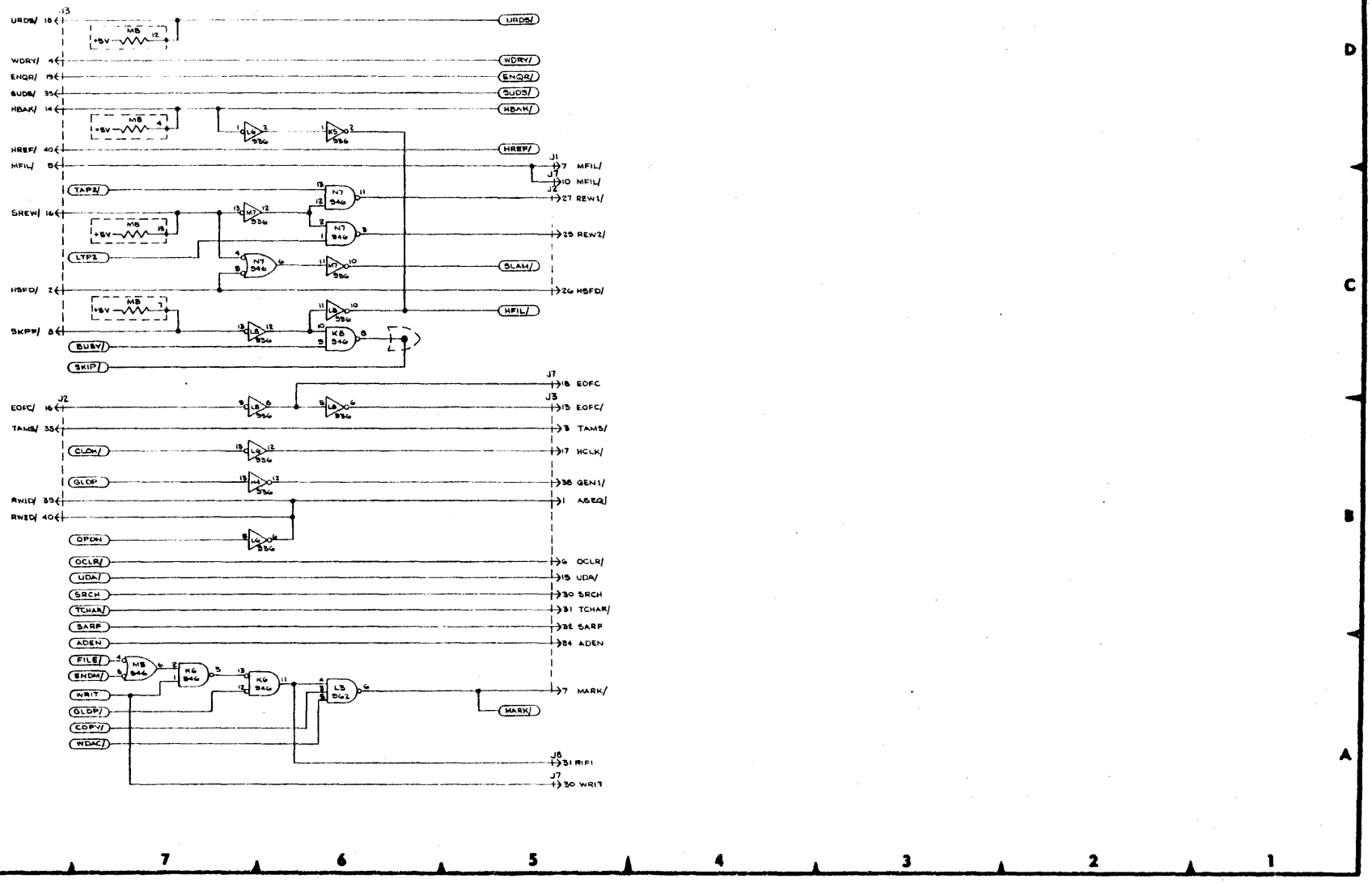
DWG. NO. 1050B0841
Sheet 10 of 12



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, INTERFACE CONTROL #3

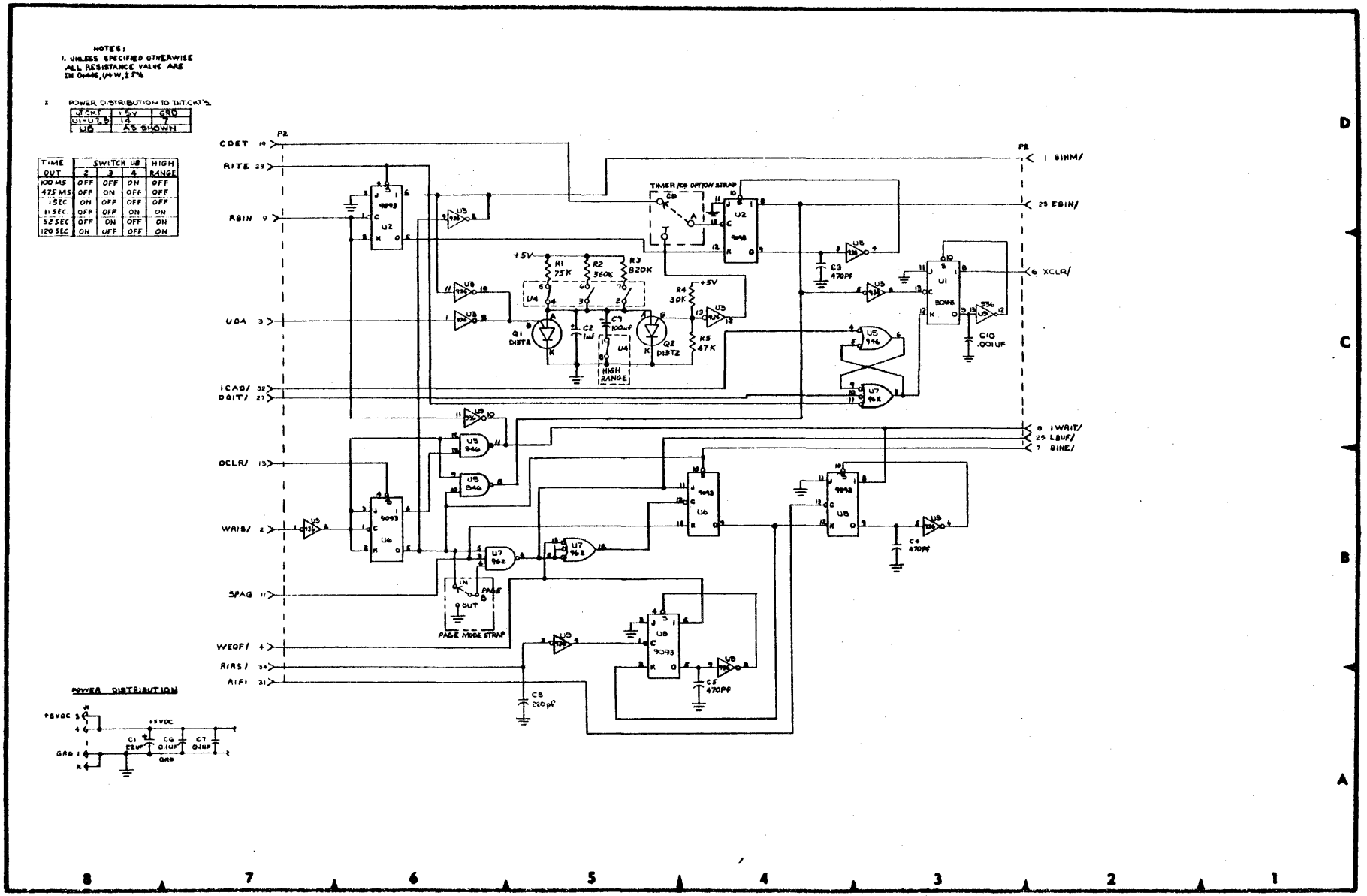
DWG. NO. 1050B0841

Sheet 11 of 12



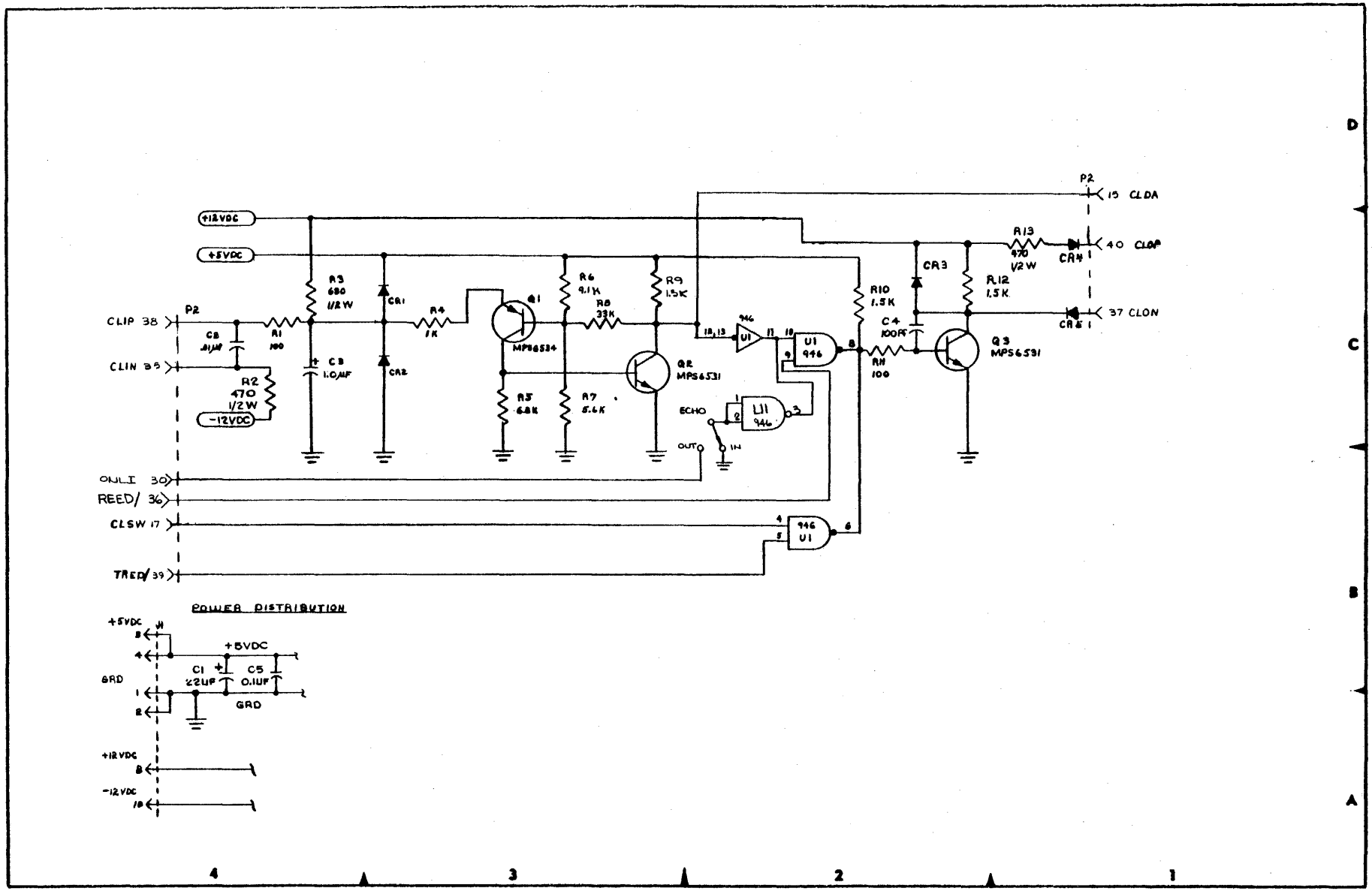
SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, DIRECT ACCESS INTERFACE

DWG. NO. 1050B0841
Sheet 12 of 12



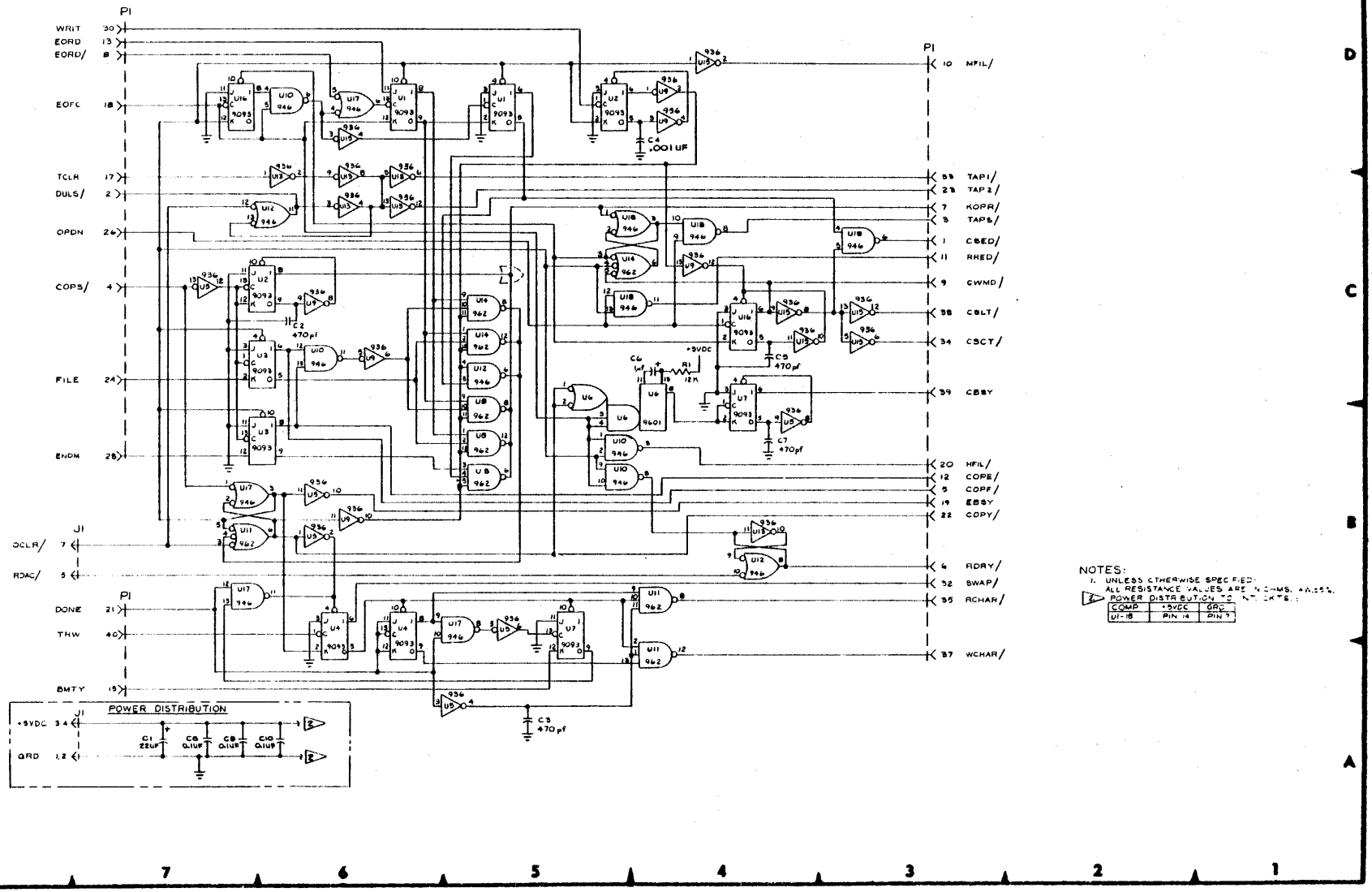
SCHEMATIC - EIA OPTION BOARD, A1 - TRANSPARENT MODE OPTION

DWG. NO. 1050B0815
SHEET 1 of 1



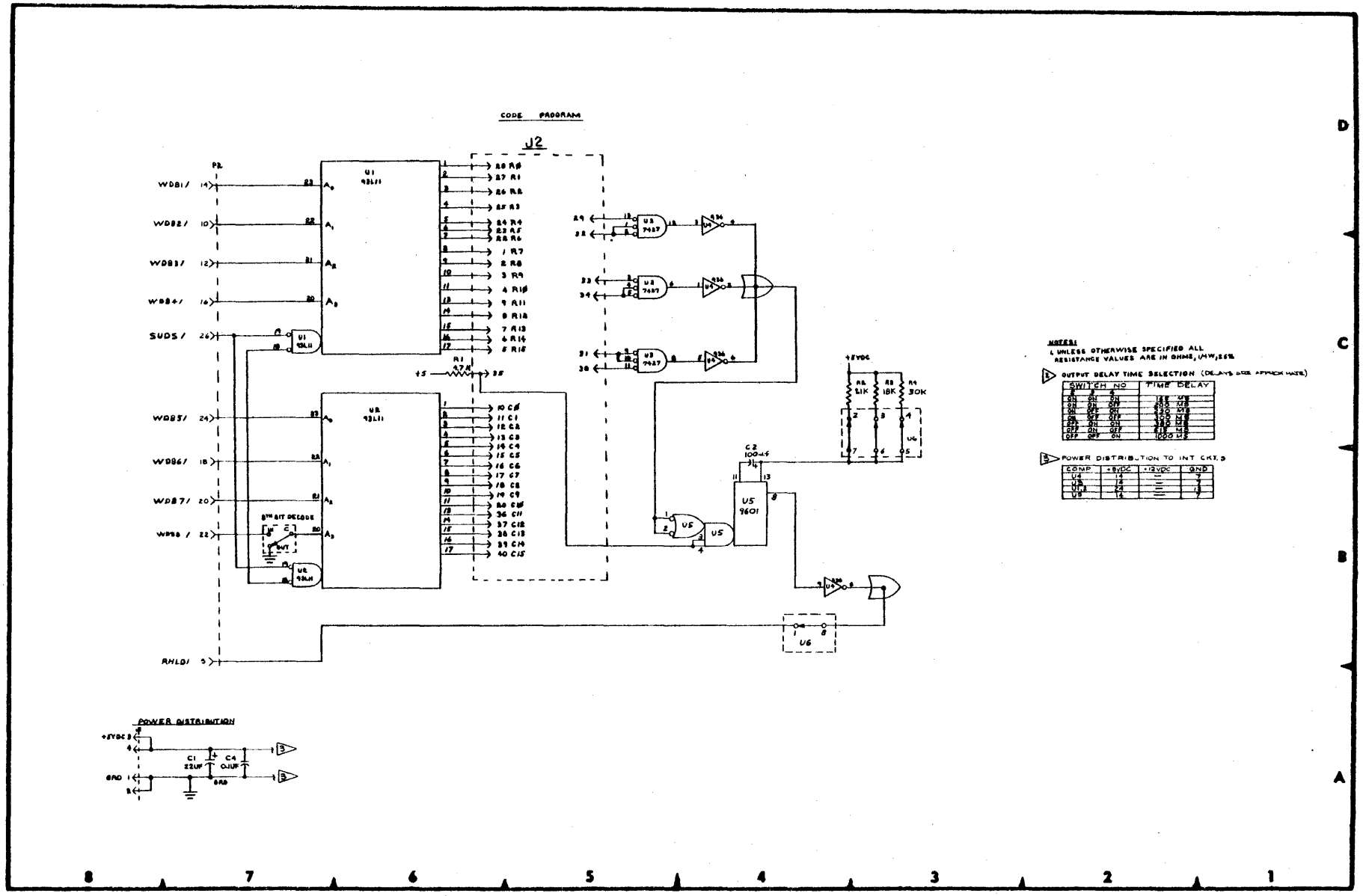
SCHEMATIC - EIA OPTION BOARD, A2 - CURRENT LOOP OPTION

DWG. NO. 1050B0817
SHEET 1 of 1



SCHEMATIC - EIA OPTION BOARD, A3 - COPY/DUAL OPTION

DWG. NO. 1050B0819
SHEET 1 of 1

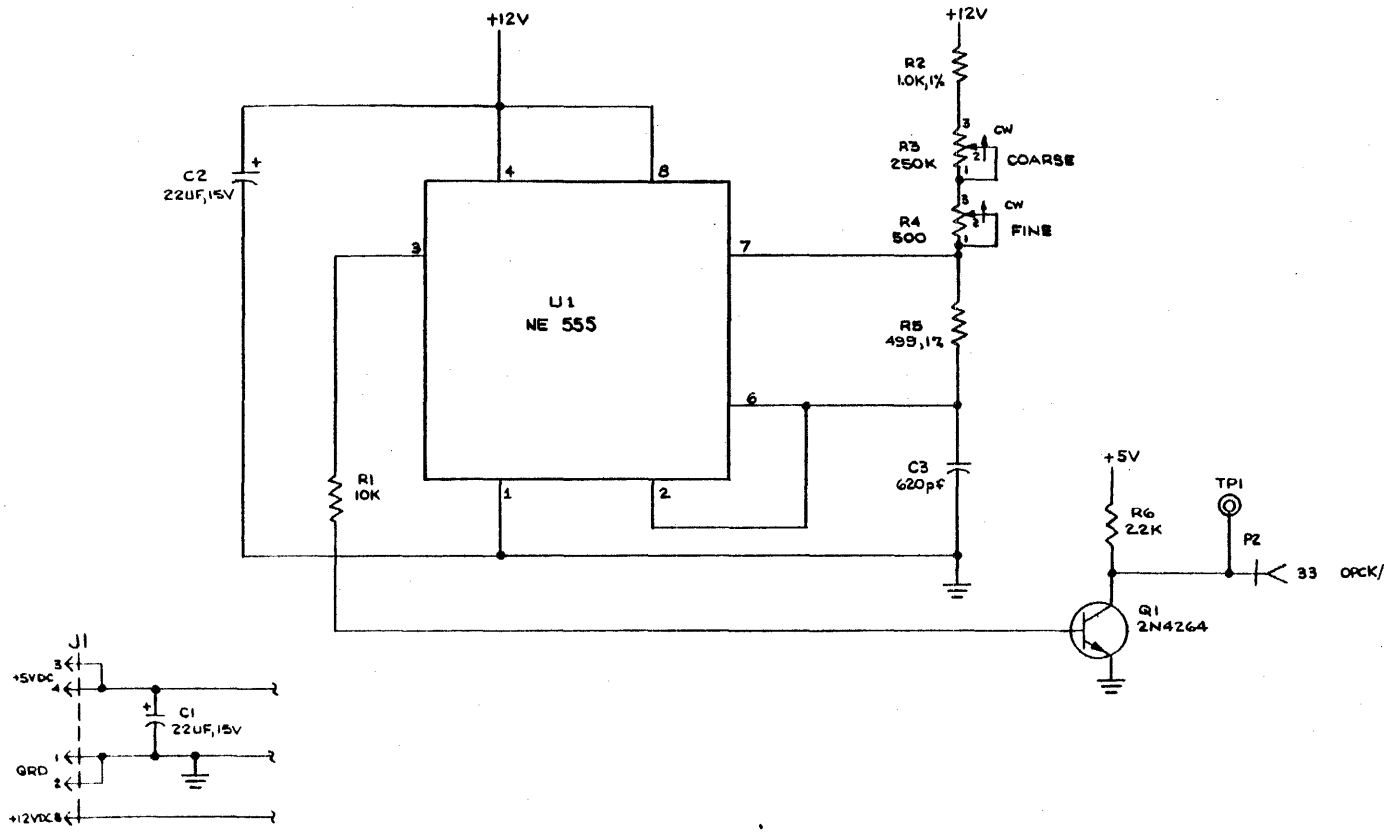


SCHEMATIC - EIA OPTION BOARD, A4 - OUTPUT DELAY OPTION

DWG. NO. 1050B0821
SHEET 1 of 1

NOTES:

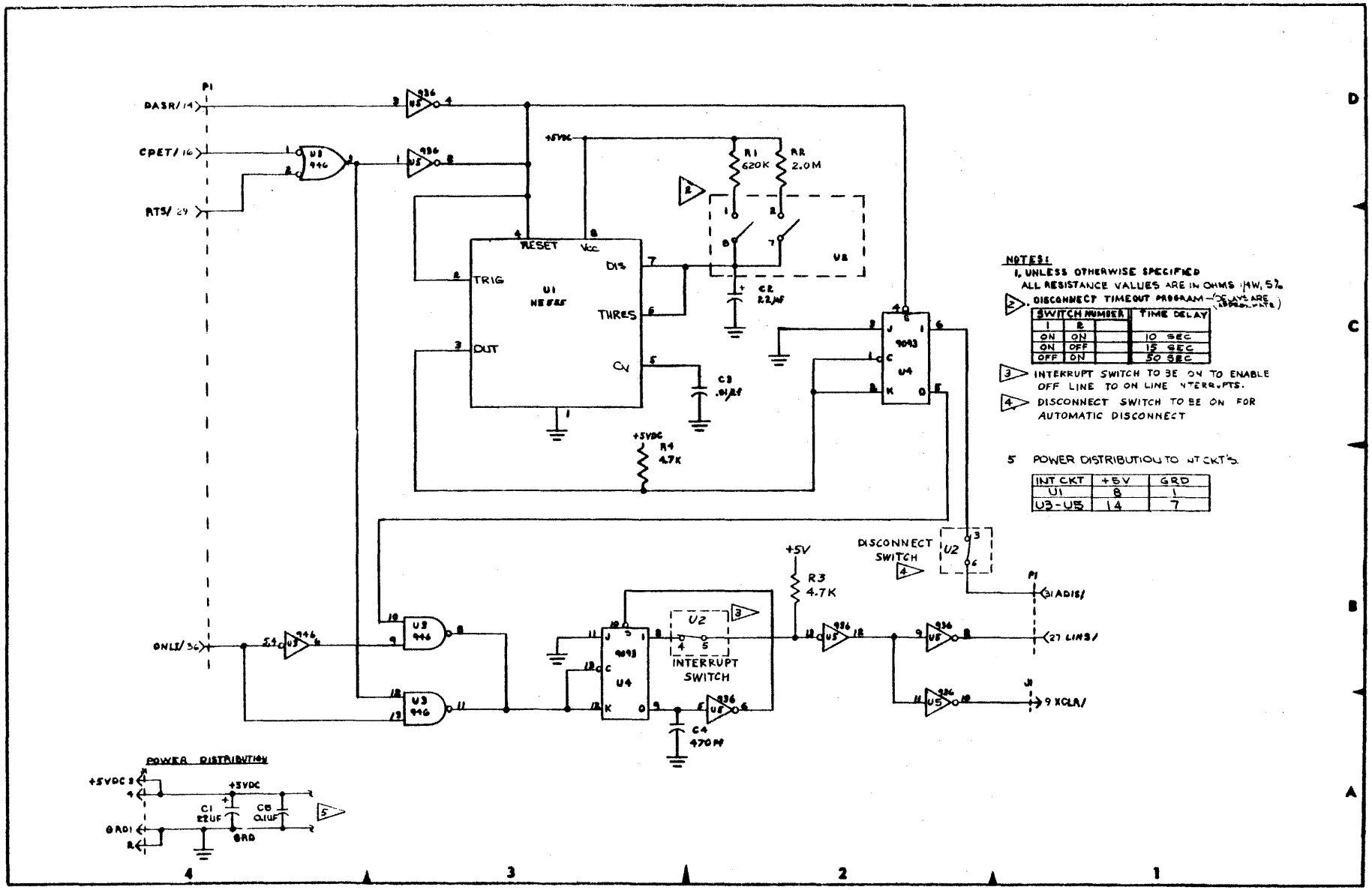
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 5%



SCHEMATIC - EIA OPTION BOARD, A5 - CUSTOM BAUD RATE

DWG. NO. 1050B0823

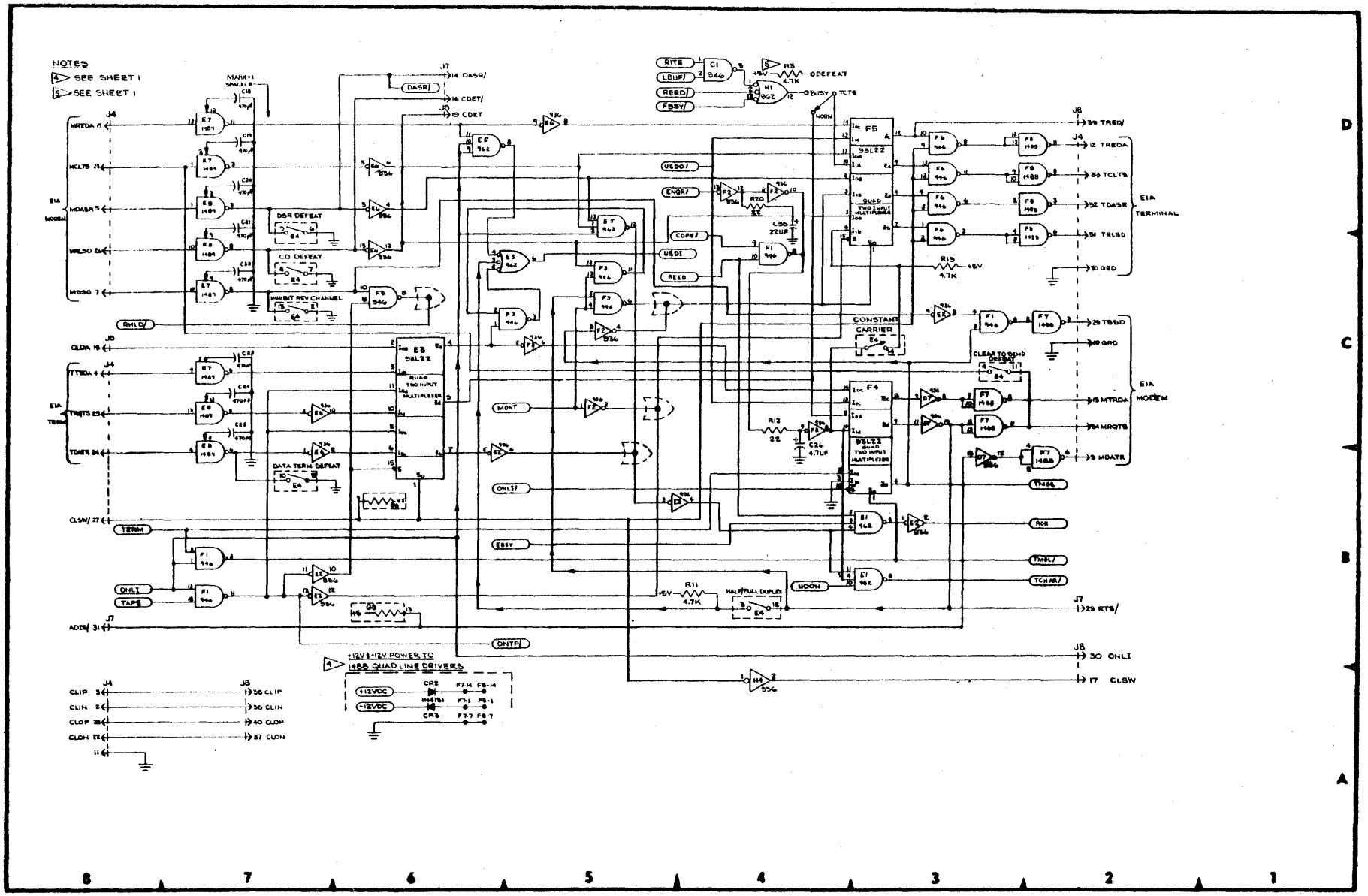
SHEET 1 of 1



SCHEMATIC - EIA OPTION BOARD, A6 - AUTO DISCONNECT/REMOTE INTERRUPT OPTION

DWG. NO. 1050B0825

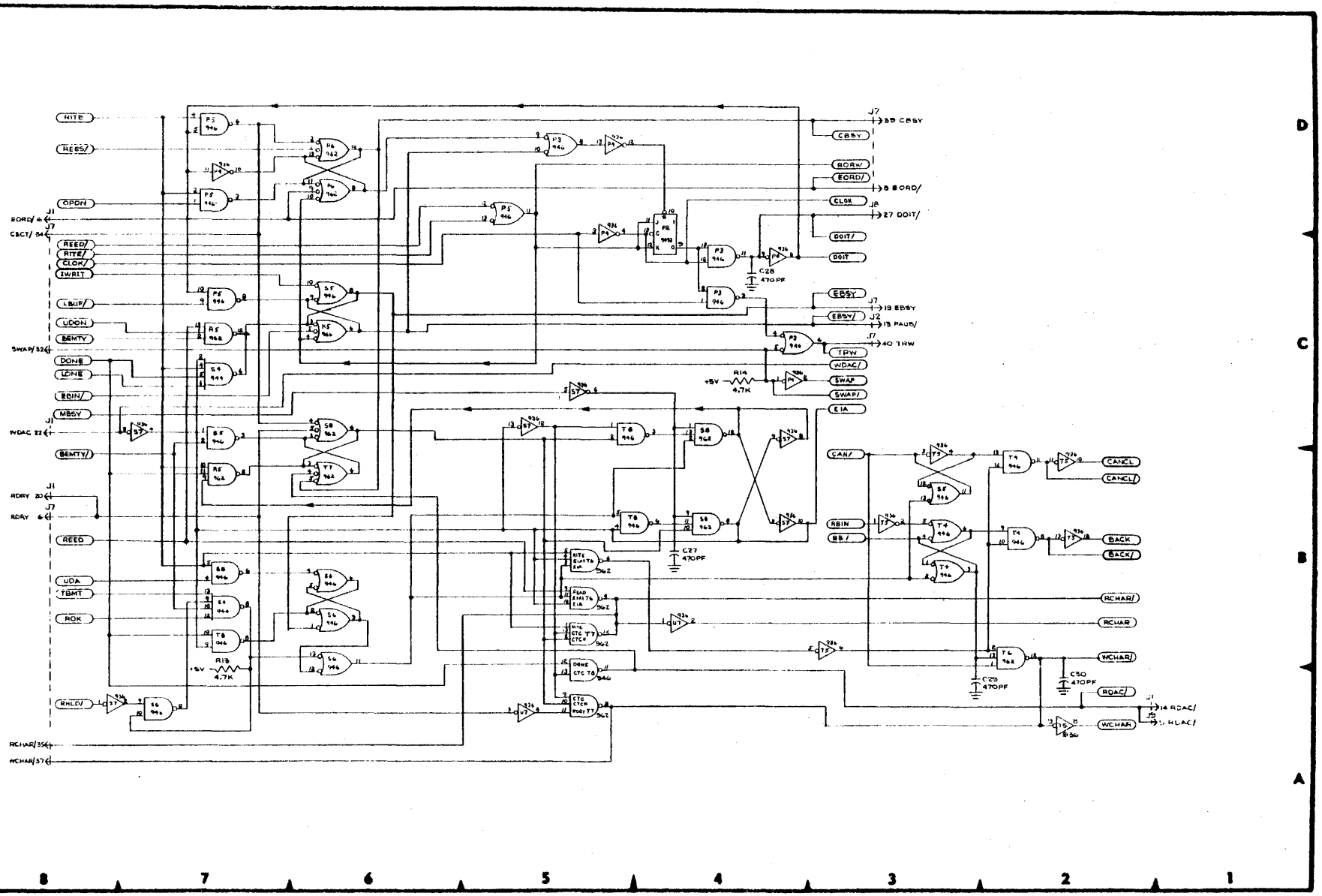
SHEET 1 of 1



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, MODEM - TERMINAL INTERFACE

DWG. NO. 1050B0841

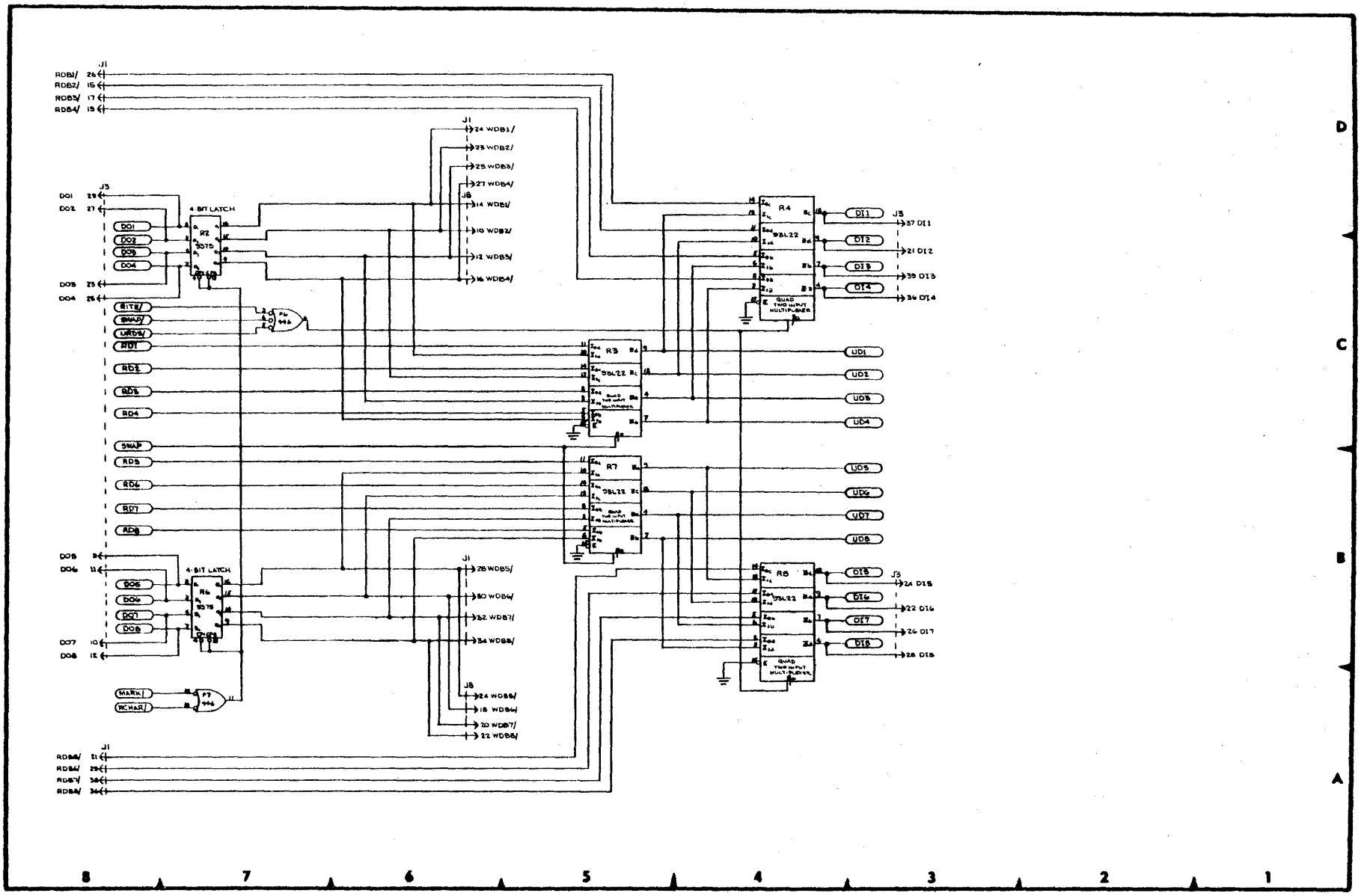
Sheet 6 of 12



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, INTERFACE CONTROL #1

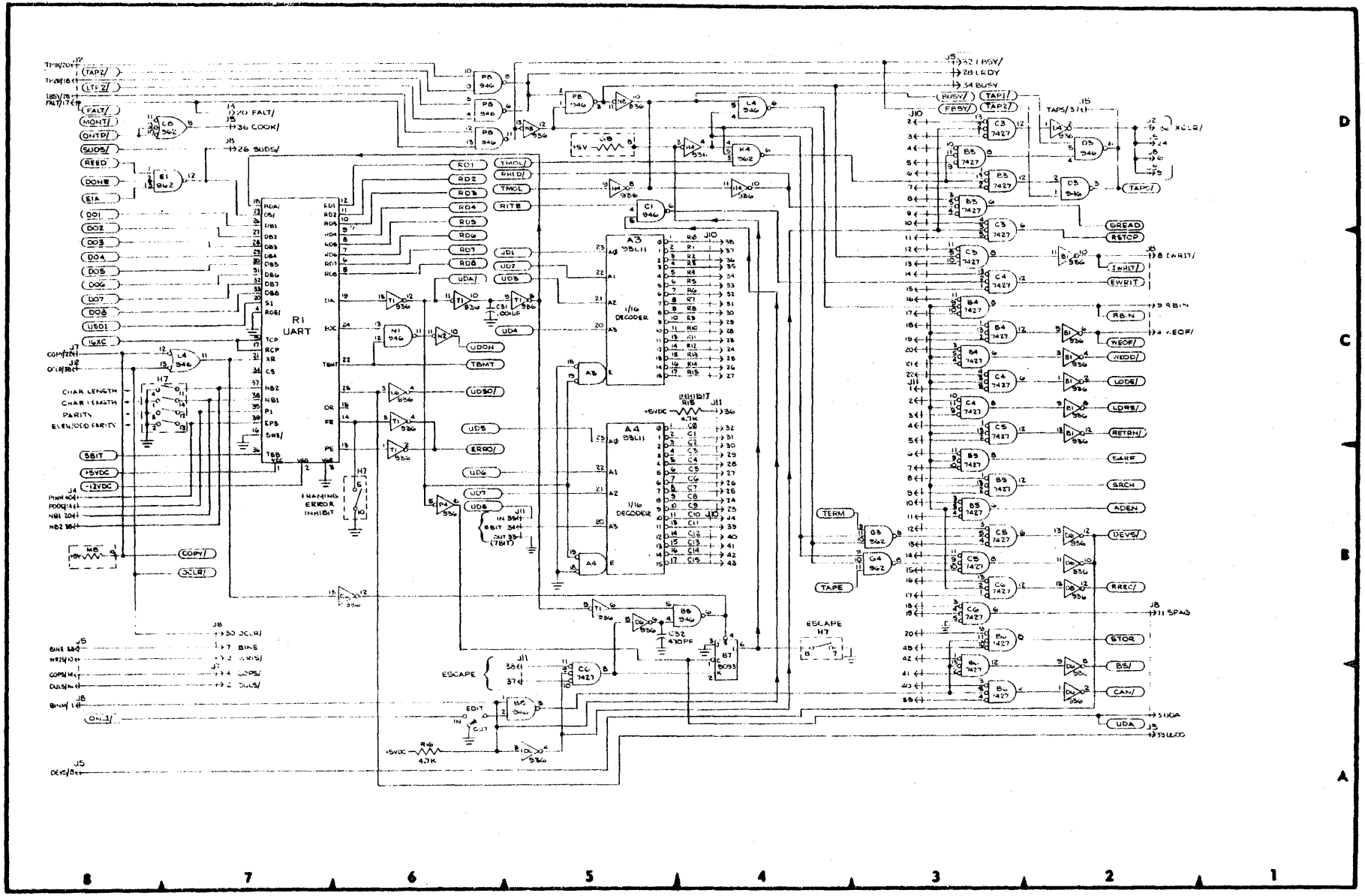
DWG. NO. 1050B0841

Sheet 7 of 12



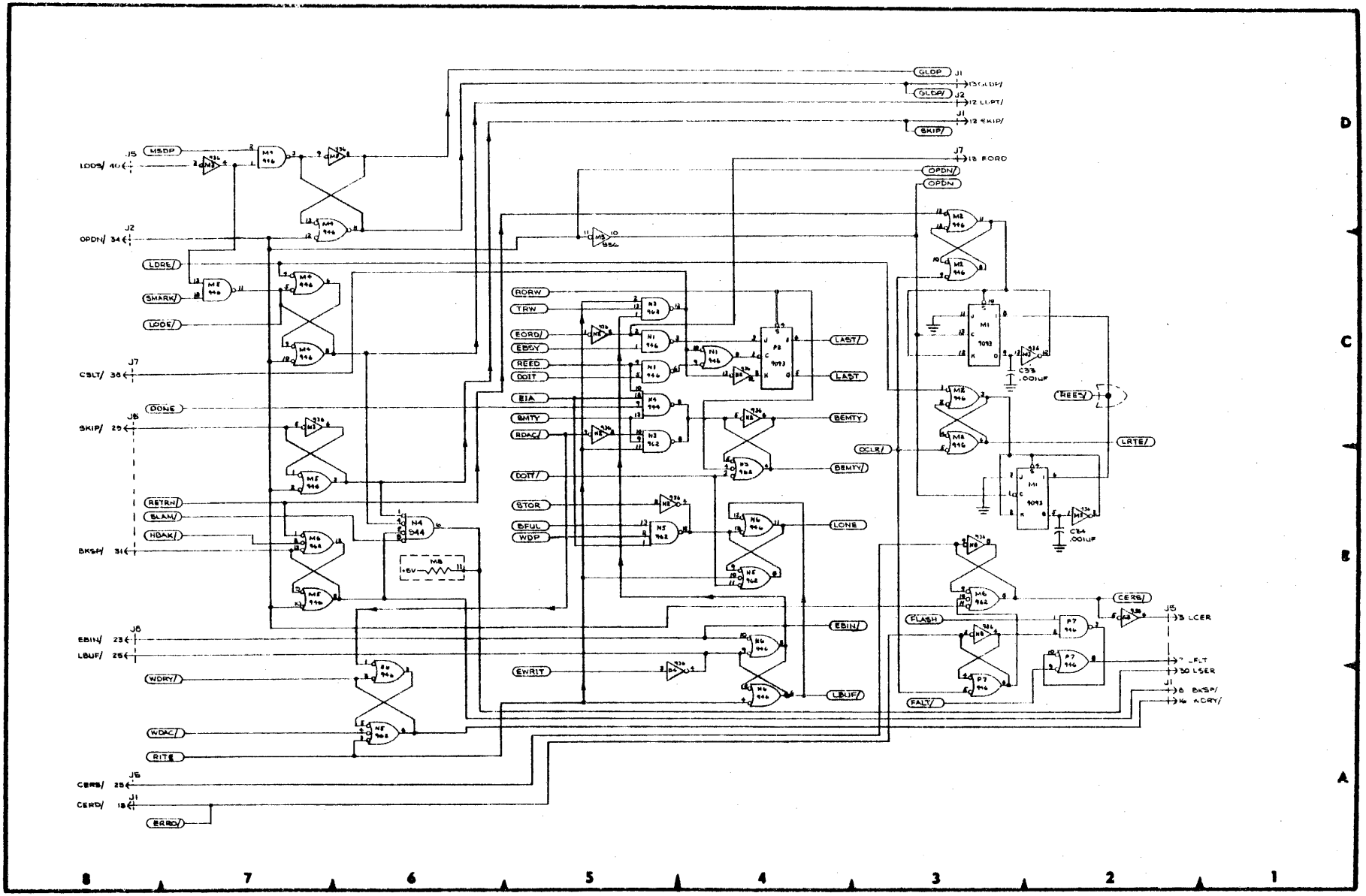
SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, DATA MULTIPLEXER & PATH CONTROL

DWG. NO. 1050B0841
Sheet 8 of 12



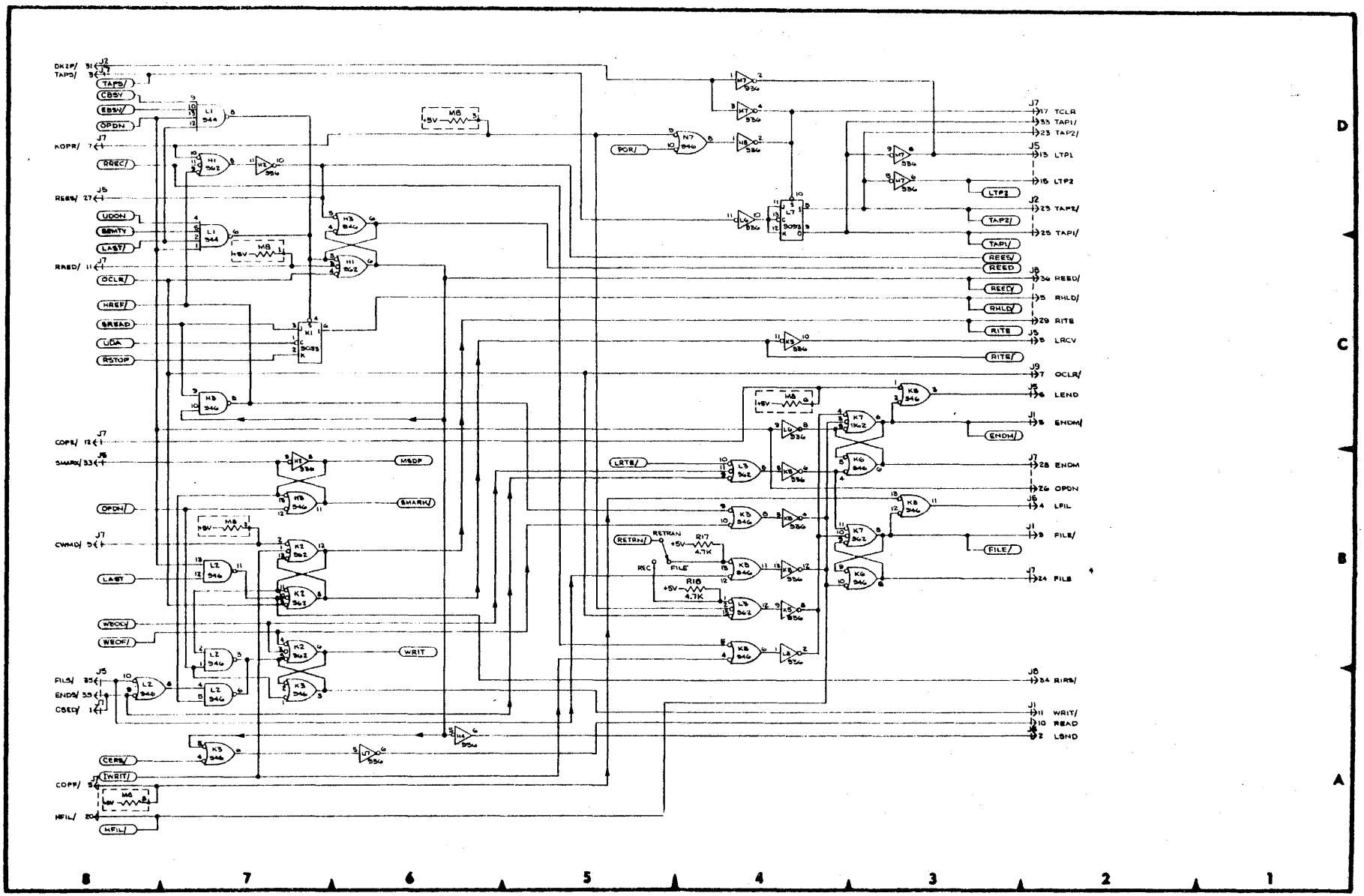
SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, UART & REMOTE FUNCTION DECODERS

DWG. NO. 1050B0841
Sheet 9 of 12



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, INTERFACE CONTROL #2

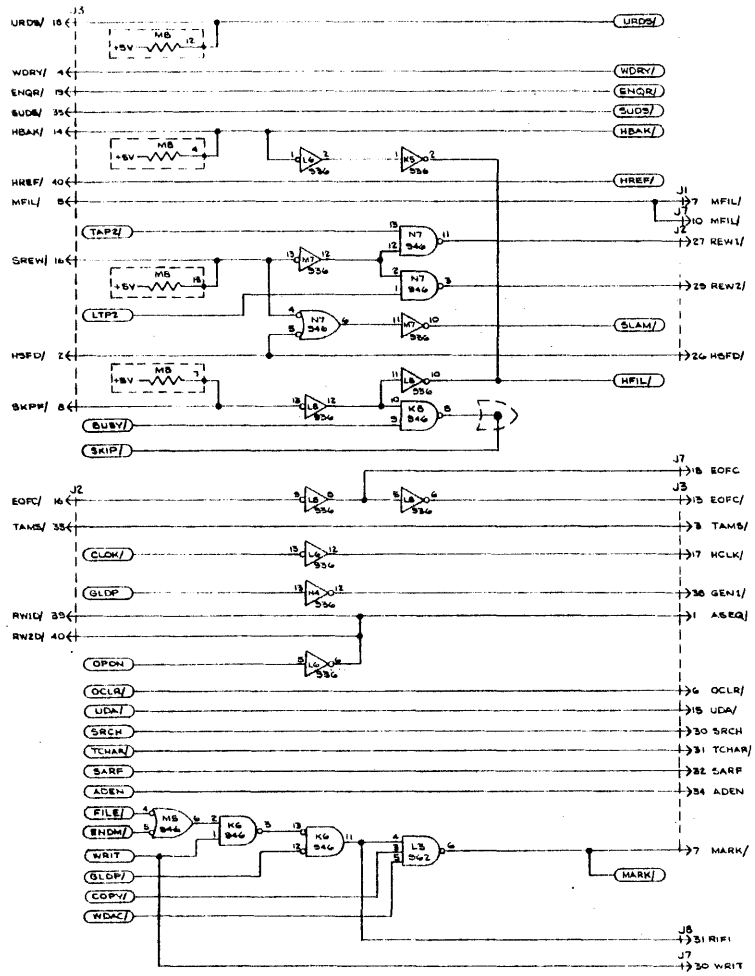
DWG. NO. 1050B0841
Sheet 10 of 12



SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, INTERFACE CONTROL #3

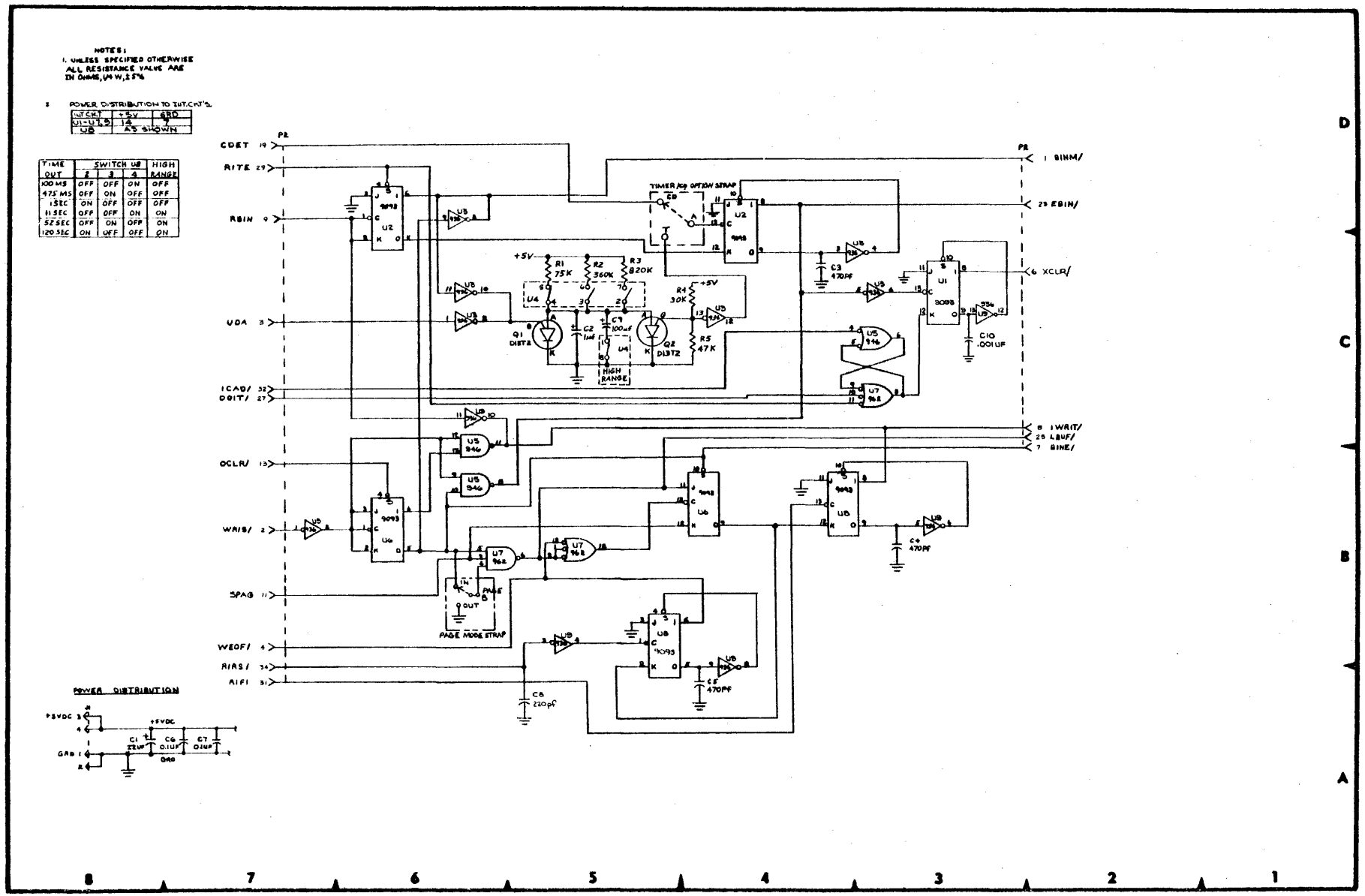
DWG. NO. 1050B0841

Sheet 11 of 12



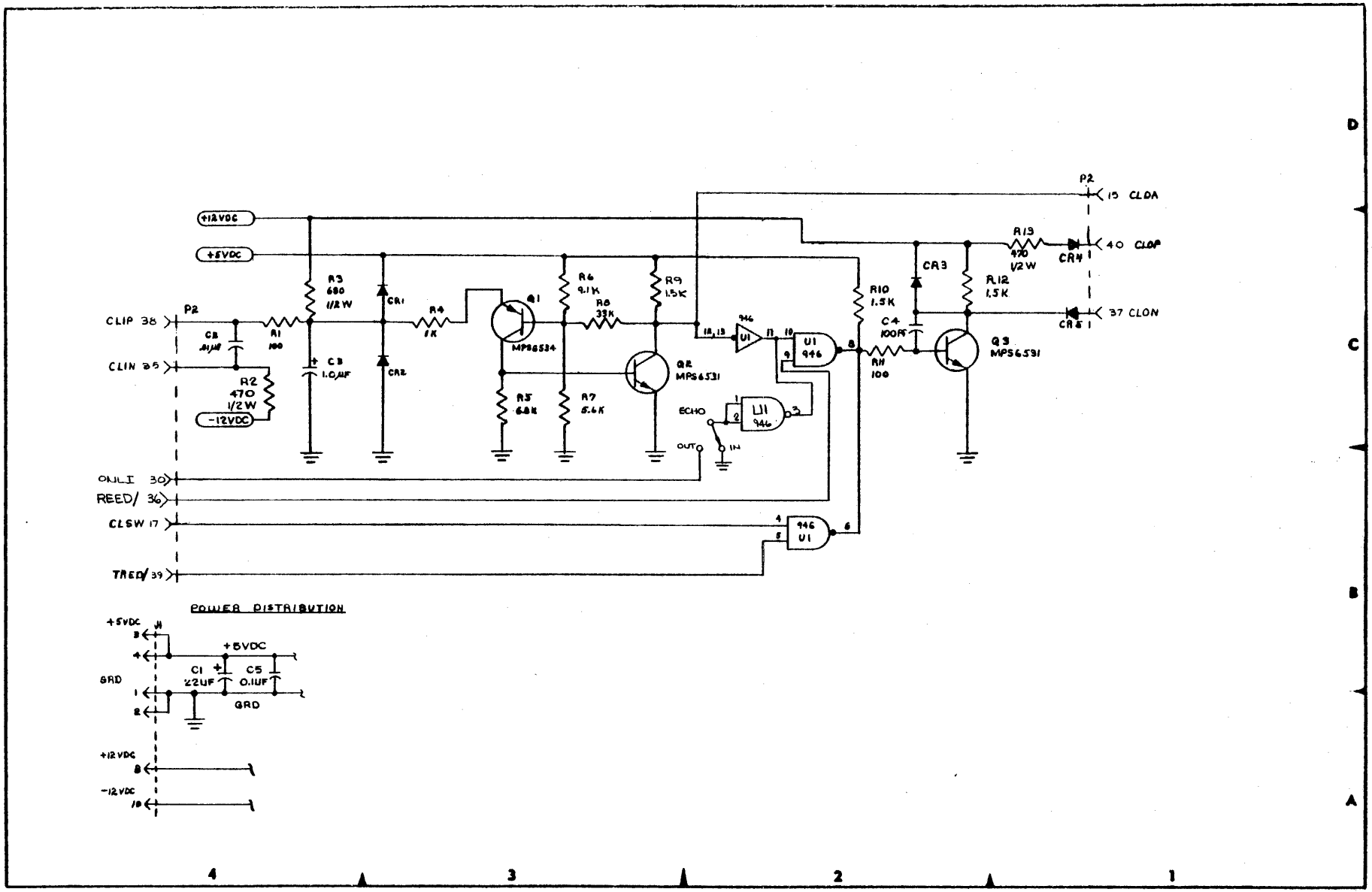
SCHEMATIC - EIA ASYNCHRONOUS INTERFACE, DIRECT ACCESS INTERFACE

DWG. NO. 1050B0841
Sheet 12 of 12



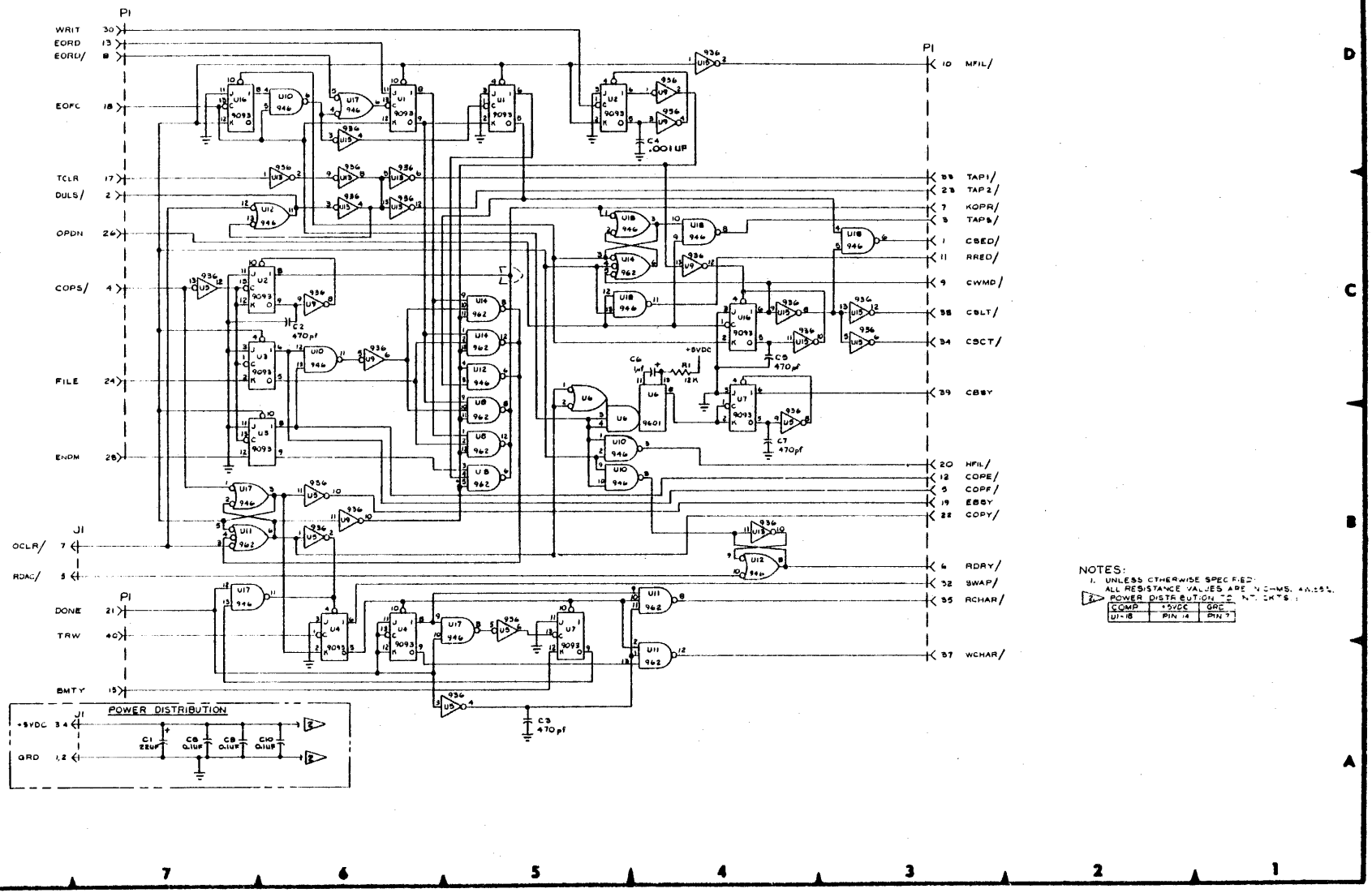
SCHEMATIC - EIA OPTION BOARD, A1 - TRANSPARENT MODE OPTION

DWG. NO. 1050B0815
SHEET 1 of 1



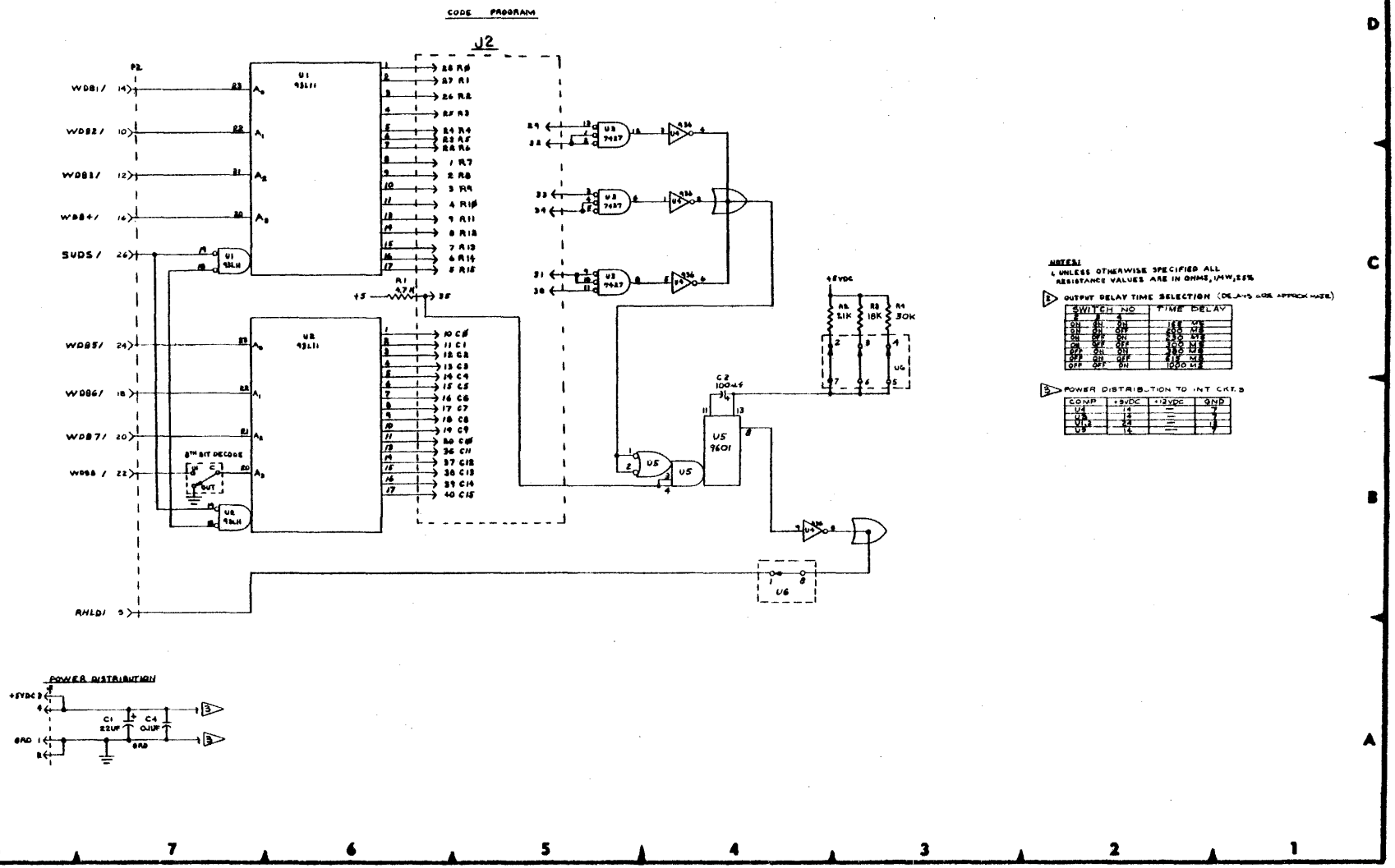
SCHEMATIC - EIA OPTION BOARD, A2 - CURRENT LOOP OPTION

DWG. NO. 1050B0817
SHEET 1 of 1



SCHEMATIC - EIA OPTION BOARD, A3 - COPY/DUAL OPTION

DWG. NO. 1050B0819
SHEET 1 of 1

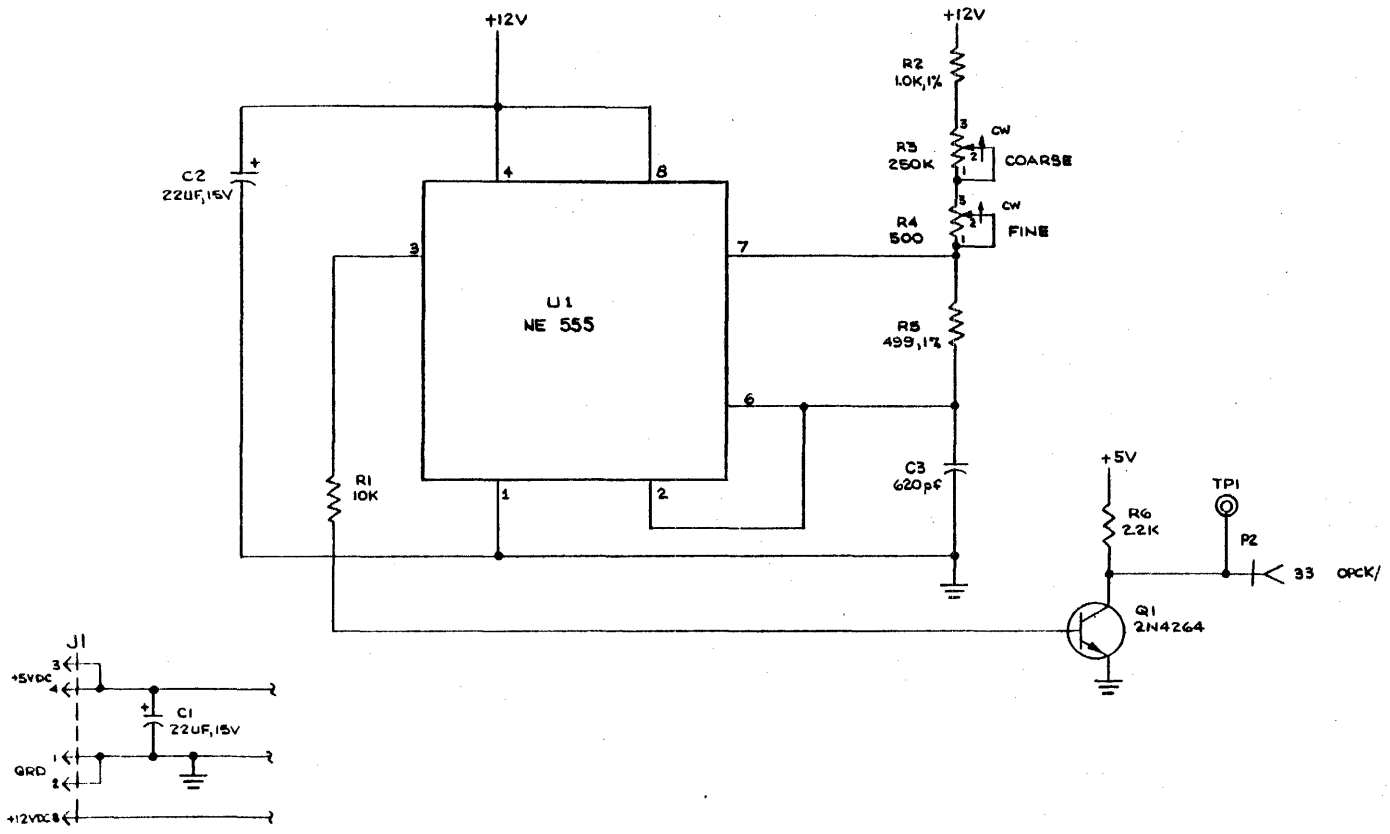


SCHEMATIC - EIA OPTION BOARD, A4 - OUTPUT DELAY OPTION

DWG. NO. 1050B0821
SHEET 1 of 1

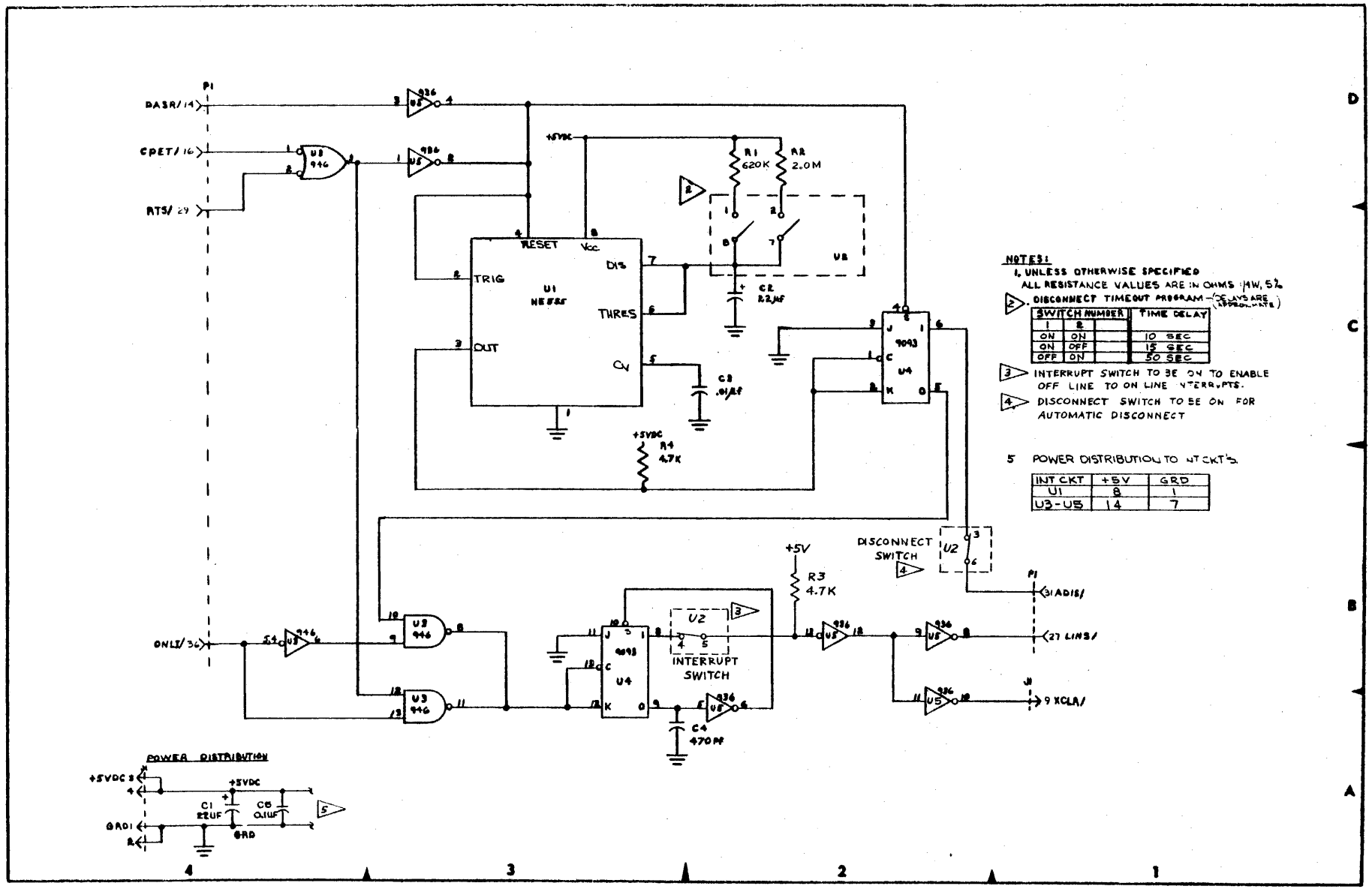
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 5%



SCHEMATIC - EIA OPTION BOARD, A5 - CUSTOM BAUD RATE

DWG. NO. 1050B0823
SHEET 1 of 1



SCHEMATIC - EIA OPTION BOARD, A6 - AUTO DISCONNECT/REMOTE INTERRUPT OPTION

DWG. NO. 1050B0825

SHEET 1 of 1