cipher data products, inc.

SERIES F880
MICROSTREAMER™ TAPE DRIVE
PRODUCT DESCRIPTION

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1.0 INTRODUCTION

The Cipher F880 Microstreamer™ tape drive consists of read and write, control and fotmatting electronics together with a reel to reel synchronous tape transport.

Data is exchanged at the interface in 9 bit parallel form compatible with the industry standard formatter interface for this class of tape transport.

The logic for data encoding, data decoding, character deskewing, error correction, error detection, data storage and tape motion control are all contained on the main logic board.

The F880 is designed to read and write ANSI compatible 1600 bpi PE tape at 100 and 25 ips.

Up to eight F880's may be daisy chained or they can be intermixed with other Cipher drives having an embedded formatter installed.

1.1 PHYSICAL DESCRIPTION. The Model F880 Microstreamer tape transport is designed to be rack-mounted in a standard 19-inch equipment rack. All components are mounted on a precision-ground, cast-aluminum plate. When the equipment rack is securely anchored, the printed circuit board and other internal components can be made accessible from the front by releasing the latch located inside the front panel bottom. Slide the drive out to the second stop and raise the front, top cover. After unscrewing the 2 retainer screws raise the front panel. The support mechanism will automatically latch in the service position, exposing the PCB and hardware.

1.2 MOUNTING. The Streamer is compatible with a 19 inch EIA Rack and is intended to be mounted on slides. Details of mounting are shown in Figure 1-4.

ACCESS. There are three different access positions on the Microstreamer. The first position, called "Operator Maintenance Access" position (Figure 1-1), provides admittance to supply reel, head and tape roller guides for cleaning. The second position, called "Take-Up Hub Access" position (Figure 1-2), allows entry to the take-up hub for a missing EOT or broken tape condition to allow for rethreading. Figure 1-3 shows the third position called "Service Access." When raised to this position, the printed circuit board may be lowered to provide access to all electronic components as well as mechanical parts.

1.3 FUNCTIONAL DESCRIPTION. The F880 reads and writes 1600 bpi phase encoded (PE) tape which meets ANSI standard X3.39-1973.

Tapes may be read or written at either of the tape speeds, 100 ips or 25 ips. The speed is selectable at the interface.

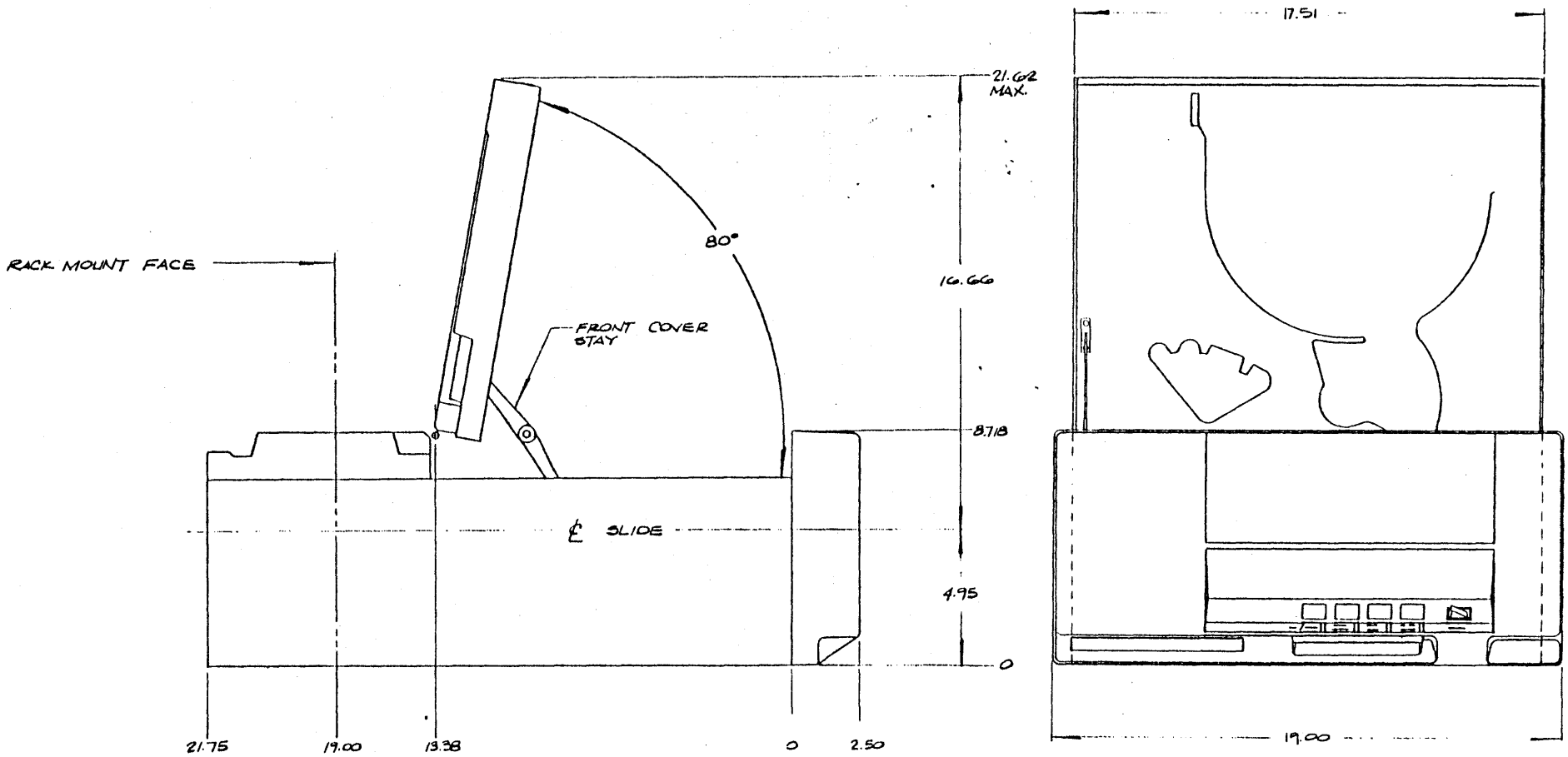

Figure 1-1. Operator Maintenance Access

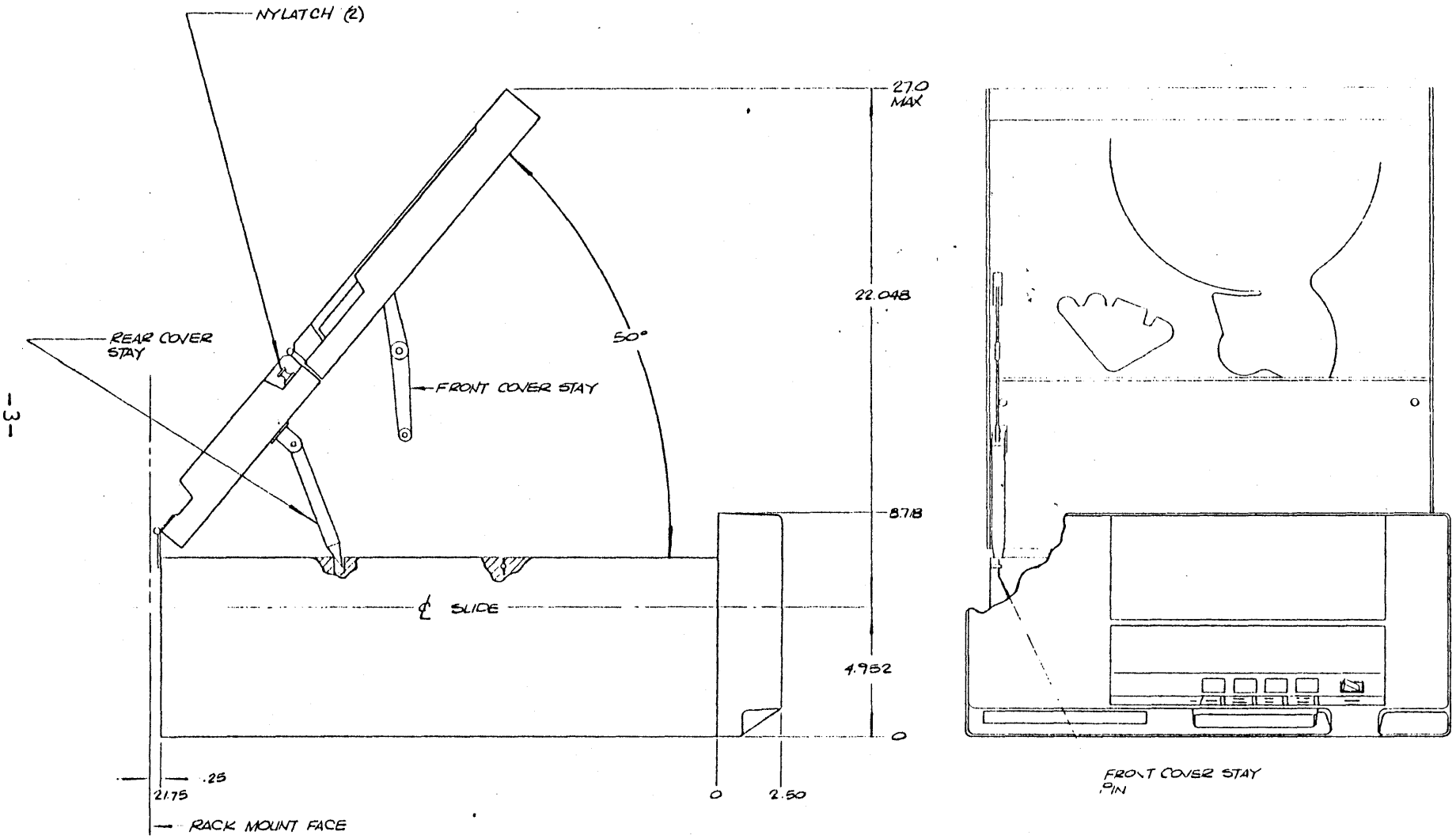

Figure 1-2. Take-UP Hub Access

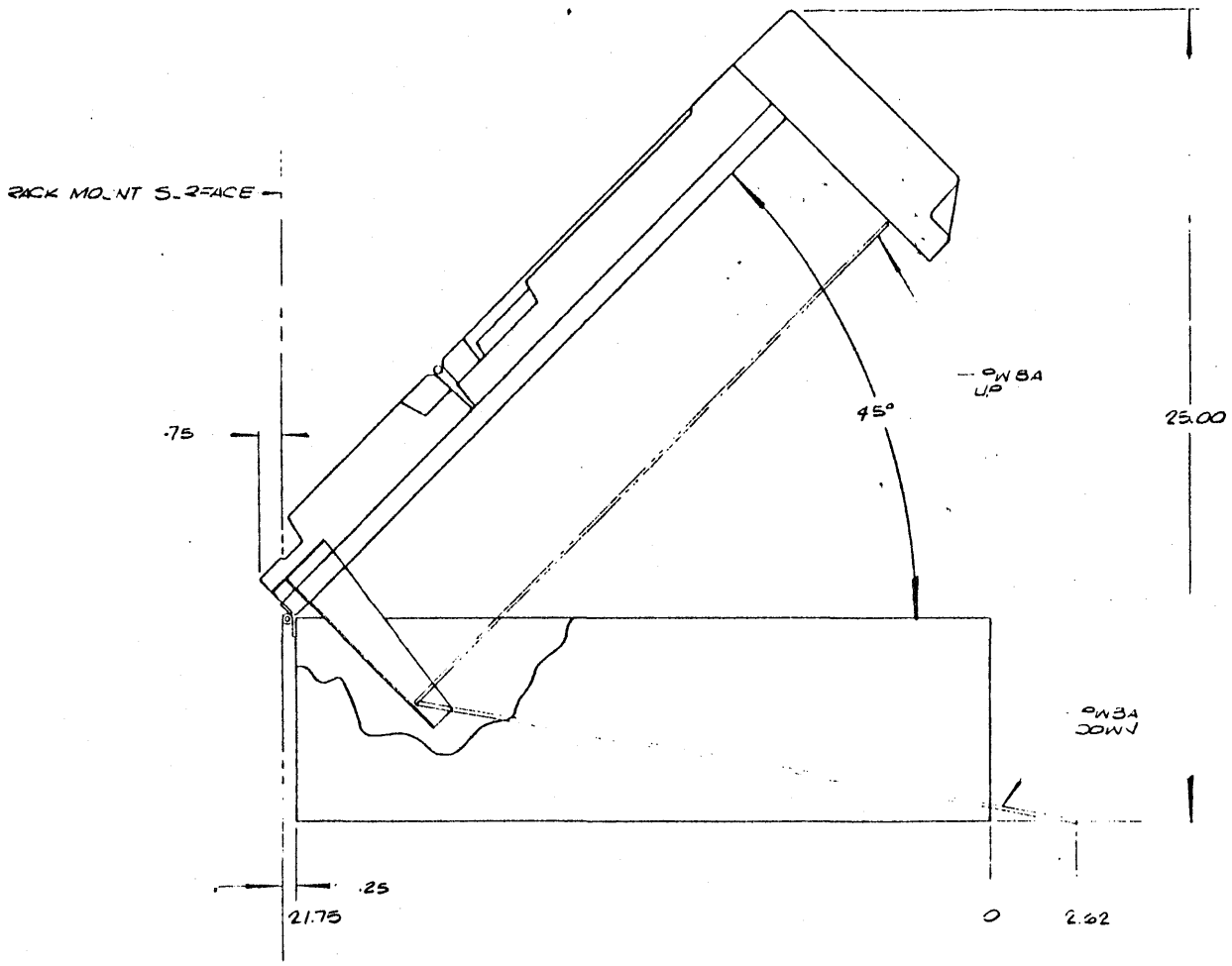

Figure 1-3. Service Access

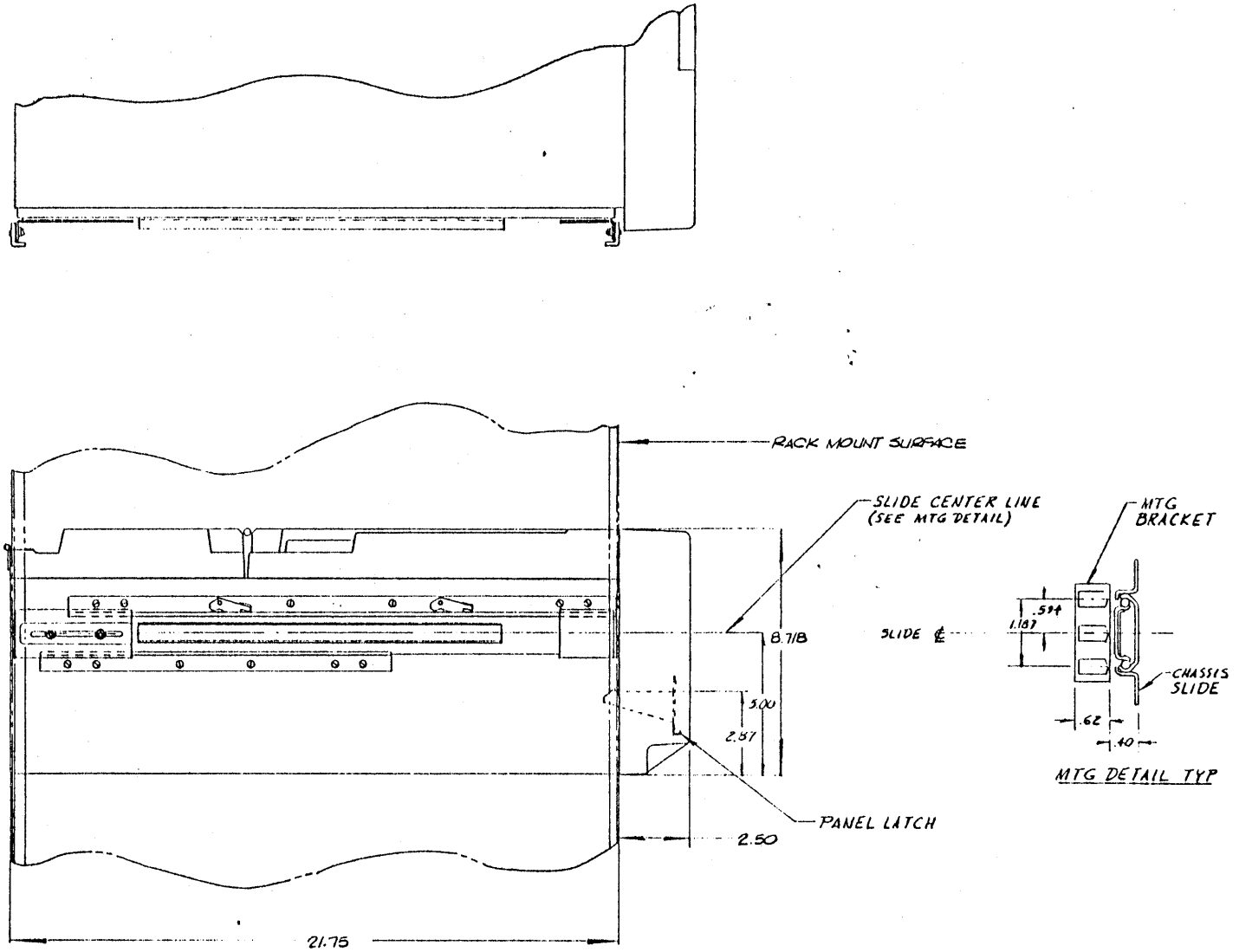

Figure 1-4. Rack Mtg Details

Due to the streaming design of the drive there are throughput overheads if the stop/start action is used. This is more significant at 100 ips than 25 ips.

Up to eight tape drives may be addressed by the interface when connected in a daisy chain configuration.

Tape loading by the operator is fully automatic and is very easy on tape wear and handling.

Due to the digital control employed by using a Z80 microprocessor minimum electrical/electronic adjustments are required in the unit.

Operation in different areas of the world is catered for by simple voltage adjustments. Selection of the appropriate operating voltage is accomplished by a quick (1 minute) removal of a cover and reconnecting the transformer input. The unit will operate at 50 or 60 Hertz.

All formatter functions including error detection and correction are performed within the unit.

2.0 OPERATION

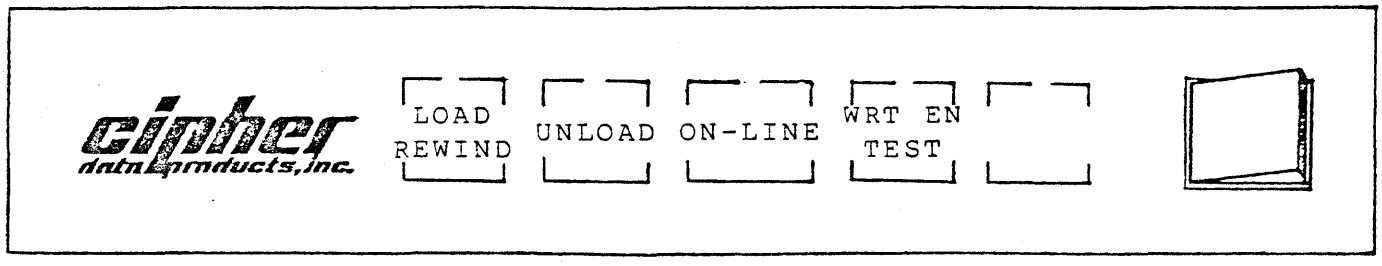

Figure 2-1. Operator Panel

POWER. Switch and inidicator.

LOAD/REWIND. Switch and indicator. When blinking the tape drive is executing a load or rewind sequence. When illuminated continuously, the BOT marker is sensed. Depressing the pushbutton:

- Initiates load sequence and advances tape to load point.
- Rewinds the tape to load point.

UNLOAD. Switch and indicator. Depressing the pushbutton causes the tape to be unloaded regardless of tape position. When blinking the tape drive is executing an unload sequence. When illuminated continuously, the tape drive has completed its unload sequence and the door is unlocked, so the tape may be removed and another tape inserted.

ON-LINE. Switch and indicator. When illuminated the tape drive is ready and on-line. Depressing the pushbutton will:

- Take the tape drive off-line and extinguish the indicator.
- Put the tape drive on-line and illuminate the indicator.

Depressing the pushbutton during a load sequence will put the tape drive on-line when the BOT marker is sensed.

TEST. Operational only in the test mode.

WRITE ENABLE. When indicator is on, write ring is installed and data may be written on tape.

When indicator is off, write ring is omitted and tape is file protected.

2.1 ERROR CONDITIONS

1. If the drive stops and loses tape tension, a combination of lights will flash a quick "double pulse." The lights are Binary-Coded-Decimal (BCD) with the LOAD/REWIND button as the least significant bit (LSB).

   Example: If LOAD/REWIND and ON-LINE Flash = Code 5 (New "IGO" before "DBSY" clear)

LOAD/ REWIND	UNLOAD	ON-LINE	TEST WRTPRT
1	2	4	8

F880 ERROR CODE DEFINITIONS
PROGRAM VERSION 1.11

LITES LOAD	LITES UNLOAD	LITES ON-LINE	LITES TEST WRTPRT	NMBR	ERROR CONDITION
X				1	ARM LIMIT-HIGH OR LOW
	X			2	SPEED ERROR->10%
X	X			3	POSITION TABLE ERROR
		X		4	ARM VOLTAGE DURING CAL
X		X		5	NEW "IGO" BEFORE "DBSY" CLEAR
	X	X		6	"WRT" CMD WHEN NOT "WRTEN"
X	X	X		7	ILLEGAL COMMAND
			X	8	FWD RAMP POSITION ERROR
X			X	9	REV RAMP POSITION ERROR

3.0 ELECTRICAL/MECHANICAL SPECIFICATIONS

Tape Speed			100 IPS or 25 IPS (Interface selectable)
Low Speed Variation (LSV)			±1% of nominal
Instantaneous Speed Variation			±4% of long term
Write Skew			300 micro inch max
Rewind Speed			200 IPS average
Nominal Access Time		25 IPS	100 IPS
	Read	40 msec	250 msec
	Write	40 msec	250 msec
Nominal Reposition Time			
	Read	100 msec	700 msec
	Write	100 msec	700 msec
100 IPS Speed Reinstruct Time			4 milliseconds
25 IPS Speed Reinstruct Time			16 milliseconds
Data Density			1600 CPI, PE
Tape (Computer grade)			ANSI X3.40-1976
	Width		0.5 inch
	Thickness		1.5 milli-inch
Reel Size			10-1/2 inch max, 7 inch min
Tape Tension			8 oz nominal
Net Weight			50 pounds
Shipping Weight			60 pounds
Dimensions:			
	Height		8.75 inches
	Width		17.0 inches
	Depth (from mounting surface)		22.0 inches
	Depth (overall)		24.5 inches
Mounting (Standard, 19 inch RETMA rack slide mounting provided)			EIA Specifications

Cipher Data Products reserves the right to change specifications without notice.

Power		100, 115, 215, 230 VAC ±10%; 48-61 Hz; 250 Watts max
Fuses		4 amp (120 VAC) or 2 amp (240 VAC), 3 AG, SLOW-BLO, 250 VAC rating
Data Reliability:		
	Write*	1 error in 10^8 bytes
	Read Recoverable	1 error in 10^9 bytes
	Read Permanent	1 error in 10^{10} bytes
	*Certified Tape	(errors other than media faults)
Operating Temperature		2 - 37.8°C
Relative Humidity		15 - 95% noncondensing
Altitude		10,000 feet
Interface Impedance		130 OHMS, at 3 VDC
Sink Current		25 ma max
Interface Connectors		(Figure 2A)
Logic Low		0.4V max
Logic High		2.4V min
Interface Rise/Fall (input and output)		100 nanoseconds max
Daisy Chain		8 dual speed tape drives or 4 dual speed tape drives plus formatted drive. 20 ft max total if active repeaters not used. Figures 1 & 2.
Cable Characteristics		28 AWG flat ribbon
MTBF		7500 Hours
MTTR*		15 mins

*To isolate and replace major assemblies

Cipher Data Products reserves the right to change specifications without notice.

4.0 INTERFACING

4.1 BASIC COMMANDS. The F880 tape drive executes the following commands:

Read (Forward and Reverse)

The F880 tape drive reads data records or file marks in either a forward or reverse direction generating output data (8 lines plus parity) and data strobes to the controller. A read reverse into load point clears the formatter. A read forward operation encountering end of tape could result in reading "off the end of the tape" if a data record or file mark is not encountered and the formatter is not externally cleared. A read forward from load point simultaneously generates a search for the PE identification burst. There are several variations of the read operation explained below.

Space (Forward and Reverse)

Identical to a standard read except that read strobe and error flags are not generated.

File Search (Forward and Reverse)

A read operation (forward or reverse) is initiated and continues until:

a. a file mark is encountered.

b. load point is encountered in a reverse direction.

c. in forward direction end of a data record or file mark is detected after having encountered the end of tape marker.

d. the formatter is externally cleared.

This operation can be combined with the space operation to disable read strobe and error flags.

Edit (Reverse Direction Only)

A read operation (or its variations) in reverse direction can be flagged to generate a delay before stopping at the end of the operation. This delay positions the write head such that in a subsequent write operation the record is replaced leaving a clean inter-record gap.

Write (Forward Only)

The tape drive starts tape and generates the proper delay before transferring the first data character to ensure compatible inter-record gaps are generated. When writing from load point the dual speed tape drive always generates the required PE identification burst.

Note that a write operation issued near end of tape could result in "writing off the end of tape" if not terminated by the controller.

True write operations (not erase) generate an automatic read verification.

There are several variations to the basic write operation explained below.

Edit

Identical to a basic write operation (or its variations) except that write current is turned off after the last character is written preventing the erase head from disturbing the following record. This operation should be preceded by the read edit.

Write File Mark

Generates the compatible file mark and produces a long (3.5 inch) preceding gap.

Erase

Produces an erase field at the head with no data flux transitions.

There are two variations to this command.

Erase Fixed Length

Erases a fixed length of tape (3.5 inches) using the Write File Mark mechanism.

Erase Variable Length

Continuous erasure until terminated by the controller. Length is determined by the last character flag used in a normal write operation.

NOTE: The previous commands can be executed in "on the fly" mode of operation meaning the tape drive need not decelerate before issuing the next command, providing consecutive commands occur within the specified reinstruct time and are of the same type and direction.

Security Erase

The Security Erase Command has been added to the Microstreamer command list. The function of this command is to erase to 4 feet beyond EOT. This eliminates residual data from prior tape usage and prevents unintentional circulation of previously taped data. This command is issued by holding the IWRIT, IEDIT, IERASE, and IFMK interface lines true with the IREV line false while the IGO line is pulsed. This combination was previously unassigned.

Rewind

Causes the tape drive to rewind at high speed to load point. This command is ignored if the drive is at load point.

Rewind and Unload

This command causes the tape drive to:

a. clear its ON-LINE flip/flop

b. rewind to load point

c. unload the tape

IHISPD

There is no restriction as to when speed may be changed from 25 to 100 or 100 to 25 ips. Since actual density and compatibility of the tape file is not changed by a speed change there is no reason to restrict speed changes to load point. Thus the user may do a high speed file search followed by low speed data transfers, if his system is not able to utilize the full high speed streaming data modes. All repositioning during speed switching is automatic and transparent to the user. The speed is clocked in with the same timing as other signals strobed by IGO.

Repositioning

The previous commands can be performed at either speed if required. It must be remembered that the acceleration delays are not related to velocity by the usual formula. Acceleration at 100 ips is more closely akin to delays typical of rewind ramp functions. For this reason, it is not possible for the tape drive to perform a start/stop operation within the nominal 0.6 inch inter-record gap.

Figure 4-2 illustrates a typical write forward (or read) operation at high speed. The first record is being written at high speed implying position is changing uniformly at 100 inches per second. At the completion of the write verification, the tape continues to move at 100 ips. If another record is to be written at high speed a GO command must be issued by the controller within four (4) milliseconds* after the last data character of the record and, if issued, the drive will continue in motion at 100 ips and respond with a WSTR after an inter-record gap has been generated.

If, however, the four (4) milliseconds* has elapsed without a GO command, the tape drive will enter a repositioning mode. This is indicated as point A in Figure 4-2. The tape drive decelerates to point B and

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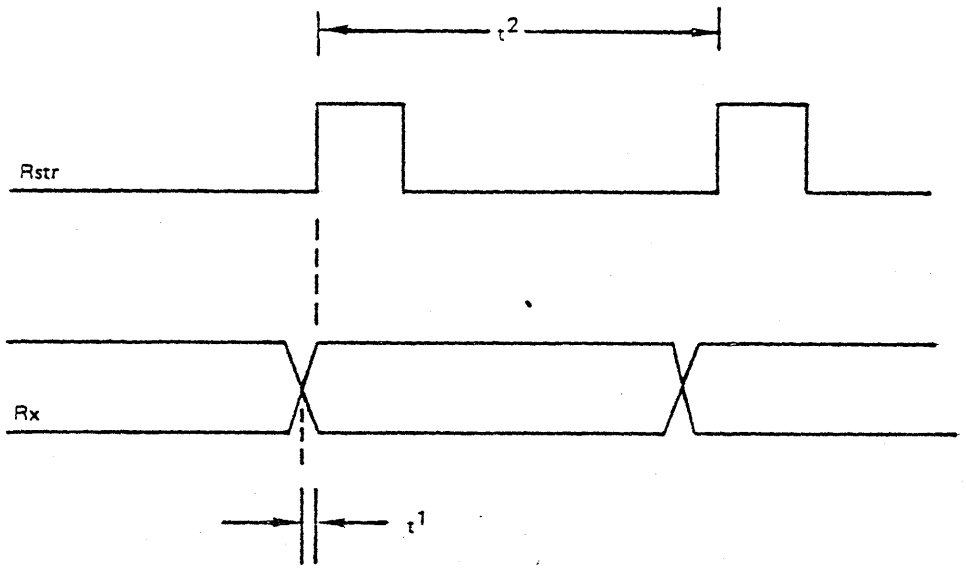
*This is a command reinstruct time which may be extended by computer command.



$t^1 m$ = 100 ns
$t^2 min$ = 3.5 µSecs @ 100 ips
= 14 µSecs @ 25 ips
$t^2 (avg)$ = 6 µSecs @ 100 ips
= 25 µSecs @ 25 ips

Figure 4-1. Read Strobe Timing

COMMAND	HEX	REVERSE	WRITE	WRITE FILEMARK	EDIT	ERASE
READ FORWARD	Ø	Ø	Ø	Ø	Ø	Ø
READ REVERSE	1	1	Ø	Ø	Ø	Ø
READ REVERSE EDIT	9	1	Ø	Ø	1	Ø
WRITE	2	Ø	1	Ø	Ø	Ø
WRITE EDIT	A	Ø	1	Ø	1	Ø
WRITE FILEMARK	6	Ø	1	1	Ø	Ø
ERASE VARIABLE LENGTH	12	Ø	1	Ø	Ø	1
ERASE FIXED LENGTH	16	Ø	1	1	Ø	1
SECURITY ERASE (to EOT)	1E	Ø	1	1	1	1
SPACE FORWARD	1Ø	Ø	Ø	Ø	Ø	1
SPACE REVERSE	11	1	Ø	Ø	Ø	1

Table 4-1. Motion Command Decode

COMMAND	HEX	REVERSE	WRITE	WRITE FILEMARK	EDIT	ERASE
FILE SEARCH FORWARD	4	Ø	Ø	1	Ø	Ø
FILE SEARCH REVERSE	5	1	Ø	1	Ø	Ø
FILE SEARCH FORWARD (IGNORE DATA)	14	Ø	Ø	1	Ø	1
FILE SEARCH REVERSE (IGNORE DATA)	15	1	Ø	1	Ø	1

Table 4-1. Motion Command Decode (Continued)

NOTE: Some combinations of these lines are illegal (e.g., Reverse and Write). It is the system's responsibility not to issue such combinations.

reverses until it reaches point C where it stops and awaits the next command. The command received, it accelerates to 100 ips achieving uniform speed in time for the next record. The last acceleration requires approximately 200 milliseconds. All delay timing and motion control is automatic and optimized by the microprocessor.

NOTE: The first WSTR or RSTR could take 800 milliseconds from the time GO is issued due to repositioning.

There is a remote possibility of increased command delays due to long term, high duty cycle direction reversals with short data blocks. how short This delay is temporarily added to command execution time preventing excessive internal motor temperatures. This additional delay comes up rarely in operation and allows faster nominal access times than would otherwise result. In extreme situations, this delay may double access and reposition times. Absolute maximum access and reposition time would be 1600 milliseconds.

The Microstreamer, operating in high or low speed, automatically adjusts for the command type and produces compatible gaps without controller supervision.

In a formatted, conventional drive, once the last word command is issued, the repositioning sequence is irrevocably started and any further commands must await a ready condition from the drive.

The Microstreamer, however, allows 16 msec of "re-instruct time" at 25 ips (4 msec @ 100 ips) before starting its repositioning sequence. If a command occurs during the re-instruct window, throughput rates will be significantly increased. (Exact figures will be dependent on program sequence.)

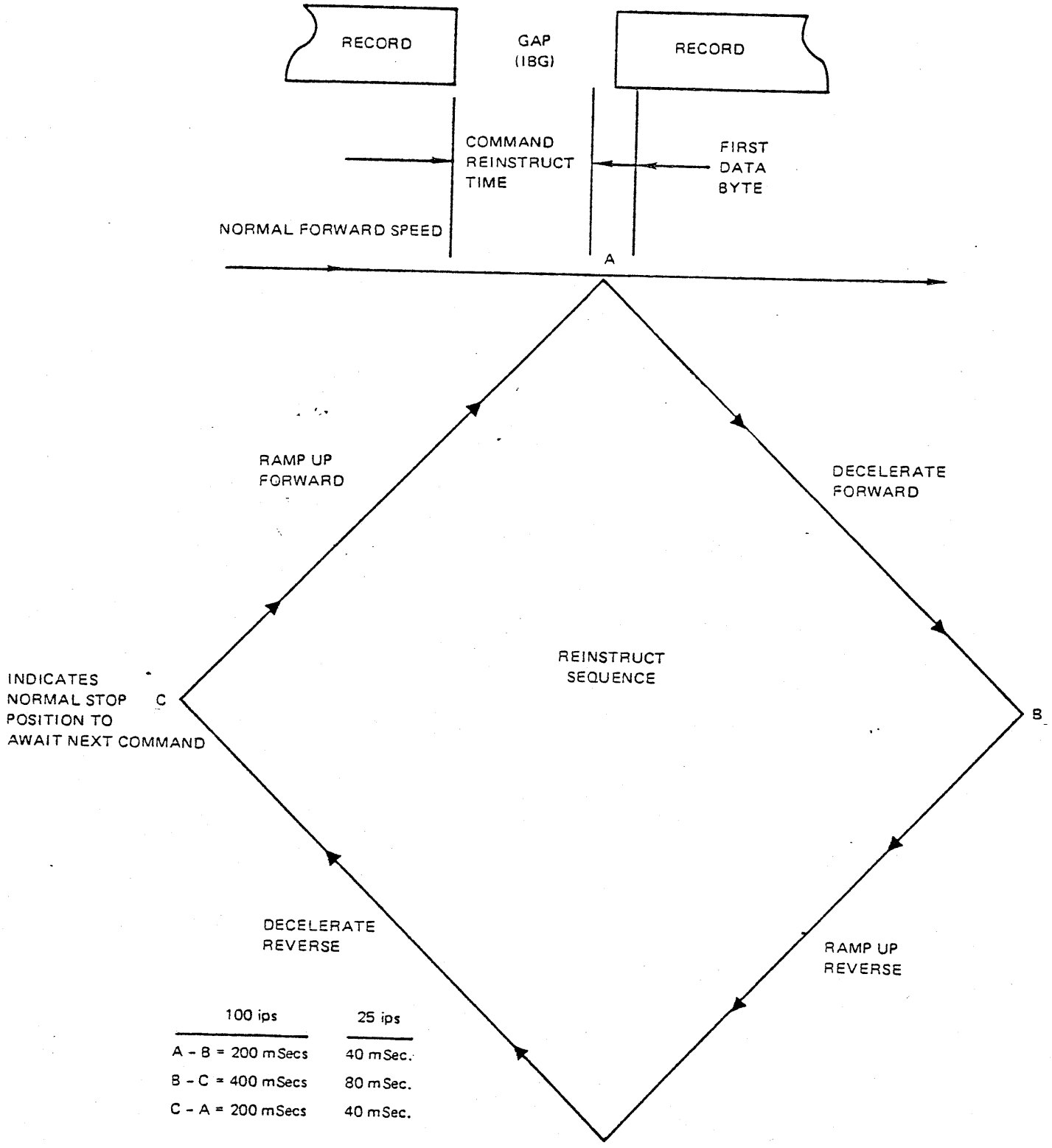


Figure 4-2. Reinstruct Sequence

4.2 CONTROLLER INTERFACE. Pin assignments are indicated in Tables 4-3, 4-4, and 4-5. Description of each signal follows. All interface signals are assumed to be zero true unless otherwise noted.

Controller to F880 Tape Drive

Signals from the controller to the Microstreamer.

IEDIT (See IWRT)

IERASE (See IWRT)

IFAD, ITAD, ITADI

Addresses lines to daisy chained tape drives. Address decoding is as follows:

IFAD	ITADØ	ITAD1	DRIVE
Ø	Ø	Ø	Ø
Ø	Ø	1	1
Ø	1	Ø	2
Ø	1	1	3
1	Ø	Ø	4
1	Ø	1	5
1	1	Ø	6
1	1	1	7

NOTE: Address lines must be set up a minimum of one microsecond before a command is issued or status is polled.

IFEN

This signal should only be used in the event of a "run-away" condition, such as a READ command on blank tape. An IFEN pulse will cause systematic termination of the current command, with data busy and formatter busy transitioning false. The system should wait until IFBSY has cleared before the issuance of a new command after an IFEN pulse. Before issuing the next command a delay of approximately 1 second should be programmed. This signal is sometimes conditioned with RDY at the controller. The formatter looks for a low to high transition of the IFEN pulse to stabilize from a "run-away" condition.

IGO

Pulse of one microsecond minimum duration. The trailing edge initiates tape motion of the selected ready tape drive and latches the command into the formatter register. The commands initiated by this pulse are shown in Table 4-1.

NOTE: When the leading edge is asserted during the reinstruct period of a write command, the repositioning, which would result from a command overrun, is delayed as long as IGO remains asserted. If a command of the same type, speed and direction is given while IGO is asserted, repositioning does not occur. This delay might generate inter-record gaps considerably longer than the 0.6 inch typical. Such longer gaps would nevertheless be ANSI compatible.

IHISP

When asserted, the F880 tape drive operates at 100 ips as described earlier. This line must be set up a minimum of one microsecond before the trailing edge of IGO. Since it is latched in the tape drive, there is no hold time requirement. Repositioning when switching speed is automatic but delays the first command by up to 400 milliseconds. There is no restriction as to when speed may be changed from 25 to 100 or 100 to 25 ips. Since actual density and compatibility of the tape file is not changed by a speed change there is no reason to restrict speed changes to load point. Thus the user may do a high speed file search followed by low speed data transfers if his system is not able to utilize the full high speed streaming data modes. All repositioning during speed switching is automatic and transparent to the user. The speed is clocked in with the same timing as other signals strobed by IGO.

ILWD

Flag associated with the last write data character. It must be asserted at least one-half character time before the associated WSTR is expected from the Microstreamer. There is no hold time requirement. See Figure 4-3. This flag is also used to terminate the variable length erase operation.

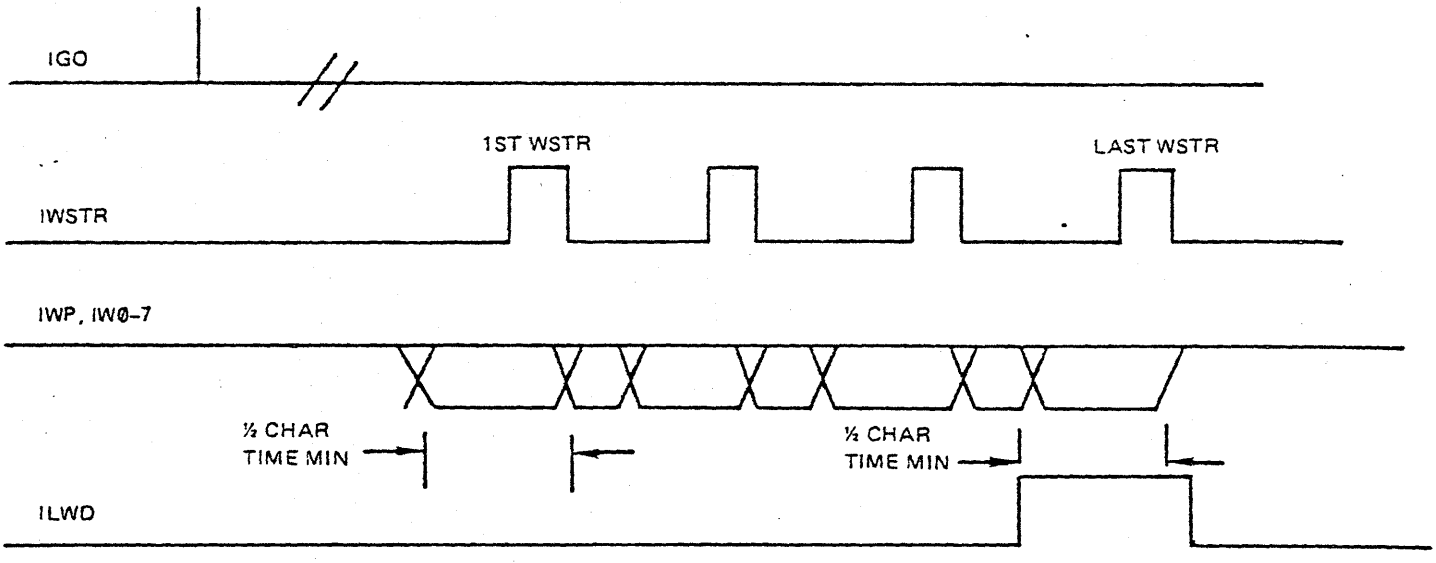


Figure 4-3. Write Timing Diagram

IREV (See IWRT)

IREW

Pulse one microsecond minimum duration initiates rewind in the selected ready (not at load point) tape drive.

IRWU

Pulse one microsecond minimum duration;

clears the ON-LINE flip/flop

generates a rewind

unloads the tape

ITAD (See IFAD)

ITAD1 (See IFAD)

IWFM (See IWRT)

IWP, IWØ - 7

Write data. These lines must be setup a minimum of one-half cell time before the expected WSTR. There is no hold time requirement. Figure 4-3 illustrates this. Table 4-2 indicates the association of these lines with tape track and computer weight.

INTERFACE LINE	TRACK NO.	ANSI TRACK* NO.	BINARY WEIGHT
IRØ/IWØ	Ø	7	2^7
IR1/IW1	1	6	2^6
IR2/IW2	2	5	2^5
IR3/IW3	3	3	2^4
IR4/IW4	4	9	2^3
IR5/IW5	5	1	2^2
IR6/IW6	6	8	2^1
IR7/IW7	7	2	$2^Ø$
IR/IWP	P	4	P

Table 4-2. Write Data Line Identification

IWRT, IREV, IWFM, IEDIT, IERASE

These lines are decoded according to Table 4-1 to produce the command described. These lines must be setup a minimum of one microsecond before the trailing edge of IGO. Since they are latched in the F880 tape drive there is no hold time requirements.

Reserved

In other controllers these lines are for various functions which are handled automatically by or not applicable to the Microstreamer. They are reserved for future options.

F880 Tape Drive to Controller

Signals from the Microstreamer to the controller. Description assumes positive logic.

ICER

This signal is asserted when a single track dropout is detected and error correction is in process. This will occur before IDBY goes false.

NOTE: To ensure ANSI compatibility, the system must re-write records containing hard or corrected errors on a read-after-write verification.

IDBY

This signal is true during the active execution of all commands initiated by IGO. On the trailing edge of this signal, another command of any type and direction may be given. There is no restriction to type or direction. All commands may be issued after the trailing edge of IDBSY from the termination of a previous command. All tests required to change direction and write/read mode are made by the Microstreamer automatically. This eliminates a restriction of the "Industry Standard" interface.

IEOT

Level indicates the end of the tape reflective marker is detected by the sensor and remains true when logically at or past the EOT marker.

IFBY

This signal will go true on the trailing edge of IGO and will go false after command completion. It is not desirable to wait for IFBY to be reset before issuing of additional commands. The use of the trailing edge of IDBY is recommended.

IFMK

This line is pulsed on a write verification or read operation when an IBM/ANSI compatible file mark is detected. This occurs prior to IDBY going false.

IFPT

Level indicates the loaded reel has no write permit ring hence the write electronics are disabled.

IHER

This line is asserted if the record being written/read contains an uncorrectable error. The line is pulsed if required before IDBY goes false. Error conditions asserting this line include:

- Multi-track dropout
- Uncorrectable parity error
- Non-Zero character in postamble
- Excessive skew
- Loss of data envelope prior to postamble detection

This line is disabled if ERASE IS specified.

IIDENT

Asserted when reading or writing from load point and the PE identification burst is detected.

ILDP

Level true when the load point reflective marker is logically at the sensor.

IONL

Indicates the tape drive ON-LINE flip/flop is set.

IRDY

Level indicates tape is tensioned and is not rewinding, off-line or loading.

IPR, IRØ - 7

Read data to the controller. Timing is indicated in Figure 4-1. The track associations are shown in Table 4-2.

IRSTR

Pulse indicating a read character is present on the controller interface. Note that although average long term transfer rate is the same as for write data, due to skew and velocity change the instantaneous rate can be almost three times that of the write data. Figure 4-1 illustrates these timings. This signal is disabled if erase is specified.

IRWD

Indicates the tape drive is in a rewind-load sequence.

ISPEED

Asserted when the tape drive is operating in the high speed mode.

IWSTR

Pulse indicating (trailing edge) the character on the data lines has been written on tape and the next character is needed. The next character and last word flag must be presented within one-half character time from the falling edge of WSTR. This timing is illustrated in Figure 4-3. The frequency of the WSTR pulse is proportional to tape speed times bit density.

$$f_w = V.BPI$$

e.g.: 100 IPS PE

$$f_w = 160{,}000 \text{ BYTES/SECOND}$$

Minimum pulse width on this line is one microsecond.

NOTE: In the high speed mode, the first write strobe might occur several hundred milliseconds after the GO command if repositioning is required.

4.3 INTERFACE SIGNALS F880 TO CONTROLLER

SIGNAL LIST

PLUG NO.	LIVE PIN	GROUND PIN	SIGNAL DESCRIPTION	SIGNAL NAME
P1	2	1	Formatter Busy	IFBY
P1	14	13	Reserved	
P1	48	47	Read Data 2	IR2
P1	50	49	Read Data 3	IR3

Table 4-3. Interface Signals F880 to Controller

SIGNAL LIST (Continued)

PLUG NO.	LIVE PIN	GROUND PIN	SIGNAL DESCRIPTION	SIGNAL NAME
P2	1	-	Read Data Parity	IRP
P2	2	-	Read Data Ø	IRØ
P2	3	-	Read Data 1	IR1
P2	4	-	Load Point	ILDP
P2	6	5	Read Data 4	IR4
P2	8	7	Read Data 7	IR7
P2	10	9	Read Data 6	IR6
P2	12	11	Hard Error	IHER
P2	14	13	Filemark	IFMK
P2	16	25	Ident 1	IIDENT
P2	20	19	Read Data 5	IR5
P2	22	21	End of TAPE	IEOT
P2	26	25	Reserved	
P2	28	27	Ready	IRDY
P2	30	29	Rewinding	IRWD
P2	32	31	File Protect	IFPT
P2	34	33	Read Strobe	IRSTR
P2	36	35	Write Strobe	IWSTR
P2	38	37	Data Busy	IDBY
P2	40	39	Hi Speed Sel	ISPEED
P2	42	41	Corrected Error	ICER
P2	44	43	Online	IONL

Table 4-3. Interface Signals F880 to Controller (Continued)

4.4 INTERFACE SIGNALS CONTROLLER TO F880

SIGNAL LIST

PLUG NO.	LIVE PIN	GROUND PIN	SIGNAL DESCRIPTION	SIGNAL NAME
P1	4	3	Last Word	ILWD
P1	6	5	Write Data 4	IW4
P1	8	7	Initiate Command	IGO
P1	10	9	Write Data Ø	IWØ
P1	12	11	Write Data 1	IW1
P1	16	15	Reserved	
P1	18	17	Reverse	IREV
P1	20	19	Rewind	IREW
P1	22	21	Write Data Parity	IWP
P1	24	23	Write Data 7	IW7
P1	26	25	Write Data 3	IW3
P1	28	27	Write Data 6	IW6
P1	30	29	Write Data 2	IW2
P1	32	31	Write Data 5	IW5
P1	34	33	Write	IWRT
P1	36	35	Reserved	
P1	38	37	Edit	IEDIT
P1	40	39	Erase	IERASE
P1	42	41	Write File Mark	IWFM
P1	44	43	Reserved	
P1	46	45	Transport Address Ø	ITADØ
P2	18	17	Formatter Enable	IFEN
P2	24	23	Rewind/Unload	IRWU
P2	46	45	Transport Address 1	ITAD1
P2	48	47	Formatter Address	IFAD
P2	50	49	High Speed Select	IHISP

Table 4-4. Interface Signals Controller to F880

4.5 INTERFACE PLUG CONNECTIONS

P-1

LIVE PIN	GROUND PIN	SIGNAL	SIGNAL NAME
2	1	Formatter Busy	IFBY
4	3	Last Word	ILWD
6	5	Write Data 4	IW4
8	7	Initiate Command	IGO
10	9	Write Data Ø	IWØ
12	11	Write Data 1	IW1
14	13	Reserved	-
16	15	Reserved	-
18	17	Reverse	IREV
20	19	Rewind	IREW
22	21	Write Data Parity	IWP
24	23	Write Data 7	IW7
26	25	Write Data 3	IW3
28	27	Write Data 6	IW6
30	29	Write Data 2	IW2
32	31	Write Data 5	IW5
34	33	Write	IWRT
36	35	Reserved	-
38	37	Edit	IEDIT
40	39	Erase	IERASE
42	41	Write File Mark	IWFM
44	43	Reserved	-
46	45	Transport Address Ø	ITADØ
48	47	Read Data 2	IR2
50	49	Read Data 3	IR3

Table 4-5. Interface Plug Connections

P-2

LIVE PIN	GROUND PIN	SIGNAL	SIGNAL NAME
1	-	Read Data Parity	IRP
2	-	Read Data Ø	IRØ
3	-	Read Data 1	IR1
4	-	Load Point	ILDP
6	5	Read Data 4	IR4
8	7	Read Data 7	IR7
10	9	Read Data 6	IR6
12	11	Hard Error	IHER
14	13	File Mark	IFMK
16	15	Identification 1	IIDENT
18	17	Formatter Enable	IFEN
20	19	Read Data 5	IR5
22	21	End of Tape	IEOT
24	23	Rewind/Unload	IRWU
26	25	Reserved	-
28	27	Ready	IRDY
30	29	Rewinding	IRWD
32	31	File Protect	IFPT
34	33	Read Strobe	IRSTR
36	35	Write Strobe	IWSTR
38	37	Data Busy	IDBY
40	39	Hi Speed Select	ISPEED
42	41	Corrected Error	ICER
44	43	On Line	IONL
46	45	Transport Address 1	ITAD1
48	47	Formatter Address	IRAD
50	49	High Speed Select	IHISP

Table 4-5. Interface Plug Connections (Continued)

4.6 CABLES. It is recommended that interconnection of Cipher and Customer equipment use ribbon cables, or a harness of individual twisted pairs, each with the following characteristics:

1. Maximum length of 20 feet.
2. Not less than one twist per inch (for twisted pairs).
3. 22- or 24-gauge conductor with minimum insulation thickness of 0.01 inch.

It is important that the alternate conductor in a ribbon cable, or 1/2 of a twisted pair, be grounded within a few inches of the interface circuit to which it is connected.

INTERFACE INPUTS/OUTPUTS (CONTROLLER TRANSPORT). All waveform names are chosen to correspond to the logical true condition. Receivers and drivers have the true level 0v and the false level is nominally +3v.

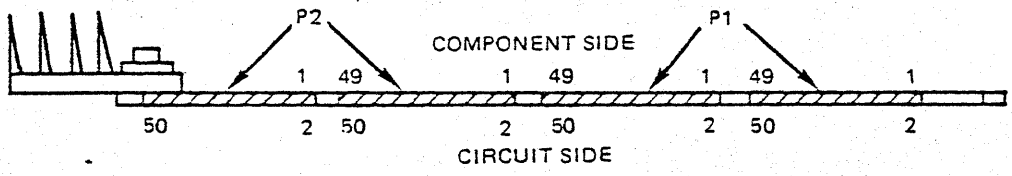


Figure 4-4. Edge Connector

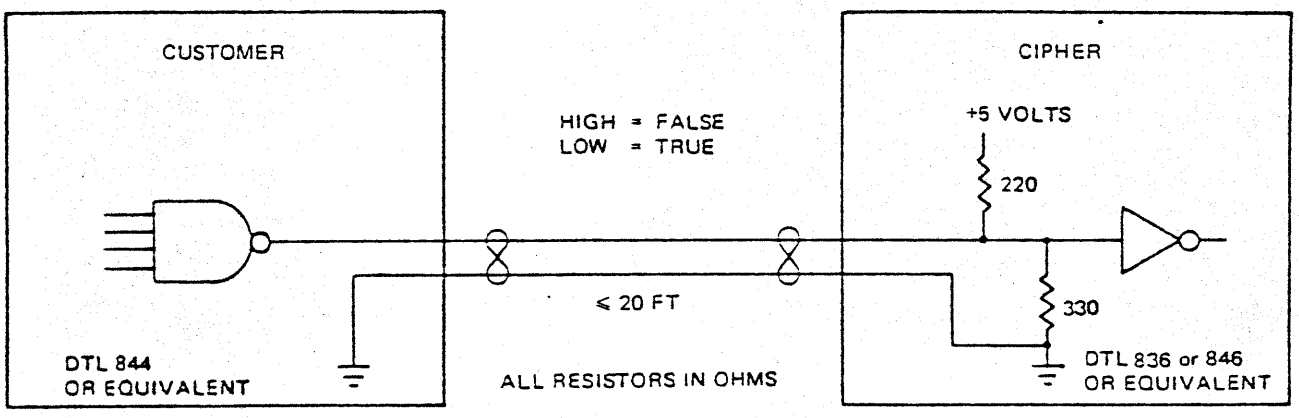


Figure 4-5. Interface Configuration

5.0 DAISY CHAINING

If only streamers are used (see Figure 5-3), only the last drive in a chain is terminated. All drives are shipped as terminated drives. To convert to intermediate drives, remove two resistor packs, U181, 185 (see Figure 5-2). If 1 to 4 streamer drives are used with an embedded formatter drive, termination occurs in embedded drive only, which must be used at the end of the chain. Up to three drives similar to the embedded drive may be used after the embedded drive using daisy chaining techniques applicable to type of drive being used (see Figure 5-4).

UNIT SELECT. Unit select switches are located on PWB at U152 and are binary coded. U152 also contains internal/external parity selection (see Figure 5-2).

- Connector type used in 3M - 3415 - 0001 or equivalent
- Cable type is 50 conductor, flat ribbon cable.
- Cable length should be no longer than 20 ft maximum total if active repeaters are not used.
- Both connectors labeled P1 are completely parallel and interchangeable.
- Both connectors labeled P2 are completely parallel and interchangeable.

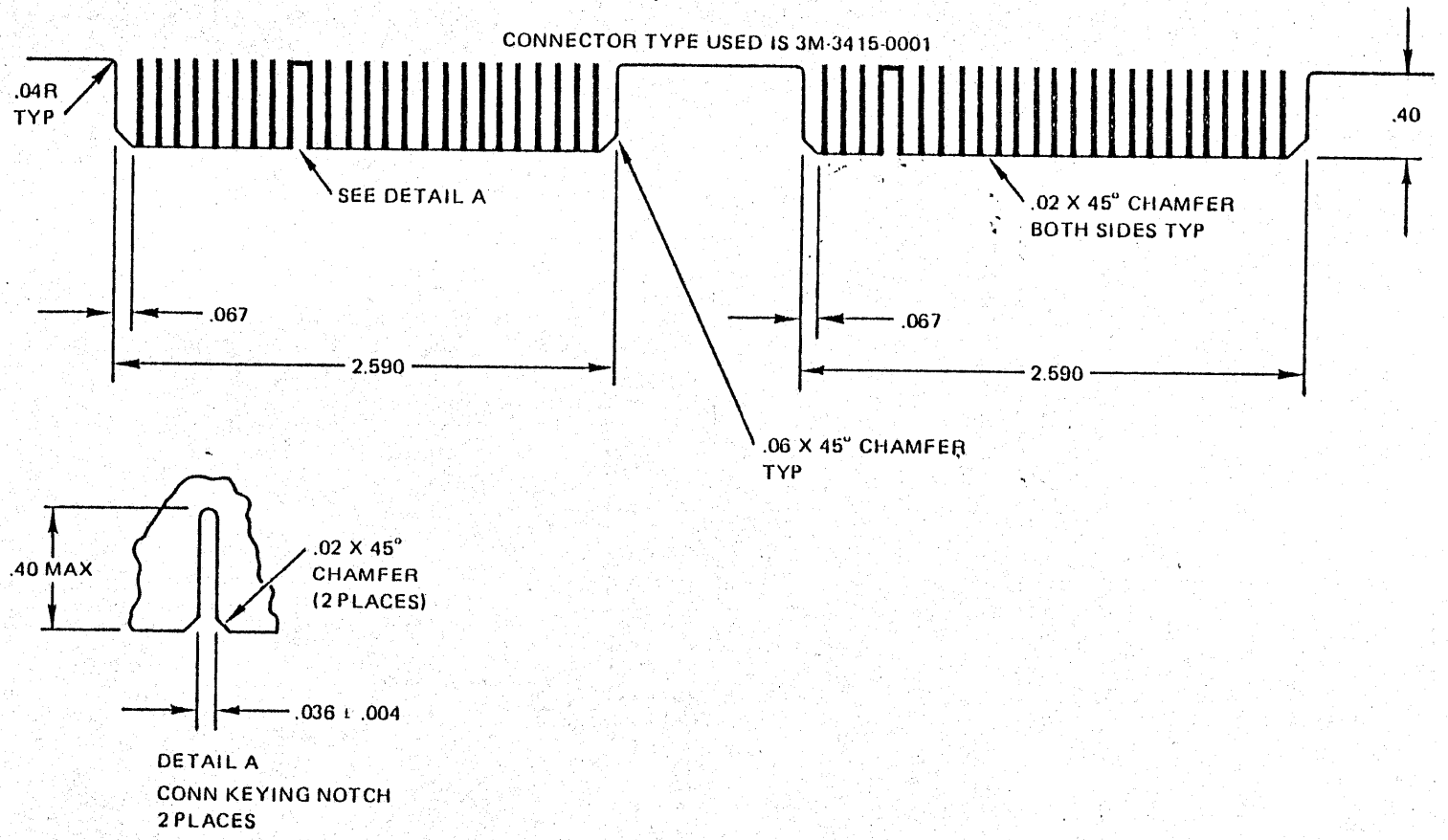


Figure 5-1. Interface Connectors Physical Description

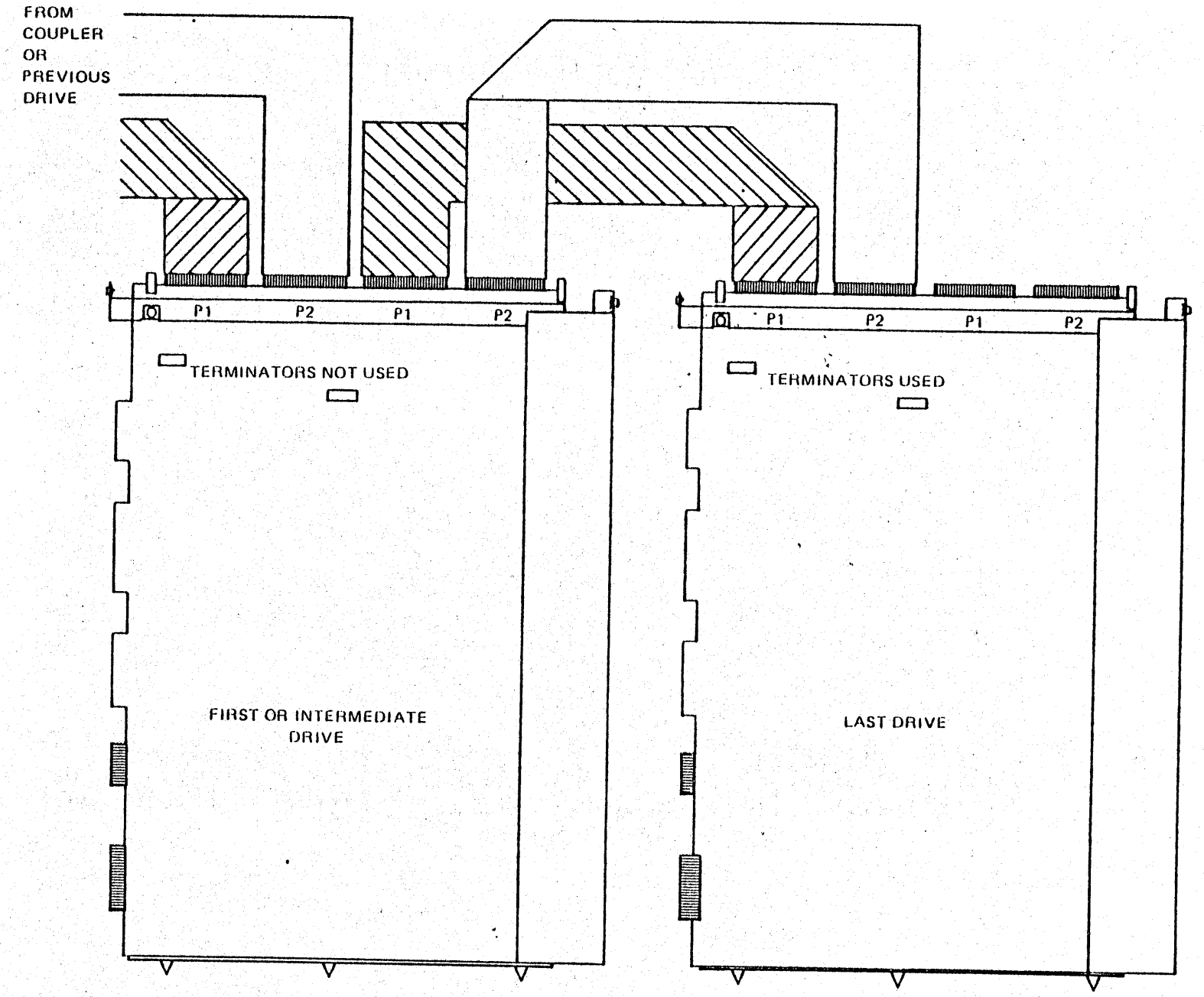


Figure 5-2. Daisy Chain Cable Configuration

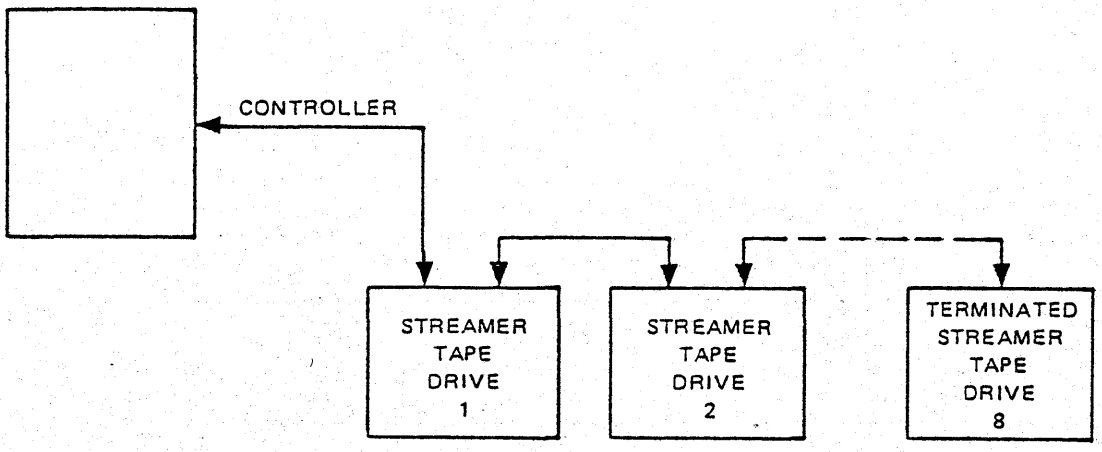


Figure 5-3. Daisy Chain Configuration F880 Only

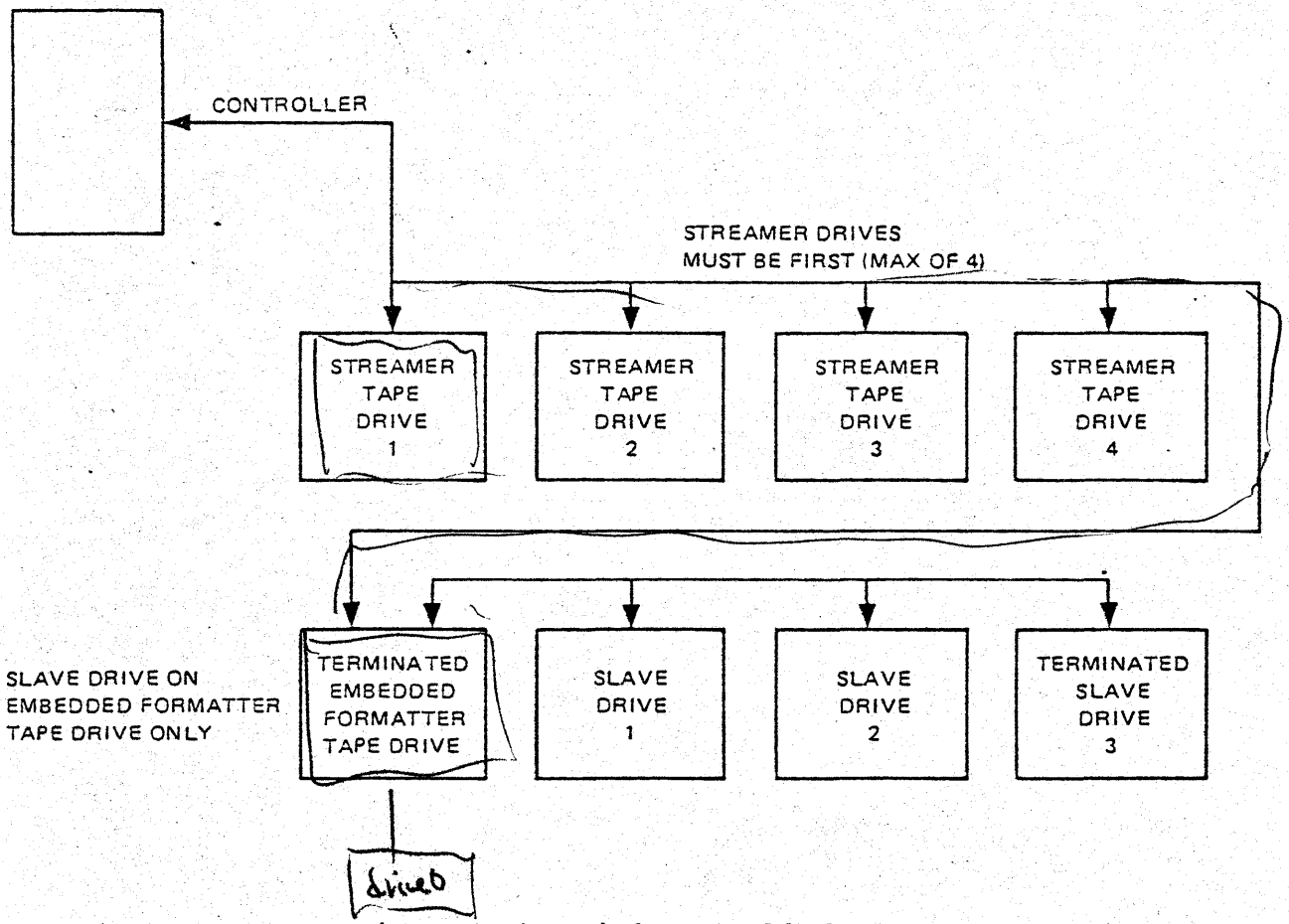


Figure 5-4. Daisy Chain with Embedded Formatted Drive

6.0 OPTIONS

The only option is internal/external generated parity. This is selected by U152, S5 or 6. See table below.

PARITY	S5	S6
Internal Parity	Closed	Open
External Parity	Open	Closed

Table 6-1. Parity Selection

UNIT NO.	S2	S3	S4
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

0 = Open 1 = Closed

	S1	S7	S8
FUNCTION	NC	NC	NC

Table 6-2. Unit Select

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