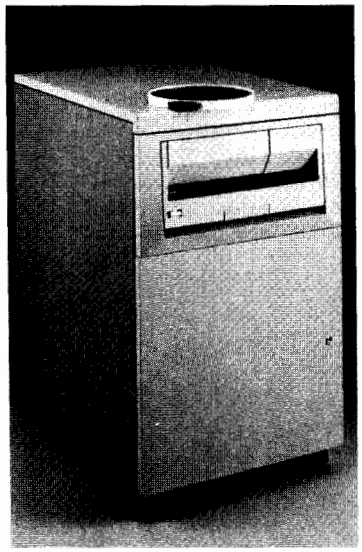
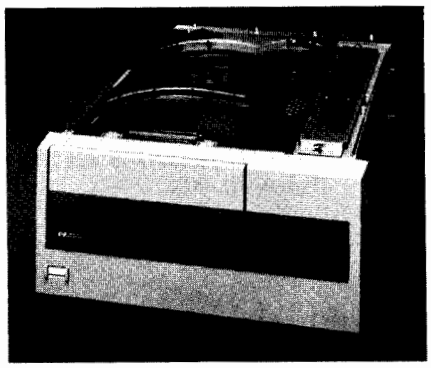
HP 7979A/7980A/7980XC
88780A/B





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NOTICE

This Handbook is intended only for service personnel trained in its use by Hewlett-Packard. It is designed as a quick reference guide to commonly-used service information. The information contained here is highly condensed from other manuals and this volume is not intended to be a substitute for, but rather a supplement to those manuals.

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There are no peripherals to this drive.

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SECTION 1

PRODUCT INFORMATION

[1] PRODUCT FEATURES

The HP 7979A, 7980A, and 7980XC are autoloading, horizontally rack-mounted, 1/2-inch reel-to-reel tape drives. The 88780A/B is the OEM version of the 7980A.

These drives offer the following features:

- low cost
- compact, ergonomic design
- front autoload
- simplified control panel
- versatile handling of all standard-sized reels (6 to 10 1/2-inch)
- 125 ips nominal tape speed for maximum streaming performance
- density configuration as needed: the 7979A supports 1600 cpi PE recording, the 7980A, 7980XC, and 88780A/B support both 1600 cpi and 6250 cpi GCR recording, the Option 800 supports 800 cpi NRZI recording on the 7980A, 7980XC, and 88780A/B
- large cache buffer for fast transfers during start-stop applications; 512 Kbyte for the 7980A/7980XC/88780A/B and 256 Kbyte for the 7979A
- extra capacity data storage at 6250 cpi selectable by operator or through host; data storage per tape increased by two to five times
- easy to use diagnostics

- custom operating features, selected from the control panel or through the host computer
- Standard 19-inch EIA rack mount
- HP-IB interface available for the 7979A/7980A/7980XC. The 88780A/B may be equipped with the Pertec-compatible interface or the Small Computer System Interface (SCSI) in either single or double-ended configurations
- low power consumption

[2] SPECIFICATIONS

DRIVE SPECIFICATIONS

	7979A	7980A 88780A/B	7980XC
Burst transfer rate (max.) (1)			
6250 GCR	N/A	769 Kb/s	769 Kb/s
1600 PE	208 Kb/s	208 Kb/s	208 Kb/s
800 NRZI	N/A	104 Kbytes/s	104 Kbytes/s

1 *These rates are the maximum tape drive potential and do not reflect actual transfer rates, which depend on the host used.*

Transfer rate to tape (avg.)			
6250 GCR	N/A	747 Kb/s (64K blocks - 0.3-inch gap)	747 Kb/s
1600 PE	198 Kb/s	198 Kb/s (16K blocks - 0.5-inch gap)	198 Kb/s
800 NRZI	N/A	99 Kbytes/s (8K blocks - 0.5-inch gap)	99 Kbytes/s

	7979A	7980A 88780A/B	7980XC
Speed (nominal)			
Read/Write			
GCR		123 ips	123 ips
PE/NRZI	130 ips	130 ips	130 ips
Rewind	320 ips average, 450 ips maximum (90 seconds to rewind a 2400-ft tape)		
Density/Format			
Density	1600 cpi	6250 cpi 1600 cpi 800 cpi (Opt. 800)	6250 cpi 6250XC 1600 cpi
Formatted Data Capacity (2400-ft reel)	40 Mb (typ. 1600 cpi)	140 Mb (typ. 6250 cpi) 40 Mbytes (typ. 1600 cpi) 20 Mbytes (typ. 800 cpi)	200-700 Mb
Maximum Physical Block Size On Tape*			
6250 GCR	N/A	256 Kb	256 Kb
1600 PE	64 Kb	64 Kb	64 Kb
800 NRZI	N/A	64 Kb	N/A

*block size may be limited by host operating system

		7979A	7980A 88780A/B	7980XC
Reliability				
Hard Error Rate (will not exceed)				
GCR	Read	N/A	1 in 10E11	1 in 10E11(2)
	Write	N/A	1 in 10E10	1 in 10E10
PE	Read	1 in 10E10	1 in 10E10	1 in 10E11(2)
	Write	1 in 10E09	1 in 10E09	1 in 10E10
NRZI	Read	1 in 10E10	1 in 10E10	1 in 10E11(2)
	Write	1 in 10E09	1 in 10E09	1 in 10E10

2 *Specified in tens of number of bytes per unrecoverable read error. Because less tape is written per amount of data, the number of bytes stored per error is less than 1 in 10E11. However, if a record is unreadable it would represent more data than with industry-standard 6250 cpi density.*

FUNCTIONAL CHARACTERISTICS

Internal Buffer Size	256K	512K	512K
Operating Mode		Streaming	
Interface		HP 7979A/7980A/7980XC	
		HP-IB (IEEE 488)	
		HP 88780A/B	
		Pertec-Compatible SCSI Single-ended SCSI Differential	

POWER REQUIREMENTS

Line Voltage (±10%)	100-120 VAC 200-240 VAC
Line Frequency	50-60 Hz

Power Consumption	
Maximum	250 Watts
Standby	20 Watts
Idle	170 Watts

PHYSICAL SPECIFICATIONS

Mechanism

	HP 7979A/7980A/7980XC/88780A
Height	222 mm (8.75 in.)
Width	483 mm (19.0 in.)
Depth	673 mm (26.5 in.)
Weight	38.5 kg (85 lbs) HP 88780B - 31.0 kg (68 lbs)

Mechanism In The Rack

	HP 7979A/7980A/7980XC
Height	1000 mm (39.37 in.)
Width	600 mm (23.62 in.)
Depth	800 mm (31.5 in.)
Weight	136.5 kg (300 lbs)
Shipping Weight	177.25 kg (390 lbs)

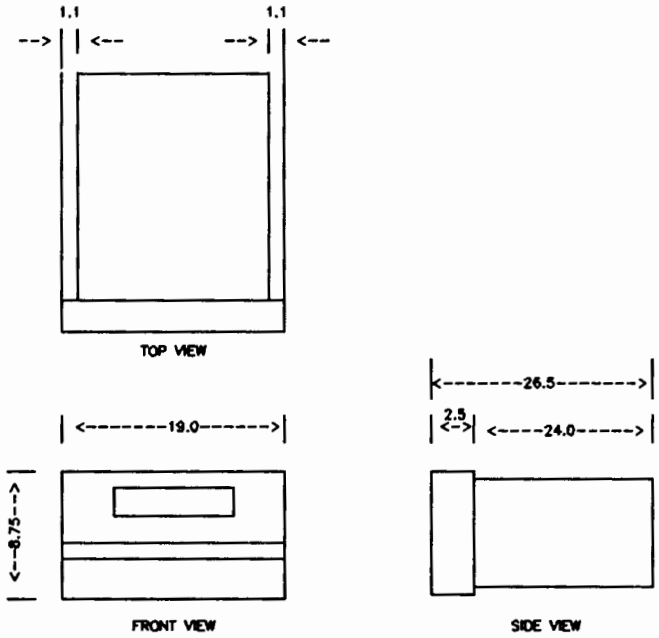

Figure 1-2. 88780A/B Dimensions (in inches).

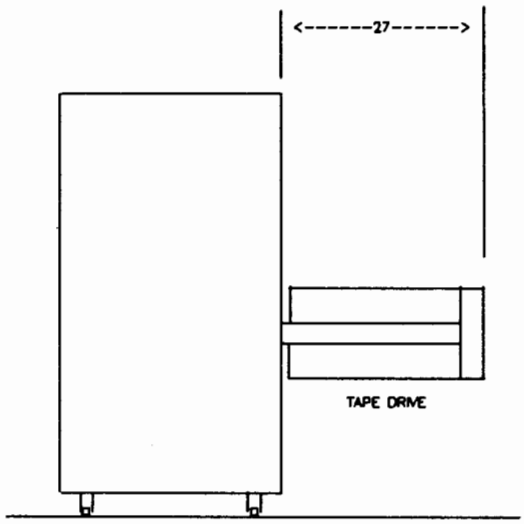

Figure 1-3. 88780A/B in Standard EIA Rack (side view)

Tape Specifications

	HP 7979A/7980A/7980XC/88780A/B
Width	12.7 mm (0.5 in.)
Thickness*	0.038 mm (1.5 mils) Tape should meet or exceed ANSI X3.40-1976)

*see "Using 1-Mil Tape" after these tape specifications.

Tension	283 g (10 oz ±1 oz)
Reel Sizes	267 mm (10.5 in.) 216 mm (8.5 in.) 178 mm (7.0 in.) 152 mm (6.0 in.)

Using 1-Mil Tape

> The following statement appears in the "HP 7979A/7980A/7980XC Tape Drive User's Guide" and the "HP 88780A (now "B") Tape Drive User's Guide."

Hewlett-Packard supports the use of 1-mil (3600-ft reel) tapes on the HP 7979A/7980A/7980XC/88780A/B tape drives under certain conditions. These conditions are stated at the end of the following background information.

Electrically and magnetically, 1-mil tapes are equivalent to ANSI-standard 1.5-mil mil tapes, but do not meet ANSI thickness specifications due to their thinner Mylar substrate. Thin tape was designed for low-speed datalogging operations.

Two characteristics of 1-mil tape must be taken into account before this tape is used; 1-mil tapes are more susceptible to deformation and breaking, and thin tapes conform to the read/write heads differently and therefore wear the heads differently than 1.5-mil tapes.

With regard to tape deformation, the HP 7979A/7980A/7980XC/ 88780A/B will physically handle 1-mil tapes without deforming or breaking them. All tape operations are supported, including autoload.

With regard to different head wear patterns, the HP 7979A/7980A/7980XC/88780A/B heads are affected by use of 1-mil tape in the same way as heads on any other tape drive; the critical read/write area of the head wears at an increased rate and forms a different profile from that made by 1.5-mil tape.

When a 1.5-mil tape is mounted on a drive in which the read/write area of the head has been worn by frequent use of 1-mil tape, the thicker 1.5-mil tape cannot conform to the wear profile caused by the 1-mil tape and will pass over the read/write area of the head at a greater distance. This increased tape-to-head distance causes signal loss. The effect of signal loss can be an increase in read and write errors. This effect is true for all industry-standard half-inch tape drives.

Because of the incompatibility of the head wear profiles, Hewlett-Packard can support the use of 1-mil tapes on the HP 7979A/7980A/7980XC/88780A/B only if the following guidelines are used:

* if a significant portion (more than 1 tape in 10) of the tapes used on the drive are 1-mil tapes, we recommend that a drive be dedicated to the use of the thinner tapes

* if less than 1 tape in 10 used on the drive is a 1-mil tape, AND at least 10 1.5-mil tapes are mounted between the mountings of the 1-mil tapes, the two tape types can be used on the same drive.

ENVIRONMENTAL SPECIFICATIONS

	HP 7979A/7980A/7980XC/88780A/B
Temperature	
Operating	15-32 C
Non-Operating	0-55 C
Storage	-40 to 70 C
Rate of Change	20 C per hour
Relative Humidity	
Operating	Tape medium limited to 20%-80% at <20 C maximum wetbulb temperature
Storage/Shipment	Tape medium limited to 90% at 40 C maximum wetbulb temperature
Altitude	
Operating	3000 m (10,000 ft)
Non-Operating	15,300 m (50,000 ft)
Shock	
Transportation	Trapezoidal pulse, 188 ips, 30 G
End-Use	Half-sine pulse, 57 ips, <3ms duration
Vibration	
Operating Random (~0.21 G RMS)	5-500 Hz
Non-Operating Random (~2 G RMS)	5-500 Hz
Non-Operating Swept Sine (0.5 G peak)	5-500 Hz
Audible Noise (weighted sound power)	
Read Write Operation	6.6 Bels (A)
Tape Loading	

Operation	7.2 Bels (A)
Heat Dissipation	1280 BTU/hr maximum

[3] Regulatory Approval

Safety
- Underwriters Laboratories
  - UL 478, 5th Edition (UL listed)
- Canadian Standards Association
  - C22.2 No. 220-M1986 (CSA certified)
- International Electrotechnical Commission
  - IEC 380, 435 (complies)
- Technischer Uberwachungs-Verein Bayern Inc. (TUV certified)

HP7979A/7980A/7980XC - DIN IEC 380/VDE 0806/08.81

HP88780A/B - DIN IEC 380/VDE 0806/08.81
IEC 435/VDE 0805/11.84

[4] Options

HP-CONNECT PRODUCTS

HP 7979A - 1600 cpi autoload drive with 256 KB Data Buffer and 1 meter cabinet. Includes HP-IB cable, accessories and installation.

To order two drives in one cabinet, order one 7979A + one 7979A Option 133.

HP 7980A - 1600/6250 cpi autoload drive with 512 KB Data Buffer and 1 meter cabinet. Includes HP-IB cable, accessories and installation.

To order two drives in one cabinet, order one 7980A + one 7980A Option 133.

HP 7980XC - 1600/6250/6250XC cpi Extra Capacity autoload drive with 512 KB Data Buffer and 1 meter cabinet. Includes HP-IB cable, accessories and installation.

To order two drives in one cabinet, order one 7980XC + one 7980XC Option 133.

Each drive above has the following options:

Option 133 - Add-on Drive. Removed: cabinet, front panel shroud, standard lower front rack panel, back door, and anti-tip feet. Added: short lower panel. Includes installation.

Option 135 - Drive Only (installation in another 19-inch rack). Removed: cabinet, front panel shroud, standard lower front rack panel, back door, anti-tip feet, slides, and rails. Does not include installation.

Option 137 - Preparation for addition of disc drive. Removed: lower front door. Added: door with window, ventilation, and safety feet. Order when installing an HP 7936/37 disc drive in the bottom of the tape drive cabinet. Disc drive and HP 19512A Rackmount Kit required. Includes installation.

Option 1A4 - Preparation for installation in HP A1001A (1.6 meter) cabinet. Deletes cabinet and lower front door. Includes installation.

The HP 7979A and 7980A also have the following additional density option:

Option 800 - Added capability to format tape in 800 cpi NRZI (Non-Return-to-Zero Inverted). Parts must be ordered separately. A Sales Representative should be contacted.

Upgrade paths

HP 88703A - HP 7979A to HP 7980A. Includes on-site installation by HP. Not customer installable. *

HP 88705A - HP 7980A to HP 7980XC. Includes on-site installation by HP. Not customer installable. *

*An HP 7979A may be upgraded to an HP 7980XC by installing both the HP 88703A and the HP 88705A.

HP 88780A/B (DISTRIBUTOR MODELS)

HP 88780B - (new orders for "A" model discontinued) 1600/6250 cpi autoload drive with 512 KB Data Buffer. Interface,

accessories, mounting hardware, and cabinet are not included. An order must include interface selection. Not intended for HP computer systems.

Order an interface by specifying Option 007 plus the Interface Kit desired (HP 88753A, 88754A, or 88755A).

Option 007 - Interface Preparation
Provides both SCSI and Pertec-compatible interface firmware. The applicable firmware is mounted on the PCA included in the Interface Kit ordered with the drive (HP 88752A, 88754A, or 88755A).

Option 131 - Desktop Enclosure for HP 88780A
Standalone cabinet for tape drive. Designed for desktop use. If ordered as an add-on, order HP 88706A described below.

Option 132 - Desktop Enclosure for HP 88780B
Standalone cabinet for tape drive. Designed for desktop use.

Option 142 - Rotating Rack Slides for the HP 88780B
Rack slides for mounting in a 19-inch rack enclosure. If ordered as an add-on, order HP 88709A Rotating Rack Slide Kit.

Option 400 - Data Compression (only supported on SCSI drives)
Adds data compression. Formats available are 1600 PE, 6250 GCR and 6250 XC (Extra Capacity.)

Option 800 - 800 cpi NRZI
Adds 800 cpi density Non-Return to Zero Inverted (NRZI) format. Not offered in kit form. Must be ordered with the drive.

HP 88752A Kit - Pertec-compatilbe Interface Kit
Pertec-compatible interface. Includes PERTEC-compatible interface PCA and mounting hardware. Cables not included.

HP 88754A Kit - Single-Ended SCSI Kit
Single-Ended Small Computer Systems Interface (SCSI) Kit. Includes Single-Ended SCSI Interface PCA and mounting hardware. Cables not included.

HP 88755A Kit - Differential SCSI Kit
Differential Small Computer Systems Interface (SCSI) Kit. Includes Differential SCSI Interface PCA and mounting hardware. Cables not included.

HP 88706A Kit - Desktop Enclosure
Standalone cabinet. Designed for using the HP 88780A/B on a desktop.

HP 88709A Kit - Rack Slide Kit
Rotating Rack Slide Kit for the HP 88780A/B.

The following interface options *were* available (before July 1989) on the HP 88780A (given here for information only). These options are not orderable on the HP 88780B.

Option 002 - (Pertec-compatible Interface
Added Pertec-compatible interface PCA. Cables not included.

Option 004 - SCSI Single-Ended Interface
Added single-ended version of Small Computer Systems Interface (SCSI) PCA. Cables not included.

Option 005 - SCSI Differential Interface
Added differential-ended version of Small Computer Systems Interface (SCSI) PCA. Cables not included.

[5] ACCESSORIES

	Customer Order Number	HP Number
- Magnetic Tape, 2400ft (box of 10)	92150F	
- Magnetic Head Cleaner Kit	92193H	
contains:		
- Tape Head Cleaner, 4 oz bottle		8500-1914
- Tape Head Cleaner, 4 oz can		8500-1251
- Foam tipped swabs		9300-0468
- Lint-free paper cloth		9310-4028

SECTION 2

ENVIRONMENTAL/INSTALLATION/PM

[1] ENVIRONMENTAL REQUIREMENTS

The tape drive is designed to operate with an ambient air temperature range of 15° to 32°C (60 to 90°F) with a rate of temperature change not to exceed 20°C (36°F) per hour. See

NOTE

The environmental specifications listed here apply when the tape drive is not connected to a Hewlett-Packard system. When this device is connected to HP systems, the more stringent environmental specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

[2] PRIMARY POWER/EXTERNAL GROUND

The female power outlet to be used to supply AC power to the tape drive must be checked by a certified electrician to ensure that the proper voltage is available for the tape drive. Permitted voltage range(s), depending on configuration and assuming 48-66 Hz, are 90 to 125 VAC (115 VAC nominal) and 198to 250 VAC (230 VAC nominal). Also check the earth (safety) ground in the poweroutlet.

Be aware that the electrical load imposed by the tape drive may reduce the available voltage below the non-load value. If the line voltage is not within the correct range, check for proper wiring.

[3] COOLING REQUIREMENTS

A minimum of 70-80 mm (3 in.) is required behind the rear door to allow air circulation. Maintain a clearance of at least 1 metre (approximately 39 in.) in front of the unit to provide adequate

space for opening the front door (490 mm / 19.3 in.) and for pulling the cabinet out during servicing.

The area does not have to be air-conditioned but an operating room temperature between 18°C to 24°C (65°F to 75°F, non-condensing) is RECOMMENDED.

[4] LOCATION REQUIREMENTS

Position the drive away from sources of particulate contamination such as frequently-used doors and walkways, stacks of supplies that collect dust, and smoke-filled rooms. If possible, allow enough room at the rear of the cabinet for access to the power switch (inside the rear cabinet door) and for service.

[5] INSTALLATION

Problems determined to be factory packaging should be reported, in detail, to the factory in order to submit a warranty claim.

In all cases the unit will be repaired or replaced. Billing of the charges depend on whether the damage was caused by the carrier or caused by factory packaging. The determination of what caused the damage will be made by the Field Service Representative.

If the carrier refuses payment of damages, replacement/repair costs should be entered into the Field Engineering Support account (F.E.S.).

Be sure to include the model number and full serial number in any correspondence with Hewlett-Packard concerning the tape drive.

Check that all standard equipment is included with the drive unit. If any items are incorrect or missing, please contact the factory Order Processing Center with the following information:

1. Original order number or unit serial number
2. Receiving address.

NOTE

When transferring the tape drive from a very cold environment to a warm environment, or vice versa, it is very important to let the drive adapt to the new conditions to obtain maximum autoload performance.

Apply power to the drive for at least one hour before autoloading (Main AC Power Switch on the rear panel "1", Standby Switch on the front panel IN). If the new environment is extremely humid or cold, allow at least two hours.

Tapes should also be acclimatized. Remove storage rings or cases and let the tapes set for at least one hour. If extremely humid or cold, allow at least two hours. This procedure allows temperatures to equalize and allows the tapes to dry out sufficiently to insure optimum autoloading.

For optimum read/write performance, allow the tapes to acclimate for 24 hours. This provides enough time for the tape humidity to equalize with that of the environment.

[6] CLEANING GUIDELINES

Many transport problems can be traced to either improper cleaning or the use of poor quality tapes that leave oxide and binder on the tape path. Without frequent cleaning, collected particles contaminate tapes, cause transport failure, and, in extreme cases, ruin the tape head. Replacing the head is costly.

The tape path should be cleaned regularly. The path should be inspected for any of the following problems:

BROWN STAINING: Low humidity levels cause brown deposits of oxide to accumulate on the head. As the stain grows, tape-to-head separation increases until the head becomes useless. Once ruined, the head must be replaced.

CLEAR FILMING: Every time a tape is used it sheds oxide and binder which forms a clear film upon the head. If not removed with cleaning solvents at frequent intervals, tape-to-head separation errors occur.

NOTE

Clear films can build up until cleaning with solvent is no longer effective and replacement of the head becomes necessary.

Frequency of cleaning depends on three factors: usage, operating environment, and tape quality. The following definitions should be used as guidelines for developing an appropriate cleaning schedule.

MINIMUM: A thorough cleaning of the tape path every shift (eight hours). Minimum cleaning is appropriate under the following conditions:

- less than 10 reels are used in eight hours (a shift)
- there is no visible debris on tape head after each reel of tape
- there is no reason to suspect a high level of dust in the computer center from vacuuming, delivery of supplies, etc.

NORMAL: A thorough cleaning of the tape path after every one to two hours of continuous running if:

- more than 10 reels are used in eight hours
- there is no visible debris on the tape head after each reel of tape
- there is no reason to suspect a high level of dust in the computer center.

HEAVY: A thorough cleaning of the tape path after each reel of tape under the following conditions:

- visible debris appears on the tape head after each reel of tape
- uncleaned interchange tapes from outside your computer center are being read
- uncleaned new tapes which have been used only once or twice are being used (new tapes usually contain additional debris from the slitting process during manufacture).

SPECIAL: A thorough cleaning of the tape path under the following conditions:

- abnormal dust level in the computer center because of custodial activity, equipment moves, supply delivery, etc.

- extended periods (days) of tape drive inactivity prior to use.

Most users find that they need to clean the transport once after every eight-hour work shift. However, if any of the problems listed listed previously develop or the excessive soft-error rate message **CHECK** begins to occur regularly, the transport should be cleaned more frequently. If an increased cleaning schedule does not improve reliability, check the tapes. Are the tapes old, worn, or kept in a dirty environment? All old and worn tapes should be copied immediately and then discarded.

If error problems persist after taking all the steps outlined above, the drive hardware may possibly have a problem.

Cleaning Supplies

Cleaning Solvent

Hewlett-Packard supports the use of a high-quality electronic-grade (at least 90%) isopropyl alcohol as a cleaning solvent for all tape drives.

NOTE

Freon TF, though still an effective tape path cleaning solvent, is damaging to the earth's ozone layer. Hewlett-Packard no longer recommends Freon TF as a tape drive cleaning solvent because of its damaging effect to the environment.

CAUTION

Do not use cleaner solutions which contain lubricants. Lubricant deposited on the tape head degrades performance.

Do not use soap and water on the tape path. Soap leaves a thick film and water may damage electronic parts.

Do not use cleaning alcohol on rubber rollers. Clean the parts with water and then dry them with a clean, dry, lint-free cloth.

Do not use aerosol cleaners, even alcohol. The spray is difficult to control and often contains metallic particles which damage the tape head.

Wiping Materials

Use non-abrasive lint-free cloth and swabs. Discard these materials after use; even if they appear clean, they contain contamination.

CAUTION

Do not use facial tissues or cotton-tipped swabs. Although seemingly effective, they introduce highly abrasive lint into the tape path.

Cleaning Procedure

a) Pour a small amount of solvent into a clean container, such as a small UNWAXED paper cup.

b) Dab all cloths and swabs into the container, as needed.

c) While applying gentle pressure in the direction of tape path, clean the following surfaces. Give attention to the inner edges of rollers and guides. (Refer to Figure 2-1 for locations).

(1)-Buffer Arm moveable roller (outboard end of the arm)

(2)-Buffer Arm fixed roller (at the base of the arm) Make sure that no debris accumulates under the movable ceramic flange at the bottom (casting side) of the fixed guide. Remove any debris from the BOT/EOT sensor holes on the black plastic BOT/EOT sensor at the base of the Buffer Arm.

(3)-Tape Cleaner Block

(4)-Read/Write/Erase Heads

(5)-Speed Encoder

d) Use a lint-free wipe to brush out any debris in the

(6)-supply reel bed (depression) in the casting

e) Periodically you may also want to

(7)- wipe off the rubber gripping fingers on the supply reel hub and check for any debris in their receptacles. Pull the reel lock lever towards you and rotate the supply hub clockwise to raise the fingers. Rotate the hub counterclockwise to lower the fingers after cleaning.

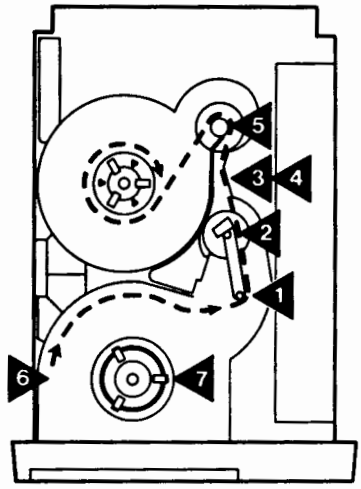

Figure 2-1. Cleaning Points

SECTION 3

CONFIGURATION

NOTE

The HP 88780A/B is basically an HP 7980XC modified to OEM requirements. These requirements, and therefore the operation and physical appearance of the drive, may vary from OEM to OEM.

Installation of an HP 88780A/B will be by the OEM and some general procedures described here may not be applicable to a specific OEM drive.

With this in mind, the installation procedures described in this chapter include the 88780A/B as if it were being installed by Hewlett-Packard service personnel. These procedures are included only as a general aid to OEMs that choose to use this Hewlett-Packard manual as their product reference. The OEM should evaluate these procedures and modify them as necessary.

[1] INITIAL CONFIGURATION AND CHECKOUT

Voltage Selection and Fusing

The tape drive power supply is configured according to the area designated as final destination on the order form. Checkout procedures involve verifying that the drive was configured correctly.

The AC line fuses are located in the Power Module on the Rear Panel. A fuse for 115 VAC (nominal) operation and a fuse for 230 VAC (nominal) operation may be held in the module at the same time. The voltage mark on the fuse module, when lined up with the reference mark on the fuse module receptacle, designates the voltage rating required of the fuse. The proper fuse must be in the fuse holder ON THE SAME SIDE as its voltage mark (rating).

OPERATION	FUSE	HP PART NUMBER
120 volt (115 VAC nom.)	6 A 250 V	2110-0056
220 volt (230 VAC nom.)	3 A 250 V	2110-0003

Check that the power cord from the Power Module has the proper connector for the country.

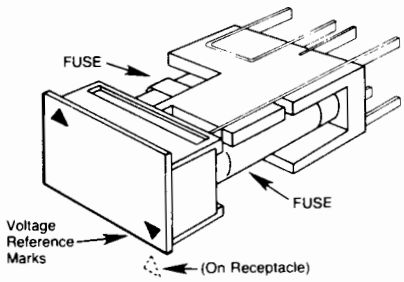

Figure 3-1. Fuse Module

CHANGING THE VOLTAGE CONFIGURATION

Remove Power from the Drive Unit

1. Make sure power is off to the drive.

   -the front panel Standby Switch is in the out (OFF) position.
   -the Main AC Power Switch on the rear panel is in the "0" position.

2. Disconnect the power cable from the rear of the drive.

Configure the Voltage

3. Slide the fuse module out.

   The fuse module is located directly under the power cable receptacle on the rear of the drive unit. When the power

cable is removed, a small slot on the the top of the module can be accessed. Insert your fingernail or a small screwdriver into this slot to help slide the module out from its flush-mounted position. Pull the fuse module all the way out.

WARNING

The correct fuse for the selected voltage must be in the proper receptacle in the holder.

For 110-120V operation, the fuse is 6 Amperes. For 220-240 V operation, the fuse is 3 Amperes (3.15 Amperes in Europe). Viewed from the end of the fuse holder as the holder is being inserted, the "active" fuse will be on the right side of the holder -- the same side as the Voltage Reference Mark.

4. Rotate the fuse module so that the desired voltage rating arrow ("110 -120 V" or "220 - 240 V") aligns with the arrow on the lower edge of the receptacle. Ensure that the correct fuse is in on the right side (see previous WARNING).

5. Connect the appropriate power cable to the power receptacle (110-120 V or 220-240 V cable).

6. Apply power by pressing the "1" on the Main AC Power Switch.

7. Press the Standby Switch on the front panel in (ON).

GENERAL DRIVE PREPARATION

INSTALL PROPER HP-IB LOADS (HP-IB interface only)

1. Make sure power is off to the drive.

   -the front panel Standby Switch is in the out (OFF) position.
   -the Main AC Power Switch on the rear panel is in the "0" position.

2. Disconnect the power cable from the rear of the drive.

3. Determine the proper HP-IB loading from the cabling situation.

HP-IB cabling requires that the total cable lengths ("loads") in a configuration, both internal and external, must not exceed the total cable lengths supported by the devices in that configuration. Cable lengths are expressed in meters.

The maximum allowed length of the HP-IB cable which connects devices to a General I/O Channel (GIC) is seven meters plus one meter for each device (most devices, including the 7979A/7980A/7980XC, support a load of one meter -- unless you change the loading in the 7979A/7980A/7980XC).

Two meters are used internally in the System Processor Unit (SPU) and must be subtracted from the total cable allowed. This leaves five meters plus one meter for each device -- the total cable supported then becomes six.

(The cable length between the 7979A/7980A/7980XC drive HP-IB Interface PCA and the rear panel of the cabinet is included in the HP-IB PCA transceiver loading, does not count as an external cable length, and is not subtracted from the one external load supported by the drive.)

The following example shows how both the internal and external cable length loads of a simple system and shows how to calculate the maximum amount of cable allowed between the GIC and the tape drive. The example assumes a HP3000 Series 64 computer using a GIC supporting seven meters of cable with two meters of cable internally (from the SPU to the outside of the cabinet).

HP 7979A/7980A/7980XC Cable length Supported*	+ 1 m
*factory setting	
GIC Total Cable length Supported	+ 7 m
HP 7979A/7980A/7980XC Internal Cable (inside cabinet)	0 m
GIC Internal Cable (inside cabinet)	- 2 m
Cable available	+ 6 m

When all supported external cable lengths (pluses (+) in this case) are added to all existing internal cable lengths (minuses in this case), the optimum result should be zero. If there is a difference, it must be on the side of HAVING MORE CABLE SUPPORTED than actually used. Loads must be balanced between peripherals as each they are added to the HP-IB loop. Trying to balance the whole HP-IB loop by placing loads in the last peripheral will not work.

If more cable length is used than is supported by the combination of GIC and peripherals, spurious and hard-to-find errors will most probably be introduced into the system.

SHORT HP-IB CABLES SHOULD NOT BE LINKED TOGETHER TO MAKE A LONGER CABLE. USE A SINGLE CABLE OF THE CORRECT LENGTH.

A GIC supports from 1 to 8 HP-IB peripherals. Depending on the type of peripheral and its time of use, connecting other peripherals to the GIC that supports this drive might degrade the performance of the drive to an unacceptable level.

4. Install loading resistor packs, as needed, on the HP-IB Interface PCA using the following diagram as a guide.

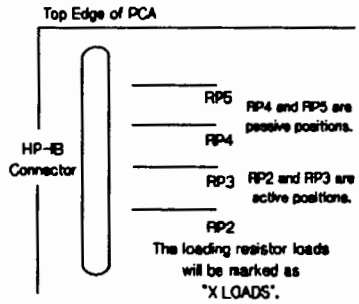

Figure 3-2. HP-IB Load Resistors

RESEAT ALL PCAs

1. Make sure the power is off.

2. Remove the RFI cover on the top of the drive, exposing the PCAs.

3. Reseat all the PCAs.

CLEAR DRIVE NON-VOLATILE RAM (NVRAM)

1. Attach a jumper wire between the GND and CLRNV points on the Data Buffer PCA as shown by the drawing below.

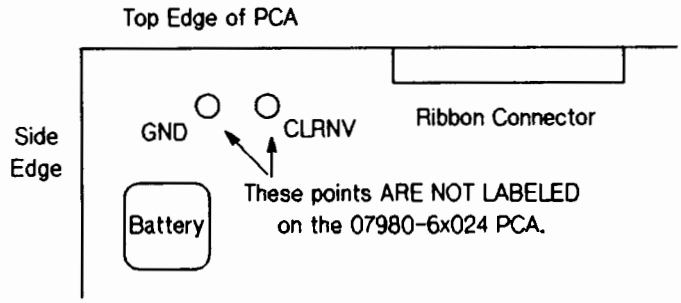

Figure 3-3. Data Buffer PCA GND/CLRNV Jumper Points

2. Apply power to the drive. The display should show "FAIL 0."

3. Remove power.

4. Remove the jumper from betweeen GND and CLRNV points.

5. Apply power to the drive. Poweron test should PASS (drive will display READY).

NOTE

At this point, the NVRAM is clear and all configurations, including autogain values, must be reconfigured.

6. Replace the RFI cover over the PCAs.

COMPUTE AUTOGAIN VALUES

NOTE

The read/write performance of the drive depends on how well the drive is tuned to cover the range of tapes used at a site. The factory setting of the

gain values (as shipped) will most probably not be correct for the typical tapes found at any particular site.

1. Load a typical customer tape.

   Judgement should be used here to select a tape that represents the "mean" of the customer's tapes (rather than the "average"). Consider the range of tapes used (hot to cold), the relative amount of each "type" of tape used, and the age of each of these "types" of tape.

2. Run Test 99, choosing ONCE, 1600, and SAVE.

3. (7980A/7980XC/88780A/B) Run Test 99 again, choosing ONCE, 6250, and SAVE.

4. (7980A/7980XC) If Option 800 is installed, run Test 99 again, choosing ONCE, 800, and SAVE.

SET THE DRIVE ADDRESS/ID

1. Make sure the drive is OFFLINE.

2. Press OPTION to enter the Option Mode. TEST * appears in the display.

3. Press NEXT until ADDR * appears (HP-IB and PERTEC-compatible interfaces). If drive is configured with a SCSI interface, ID * appears.

4. Press ENTER to select the ADDRessing Option. (ID Option for SCSI.)

5. Using the NEXT or PREV Keys, display the address/ID desired.

6. Press ENTER.

   The address/ID you selected appears as SET <#>. The # will be the HP-IB address (or OFF - see NOTE below). This display will last for 1 second and then return to the ADDR * or (or ID) display.

NOTE

The HP 7979A/7980A/7980XC drive is shipped with the HP-IB address set to OFF. The setting should only be used to remove the drive from the HP-IB.

7. Leave the Option Mode by pressing OPTION or RESET.

After preparing the drive in the steps above, the customer may change the values of UNLOCKED configurations as desired. After the customer makes any additional changes to drive configurations the configurations should be saved to tape. Refer to 'Storing Configurations" that follows.

STORING CONFIGURATIONS

(Running tests and a description of Test 99 is in Section 5.).

1. LOAD a short tape, with a write enable ring.

2. Run Test 150 to write an ID on the tape.

3. Run Test 128 to dump the non-volatile RAM to tape.

4. UNLOAD the tape. Mark the tape "STORED CONFIGURATIONS" or something similar.

5. Store the tape.

NOTE

Update this tape using the steps above when configurations are changed.

6. Request that the customer fill out and mail the "Customer Satisfaction Survey Card" shipped with the drive.

7. (Installing Engineer) Fill out the "CE Comment Card" and mail it.

NOTE

Initial factory-set configurations are listed in the SYSTEM CONFIGURATION 40 - 96 in Chapter 8.

SCSI INTERFACE PCA CONFIGURATION

The SCSI Bus must be resistively terminated at both ends. Typically, one end is terminated by the computer, the other end is, in the case of these HP tape drives, terminated by an external

terminator inserted into an unused cable connector on the interface PCA (if the drive is the last device on the Bus).

To make the termination work, the termination must be supplied with +5 V. This voltage is called Termpower.

On the SCSI Interface PCAs, selecting the source of the Termpower is done by the JM2 jumper. The two positions available are:

- "Initiator Termpower"-- the host computer supplies the power
- "Device Termpower"-- the peripheral device supplies the power.

The default setting is "Initiator Termpower."

DISTRIBUTION OF TERMPOWER (Single-Ended SCSI Interface PCA)

If 88780-6xx15 PCA ------

The distribution of Termpower on the Single-Ended SCSI Interface PCA (-6xx15) depends on the configuration of the R1 jumper wire. This wire located between the jumper JM2 and the large, square IC -- close to the top edge of the PCA.

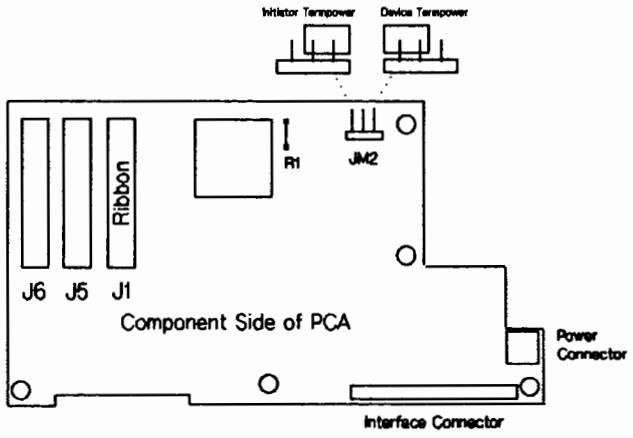

Figure 3-4. Single-Ended SCSI Interface (88780-6xx15)

There are three possibilities.

- If "Initiator Termpower" is selected on JM2 the configuration of R1 does not matter. Drive interface does not supply any Termpower.

- If "Device Termpower" is selected on JM2 and R1 is in place, Termpower is supplied to all three SCSI connectors.

- If "Device Termpower" is selected on JM2 and R1 is removed (cut), Termpower is supplied only to the J6 SCSI connector.

There is diode protection on the +5 V line for protection when more than one device supplies power to the SCSI Bus.

CAUTION

If the host computer GROUNDs Termpower and the tape drive is supplying Termpower, the interface supply will be grounded and the interface fuse will blow.

If 88780-6xx35 PCA ------

The distribution of Termpower on the Single-Ended SCSI Interface PCA (-6xx35) depends on the configuration of the JM1 jumper. This jumper is located between the jumper JM2 and the large, square IC -- close to the top edge of the PCA.

There are three possibilities.

- If "Initiator Termpower" is selected on JM2 the position of JM1 does not matter. Drive interface does not supply any Termpower.

- If "Device Termpower" is selected on JM2 and JM1 is set to "Bus Continuous", Termpower is supplied to all three SCSI connectors.

- If "Device Termpower" is selected on JM2 and JM1 is set to "Dev Only", Termpower is supplied only to the J6 SCSI connector.

There is diode protection on the +5 V line for protection when more than one device supplies power to the SCSI Bus.

CAUTION

If the host computer GROUNDs Termpower and the tape drive is supplying Termpower, the interface supply will be grounded and the interface fuse will blow.

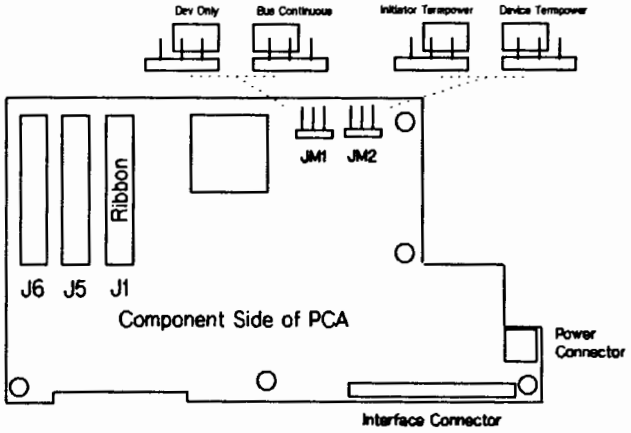

Figure 3-5. Single-Ended SCSI Interface (88780-6xx35)

DISTRIBUTION OF TERMPOWER (Differential SCSI Interface PCA)

The selection of the "Initiator" or "Device" supply for Termpower using JM2 is the same as on the Single-Ended SCSI Interface. If "Device Termpower" is selected, Termpower is supplied to both SCSI connectors on the PCA.

PERTEC-COMPATIBLE INTERFACE PCA CONFIGURATION

The Pertec-compatible Bus must be terminated at both ends. Typically, one end is terminated at the computer and the other end, in the case of these HP tape drives, is terminated by Termination Resistors on the Interface PCA.

These Termination Resistors may or may not be used, depending on whether that particular drive is at the end of the Pertec-compatible Bus or not.

The default configuration assumes that the drive (interface) is at the end of the Pertec-compatible Bus. The Termination Resistors are inserted in positions RP4 and RP5 and are "active." These resistor packs are identical and may be used in either position.

If the drive is being connected "in the middle" of the Pertec-compatible Bus, the Termination Resistors must be removed from the active RP4 and RP5 positions and should be stored in the "Spare RP4" and "Spare RP5" sockets.

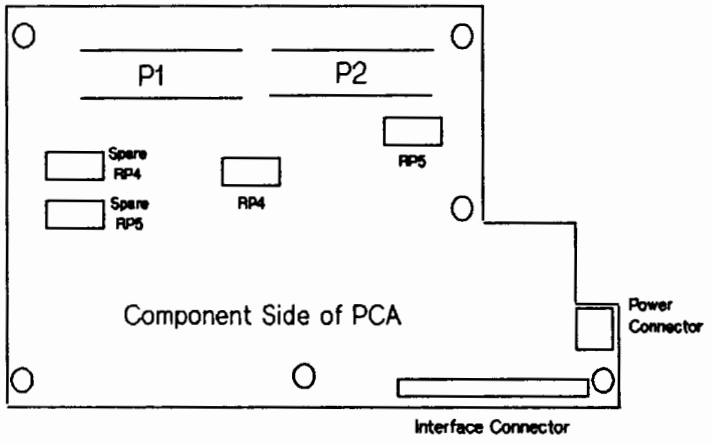

Figure 3-6. Pertec-Compatible Interface

POWERON

NOTE

When transferring the tape drive from a very cold environment to a warm environment, or vice versa, it is very important to let the drive adapt to the new conditions to obtain maximum autoload performance.

Apply power to the drive for at least one hour before autoloading (Main AC Power Switch on the rear panel "1", Standby Switch on the front panel IN --see next NOTE). If the new environment is extremely humid or cold, allow at least two hours.

Tapes should also be acclimatized. Remove storage rings or cases and let the tapes set for at least one hour. If extremely humid or cold, allow at least two hours. This procedure allows temperatures to equalize and allows the tapes to dry out sufficiently to insure optimum autoloading.

For optimum read/write performance, allow the tapes to acclimate for 24 hours. This provides enough time for the tape humidity to equalize with that of the environment.

NOTE

Two switches must be in the ON position to operate the drive; the Main AC Power Switch, which is located on the rear panel of the drive unit (inside the back door), and the Standby Switch, which is located on the lower left of the front panel.

The Main AC Power Switch controls input power to the drive and should be remain ON continuously during normal operations. The Standby Switch allows input power to be passed to the electronics of the drive.

If no display appears on the Control Panel when the Standby Switch is pressed IN, do Steps 1 to 4 that follow. Otherwise, start at Step 5.

1. Make sure the Standby Switch on the lower left of the front panel is out (OFF). The is a toggle IN/OUT switch.

2. Access the rear of the drive unit by opening the rear door to the drive cabinet.

3. Press the top of the Main AC Power Switch ("1" on the rocker switch) to apply power.

4. Close the rear of the cabinet and move the cabinet back to its operating position.

5. Make sure the tape door is closed.

6. Press the Standby Switch on the lower left of the front panel IN (ON).

When the drive is powered up, all segments of the Control Panel display light up and then TESTING appears in the Control Panel display. As the drive runs through the poweron sequence of tests, all lights on the panel are individually flashed.

When the drive passes selftest, READY appears. This message means that the drive is ready to load a tape or to accept commands from the Control Panel.

If a tape had already been placed in the drive, the tape would be automatically be LOADed at this point.

TAPE OPERATIONS

If a tape is not present and the door is closed during poweron, the drive remains in the "ready" state. If a tape was inserted before poweron, and the door is closed, the drive begins LOADing the tape right after completion of the poweron selftests. LOADing stops when the tape is tensioned and positioned at the proper starting point in relation to the Beginning of Tape (BOT) marker.

NOTE

The use of 1-mil tape on the 7979A/7980A drives is supported only under certain conditions. See Chapter 1 under "Tape Specifications" for the same text given the customer in the "HP 7979A/7980A/7980XC Tape Drive User's Guide" and the 88780A/B user's guides"

BEFORE INSERTING THE TAPE

1. For consistent, optimum tape performance, the end of the of the tape should be rounded and crimped. (Most new tapes come from the manufacturer with the tape end prepared this way.)

   Autoloading should not be affected by small folds or irregularities in the last couple of feet of the leader, but if the leader has folds that run lengthwise along the tape or if that portion is definitely "crumpled", you should cut that part of the tape off. For best results use a tool made for this purpose -- like the tape cutter/crimper from Pericomp Corporation.

NOTE

If the tape end becomes damaged, cut off only what is necessary to remove the damage from the end of the tape.

To ensure that the tape can be loaded on any drive that conforms to ANSI standards, do not shorten the tape leader to less than 14 feet.

2. Ensure that the tape end is free to move.

3. Check for tape write-enable capability, as desired.

INSERTING A TAPE

4. Press **UNLOAD** to open the tape path door.

CAUTION

Always press **UNLOAD** to open the door or to stop a LOAD operation. **Do not try to force the tape door open.**

NOTE

If the tapes you are going to use have recently been stored in a place that had a much different temperature and/or humidity level, the tapes should be acclimatized before use. Remove storage rings or cases and let the tapes set for at least one hour. If the difference in environments is "extreme", allow at least two hours. This procedure allows temperatures to equalize and allows the tapes to dry out sufficiently to insure optimum autoloading.

For optimum read/write performance, allow the tapes to acclimate for 24 hours. This provides enough time for the tape humidity to equalize with that of the environment.

5. Slide a tape, free end to the right, into the center of the tape door opening. If inserting a small tape, it is best to insert the tape either to the center or a little to the right of center of the tape door.

Make sure the tape leader is free on the right side of the reel, not trapped under the reel or by the tape path door.

6. Close the tape path door. Closing the door initiates the loading sequence. LOADING appears in the display.

7. You may press **ONLINE** anytime after closing the door. You may queue the command to go ONLINE immediately after closing the door or wait until the drive finds the BOT marker.

   If you press **ONLINE** before loading has finished, the ONLINE INDICATOR flashes and the drive waits to go ONLINE until loading is finished.

   If you press **ONLINE** after loading has finished, the drive goes ONLINE.

When the drive goes ONLINE, the ONLINE INDICATOR remains lit, the tape density indicator comes on showing the density of the current tape, and the write-enable status indicator comes on showing the write enable/disable status of the tape.

The message in the display corresponds to the command the host is currently sending to the tape drive.

UNLOADING A TAPE

1. Take the drive offline by pressing **ONLINE**.

2. Press **REWIND** to position the tape at the BOT marker.

3. Press **UNLOAD** anytime after starting the rewind. The drive UNLOADs the tape and opens the tape door.

4. Remove the tape.

Configuration Choices in Non-Volatile RAM

The factory-set, default configurations for HP-IB, SCSI, and Pertec-compatible interfaces are in the "SYSTEM CONFIGURATION 40-96" in Section 5.

Configurations that may not be changed by the operator (unless changed as shown below) are marked by "LCK" in the table.

Procedures for changing UNLOCKED and LOCKED configurations are in the next section. Procedures and passwords for changing LOCKED configurations are also explained

CHANGING AN UNLOCKED CONFIGURATION

To set/change a configuration option, follow these steps:

1. Take the drive offline.
2. Press **OPTION** to enter the Option Mode. TEST * appears in the display.
3. Press **NEXT** until CONF * appears.
4. Press **ENTER** to select the configuration set mode.
5. Using **NEXT** or **PREV**, bring 40 into the display. This configuration must be set before any others; it is the Enable Change to the Non-Volatile Memory.
6. Press **ENTER**.
7. Using **NEXT** or **PREV**, bring the number of the desired configuratio into the display.
8. Press **ENTER**.
9. A "VALUE" of the configuration will appear in the display. Use **NEXT** or **PREV** to display the "VALUE" desired (depends on the type of configuration being set).
10. Press **ENTER** to select the "VALUE". The display will show SET <value>.
11. Press **RESET** to return to the "ready", offline state.

CHANGING A LOCKED CONFIGURATION

Access passwords are in Configuration location numbers 100 and 101. The two passwords for configuration changes are 48 (in CONF 100) and 76 (in CONF 101). With these two passwords entered, access is available to change locked configurations 40 through 96 and to change the locks to ON or OFF (enabling the user to change these configurations at will). Normally, service personnel will be called on to change a particular configuration, but a

continuing capability to change that configuration by the user will not be made available. However, the procedure for leaving the customer that capability is also included in the following procedure.

Example: To change CONF 82, which switches the AMIGO ID from that of a 7980A to that of a 7978B, perform the following steps:

1. Select CONF 100 and set it to 48.
2. Select CONF 101 and set it to 76.
3. Select CONF 40 and set it to "ON" (keeps change in NVRAM).
4. Select CONF 82 and set it to "HP7978".

To unlock CONF 82 so the user can change it from the front panel without passwords, do Step 5. Otherwise go to Step 6.

5. Select CONF 182 and set it to "OFF". (Configuration locks are stored in the CONF number plus decimal 100. In this example, 82+100=182.)
6. Cycle the power to OFF to erase the passwords.

To lock CONF 82 again:

7. Select CONF 100 and set it to 48.
8. Select CONF 101 and set it to 76.
9. Select CONF 182 and set it to "ON".
10. Power cycle the drive to enable the lock.

The passwords to clear the Odometer and powercycle logs are 63 for CONF 100 and 21 for CONFIG 101. To clear the Odometer or powercycle log after a NVRAM initialization, use the following example.

Example: To clear and reset the Odometer to zero from "******", do the following:

1. Select CONFIG 100 and set it to 63.
2. Select CONFIG 101 and set it to 21.
3. Select CONFIG 10 and set it to "CLEAR".

Selecting INFO 10 now displays "0" instead of "******".

THE CONTROL PANEL

(includes the 7979A/7980A/7980XC panel, and the 88780A/B panel)

The Control Panel allows the operator to select operating, diagnostic, addressing, and configuring functions.

The four OPERATION KEYS located on the bottom row of the Control Panel are used for normal operation. Other functions are selected using the OPTION KEYS on the top row. The STATUS INDICATORS indicate the status of the drive.

Operation, option, and error messages appear in the seven-character display under the STATUS INDICATORS. A tape odometer that shows the relative position of the tape during operation is located under this display.

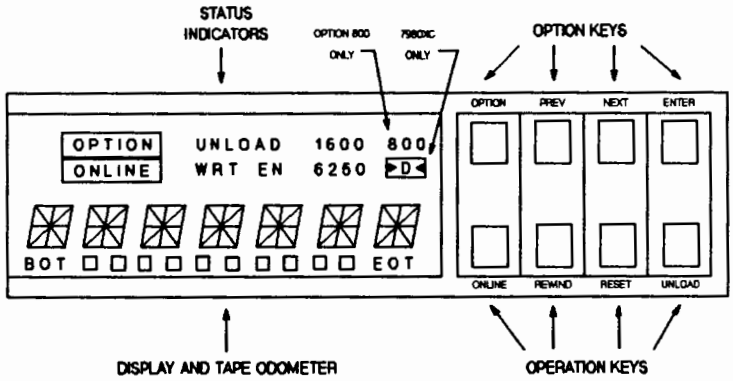

Figure 3-7. Control Panel for the 7979A/7980A/7980XC

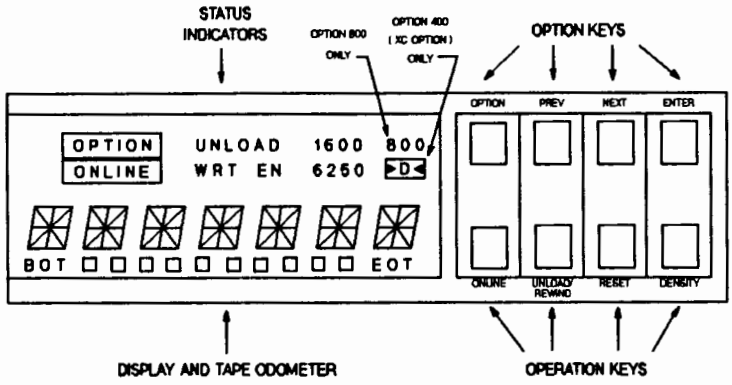

Figure 3-8. Control Panel for the 88780A/B

The following list describes the purpose and response of each key and indicator. Any differences between the 7979A/7980A/7980XC and the 88780A/B Control Panel indicators and operation are noted where necessary:

OPERATION KEYS

ONLINE

A toggle key that selects either ONLINE or OFFLINE operation of the drive. When the drive is ONLINE, it can accept and execute commands from the host. When the drive is OFFLINE, only local commands from the Control Panel can be executed.

The ONLINE STATUS INDICATOR lights when the drive goes ONLINE.

The ONLINE command may be *queued*; that is, you may press the key before the command can be performed, and the drive waits until the current operation is finished before going ONLINE. To indicate that the command is queued, the ONLINE STATUS INDICATOR flashes.

You may cancel a queued ONLINE command by pressing the ONLINE Key a second time.

REWIND	Pressing REWIND positions the tape at BOT. When the BOT Marker is reached, "BOT" appears in the display. The REWIND Key is inoperative while the drive is ONLINE or the tape door is open.

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UNLOAD/ REWIND	If a tape is between BOT and EOT and the drive is OFFLINE with the tape door closed, pressing this key *once* positions the tape at BOT. When the BOT Marker is reached, "BOT" appears in the display. Pressing the key *twice* (before the tape has rewound to BOT), initiates the REWIND sequence and queues the UNLOAD command. The tape continues past BOT, UNLOADs, and the tape door opens. If the tape is at BOT when the UNLOAD/REWIND Key is pressed, the tape UNLOADs and the tape door opens. If no tape is in the drive, the door opens immediately when this key is pressed. This key is inoperative if the drive is ONLINE or if the tape door is open.
RESET	RESET aborts operations; both those from the Control Panel and those under control of the host (if *BUSY* is being displayed).

CAUTION

Pressing the RESET Key while *BUSY* is displayed causes the data in the drive buffer to be lost.

If the RESET Key is pressed during a tape LOAD, the LOAD will be aborted - the tape door remains closed.

While in OPTION mode, pressing RESET backs up the selection process (and display) to the previous level.

UNLOAD

Pressing the UNLOAD Key UNLOADs the tape and opens the tape door. The UNLOAD STATUS INDICATOR lights. The key is active only when the drive is OFFLINE.

If no tape is present in the drive, the tape door opens immediately.

The UNLOAD command may be *queued*. You may press the key immediately after pressing REWIND and the drive will wait until REWIND is finished and then execute an UNLOAD.

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DENSITY

Used to change the write density.

This key is active before a tape is loaded or when a loaded tape is at BOT and the drive is OFFLINE. When pressed, *DENSITY* appears in the display (the density indicator corresponding to the current density selection is already on). (The density indicators which may be lit depend on the Options installed in the drive.)

The **DENSITY** Key can be used to change the write density entered into

the drive only while the *DENSITY* message is in the display.

While *DENSITY* is in the display, repeatedly pressing the **DENSITY** Key causes the next density indicator, in turn, to flash.

If the **ONLINE** Key not pressed within four seconds (to "enter" the density shown by the current flashing indicator) or if the **DENSITY** Key is not pressed again to select a different density choice, the drive automatically accepts the density shown by the currently-lit density indicator.

OPTION KEYS

OPTION	OPTION activates the Option mode, lights the OPTION INDICATOR, and disables the Operation Keys. While in this mode, you may select options of TEST, CONFiguration, INFOrmation, or ADDRess (or ID if a SCSI interface on the 88780A/B). Pressing the OPTION Key while in any state except running a test or within the INFO display, returns the drive to normal, OFFLINE operation.
PREV	Pressing PREV decrements the number in the display or returns to the previous option.
NEXT	Pressing NEXT increments the number in the display or advances to the next option.
ENTER	Selects the OPTION currently shown in the display (TEST, CONFiguration,

INFOrmation, ADDRess (or ID if a SCSI interface on the 88780A/B).

Once an OPTION is selected, the NEXT and PREV Keys are used to step through possible values for that OPTION and the ENTER Key is used to select the value.

STATUS INDICATORS

OPTION — The OPTION INDICATOR is lit when the drive is in OPTION mode and remains lit while you are accessing a particular option.

The OPTION INDICATOR turns off if you press the OPTION Key a second time.

ONLINE — The ONLINE INDICATOR remains on while the drive is ONLINE. This indicator flashes if the ONLINE command is in a queued state; caused by pressing the ONLINE Key immediately after starting a LOAD sequence. When the LOAD sequence is finished, the drive will automatically go ONLINE and the ONLINE INDICATOR will remain on continuously.

The ONLINE INDICATOR turns off when you place the drive OFFLINE by pressing the ONLINE Key second time.

UNLOAD — Lights when an UNLOAD operation is in progress. Goes out after the tape door opens in the UNLOAD sequence; *UNLOAD* appears in the display.

This indicator flashes if the UNLOAD command is queued (the UNLOAD Key (or 88780A/B UNLOAD/REWIND Key) was pressed before the previous command finished executing).

WRT EN — The WRT EN (Write-Enable) INDICATOR lights, and remains on, when a tape

	with a write-enable ring is LOADed into the drive. The WRT EN INDICATOR turns off when the write-enabled tape is UNLOADed.
800	(Option 800 required) The 800 INDICATOR lights when a 800 cpi density tape is LOADed. It remains on until the recording density changes or the tape is UNLOADed. All density indicators stay off if a blank tape is LOADed.
88780A/B	
800	(Option 800 required) Continually lit to show that a 800 cpi write density has been selected. During the density selection process, this indicator is flashed to show that 800 cpi density was selected.
1600	The 1600 INDICATOR lights when a 1600 cpi density tape is LOADed. It remains on until the recording density changes or the tape is UNLOADed. If a tape of unknown density is LOADed, both this indicator and the 6250 INDICATOR light. All density indicators stay off if a blank tape is LOADed.
88780A/B	
1600	Continually lit to show that a 1600 cpi write density has been selected. During the density selection process, this indicator is flashed to show that 1600 cpi density was selected.

6250	(HP 7980A/HP 7980XC) The 6250 INDICATOR lights when a 6250 cpi density tape is LOADed. It remains on until the recording density changes or the tape is UNLOADed. (HP 7980XC) This indicator lights, along with the *>D<* INDICATOR, when a tape is loaded that was written using Extra Capacity procedures. If a tape of unknown density is LOADed, both this indicator and the 1600 INDICATOR light. All density indicators stay off if a blank tape is LOADed.
88780A/B	
6250	Continually lit to show that a 6250 cpi write density has been selected. During the density selection process, this indicator is flashed to show that 6250 cpi density was selected. This indicator is used along with the **>D<** INDICATOR to show 6250XC selection. See description of the **>D<** INDICATOR below.

7980XC Only

>D<	Lights when a tape is loaded that was written using Extra Capacity data storage procedures.
TAPE ODOMETER	Located under the seven-character display, the odometer consists of the BOT INDICATOR, a row of fluorescent segments, and an EOT INDICATOR. Shows

relative position of the tape during operation.

The following list describes the messages and prompts that may appear in the display.

MESSAGES

NOTE

A question mark at the end of the message description means that the message is a prompt; what is shown in the display will be selected if the **ENTER** Key is pressed.

MESSAGES DURING NORMAL OPERATION

|XXXXX|	The drive is powering up. All segments of all digits light.
|TESTING|	Displayed during poweron selftest sequence.
|LOADING|	The drive is LOADing a tape.
|UNLOAD |	The drive is UNLOADing a tape.
|READING|	The host is reading data from the tape.
| RETRY |	(88780A/B) The drive is retrying an operation.
|WRITING|	The host is writing data to the tape.
|REWIND |	The drive is REWINDing tape.
| RESET |	The drive is RESETting (commanded from either the Control Panel or the host).
|DENSITY|	(88780A/B) The drive is waiting for a density selection from the Control Panel.

| 6250 | The tape LOADed into the drive has a density of 6250 cpi.

| 1600 | The tape LOADed into the drive has a density of 1600 cpi.

| 800 | The tape LOADed into the drive has a density of 800 cpi.

| BLANK | A blank tape was LOADed.

|UNKNOWN| A tape of unknown density was LOADed.

7980XC Only

|XC ON| FLASHING--A density of 6250 cpi has been selected by the host and the drive is requesting a confirmation that the next write will be 6250XC. The operator may choose to select the alternative, industry-standard 6250 cpi, at this time by use of the **NEXT** or **PREV** Key to display *XC OFF* and then pressing the **ENTER** Key.

7980XC Only

|XC OFF| FLASHING--A density of 6250 cpi has been selected by the host and the drive is requesting a confirmation that the next write will be industry-standard 6250 cpi. The operator may choose to select the alternative, 6250XC, at this time by use of the **NEXT** or **PREV** Key to display *XC ON* and then pressing the **ENTER** Key.

WARNING AND ERROR MESSAGES

| BUSY | The drive is completing commands from the host. This display appears if the OFFLINE Key is pressed while the drive is completing host commands.

| WAIT | The drive is waiting for the interface to complete a request from the host. This message is displayed briefly.

|ONLINE | A keypress on the front panel key was received but cannot be accepted because the drive is ONLINE.

|INVALID| The keypress received from the Control Panel cannot be executed in the present mode.

|DISABLE| (88780A/B) The host has disabled capability to remove the tape from the drive (SCSI interface only).

|MISLOAD| An attempt to LOAD a tape failed.

|NO BOT | The drive could not find a Beginning-of-Tape (BOT) Marker.

|INVERT | The tape was inserted upside down.

| DOOR | The tape door or the top cover has been opened. This message is displayed if a front panel operation is attempted.

IDLE OPERATION AND TAPE POSITION MESSAGES

| READY | The drive is ready to accept commands or LOAD a tape.

==========

88780A/B

| READY | The drive is ready to accept commands or LOAD a tape. Whether this phrase or one of the next two phrases (NO TAPE or UNIT #) appears in the display depends on the values stored in the Language Configuration (48). See NO TAPE and UNIT # described below.

==========

|NO TAPE|	Phrase used instead of *READY* message. See description of Configuration 48 in Chapter 8).

88780A/B

|UNIT # |	The "#" is the current bus address or ID. This message may be used instead of the READY message. (See Language Configuration (48)).
| BOT |	The tape is at the Beginning-of-Tape (BOT) Marker and is ready to accept commands.
| EOT |	The tape is beyond the End-of-Tape (EOT) Marker.
| |	The drive is waiting for a command. The tape is between BOT and EOT (but not at either one). If a command is not received in five seconds, the display changes to "IDLE" (see the next message description). This is not an error message.
| IDLE |	The drive is waiting for a command. The tape is between BOT and EOT (but not at either one) and a command has not been received in the last five seconds. This is not an error message.
| CHECK |	An excessive "soft" error rate has been detected by the drive. A "soft" error is anything that causes the drive to retry reading or writing a record. This message usually indicates that the tape path and head should be cleaned.

MESSAGES WHEN ENTERING OPTION SELECTION

|TEST * |	Selecting TEST Option?
|CONF * |	Selecting CONFIGURATION Option?
|INFO * |	Selecting INFORMATION Option?
|ADDR * |	Selecting ADDRESS Option? (HP-IB and 88780A/B/B with Pertec-compatible interface)
| ID * |	(88780A/B) Selecting SCSI Interface Bus ID number?

MESSAGES WHEN WITHIN OPTIONS

|TEST###|	Selecting Test <###>? (### = test number)
|CONF###|	Selecting Configuration <###>? (### = configuration number)
|INFO###|	Selecting Information <###>? (### = information number)
|ADR OFF|	Selecting an HP-IB address of OFF?
|ADR OFF|	(88780A/B) Selecting a Pertec-compatible interface to OFF?
|ADDR # |	Selecting Address <#>? (# = address number)
|ID OFF |	(88780A/B) SCSI interface is set to OFF.
|SET ###|	Configuration has been set to <###>.
|SET OFF|	(88780A/B) Configuration has been set to OFF.

MESSAGES WHEN WITHIN TEST OPTION MODE

|ONCE * |	Run the selected test once?

| 10 * |	Run the selected test 10 times?
| 100 * |	Run the selected test 100 times?
|1000 * |	Run the selected test 1000 times?
|LOOP * |	Run the selected test until an error or until stopped by the operator?
|RUN ###|	The drive is executing Test <###>. (### = test number)
|PASS###|	Test <###> passed. (### = test number)
|FAIL###|	Test <###> failed. (### = test number)
|A #####|	Selecting parameter A <#####>? (##### = selected value)
|B #####|	Selecting parameter B <#####>? (##### = selected value)
|C #####|	Selecting parameter C <#####>? (##### = selected value)
|SEQ 39|	User-defined sequence of tests is running.

MESSAGES DURING DIAGNOSTICS

|OPTION |	OPTION Key name.
| ENTER |	ENTER Key name.
| NEXT |	NEXT Key name.
| PREV |	PREVIOUS Key name.
|BOT EOT|	BOT EOT sensor test message.
| * |	Sensor seen.
| KEY * |	Key test.

CONFIGURATION VALUE MESSAGES

| **|	Configuration value is unknown.
| OFF|	Select Configuration value of "OFF"?
| ON |	Select Configuration value of "ON"?
| ###|	Select configuration value of <###>?
| CLEAR|	Select Configuration value of "CLEAR"?
| SAVE|	Select Configuration value of "SAVE"?
| HOST |	Select Configuration value of "HOST"?
| REW * |	Select normal, high-speed rewind?
| ATC * |	Select Archival Tape Conditioning rewind?

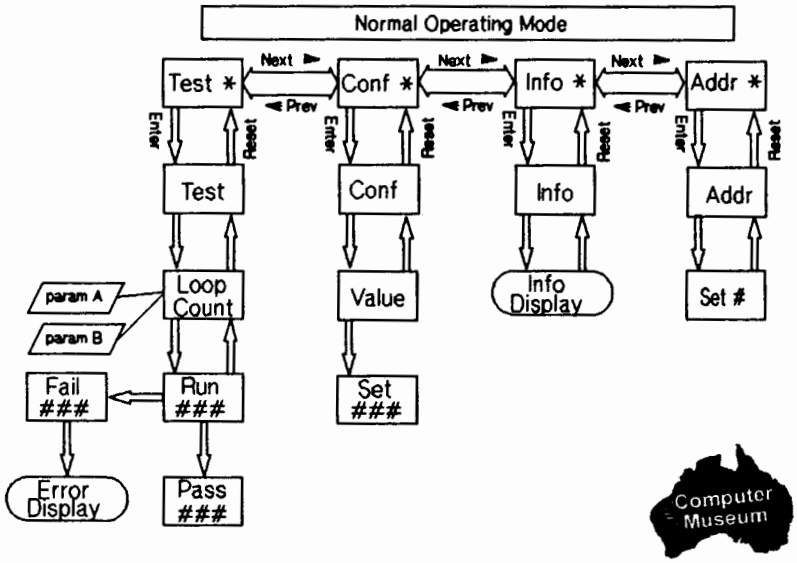


Figure 3-9. Front Panel Operation - HP 7979A/7980A/7980XC

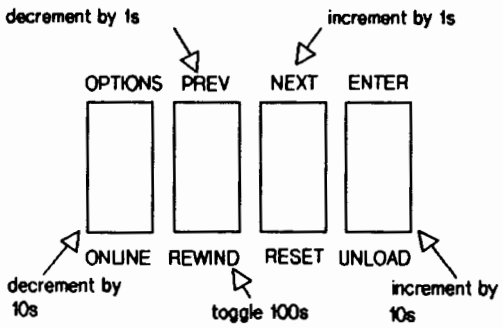


Figure 3-10. Incrementing/Decrementing Numbers on HP 7979A/7980A/7980XC

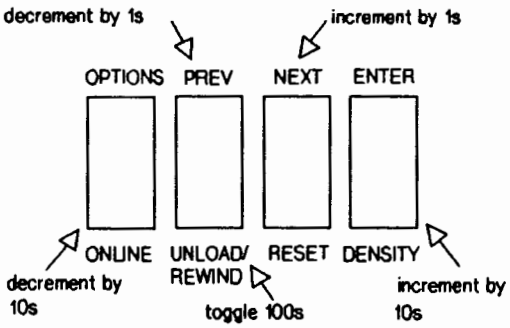


Figure 3-11. Incrementing/Decrementing Numbers on the HP 88780A/B

SECTION 4

TROUBLESHOOTING

[1] GENERAL PROCEDURES

Troubleshooting the drive is primarily done with the aid of selftests selected at the front panel. Various test categories are provided for a wide variety of troubleshooting demands. A list of test number ranges and their purpose is shown below. An expanded explanation of these categories is in "Selectable Test Groups" in the next subsection.

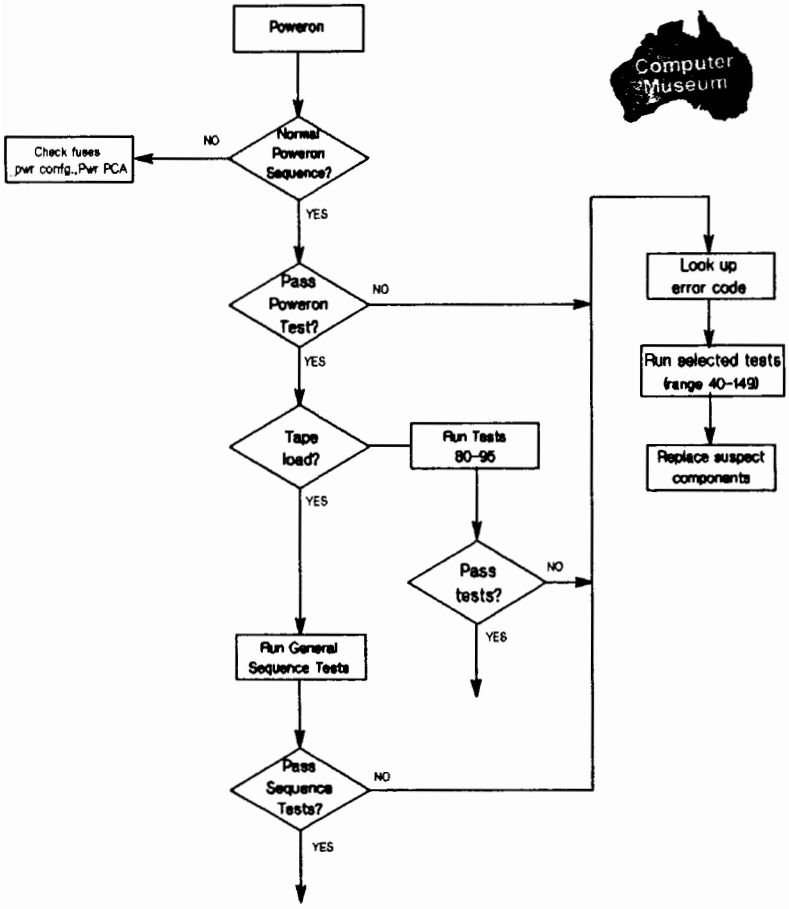
The following is a brief list. The test number ranges are those reserved for tests of a particular category -- not all numbers are used at this time. An expanded test listing is given in Chapter 5.

Poweron Test	General check of digital circuitry
(0-36)	General drive function test sequences
(38-39)	User-defined test sequences of up to three tests each
(40-49)	Kernal tests
(50-59)	Processor communication tests
(60-69)	Loopback tests
(70-149)	Subsystem tests
(70-119)	Drive Controller tests
(120-139)	Buffer Controller tests
(140-149)	Interface Controller tests
(150-199)	Tape motion and Read/Write tests
(200-255)	Host-specific tests/utilities.

When a failure occurs, start with the Poweron Test, followed by general check sequence tests. These general tests initiate a sequence of exerciser and circuitry tests which verify most common drive functions. Passing the general sequence tests indicates that the digital circuitry and basic drive functions are working. This may also be a good time to check the error logs for the drive error history. Instructions for reading the error log appear in the Utilities section of this chapter.

When a sequence test detects a malfunction, the suspected failing component error code is displayed. The next step is to run the suggested selectable tests which exercise the suspected failing component and function. "Selecting Tests for Particular Assemblies" and "Tests and Assemblies Tested" in this chapter relate test numbers to components and functions to be tested.

If the sequence tests pass, interactive tests should be used to test the analog circuitry and electromechanical devices. These tests generally do not detect and report errors. They exercise an assembly and require the operator to watch for proper drive operation. To test the Tape Displacement Unit (TDU), for example, you would run Test 75 and watch for TDU movement.



With the exception of the Poweron sequence test, the running of tests requires operator intervention. Test *sequences*, however, do provide automatic branching to tests necessary for the sequence.

All tests can be initiated from the front panel. All tests, with the exception of tests which require operator intervention, can also be exercised remotely. When a failure is detected, an error

message and isolation information is generated, logged and returned to the test initiator.

SECTION 5

DIAGNOSTICS

[1] DIAGNOSTIC OPERATIONS

Poweron Test Sequence

When the machine is powered up, a sequence of tests are performed. The sequence order used when the drive is powered on is different than the Poweron sequence initiated on an already powered up drive.

At poweron, each of the processors is tested by the related kernel test. This testing takes place in parallel among all processors to minimize the poweron time. Once all processors have completed individual tests, a Poweron handshake takes place between the processors. The drive controller is then placed in control to execute a test sequence which completes the diagnostic power up procedure.

The following table shows the poweron sequence more graphically.

Drive controller	Buffer controller	Interface controller
Kernel tests	Kernel tests	Kernel tests
Drive-specific tests	Buffer tests	Interface-specific tests
Front panel lights	-	-
Poweron handshake		
Complete dual-port RAM test		
Loopback tests		

Errors detected during power-up are displayed on the front panel, stored in the error log held in non-volatile RAM.

It is possible for one of the processors go through a power-up without the other processors. If this happens, the functional

controllers will operate normally but will not send commands or tests to the non-functioning controller.

Runtime Processing

During runtime certain functions are provided within the drive. They are mainly used to provide information for predictive diagnostics but also are used by some of the diagnostic tests.

ERROR LOGGING
Whenever a hard error occurs, the error is logged. This includes all errors which are detected by the drive while running a diagnostic which uses normal drive commands, as well as hardware failures during operation, and hard read/write failures resulting from unreadable or unwriteable tape.

ERROR RATE LOGGING
For each read or write command that is received from the host, an entry is made in the current error rate log to account for the amount of read or write data in the transaction. The data from verify commands is included within the count since it requires that data be recovered, but data from move commands are not included even though readaheads would have recovered the data from the tape. Readaheads which are not passed to the host are not included. Whenever an error, either soft or hard occurs, it is added to current entry in the appropriate read or write accumulated error rate log. It is also added to the cumulative error log.

SOFT ERROR WARNING
As each command is logged, a check of the soft error rate is made for the current log entry. A threshold has been set at a approximately 100 allowable errors per tape. The actual thresholds for the two densities are:

	threshold	minimum transfer
NRZI	5 X E5	2 X E6
PE	5 X E5	2 X E6
GCR	2 X E6	8 X E6

A minimum transfer is required to prevent the warning from going off near the beginning of tape without a large enough sample. If these thresholds are exceeded, the message CHECK is displayed on the front panel in place of the IDLE message. The CHECK message DOES NOT indicate a lost of data. Cleaning the tape head typically will alleviate high soft error rate; however, it may

indicate a more serious problem. The warning stays on as long as the threshold is exceeded.

ODOMETER
Each time the tape is unloaded, the amount of tape which passed over the head is accumulated with the odometer. This includes all tape motion including ramp up and ramp down lengths, as well as rewinds.

Selectable-Test Groups

All of the tests are combined into similar-function groups as described below. Individual test descriptions follow.

(0 - 36) Sequence tests
This group does not contain individual tests but rather sequences of tests in the range of Tests 40 through 199. Sequences may be used as a general test of the drive, or as a drive exerciser. When a sequence is selected, The drive will execute the tests in the sequence until an error occurs, or until the sequence successfully completes. If an error occurs, the sequence may contain branch information which will cause the sequence to branch to a different isolation sequence which will run an additional sequence of tests in order to more closely isolate the failure. If the branch isolation locates a failure, the error from the branch is reported.

(38 - 39) User-defined sequences
Up to three sequences can be defined by the user and maintained within non-volatile RAM. User sequences do not allow isolation-branching capabilities which are included in Tests 0-36. Sequences are defined by invoking the same utility number as the number of the desired test.

(40 - 49) Kernel tests
The kernel tests the microprocessors and associated circuitry. Tests may be set to include one or all processors.

(50 - 59) Processor communication tests
These tests verify the dual-port RAM functions through which all inter-processor command communication takes place.

(60 - 69) Loopback tests
These tests perform data transfers between subsystems.

(70 - 149) Subsystem tests
This group is divided into a number of subgroups, one for each processor.

(70 - 119) Drive controller tests

(120 - 139) Buffer controller tests

(140 - 149) Interface controller tests

(150 - 199) Execute drive commands This range of tests execute many of the read/write and tape handling commands, either individually from the front panel or as part of a sequence. Errors which occur while executing these commands use the runtime error set. No isolation or suspected FRUs are indicated in the error message.

(200 - 209) Host default parameter settings
Not available for use.

(210 - 255) Host configuration access
Not available for use.

Test Selection

Tests are executed from the front panel by entering the test number, desired number of test passes, and parameters, when necessary. Tests results will be displayed as either a PASS or a FAIL.

To run a test, follow these steps.

1. Make sure the drive is powered on and the Poweron Selftest has completed. Also make sure the drive is offline and the loaded tape (if a tape is loaded) is a scratch tape.

2. Press the OPTION key.

3. While the TEST option is displayed, press the ENTER key.

4. Using the NEXT or PREVIOUS keys, increment or decrement to the desired test number and press ENTER. The ONLINE key (or DENSITY key on the 88780A/B) can be used to increment the 10's digit. (Individual test descriptions are listed following this procedure.)

5. You will be asked for the desired number of test passes. Find the desired number (once, 10, 100, 1000, or LOOP) using the NEXT or PREVIOUS key and press ENTER. A test will continue to execute until the test count is met, an error occurs, or until RESET is pressed.

6a. If the Test asks for additional parameters, use the NEXT or PREVIOUS key to choose the parameter and press ENTER.

6b. If no parameters are required, press ENTER.

TYPES OF TESTS

The three classes of diagnostic tests are the following.

INTERACTIVE CHECKS - These require operator intervention, and give immediate front panel response indicating the results of the intervention. Checks continue to operate until the reset button is pressed, and always return a diagnostic result of passed. The loop count parameter is ignored during these tests.

EXERCISERS - These tests cause the drive to perform a specific function to be observed or monitored by the operator. They do not return an error unless an invalid setup prevents the test from operating.

TESTS - These tests are written such that the drive can detect a failure. A PASS or FAIL is returned on test completion.

Sequences may combine both exercisers and tests, but will typically not include checks because of their need for operator intervention.

All three test classes are described below. Additional parameters or special requirements, where necessary, are included.

[2] TEST REFERENCE TABLE

Test type - C = Check (no remote access)
E = Exerciser
T = Test
X = Cmd Execution

Processors - A = All
F = Front panel
D = Drive controller
B = Buffer controller
I = Interface

Poweron (P = used at poweron)

Parameters

Used in sequence numbers

TEST #	DESCRIPTION	Test type	Processors	Poweron	Parameters	Used in sequence numbers	FRUs tested
40	Microprocessor Test	T	A	P	1	0,1,13,14,15	Dc,Db,Gi
41	ROM Checksum	T	A	P	1	0,1,13,14,15	Dc,Db,Gi
42	Destructive Ram	T	D,I	P	-	-	Dc,Gi
43	Non-destructive RAM	T	A	P	1	0,1,13,14,15	Dc,Db,Gi
44	Complete Ram	T	A	-	1	-	Dc,Db,Gi
45	Connectivity Test	T	A	P	1	0,1,13,14,15	Ic,Sc,Fc Es,Ba,Mc
46	Destructive DPR	T	D,B	P	-	-	Dc,Db
48	Non-Volatile Ram	T	B	P	-	0,1,14	Db
49	Timer Circuitry	T	D	P	-	0,1,13	Dc
50	Onboard DPR Test	T	D,B	P	1	0,1,9,11	Dc,Db,Gi
51	Offboard DPR Test	T	B,I	P	1	0,1,9,11	Dc,Db,Gi
52	DPR Collision Test	T	A	P	1	0,1,9,11	Dc,Db,Gi
53	Sub DPR Interrupt	T	D,B	P	1	0,1,9,11	Dc,Db,Gi
54	Master DPR Interrupt	T	B,I	P	1	0,1,9,11	Dc,Db,Gi
60	Interface Loopback	T	I	P	1	0,1,9,12	Gi
61	Buffer-Initiated Loopback	T	B	P	2	0,1,9,12	Db,Fm
62	Drive-Initiated Loopback	T	D	P	1	0,1,9,12	Dc,Fm,Rw
63	Digital Loopback Exerciser	E	D	-	2	-	Dc,Fm,Rw
64	Drive-Initiated Analog Loopback	T	D	-	1	-	Hd,Dc,Fm Rc,Wc,Rw

Test type - C = Check (no remote access)
E = Exerciser
T = Test
X = Cmd Execution
_Processors - A = All
F = Front panel
D = Drive controller
B = Buffer controller
I = Interface
_Poweron (P = used at poweron)
_Parameters
_Used in sequence numbers

TEST #	DESCRIPTION	Test type	Processors	Poweron	Parameters	Used in sequence numbers	FRUs tested
65	Analog Loopback Exerciser	E	D	-	1	-	Hd,Dc,Fm Rc,Wc,Rw
70	Front Panel Light Show	C	F	P	-	0,1,13	Fp
71	Front Panel Button Check	C	F	-	-	-	Fp
72	Front Panel Message Check	C	F	-	-	-	Fp
75	TDU Test	T	D	-	-	1	Td
76	DAC Test	T	D	P	-	0,1,13,17	Dc
77	Tachometer Test	T	D	P	-	0,1,13,17	Dc
78	ADC Test	T	D	P	-	0,1,13,17	Dc
80	Motor Drive Loopback	T	D	P	-	0,1,13,17	Dc,Md
81	48-Volt Power Supply	T	D	P	-	0,1,13,17	Md
82	Position Counter Test	T	D	P	-	0,1,13,17	Dc,Se
84	Tension Shutdown Check	C	D	-	-	-	Ba,Es
85	Tension Sensor Check	C	D	-	-	-	Ba,Es
86	Speed Encoder Check	C	D	-	-	-	Se
87	Tape-In-Path Sensor Check	C	D	-	-	-	Sb
88	Door Sensors Check	C	D	-	-	-	Sb,Dc

Test type - C = Check (no remote access)
E = Exerciser
T = Test
X = Cmd Execution
_Processors - A = All
F = Front panel
D = Drive controller
B = Buffer controller
I = Interface
_Poweron (P = used at poweron)
_Parameters
_Used in sequence numbers

TEST #	DESCRIPTION							FRUs tested
89	Reel Encoders/ Write Enable Ring Sensor Check	C	D	-	-	-		Hl,Sb
90	TDU Functionality Check	C	D	-	-	-		Td
91	Hub Lock Check	C	D	-	-	-		Hl,Md
92	Hub Unlock Check	C	D	-	-	-		Hl,Md
93	Load Fan Check	C	D	-	-	-		FAN
94	EOT/BOT Sensor Check	C	D	-	-	-		Es
95	Servo Performance Test	T	D	-	-	1,18		Dc,Md
96	Servo Reposition Exerciser	E	D	-	2	18		-
97	Servo Close Loops Test	T	D	-	-	-		Dc,Ba
98	Read Ch Gain Profile	C	D	-	1	-		Rw
99	Read Channel Calibration Test	T	D	-	2	-		-
99	Auto Calibration Exerciser	E	D	-	-	-		-
100	Erase Tape Test	T	D	-	1	-		Hd,Rw
101	Write Electronics Exerciser	E	D	-	1	-		-
102	Read Electronics Exerciser	E	D	-	1	-		-

TEST #	DESCRIPTION	Test type (C = Check (no remote access), E = Exerciser, T = Test, X = Cmd Execution)	Processors (A = All, F = Front panel, D = Drive controller, B = Buffer controller, I = Interface)	Poweron (P = used at poweron)	Parameters	Used in sequence numbers	FRUs tested
103	Read Reverse Exerciser	E	D	-	1	-	-
104	Head Crosstalk Exerciser	E	D	-	1	-	-
105	Read Skew Calibration	T	D	-	1	-	-
106	Write Skew Calibration	T	D	-	1	-	-
107	NRZI Skew Value Display	C	D	-	1	_	-
108	Current Gain Profile	C	D	-	1	-	-
110	Tape Pack Conditioner	E	D	-	-	-	-
120	Buffer Register Test	T	B	P	-	0,1,12,14,19	Db
121	Buffer Function Test	T	B	P	-	0,1,12,14,19	Db
122	Buffer RAM Test	T	B	P	-	0,1,12,14,19	Db
128	Dump NV RAM to Tape	X	B	-	-	-	-
129	Load NV Ram from Tape	X	B	-	-	-	-
130	Data Compression Register Test	T	B	P	-	0,1,12,14,19	Db (FRU 24 only)
131	Data Compressiion Functionality	T	B	P	1	0,1,12,14,19	Db (FRU 24 only)

TEST #	DESCRIPTION	Test type - C = Check (no remote access) E = Exerciser T = Test X = Cmd Execution	_Processors - A = All F = Front panel D = Drive controller B = Buffer controller I = Interface	_Poweron (P = used at poweron)	_Parameters	_Used in sequence numbers	FRUs tested
132	Data Compression RAM TEst	T	B	P	-	0,1,12,14,19	Db (FRU 24 only)
133	Data Compression Ext'd Func'ality	T	B	P	1	0,1,12,14,19	Db (FRU 24 only)
140	HP-IB Controller Test	T	I	P	-	0,1,12,15,20	Hp
140	SCSI Controller Test	T	I	P	-	0,1,12,15,20	Sd,Ss
141	Onboard Hardware Tests	T	I	P	-	0,1,12,15,20	Hp,Sd,Ss Pt
150	Write Density ID	X	D	-	1	1,2,3,4	-
151	Write Test Record	X	D	-	1	-	-
152	Write Tape Mark	X	D	-	-	1,2,3,4	-
153	Write Gap	X	D	-	1	-	-
160	Verify Record	X	D	-	1	-	-
161	Forward Space Block	X	D	-	-	-	-
162	Backspace Block	X	D	-	-	-	-
163	Forward Space File	X	D	-	-	-	-
164	Backspace File	X	D	-	-	-	-
165	Load Tape	X	D	-	-	1,2,3,4,18	-
166	Rewind	X	D	-	-	1,2,3,4,18	-
167	Unload Tape	X	D	-	1	18	-
170	Write Tape Mark to Buffer	X	B	-	-	-	-
171	Create Record in Buffer	X	B	-	2	1,2,3,4	-

Test type - C = Check (no remote access)
E = Exerciser
T = Test
X = Cmd Execution
_Processors - A = All
F = Front panel
D = Drive controller
B = Buffer controller
I = Interface
_Poweron (P = used at poweron)
_Parameters
_Used in sequence numbers

TEST #	DESCRIPTION						FRUs tested
172	Write Buffer to Tape	X	B	-	1	1,2,3,4	-
173	Read from Tape to Buffer	X	B	-	1	1,2,3,4	-
174	Clear Data Buffer	X	B	-	-	1,2,3,4	-
175	Initialize Cumulative Log	X	B	-	-	3	-
176	Buffer Write Tape Mark	X	B	-	-	-	-
177	Buffer Write Density ID	X	B	-	-	-	-

[3] TESTS FOR FIELD-REPLACEABLE UNITS

The following is a list of all FRUs and all tests which can detect problems with the particular FRU.

PC Boards

01 Rw	Read/Write/PLL	62,63,64,65,98,100
02 Fm	Formatter	61,62,63,64,65
03 Dc	Drive controller	40-44,46,49,50-54,62-65, 76-80,78,80,82,88,95,97
04 Db	Data buffer	40,41,43,44,46,48,50-54, 61,120-122
05 Md	Motor drive / power supply	80,81,91,92,95
06 Gi	Generic (any) interface	40-44,50-54,60
07 Hp	HP-IB interface	40-44,50-54,60,140,141
08 Fp	Front Panel (display)	70-72
09 Sb	Sensor PCB	87-89
16 Sd	SCSI differential interface	40-44,50-54,60,140,141
15 Ss	SCSI single-ended interface	40-44,50-54,60,140,141
22 Pt	Pertec interface	40-44,50-54,60,140,141
13 Dc	7979 Drive controller	40-44,46,49,50-54,62-65, 76-80,78,80,82,88,95,97
14 Db	Data buffer non XC	40,41,43,44,46,48,50-54, 61,120-122
21 Fm+Rw	Formatter/R/W/PLL	61,62,63,64,66,98,100
24 Db	Data buffer 7980 XC	40,41,43,44,46,48,50-54, 61,120-122,130-133
31 +NRZI Fm+Rw	Formatter/R/W/PLL	61,62,63,64,66,98,100,105, 106
34 Db	Data Buffer w/ 1MB RAM	40,41,43,44,46,48,50-54, 61,120-122

Assemblies

40 Es	EOT/BOT sensors	45,84,85,94
41 Se	Speed encoder	82,86
42 Hd	Head assembly	64,65,100
44 Hl	Hub lock	89,91,92
45 Ba	Buffer arm	45,84,85,97
51 Td	Tape displacement unit	75,90

Cables

62 Sc	Speed sensor cable	45
64 Fc	Front panel cable	45
65 Mc	Motor cable	45
66 Sc	Slave connector	45
67 Ic	Interface cable	45

```
70 Sv  Servo cable              |
71 Rc  Read cable               | 64,65
72 Wc  Write cable              | 64,65

Other
50 Mo  Motors                   |
-- Ds  Door solenoid            | 88
```

Evaluation of the following FRUs must be done by inspection.

Fan
Mother board/card cage
Hubs
Transformer

[4] TESTS AND ASSEMBLIES TESTED

```
1  - GENERAL CHECKOUT
2  - WELLNESS TEST
3  - INITIALIZE ERROR RATE SEQUENCE
4  - ERROR RATE SEQUENCE
9  - MULTI-PROCESSOR TESTS
11 - DUAL-PORT RAM SEQUENCE
12 - LOOPBACK ISOLATION SEQUENCE
13 - DRIVE CONTROLLER POWERON TEST SEQUENCE
14 - BUFFER CONTROLLER POWERON TEST SEQUENCE
15 - INTERFACE POWERON TEST SEQUENCE
17 - SERVO/MOTOR DRIVE ELECTRONICS SEQUENCE
18 - SERVO/MOTOR DRIVE CHECKOUT SEQUENCE
19 - BUFFER HARDWARE SEQUENCE
20 - INTERFACE-SPECIFIC HARDWARE SEQUENCE
38 - ENTER USER-DEFINED SEQUENCE
39 - RUN USER-DEFINED SEQUENCE
40 - MICROPROCESSOR OPERATION TEST
41 - ROM CHECKSUM
42 - DESTRUCTIVE RAM TEST
43 - NON-DESTRUCTIVE RAM TEST
44 - COMPLETE RAM TEST
45 - CONNECTIVITY TEST
46 - DESTRUCTIVE DUAL-PORT RAM TEST
48 - NON-VOLATILE RAM CHECKOUT
49 - TIMER CIRCUITRY TEST
50 - ON-BOARD DUAL-PORT RAM TEST
51 - OFFBOARD DUAL-PORT RAM TEST
52 - DUAL-PORT RAM COLLISION TEST
```

53 - SUBORDINATE DUAL-PORT RAM INTERRUPT TEST
54 - MASTER DUAL-PORT RAM INTERRUPT TEST
60 - INTERFACE LOOPBACK TESTS
61 - BUFFER-INITIATED LOOPBACK TESTS
62 - DRIVE-INITIATED DIGITAL LOOPBACK
63 - DIGITAL LOOPBACK EXERCISER
64 - DRIVE-INITIATED ANALOG LOOPBACK
65 - ANALOG LOOPBACK EXERCISER
70 - FRONT PANEL LIGHT SHOW
71 - FRONT PANEL BUTTON CHECK
72 - FRONT PANEL MESSAGE CHECK
75 - TDU TEST
76 - DAC TEST
77 - TACHOMETER TEST
78 - ADC TEST
80 - MOTOR DRIVE LOOPBACK TEST
81 - 48-VOLT POWER SUPPLY TEST
82 - POSITION COUNTER TEST
84 - TENSION SHUTDOWN CHECK
85 - TENSION SENSOR CHECK
86 - SPEED ENCODER CHECK
87 - TAPE-IN-PATH SENSOR CHECK
88 - DOOR SENSORS CHECK
89 - REEL ENCODERS/ WRITE ENABLE RING SENSOR CHECK
90 - TDU FUNCTIONALITY CHECK
91 - HUB LOCK CHECK
92 - HUB UNLOCK CHECK
93 - LOAD FAN CHECK
94 - EOT/BOT SENSOR CHECK
95 - SERVO PERFORMANCE TEST
96 - SERVO REPOSITION EXERCISER
97 - SERVO CLOSE LOOPS TEST
98 - READ CHANNEL GAIN PROFILE DISPLAY
99 - READ CHANNEL CALIBRATION TEST
100 - ERASE TAPE TEST
101 - WRITE ELECTRONICS EXERCISER
102 - READ ELECTRONICS EXERCISER
103 - READ REVERSE EXERCISER
104 - HEAD CROSSTALK EXERCISER
105 - READ SKEW CALIBRATION
106 - WRITE SKEW CALIBRATION
107 - NRZI SKEW VALUE DISPLAY
108 - CURRENT GAIN PROFILE DISPLAY
110 - TAPE PACK CONDITIONER
120 - BUFFER REGISTER TEST
121 - BUFFER FUNCTION TEST
122 - BUFFER RAM TEST
128 - DUMP NON-VOLATILE RAM TO TAPE

```
129 - LOAD NON-VOLATILE RAM FROM TAPE
130 - DATA COMPRESSION REGISTER TEST
131 - DATA COMPRESSION FUNCTIONALITY
132 - DATA COMPRESSION RAM TEST
133 - DATA COMPRESSION EXTENDED FUNCTIONALITY
140 - HP-IB CONTROLLER TEST (if HP-IB)
140 - SCSI CONTROLLER TEST (if SCSI)
140 - PERTEC CONTROLLER TESTS (if PERTEC-COMPATIBLE)
141 - ON-BOARD HARDWARE TESTS
145 - SCSI CONNECTOR LOOPBACK TEST
150 - WRITE DENSITY ID
151 - WRITE TEST RECORD
152 - WRITE TAPE MARK
153 - WRITE GAP
160 - VERIFY RECORD
161 - FORWARD SPACE BLOCK
162 - BACKSPACE BLOCK
163 - FORWARD SPACE FILE
164 - BACKSPACE FILE
165 - LOAD TAPE
166 - REWIND
167 - UNLOAD TAPE
170 - WRITE TAPE MARK TO BUFFER
171 - CREATE RECORD IN BUFFER
172 - WRITE BUFFER TO TAPE
173 - READ FROM TAPE TO BUFFER
174 - CLEAR DATA BUFFER
175 - INITIALIZE CUMULATIVE LOG
176 - BUFFER WRITE TAPE MARK
177 - BUFFER WRITE DENSITY ID
```

[5] ERROR CODES

Error codes are grouped into three categories. Each group begins with a specific number.

0xx-- Runtime/Operational Status Codes

3xx, **4xx**, and **6xx**-- Kernal Test Error Codes

Cxx-- Multi-Processor Error Codes

0xx RUNTIME/OPERATIONAL STATUS CODES

GENERAL OPERATION

0xx	= Error
000	= No error
001	= No tape is loaded
002	= Drive is not online
003	= Drive is not offline
004	= Drive is write protected
005	= Tape loaded prevents access to test
006	= Front door or top cover is open
007	= Test is currently in diagnostic mode
008	= Drive is not in diagnostic mode
009	= Not streaming error
00A	= Invalid format on read
00B	= Invalid format on write
00C	= Not at BOT for a write ID
00D	= Backspace at BOT requested
00E	= Tape past EOT
00F	= Tape 10 feet past EOT, cannot write to tape
010	= Invalid cmd error
011	= Invalid param error
012	= Invalid test/info number
013	= Test not remotely accessible
014	= Test aborted by reset
015	= Nested sequence error
016	= Density NA error
017	= Invalid target ID
018	= Requested record length exceeded maximum supported
019	= Write record request did not precede write record transfer
01A	= Write record transfer did not follow write record request
01B	= Command rejected due to poweron selftest failure
01C	= Buffer is full, cannot retrieve a record from buffer
01D	= Buffer is full, cannot place a record in buffer
01E	= Block header invalid for a non-volatile memory load
01F	= Record length or checksum error on a non-volatile memory load

READ ERRORS

0xx	= Error

020 = Buffer overrun error
021 = Gap before EOD error
022 = 2 or more Tracks in error
023 = 2 Tracks in error
024 = 1 Track in error
025 = CRC error
026 = ACRC error
027 = Residual error
028 = Reserved1 RF error
029 = Reserved2 RF error
02A = Unknown RF error
02B = Block timeout error
02C = Block detect error
02D = End block error
02E = Bad gap after ID error
02F = Gap check error
030 = Short post-gap error
033 = Bad tape mark error
039 = Bad NRZI tape mark read
03A = Tracks w/ gain too low during read channel autocalibration
03B = Tracks w/ gain too high during read channel autocalibration
03C = Tracks w/ gain too low and high during read channel autocalibraton

WRITE ERRORS

0xx	= Error

040 = Buffer underrun error
041 = Gap before EOD error
042 = 2 or more Tracks in error
043 = 2 Tracks in error
044 = 1 Track in error
045 = CRC error
046 = ACRC error
047 = Residual error
048 = Reserved1 RF error
049 = Reserved2 RF error
04A = Unknown RF error
04B = Block timeout error
04C = Block detect error
04D = End block error
04E = Bad gap after ID error
04F = Gap check error
050 = Erase verify error

051 = PE ID detect error
052 = PE ID verify error
053 = GCR ID detect error
054 = GCR ID verify error
055 = GCR burst detect error
056 = GCR burst verify error
057 = GCR ARA detect error
058 = GCR ARA verify error
059 = Bad TM detect error
05A = Bad TM verify error
05B = Bad pre-gap error
05C = Buffer parity error
05D = No data detect error
05E = No TM detect error
05F = No ID detect error

SERVO ERRORS

0xx	= Error

060 = Tension shutdown error
061 = Tape speed error
062 = Tape ramping error
063 = Servo unresponsive error
06E = No reel found error
06F = Hub lock error
070 = Reel not seated error
071 = Reel inverted error
072 = Tape stuck to reel error
073 = Tape stuck in path error
074 = Tape tensioning error
075 = Tape eject error
076 = Door open error
077 = Failure to re-identify tape on rewind
078 = No BOT detected
079 = Operator reset abort of tape operation
07A = Host reset abort of tape operation
07D = Block missing error
07E = Gap recapture error
07F = Block recapture error
080 = Reel encoder failure
083 = Unable to thread tape
084 = Open loop motor error
085 = Gap timer circuitry check failed

NRZI SKEW ERRORS

0xx	Error
086	Invalid measurement error
087	Read skew test not executed
088	Skew measurement verify error
089	Corrupt skew measurement data
08A	Measurement limit exceeded
08B	Excessive write skew
08C	Excessive write correction
08D	Excessive dynamic skew

BUFFER ERRORS

0xx	Error
0A0	Pop parity error
0A1	Push parity error
0A2	Byte count mismatch
0A3	Prior error reject
0A4	Write stopped at EOT
0A5	Zero byte record read or requested
0A6	Final report not valid
0A7	Tape runaway during manual commands
0A8	Tape position synchronization mismatch
0A9	Physical data record too small to deblock
0AA	Invalid pointer found during deblocking of physical record
0AB	Invalid access table contents
0AC	Incomplete access table contents
0AD	Improper byte count sum of access table entries
0B0	Hardware error in data compression circuitry
0B1	Bad parity from data compression circuitry
0B2	Data improperly flushed from data compression circuitry
0B3	Bad parity from interface into data compression hardware
0B4	Bad parity from buffer into data compression hardware
0B5	Data compression-to-interface byte count mismatch
0B6	Data compression-to-buffer byte count mismatch
0BF	Fatal error encountered

INTERFACE ERRORS --HP-IB ONLY

0xx	Error
0C0	Request DSJ expected
0C5	Data byte expected
0C8	Command phase error
0CC	Cold load protocol error
0CD	HP-IB sequence protocol error
0CE	End complete expected
0D0	End data expected
0D2	Improper secondary
0D3	Misplaced data byte
0D6	Loopback protocol error
0D7	Selftest protocol error
0DA	HP-IB parity error
0DB	Reset by operator
0DC	Data parity error
0F0	Invalid tape command
0F1	Selftest failure

INTERFACE ERRORS -- SCSI ONLY

0xx	Error
0C0	Unsupported command
0C1	Drive not online
0C2	Illegal field in command datablock
0C3	Illegal mode select parameter
0C4	Illegal mode length
0C5	Fixed mode but fixed bit not set in command byte
0C6	Microprocessor halted
0C7	Byte compare not supported
0C8	Front panel reset
0C9	Suppress. incorrect length indic. ON and fixed bit set
0CA	Rewind while offline
0CB	Clear log occurred correctly (reported to host only)
0CC	Parity error
0CD	Bad log page (error code for SCSI bus)
0CE	Poweron has occurred (reported to host only)
0CF	Tape changed (reported to host only)
0D0	Spurious reset
0D1	Spurious SCSI controller interrupt
0D2	Write length too long
0D3	Verify immediate not supported
0D4	Illegal message abort

```
0D5   = Invalid Logical Unit Number
0D6   = Diagnostic failure (reported to host only)
0D7   = Immediate bit set without IR mode
0D8   = Unsupported page in mode select
0D9   = Invalid length
0DA   = Invalid header
0DB   = Non-zero reserved fields
0DC   = Write byte count mismatch
0DD   = Poweron selftest failure
0DE   = Bus protocol error
0DF   = Reselection error
0E0   = Lost data reset
0E1   = Error detected from the target copy
0E2   = Illegal request during copy
0E3   = Invalid command op code during copy
0E4   = Illegal function request for the device type
0E5   = Unsupported function requested during copy
0E6   = Reserved field used during copy
0E7   = Invalid field in the parameter list during copy
0F0   = Target went to an incorrect phase or sent an
        unexpected status
```

INTERFACE ERRORS -- PERTEC-COMPATIBLE ONLY

```
0xx   = Error
---     ------------------------------------

0C0   = I/O fault error
0C1   = Density not available
0C2   = Front panel reset
0C3   = Protocol reset error
0C4   = Host reset error
0C5   = Hard error offline
```

3XX, 4XX, AND 6XX KERNAL TEST ERROR CODES

3XX DRIVE CONTROLLER DIAGNOSTIC ERROR CODES

```
3xx   = Error
---     ------------------------------------

301   = ROM checksum error
302   = RAM test error (destructive data)
303   = RAM test error (non-destructive)
304   = Complete RAM test error
308   = Timer error
```

309 = Microprocessor test error
346 = Optical sensors cable not connected
347 = Motor Drive cable not connected
348 = Speed Encoder cable not connected
349 = Tension Arm cable not connected
34A = Front Panel cable not connected
34B = Interface cable not connected
34C = Interface cable plugged into Slave connector
34D = Slave cable plugged into Interface connector
34E = 48-Volt PSU failure
34F = A to D converter failure
350 = Speed DAC failure
351 = Feed Forward circuit failure
352 = Gain/Load DAC failure
353 = Supply Motor loopback failure
354 = Take-up Motor loopback failure
355 = Quadrature Decoder failure
356 = Tachometer circuit failure
357 = Door failed to open
358 = Excess tension arm motion
359 = Servo ramps too slow
361 = Tape speed error
362 = Tape ramping error
364 = TDU inoperative
365 = TDU is slow
366 = TDU is slightly slow
372 = Missing or unsupported revision of Read/Write Assembly
3FF = Buffer controller not responding

4XX, Exx BUFFER CONTROLLER ERROR CODES

4xx	= Error
401	= ROM checksum error
402	= RAM test error (destructive data)
403	= RAM test error (non-destructive data)
404	= Complete RAM test error
405	= Error in testing controlled area of non-volatile RAM
407	= Connectivity test error
409	= Microprocessor test error
40A	= Error in checksum of controlled area of non-volatile RAM
40E	= DPRAM test error (Test 51) in offboard DPRAM
433	= Parity error in Push data
434	= Parity error in Pop data
435	= Error found in pre-fetch circuitry

```
436   = Pop data mismatch in buffer function test
437   = Push end of data status error
438   = Push interrupt circuit error
439   = Pop end of data status error
43A   = Pop interrupt circuit error
43E   = Error in buffer dynamic RAM test
446   = Error in Push counter extend register of buffer USM
447   = Error in Push counter upper register of buffer USM
448   = Error in Push counter lower register of buffer USM
449   = Error in Push address extend register of buffer USM
44A   = Error in Push address upper register of buffer USM
44B   = Error in Push address lower register of buffer USM
44C   = Error in Pop counter extend register of buffer USM
44D   = Error in Pop counter upper register of buffer USM
44E   = Error in Pop counter lower register of buffer USM
44F   = Error in Pop address extend register of buffer USM
450   = Error in Pop address upper register of buffer USM
451   = Error in Pop address lower register of buffer USM
481   = Checksum error in non-volatile RAM load from tape
482   = Byte count mismatch in non-volatile RAM load from tape
483   = Buffer header mismatch in non-volatile RAM load from
          tape
484   = Attempt to load data from tape into illegal address
          (not RAM)
490   = Hardware error in data compression circuitry
491   = Bad parity from data compression circuitry
492   = Data improperly flushed from data compresssion
          circuitry
493   = Bad parity from interface into data compression
          hardware
494   = Bad parity from buffer into data compression hardware
495   = Data compression-to-interface byte count mismatch
496   = Data compression-to-buffer byte count mismatch
4A0   = Data compression chip status byte 0 error
4A1   = Data compression chip status byte 1 error
4A2   = Data compression input byte count error
4A3   = Data compression output byte count error
4A4   = Data compression chip interrupt circuit error
4A5   = Data compression chip functional error
4FF   = Interface not responding

Exx   = Error
---     -----------------------------------

Exx   = Fatal internal error (xx) encountered
```

6XX INTERFACE CONTROLLER ERROR CODES

GENERAL

6xx	= Error
601	= ROM checksum error
602	= RAM test error (destructive data)
603	= RAM test error (non-destructive)
604	= Complete RAM test error
607	= Connectivity test error
609	= Microprocessor test error
66E	= Error in write loopback with good data
66F	= Error in read loopback with good data
670	= Parity error in write loopback not detected
671	= Parity error in read loopback not detected
672	= Loopback compare error

HP-IB-SPECIFIC INTERFACE ERROR CODES

0xx	= Error
46	= HP-IB controller loopback error
47	= EOI test error
48	= Inbound FIFO jammed

SCSI-SPECIFIC INTERFACE ERROR CODES

0xx	= Error
646	= SCSI controller register error
647	= SCSI controller RAM error
648	= SCSI controller message error
649	= SCSI controller command error
64A	= SCSI controller kill error
64B	= SCSI controller request error
64C	= SCSI controller target sequence error
64D	= SCSI controller command sequence error
64E	= SCSI controller status sequence error
65B	= SCSI controller request error
650	= Hardware clear error
651	= Hardware EOD error
652	= Hardware "walking ones" error
660	= Connector loopback error in DB0 or I/O
661	= Connector loopback error in DB1 or C/D
662	= Connector loopback error in DB2 or MSG
663	= Connector loopback error in DB3 or REQ

```
664   = Connector loopback error in DB4 or ACK
665   = Connector loopback error in DB5 or ATN
666   = Connector loopback error in DB6 or SEL
667   = Connector loopback error in DB7 or BSY
668   = Connector loopback error in DBP or RST
```

CXX MULTI-PROCESSOR ERROR CODES**

```
Cxx   = Error
---     ------------------------------------

C07   = Connectivity test error
C0E   = On-board dual-port RAM test error
C0F   = Off board dual-port RAM test error
C10   = Subordinate detected dual-port RAM collision test
          error
C11   = Master detected dual-port RAM collision test error
C12   = Error in master dual-port RAM interrupt test
C13   = Error in subordinate DPR interrupt test
C66   = Pop count mismatch in loopback to formatter
C67   = Push count mismatch  in loopback to formatter
C68   = Parity error not detected in loopback to formatter
C69   = Data mismatch in loopback to formatter (return data)
C6A   = Buffer overrun not detected
C6B   = Buffer underrun not detected
C6E   = Error in write loopback with good data
C6F   = Error in read loopback with good data
C70   = Parity error in write loopback not detected
C71   = Parity error in read loopback not detected
CC8   = Loopback timeout
```

** If a "Cxx" code appears that is not in this list, check under "4xx" and "6xx" error codes to see if the "xx" appears after those prefixes.

[6] TEST DESCRIPTIONS

SEQUENCE TESTS (0 - 36)

TEST 0 - POWER ON

Checks out all digital data paths and normal machine operation. This sequence runs tests that are similar to

those normally run at poweron. The tests for each controller are run serially here rather than in parallel as in actual powerup.

Sequence Order:

13 - Drive Controller Poweron sequence
14 - Buffer Controller Poweron sequence
15 - Interface Poweron sequence
9 - Multi-processor Sequence

TEST 1 - GENERAL CHECKOUT (scratch tape required)

This test performs a complete machine checkout. It runs all poweron tests, then loads a tape and checks out all sensors. It then runs the tests in the multi-processor, sensor, and wellness sequences.

Sequence Order:

0 - Power On
165 - Load Tape
75 - TDU Test
95 - Servo Performance Test
2 - Wellness Test

TEST 2 - WELLNESS (scratch tape required)

This test checks out the general read/write capability of the HP 7979A or 7980A. The sequence includes the tests necessary to write a GCR tape, rewind and read the tape, rewind, write the tape in PE, rewind and read the PE tape, rewind, write the tape in NRZI (if available), rewind and read the NRZI tape, then rewind.

During the write process, the enter key causes the write to end early so that the entire tape is not written. The subsequent read pass will only read as far as the write pass had written.

Sequence Order:

165 - Load Tape
174 - Clear Data Buffer
171 - Create Record in Buffer (A = 1, all ones, B = 4K)
171 - Create Record in Buffer (A = 2, alternating,

```
                                          B = 16K)
    171 - Create Record in Buffer         (A = 3, rotating,
                                          B = 32K)
  * 150 - Write Density ID                (A = 6250)
 ** 177 - Write Density ID                (A = 6250)
    172 - Write Buffer to Tape            (A = 1, LOOP *)
    176 - Write Tape Mark
    176 - Write Tape Mark
    166 - Rewind
    173 - Read From Tape to Buffer        (A = 0, LOOP *)
    166 - Rewind
    174 - Clear Data Buffer
    171 - Create Record in Buffer         (A = 1, all ones,
                                          B = 4K)
    171 - Create Record in Buffer         (A = 2, alternating,
                                          B = 16K)
    171 - Create Record in Buffer         (A = 3, rotating,
                                          B = 32K)
  * 150 - Write Density ID                (A = 1600)
 ** 177 - Write Density ID                (A = 1600)
    172 - Write Buffer to Tape            (A = 1, LOOP *)
    176 - Write Tape Mark
    176 - Write Tape Mark
    166 - Rewind
    173 - Read From Tape to Buffer        (A = 0)

    166 - Rewind
    174 - Clear Data Buffer
    171 - Create Record in Buffer         (A = 1, all ones,
                                          B = 4K)
    171 - Create Record in Buffer         (A = 2, alternating,
                                          B = 16K)
    171 - Create Record in Buffer         (A = 3, rotating,
                                          B = 32K)
    177 - Write Density ID                (A = 800)
    172 - Write Buffer to Tape            (A = 1, LOOP *)
    176 - Write Tape Mark
    176 - Write Tape Mark
    166 - Rewind
    173 - Read From Tape to Buffer        (A = 0, LOOP *)
    166 - Rewind
    174 - Clear Data Buffer

      * = FRU 4 Buffer
     ** = FRU 14 or 24 Buffer
```

TEST 3 - INITIALIZE ERROR RATE SEQUENCE

Sequence 3 initializes the cumulative logs in preparation to running error rate.

Sequence Order:

175 - Initialize cumulative logs

TEST 4 - ERROR RATE SEQUENCE (scratch tape required)

Sequence 4 writes a tape in GCR, rewinds and reads it, then performs the same operations in PE and NRZI (if available). While the sequence runs, read/write errors are recorded in the cumulative error rate log. The error rate results are viewed in the cumulative error rate logs from INFO 3,4,and 5. Error rate results are accumulated until sequence 3 is used to initialize the log.

The error rate sequence operates very similar to the wellness test but differs in that hard read and write error do not terminate the error rate test. Hard errors are only logged.

Sequence Order:

165 - Load Tape		
174 - Clear Data Buffer		
171 - Create Record in Buffer	(A = 1, all ones, B = 4K)	
171 - Create Record in Buffer	(A = 2, alternating, B = 16K)	
171 - Create Record in Buffer	(A = 3, rotating, B = 32K)	
* 150 - Write Density ID	(A = 6250)	
** 177 - Write Density ID	(A = 6250)	
172 - Write Buffer to Tape	(A = 5, LOOP *)	
176 - Write Tape Mark		
176 - Write Tape Mark		
166 - Rewind		
173 - Read From Tape to Buffer	(A = 4, LOOP *)	
166 - Rewind		
174 - Clear Data Buffer		
171 - Create Record in Buffer	(A = 1, all ones, B = 4K)	
171 - Create Record in Buffer	(A = 2, alternating, B = 16K)	
171 - Create Record in Buffer	(A = 3, rotating,	

```
                                          B = 32K)
   * 150 - Write Density ID               (A = 1600)
  ** 177 - Write Density ID               (A = 1600)
     172 - Write Buffer to Tape           (A = 5, LOOP *)
     176 - Write Tape Mark
     176 - Write Tape Mark
     166 - Rewind
     173 - Read From Tape to Buffer       (A = 4, LOOP *)
     166 - Rewind
     174 - Clear Data Buffer
     171 - Create Record in Buffer        (A = 1, all ones,
                                          B = 4K)
     171 - Create Record in Buffer        (A = 2, alternating,
                                          B = 16K)
     171 - Create Record in Buffer        (A = 3, rotating,
                                          B = 32K)
     177 - Write Density ID               (A = 800)
     172 - Write Buffer to Tape           (A = 5, LOOP *)
     176 - Write Tape Mark
     176 - Write Tape Mark
     166 - Rewind
     173 - Read From Tape to Buffer       (A = 4, LOOP *)
     166 - Rewind
     174 - Clear Data Buffer

       * = FRU 4 Buffer
      ** = FRU 14 or 24 Buffer
```

TEST 5 - NRZI ERROR RATE SEQUENCE (scratch tape required)

Sequence 5 writes a tape in NRZI then rewinds and reads it. While the sequence runs, read/write errors are recorded in the PE cumulative error rate log. The error rate results are viewed in the cumulative error rate logs INFO 4 and 5. Error rate results are accumulated until sequence 3 is used to initialize the log.

The NRZI error rate sequence operates very similar to the wellness test but differs in that hard read and write errors do not terminate the error rate test. Hard errors are only logged.

Sequence Order:

```
     165 - Load Tape
     174 - Clear Data Buffer
     171 - Create Record in Buffer    (A = 1, all ones,
```

```
                                        B = 4K)
171 - Create Record in Buffer           (A = 2, alternating,
                                        B = 16K)
171 - Create Record in Buffer           (A = 3, rotating,
                                        B = 32K)
177 - Buffer Write Density ID           (A = 800)
172 - Write Buffer to Tape              (A = 5, LOOP *)
176 - Write Tape Mark
176 - Write Tape Mark
166 - Rewind
173 - Read From Tape to Buffer          (A = 4)
                                        (loop)
166 - Rewind
174 - Clear Data Buffer
```

TEST 9 - MULTI-PROCESSOR SEQUENCE

This sequence will execute all multi-processor tests to check out the communication between processors, the message bus, and data transfer paths. It will normally be called after each processor has executed its individual poweron sequence and established communications at powerup.

Sequence Order:

```
11 - Dual-Port RAM Test Sequence
62 - Formatter Initiated Loopback Test
61 - Buffer Initiated Loopback Test  (param B = 3)
60 - Interface Initiated Loopback Test
```

TEST 11 - DUAL-PORT RAM SEQUENCE

This sequence will perform all tests on the dual-port RAM between all target processors.

Sequence Order:

```
50 - DPR On Board Test  (A = 3, DC)
51 - DPR Off Board Test (A = 4, BC)
50 - DPR On Board Test  (A = 4, BC)
51 - DPR Off Board Test (A = 6, IF)
53 - DPR Interrupt Test (A = 4, DC to BC)
54 - DPR Interrupt Test (A = 3, BC to DC)
54 - DPR Interrupt Test (A = 4, IF to BC)
52 - DPR Collision Test (A = 3, BC to DC)
52 - DPR Collision Test (A = 4, IF to BC)
```

TEST 12 - LOOPBACK ISOLATION SEQUENCE

This sequence will execute all Interface, Buffer initiated, and Formatter initiated loopback isolation sequences. All hardware areas used by loopbacks will be checked out. Each loopback test is stepped through and a loopback problem should be isolated. Each test will be executed with a loopback check number (param A) of zero and will run all loopback checks.

Sequence Order:
- 62 - Formatter Initiated Loopback test
- 19 - Buffer Hardware Sequence
- 61 - Buffer Initiated Loopback test
  (param B 3, rotating)
- 20 - Interface Specific Hardware Sequence
- 60 - Interface Loopback Test

TEST 13 - DRIVE CONTROLLER POWERON TEST SEQUENCE

This sequence will be executed by the drive controller at powerup to check out all paths and operation of the servo and motor drive circuitry.

Sequence Order:
- 41 - Rom Checksum
- 40 - Processor Test
- 43 - Non-Destructive RAM Test
- 45 - Connectivity Test
- 49 - Timer Circuitry Test
- 70 - Front Panel Test
- 17 - Servo/Motor Drive Electronics Sequence

TEST 14 - BUFFER CONTROLLER POWERON TEST SEQUENCE

This sequence will be executed by the buffer controller at powerup and will check out all paths and operation of the buffer circuitry.

Sequence Order:
- 41 - ROM Checksum
- 40 - Processor Test
- 48 - Non-volatile RAM Checksum

43 - Non-destructive RAM Test
45 - Connectivity Test
19 - Buffer Hardware Sequence

TEST 15 - INTERFACE POWERON TEST SEQUENCE

This sequence will be executed by the interface controller at powerup and will check out all paths and operation of the specific interface.

Sequence Order:
41 - Rom Checksum
40 - Processor Test
43 - Non-Destructive RAM Test
45 - Connectivity Test
20 - Interface Specific Hardware Sequence

TEST 17 - SERVO/MOTOR DRIVE ELECTRONICS SEQUENCE
(no scratch tape)

This sequence will check out the operation of the servo and motor drive circuitry. These sequence tests are non-interactive.

Sequence Order:
78 - ADC Test
76 - DAC Test
82 - QDC Test
77 - Tachometer Test
81 - 48 Volt PSU Test
80 - Motor Drive Loopback

TEST 18 - SERVO/MOTOR DRIVE CHECKOUT SEQUENCE
(scratch tape tape required)

Sequence Order:
165 - Load Tape
95 - Servo Performance Test
96 - Servo Repositioning Test
166 - Rewind Tape
167 - Unload Tape

TEST 19 - BUFFER HARDWARE SEQUENCE

This sequence will checkout the data path and operation of the data buffer registers and RAM. It will isolate any problems specific to the data buffer.

Sequence Order:

```
      120 - Buffer Register Test
      121 - Buffer Function Test
      122 - Buffer RAM Test
   ** 130 - Data Compression Register Test
   ** 131 - Data Compression Functionality Test
   ** 132 - Data Compression RAM Test

        ** = 7980XC product only
```

TEST 20 - INTERFACE-SPECIFIC HARDWARE SEQUENCE

This sequence will run through all of the interface specific hardware tests.

Sequence Order:

```
      140 - Interface Specific Test 1
      141 - Interface Specific Test 2
```

USER-DEFINED SEQUENCE (38 - 39)

A sequence consisting of up to twenty tests may be defined by the user during runtime. The sequence entries may consist of any existing tests or sequences. The sequence is defined by invoking Test 38 and entering the test or sequence numbers in the correct order. The user defined sequence is run using Test 39. The current definition remains until another sequence is defined using Test 38.

TEST 38 - ENTER USER-DEFINED SEQUENCE

This test will allow a user-defined sequence to be entered. When tests are run while defining Test 39, they will complete with a "SEQ 39" message immediately, instead of

the normal "PASS" or "FAIL." Running Test 38 a second time terminates the sequence of definition mode.

TEST 39 - RUN USER-DEFINED SEQUENCE

This test will run the current user-defined sequence. If Test 39 is currently being defined, this test completes the sequence definition and then runs the test.

KERNAL TESTS (40 - 49)

NOTE

All kernel tests and certain multi-processor tests require a Target processor parameter. These tests are common to more than one processor and as such the processor must be specified. The possibilities are as follows:

TARGET PROCESSOR

0 - All processors
3 - Drive controller
4 - Buffer controller
6 - Interface controller
7 - HP-IB Interface controller

The default processor is "All processors." With all processors set, each processor which has the test defined, will execute the test, beginning with the interface controller, and ending with the drive controller.

TEST 40 - MICROPROCESSOR OPERATION (param A - processor (0,3,4,6))

A functional check of the microprocessor is performed.

TEST 41 - ROM CHECKSUM (param A - processor (0,3,4,6))

A checksum verification of the ROM is performed.

TEST 42 - DESTRUCTIVE RAM TEST

Volatile RAM is tested, checking for data acceptance and retention. The test insures that writing to one location has no affect on other locations. This test is destructive and as such will only run at poweron.

TEST 43 - NON-DESTRUCTIVE RAM TEST

(param A - processor (0,3,4,6))

RAM is tested, checking for data acceptance and retention. The test is non-destructive. This test is used at poweron for non-volatile RAM and while running the poweron test sequence for all RAM areas.

TEST 44 - COMPLETE RAM TEST

(param A - processor (0, 3, 4,6))

RAM is fully tested for data acceptance and retention. The test also insures that no memory cells affect other cells within the RAM. This test is non destructive and may be used without powercycling the drive, but does require extended times to run.

param A	processor	time required for test
3	Drive_controller	17 minutes
4	Buffer controller	72 minutes (04 buffer) 1.5 minutes (14/24 buffer)
6	Interface controller	4 minutes HP-IB and PERTEC 17 minutes SCSI
0	All of above	22.5 to 106 depending on buffer and interface FRUs (see above).

TEST 45 - CONNECTIVITY TEST

(param A - processor (0,3,4,6))

All connectors are checked for proper connectivity.

TEST 46 - DESTRUCTIVE DUAL-PORT RAM TEST

The dual-port RAM is tested using the destructive RAM test. This test is destructive and is only run at poweron. It is NOT accessible from the front panel.

TEST 48 - NON-VOLATILE RAM CHECKOUT

A RAM test and checksum verification of the controlled portion of non volatile RAM is performed.

TEST 49 - TIMER CIRCUITRY

The PTM is checked for proper counting. The oscillator is used to verify that the STS has the proper period.

PROCESSOR COMMUNICATION TESTS (50 - 59)

TEST 50 - ONBOARD DPR (param A - processor (0, 3, or 4))

This test allows the DPR to be checked out from the subordinate side. The test performs a walking ones and zeros test in a non-destructive manner. All of the RAM may be accessed for checking with the exception of the master interrupt location.

TEST 51 - OFFBOARD DPR (param A - processor (0, 4, or 6))

This test allows the DPR to be checked out from the master side. The test performs a walking ones and zeros test in a non-destructive manner. All of the RAM may be accessed for checking with the exception of the subordinate interrupt location.

TEST 52 - DPR COLLISION (param A - processor (0, 3, or 4))

This test checks DPR arbitration by creating read/write collisions at the DPR. The two processors then pass incrementing information back and forth through the diag message area (DPR location 084H).

TEST 53 - SUBORDINATE DPR INTERRUPT (param A - processor (0, 4, or 6))

This test verifies the ability of the master to be interrupted by the subordinate through the DPR. The test is initiated by the target processor sending a

multi-processor command with the parameter set to "subordinate interrupt". The receiving processor will write the interrupt test value to the interrupt location of the DPR then report on the command.

TEST 54 - MASTER DPR INTERRUPT

(param A - processor (0, 3, or 4))

This test verifies the ability of the subordinate to be interrupted by master through the DPR. The test is initiated by the target processor sending a multi-processor command with the parameter set to "master interrupt". The receiving processor will write the interrupt test value to the interrupt location of the DPR then report on the command.

LOOPBACK TESTS (60 - 69)

TEST 60 - INTERFACE LOOPBACKS

(param A - loopback check number)

The interface uses manual CCL commands to communicate with the data buffer. Test will pass if expected result occurs.

Parameter A indicates the extent of the test:

param A	loopback check	expected result
0	run all loopback checks from 1 through 3	-
1	loopback correct data	= no error
2	data to buffer with a parity error (This test option is not available on HP-IB interface)	= data parity error
3	data from buffer with a parity error	= data parity error

TEST 61 - BUFFER-INITIATED LOOPBACKS
(param A - loopback type)
(param B - data pattern)

Data is generated within the buffer then looped through the formatter using the multi-processor loopback command. Parameter A indicates the extent of the test:

param A loopback check

0 - run all loopback checks from 1 through 5
1 - correct PE data
2 - correct GCR data
3 - correct GCR data underrun (PE for 7979 drives)
4 - correct GCR data overrun (PE for 7979 drives)
5 - GCR data with a parity error (PE for 7979 drives)
6 - correct NRZI data

param B data pattern

0 - All zeros
1 - All ones
2 - Alternating ones and zeros
3 - Rotating 0 - 255
4 - Pseudo-random

TEST 62 - DRIVE INITIATED DIGITAL LOOPBACK
(param A - loopback block type)

Loopback data or a write pattern is generated by the drive controller and passed through the formatters.

number loopback block type

0 - run all block types form 1 through 16
1 - 1600 PE data block
2 - 1600 PE data block with 1 track in error
3 - 1600 PE density ID
4 - 1600 PE tape mark
5 - 1600 PE gap
6 - 6250 GCR data block
7 - 6250 GCR data block with 1 track in error
8 - 6250 GCR data block with 2 tracks in error
9 - 6250 GCR density ID
10 - 6250 GCR ARA burst
11 - 6250 GCR ARA ID
12 - 6250 GCR tape mark

13 - 6250 GCR gap
14 - 800 NRZI data block
15 - 800 NRZI tape mark
16 - 800 NRZI gap

TEST 63 - DIGITAL LOOPBACK EXERCISER
(param A - density)
(param B - tracks selector)

Digital loop back is performed using a data block in the selected density with the selected tracks turned off. Tracks selector is in the form of 'XY' where X and Y are combinations of two tracks to disable. Tracks may be specified as 1 through 9 with 0 indicating no tracks.

TEST 64 - DRIVE INITIATED ANALOG LOOPBACK
(param A - loopback block type)
(requires scratch tape)

Loopback data or a write pattern is generated by the drive controller and passed through the formatters and the tape. Loopback block type is defined in test 62.

BECAUSE THIS TEST DOES NOT DO RETRIES, TAPE DEFECTS WILL CAUSE ERRORS WHEN RUNNING THIS TEST.

TEST 65 - ANALOG LOOPBACK EXERCISER
(param A - density)
(param B - tracks selector)

Analog loop back is performed using a data block in the selected density with the selected tracks turned off. Tracks selector is in the form of 'XY' where X and Y are combinations of two tracks to disable. Tracks may be specified as 1 through 9 with 0 indicating no tracks.

BECAUSE THIS TEST DOES NOT DO RETRIES, TAPE DEFECTS WILL CAUSE ERRORS WHEN RUNNING THIS TEST.

DRIVE CONTROLLER TESTS (70 - 119)

TEST 70 - FRONT PANEL LIGHT SHOW

TEST 71 - FRONT PANEL BUTTON CHECK (interactive test)

Displays the name of each button for one second after they are pressed. The test is terminated by pressing reset twice.

TEST 72 - FRONT PANEL MESSAGE CHECK (interactive test)

This test displays all the front panel messages.

The front panel buttons are defined as follows for the duration of the test:

NEXT : Selects the next message to be displayed, cycling through all the messages for the current language.

PREV : Selects the previous message to be displayed, cycling through all the messages for the current language.

OPTION : Selects the next language, cycling through all the languages (English, German, French, Spanish). The odometer indicates the current language (0=English, 1=German, 2=French, 3=Spanish).

ONLINE : resets the message pointer back to the first message.

ENTER or RESET : TERMINATES the test.

TEST 75 - TDU (scratch tape required)

Performs a write/read test with TDU engages and disengages to verify proper TDU operation. The scratch tape must have a PE or GCR density id and be positioned at BOT.

TEST 76 - DAC (tape must be unloaded)

Values are written to the DACs and check with an A/D converter.

TEST 77 - TACHOMETER (tape must be unloaded)

The tach circuit at the speed encoder inputs is simulated. Proper speed translation ad the A/D converter is checked for.

TEST 78 - ADC

Test the A/D converter for proper operation.

TEST 80 - MOTOR DRIVE LOOPBACK (tape must be unloaded)

Values are written to the motor DAC and read back at the A/D converter.

TEST 81 - 48-VOLT POWER SUPPLY

The A/D converter is read for the 48-volt PSU

TEST 82 - POSITION COUNTER (tape must be unloaded)

CHAN_A and CHAN_B bits are toggled on the QDC. Proper counts are checked for.

TEST 84 - TENSION SHUTDOWN CHECK
(interactive test)
(tape must be unloaded)

As the operator moves the tension arm (buffer arm), the front panel displays "*" when a tension shutdown limit is reached.

TEST 85 - TENSION SENSOR CHECK (interactive test)

The front panel displays the tension arm value obtained from the A/D converter in the range of 0 - 255. The midpoint of the readings (seen when no tension arm is installed) is approximately 122.

TEST 86 - SPEED ENCODER CHECK (interactive test)

As the operator rotates the speed encoder, the front panel displays QDC counts in the range of 0 - 4095.

TEST 87 - TAPE IN PATH SENSOR CHECK
(interactive test)
(tape must be unloaded)

The front panel displays "*" whenever the optical sensor beam is blocked.

TEST 88 - DOOR SENSORS CHECK (interactive test)

The front panel displays "DOOR" whenever the door or the top cover is open. The unload key allows the door to be opened during this test. When the unload key is pressed, if the door is not detected open within one half second, then "CHECK" is displayed in the front panel.

TEST 89 - REEL ENCODERS/WRITE ENABLE RING SENSOR CHECK
(interactive test)
(requires scratch tape)
(tape must be unloaded)

The user loads a write enabled scratch tape and spins it with his hand. The front panel displays "*" each time a reel encoder pulse is seen. The front panel illuminates the "wrt en" annunciator when the write enable encoder is seen. The "wrt en" annunciator remains lit until cleared.

TEST 90 - TDU FUNCTIONALITY CHECK (interactive test)

The TDU is engaged. After one half second it will be retracted.

TEST 91 - HUB LOCK CHECK (interactive test)

This check causes the hub to be locked.

TEST 92 - HUB UNLOCK CHECK (interactive test)

This check causes the hub to be unlocked.

TEST 93 - LOAD FAN CHECK (interactive test)

The load fan is turned on for thirty seconds.

TEST 94 - EOT/BOT SENSOR CHECK (interactive test)

The front panel displays "BOT" when a BOT sticker is detected. The front panel displays "EOT" when an EOT sticker is detected. This test should be performed with a tape threaded through the tape path (not tensioned). The operator can then manually turn the tape reels to to move the BOT/EOT sticker past the sensors.

TEST 95 - SERVO PERFORMANCE (scratch tape required)

A complete check of the servo system is performed. The test performs worst case repositions, forward and reverse speed checks, high speed rewinds, etc. The buffer arm is tested for displacement, the velocity is checked for specifications, and the servo ramp rate is checked.

TEST 96 - SERVO REPOSITION EXERCISER
(param A - forward time in seconds)
(param B - reverse time in seconds)
(scratch tape required)

The drive will continuously reposition to EOT then rewind, if param A is greater than or equal to param B. Otherwise, the drive repositions until BOT.

TEST 97 - SERVO CLOSE LOOPS (scratch tape required)

The ability to close the servo loops is tested.

TEST 98 - READ CHANNEL GAIN PROFILE DISPLAY
(param A - density)

This test displays the read channel gain profile for the selected density. The display will show "TX YYY" where X is the track number (1..9 and A) and YYY is the gain required for that track. The next/previous keys can be used to view all the tracks. Track A is the average of all 9 tracks. The enter key is used to terminate the gain display. The gain profiles are generated by Test #99 and typically saved in non-volatile memory.

TEST 99 - READ CHANNEL CALIBRATION

(param A - density)
(param B - cntl)
(write enabled tape required)

This test is used to calibrate the read channel gain profile. A tape which is typical of those used in the unit should be used for the calibration. This test will write a calibration pattern on the tape and then read the pattern to calibrate the drive. When the test is complete it will display the gain (see test #98). Dual density drives should be calibrated in both densities. If parameter B is set as "SAVE" then the calculated gain profile will be saved in non-volatile RAM. If parameter B is set as "TEMP" then the calculated gain profile will be after this test is complete.

TEST 100 - ERASE TAPE

(param A - prewrite control)
(scratch tape required)

This test verifies an erase from the current tape position to the end of tape marker. The tape is rewound upon encountering EOT.

param A prewrite control

0 - erase only
1 - write tape at GCR data rate first (PE for 7979)
2 - write tape at PE data rate first
3 - write tape at NRZI data rate first

TEST 101 - WRITE ELECTRONICS EXERCISER

(param A - density)
(scratch tape required)

This exerciser writes an all ones pattern in the specified density from the current tape position to the end of tape marker. The tape is rewound when EOT is encountered.

TEST 102 - READ ELECTRONICS EXERCISER

(param A - density)
(scratch tape required)

This exerciser runs from the current tape position to the end of tape marker with the read electronics turned on and setup in the specified density. The tape is rewound when EOT is encountered.

TEST 103 - READ REVERSE EXERCISER

(param A - density)
(scratch tape required)

This exerciser positions the tape at EOT then runs in the reverse direction to the beginning of tape marker with the read electronics turned on and setup in the specified density.

TEST 104 - HEAD CROSSTALK EXERCISER

(param A - density)
(scratch tape required)

This exerciser rewinds the tape, then runs to the EOT marker with the erase head on in order to prepare the tape for crosstalk. It then runs in the reverse direction to the beginning of tape marker with the read and write electronics on and setup in the specified density.

TEST 105 - NRZI READ SKEW CALIBRATION

(param A - control)
(master head alignment tape required)
(test valid for option 800 drives only)

This test is used to calibrate the NRZI read deskewing hardware. A master head alignment (skew) tape is required for this test. The test will make a forward pass from BOT to EOT during which 2000 skew measurements will be taken and then will make a reverse pass from EOT to BOT during which an additional 2000 measurements in the reverse direction are taken. If the required number of samples in either direction is not achieved in one pass the tape will be repositioned at the other end and sampling will continue. After the read passes are completed the skew correction values are calculated and displayed (see test #107). IF parameter A is set as "SAVE" the calculated read skew correction values will be saved in non-volatile RAM. IF parameter A is set as "TEMP" then the resulting values will be used by the hardware until either this test is executed again or the tape drive is power cycled.

TEST 106 - NRZI WRITE SKEW CALIBRATION

(param A - control)
(write enabled tape required)
(test valid for option 800 drives only)

This test is used to calibrate the NRZI write deskewing hardware. A tape typical of those used in the unit should be used for this calibration. TEST 105 "NRZI READ SKEW CALIBRATION" MUST BE EXECUTED PRIOR TO THE EXECUTION OF THIS TEST AND THE DRIVE MUST NOT BE POWER CYCLED BETWEEN THE EXECUTION OF TEST 105 AND THIS TEST. This test will write a calibration pattern on the scratch tape from BOT to EOT. The pattern will be read, the write skew correction values will be calculated and the results will be displayed (see test #107). IF parameter A is set as "SAVE" the calculated read skew correction values will be saved in non-volatile RAM. IF parameter A is set as "TEMP" then the resulting values will be used by the hardware until either this test is executed again or the tape drive is power cycled.

TEST 107 - NRZI SKEW CALIBRATION VALUE DISPLAY

(param A - value set)

This test displays the skew correction values currently in use for each track for the selected value set.

For read correction values the display will show "XRTY ZZ" where X is "F" (forward) or "R" (reverse), Y is the track number (1..9) and ZZ is the correction value. Each value represents the amount of correction for the selected track and direction in increments of 78 micro inches.

For write correction values the display will show "FWTY ZZ" where Y is the track number (1..9) and ZZ is the correction value. Each value represents the amount of correction for the selected track in increments of 19.5 micro inches.

The next/previous keys can be used to view each track's correction value and the enter key is used to terminate the value display.

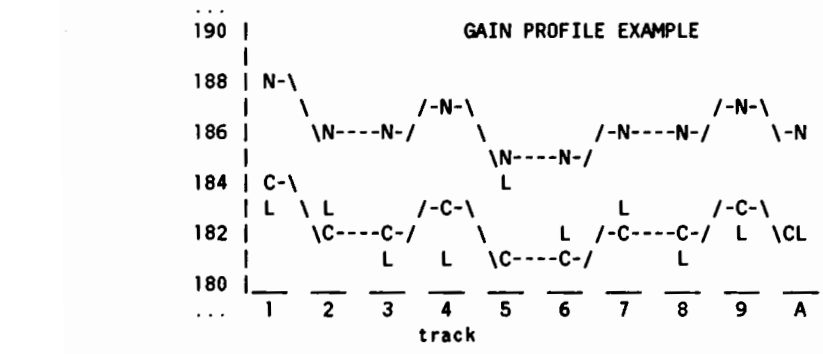
param A value set

0 - read correction values
1 - write correction values

TEST 108 - CURRENT GAIN PROFILE DISPLAY

(param A - display select)

This test will display the gain profile for the currently loaded tape. The gain profile is read whenever a tape is identified (following a load or a rewind) or a density ID is written. select 0 will display the load gain profile for the current tape. Display select 1 will display the load gain profile for the current tape relative to the non-volatile profile. Display select 2 will the current profile used for reading and writing the tape. It is the non-volatile profile normalized to match the average gain current tape. Gains are displayed as described in test #98. For PE tapes, display select 0 and 1 will show track 4 only (the PE ID track).



N = NVRAM gain profile (from test #99)
L = Load gain profile (when tape was loaded)
C = Current R/W gain profile

The non-volatile gain profile is normalized such that its average N[A] is the same as the average of the load gain L[A].

TEST 109 - NRZI DYNAMIC SKEW

(write enabled tape required)
(test valid for option 800 drives only)

This test measures the dynamic skew present in the tape system (ie tape path + current tape). TEST 106 MUST BE EXECUTED PRIOR TO THE EXECUTION OF THIS TEST. The test will alternately write and then read a test pattern with

tracks 1 and 9 offset by a known amount of static skew. After the measurements are complete the result is calculated and displayed.

The display will show "DSW xxx" where xxx represents the percentage of the measurements that fell within +- 39 micro inches of the expected offset of tracks 1 and 9. A higher value corresponds to less dynamic skew. A value >= 64 indicates the the dynamic skew is within acceptable limits.

TEST 110 - TAPE PACK CONDITIONER (any tape)

The tape is positioned at EOT then rewound at the archive rewind speed.

BUFFER CONTROLLER TESTS (120 - 129)

TEST 120 - BUFFER REGISTER

Write to and read values from all of the buffer registers to verify their data acceptance and retention.

TEST 121 - BUFFER FUNCTION

Perform push and pop operations from the buffer controller, verifying counter and address operation, parity circuitry, and prefetch latching.

TEST 122 - BUFFER RAM

Buffer RAM is tested for data acceptance and retention. The test is destructive to data in the data buffer.

TEST 128 - DUMP NVRAM TO TAPE (scratch tape required)

The non-volatile RAM of the data buffer is dumped and written onto the tape as the first record, and with the appropriate header. This test should be run prior to replacing the battery.

TEST 129 - LOAD NVRAM FROM TAPE
(pre-written dump tape required)

The non-volatile RAM of the data buffer is loaded from a tape written using Test 128. This test is used to reload non-volatile RAM information following the changing of the battery. After this test is run the drive must be powercycled for the interface and drive controller to receive the new non-volatile RAM values.

TEST 130 - DATA COMPRESSION REGISTER (7980XC ONLY)

Setup and verify data compression hardware modes and status registers.

TEST 131 - DATA COMPRESSION FUNCTIONALITY (7980XC ONLY)
(param A - subtest)

param A	definition
0	- runs sub tests 1 through 3
1	- pass through mode test
2	- normal/observation mode test
3	- normal/output disable mode test

TEST 132 - DICTIONARY RAM (7980XC ONLY)

Generates and loops data through the data compression hardware to provide a high level of dictionary RAM coverage.

TEST 133 - DATA COMPRESSION EXTENDED FUNCTIONALITY
(7980XC ONLY) (param A - ptrn)

param A	pattern
0 -	all zeros
1 -	all ones
2 -	alternating all zeros, all ones
3 -	rotating data bytes (0 .. 255)
4 -	pseudo random data
5 -	all data patterns (0 through 4)

HP-IB INTERFACE CONTROLLER TESTS (140 - 149)

TEST 140 - HP-IB CONTROLLER

Checks out operations of the HP-IB controller chip.

TEST 141 through 145 - (reserved tests; always pass)

SCSI INTERFACE CONTROLLER TESTS (140 - 149)

TEST 140 - SCSI INTERFACE CONTROLLER CHIP

Checks out operations of the SCSI Interface controller chip.

TEST 141 - ONBOARD HARDWARE TESTS

Checks out additional onboard functions.

TEST 142 through 144 - (reserved tests; always pass)

TEST 145 - SCSI CONNECTOR LOOPBACK

This test performs a loopback through SCSI connectors checking proper operation of the SCSI drivers, receivers and cables. This test requires an external loopback hood with terminator power.

PERTEC-COMPATIBLE INTERFACE CONTROLLER TESTS (140 - 149)

TEST 140 through 145 - (reserved tests; always pass)

DRIVE COMMAND EXECUTION (150 - 199)

NOTE

All of these commands with the exception of host to buffer commands require that a scratch tape be loaded.

Test 150-167 are run by the drive controller and will not perform retries.

TEST 150 - WRITE DENSITY ID
(param A - density 800, 1600, 625)
(tape must be at BOT)

TEST 151 - WRITE TEST RECORD (param A - test record size)

A single record is generated within the drive controller and written to tape.

param A	test record size
0	1 byte
1	256
2	512
3	768
4	1024
5	1280
6	1536
7	1792
8	2048
9	2304
10	2560
11	2816
12	3072
13	3328
14	3584
15	3840

TEST 152 - WRITE TAPE MARK

TEST 153 - WRITE GAP (param A gap length)

param A	gap length
0	2.0 inch write gap
1	4.0 inch write gap
2	8.0 inch write gap
3	12.0 inch write gap
4	16.0 inch write gap
5	erase to EOT

TEST 160 - VERIFY RECORD (param A - runaway control)

A single record is read from the tape verifying the data but without the results being placed in the data buffer. The runaway control parameter sets the maximum amount of blank tape the drive will cover while looking for the record. 0 = 25 feet, 1 = 12 inches.

TEST 161 - FORWARD SPACE BLOCK

Single blocks are spaced over without verifying any data in the blocks.

TEST 162 - BACKSPACE BLOCK

Single blocks are spaced over without verifying any data in the blocks.

TEST 163 - FORWARD SPACE FILE

Blocks are spaced over until a file mark in encountered.

TEST 164 - BACKSPACE FILE

Blocks are spaced over until a file mark in encountered.

TEST 165 - LOAD TAPE

TEST 166 - REWIND

TEST 167 - UNLOAD TAPE (param A - door control)

param A	door control
0 -	remain closed
1 -	open door

NOTE

Test 170-177 are run by the buffer controller and will perform retries.

TEST 170 - WRITE TAPE MARK TO BUFFER

A tape mark entry is generated in the buffer without writing it to tape.

TEST 171 - CREATE RECORD IN BUFFER (param A - pattern) (param B - record size)

A record is created in the buffer without writing it to tape. The pattern parameter indicates the type of data to be generated.

param A pattern

0 - all zeros
1 - all ones
2 - alternating all zeros, all ones
3 - rotating data bytes (0 .. 255)
4 - pseudo random data
5 - use existing data in buffer RAM
6 - rotating data with parity error on the last byte

param B record size

0 - 1 byte
1 - 256 bytes
2 - 1K
3 - 4K
4 - 16K
5 - 32K
6 - 64K
7 - 128K
8 - 256K

TEST 172 - WRITE BUFFER TO TAPE (param A - retain data / next write control)

Write the contents of the next entry in the queue to tape. The following parameters affect the write.

remove - remove record from buffer following the write
Note that if the test is looped more times than there are buffer entries, the test will fail with an empty buffer.

retain - retain record in buffer following the write

stream - attempt to stream by starting to write the next record in the buffer. If no write is received, the startup is aborted and the tape repositioned.

single - do not startup the next write. Streaming will not occur.

err normal - fail on all errors.

err bypass - fail on all errors except write errors. Write errors will be logged in the error and error rate logs and can can be displayed using INFO.

param A

0 - remove / stream / err normal
1 - retain / stream / err normal
2 - remove / single / err normal
3 - retain / single / err normal
4 - remove / stream / err bypass
5 - retain / stream / err bypass
6 - remove / single / err bypass
7 - retain / single / err bypass

TEST 173 - READ FROM TAPE TO BUFFER (param A - retain data/ readahead control)

A record is read from the tape into the data buffer. The following parameters affect the read.

remove - remove record from buffer following the read.

retain - retain record in buffer following the write. If the test is looped more times than there is room left in the buffer, the test will fail with a full buffer.

```
stream     - attempt to stream by starting to read the next
             record from the tape.  If no read command is
             received, the startup is aborted and the tape
             repositioned.

single     - do not startup the next read.  Streaming will
             not occur.

err normal - fail on all errors.

err bypass - fail on all errors except read errors.
             read errors will be logged in the error and
             error rate logs and can can be displayed using
             INFO.

param A

0 - remove / stream / err normal
1 - retain / stream / err normal
2 - remove / single / err normal
3 - retain / single / err normal
4 - remove / stream / err bypass
5 - retain / stream / err bypass
6 - remove / single / err bypass
7 - retain / single / err bypass
```

TEST 174 - CLEAR DATA BUFFER

All entries in the data buffer are removed.

TEST 175 - INITIALIZE CUMULATIVE LOG

The PE and GCR cumulative logs are cleared.

TEST 176 - BUFFER WRITE TAPE MARK

A tape mark is written to the tape, with retries performed if necessary. The contents of the buffer are not affected. This test will not stream if looped. THIS TEST IS NOT AVAILABLE ON UNITS WITH AN FRU 4 BUFFER CONTROLLER (FIRMWARE BELOW 6.00).

TEST 177 - BUFFER WRITE DENSITY ID

(param A density - 800, 1600, 6250)
(tape must be at BOT)

The selected density ID is written to the tape, with retries performed if necessary. The contents of the buffer are not affected. THIS TEST IS NOT AVAILABLE ON UNITS WITH AN FRU 4 BUFFER CONTROLLER (FIRMWARE BELOW 6.00).

HP-IB HOST ONLY TESTS

TEST 200 - HARDWARE ID

This test is used to identify the hardware assemblies and options which may vary within the 7979/7980/7980XC products. This test is only available with firmware revisions of 3.50/6.00 or later. If this test is available, the error returned is zero and the FRU 1 field (byte 3) contains a hardware ID code as follows:

ID CODE	PRODUCT#	DRIVE FRU	BUFFER FRU	R/W FRU
0	7979A	'79-66503	66504	66521
1	7980A	'80-66503	66504	66521
2	7979A	'79-66503	66514	66521
3	7980A	'80-66503	66514	66521
4	7979A W/NRZI	'79-66503	66514	66531
5	7980A W/NRZI	'80-66503	66514	66531
6	7980XC	'80-66503	66524	66521
7	7980XC W/NRZI	'80-66503	66524	66531

TESTING THE SERVO FROM THE FRONT PANEL

The servo selftests in the drive can be used to isolate failures to the component level. Servo failures must be tested in the open loop because once the loop is closed it is no longer possible to determine which component caused the failure. The following discussion assumes that the drive passed the poweron selftests. This means that the drive controller can perform the interactive diagnostics.

AUTOLOAD FAILURES

The following tests determine failures which affect the autoload before the tape is tensioned.

If the autoload sequence does not begin at all, check the door with Test 88.

First check the tape in path sensor with Test 87. Block the beam with a tape. Lay the tape in the casting to block the tape in path. A * should show on the front panel.

Test the reel encoder and write enable (Test 89). Load a tape on the hub. There should be three reel encoder pulses per revolution and one write enable pulse.

If these pass, then check hub lock (Test 91) and unlock (Test 92). Then check the load fan (Test 93).

CLOSED LOOP OPERATION

First determine whether the servo loop operates in general. The most common indicator of a servo problem is loss of tension. Run the close loops selftest (Test 97) without a tape. First notice that the motors attempt to load a tape. Move the tension arm to its operating position. The motors should come to a stop. As the arm is disturbed from this position the motors will move in opposition to the sensor. More tension will pay tape out and less tension will reel it in with the supply motor. While holding the tension arm so as to stop the motors, turn the speed sensor slowly. Both motors should rotate to oppose the sensor. This test should give a quick indication of any obvious problem with the sensors, motor drive, or motors.

Check the tension arm (Test 85). The number on the front panel should range smoothly from about 30 to 255, with the nominal arm position at about 150. Test the shutdown limits (Test 84). The limits should occur before the arm has reached its hard stops.

Test the speed encoder (Test 86). As the encoder is spun by hand the value should change smoothly from 0 to 4095. Check for any stuck bits. If the encoder seems to malfunction, run the position counter test (Test 82). This verifies that the counter on the drive controller is operational. If Test 82 passes but Test 86 fails, then the encoder or its cable is faulty.

If the motors fail to rotate during the close the loops test, rerun the test and listen for a click of the relay. A single click indicates that the motors are being enabled, a double click indicates that the shutdown circuits are not working.

MOTION TESTS

If the problem appears to be loss of position or tension shutdown while the servo operates, check the TDU (Test 75 or 90).

If the tape runs off the BOT or EOT, check the BOT/EOT sensor assembly with Test 94. To do this test, run a piece of tape over the tape path at least one foot per second over the BOT/EOT sensor. The top sensor is the BOT, and the bottom is EOT.

[7] UTILITIES (Accessing Configurations and Logs)

Utilities provide access to the configuration variables and logs within the drive. Each of the variables and data structures are accessible from the host and from the front panel. A description of each is given below .

To display a particular utility, first take the drive offline then press the OPTION key on the front panel. "TEST *" will appear on the display. Press the NEXT key until "INFO *" appears then press the ENTER key and then using PREV and NEXT for 1's and the ONLINE and UNLOAD keys for 10's (ONLINE and DENSITY Keys on the 88780A/B) enter the number corresponding to the utility to be displayed. Press the ENTER key. The information will now appear.

For those logs which contain multiple entries, the NEXT and PREV keys provide a mechanism to move through the entries. For those entries which have multiple displays, the drive automatically scrolls through all of the displays in the entry. Either the ENTER or RESET key can be used to exit the display.

The header display will be displayed for approximately two seconds. Each additional display will then be shown for approximately one second.

In this description displays will be described as:

```
| "LABEL" HHHH | DDDDDD |  DeDD  |
```

Where vertical bars separate displays, Double quotes indicate labels, 'H' indicates a hexadecimal digit, 'D' indicates a decimal digit, and 'DeDD' indicates exponential notation of 'D' times ten to the 'DD'. Each display show on the same line below will be shown and then repeated until an applicable front panel button is pressed for the next desired action.

INFO 0 - ERROR LOG

Displays current log entries.

The error log maintains the last 30 errors which occurred within the drive . A full description of the log contents is contained within the Data structures appendix. The initial error log display is for the most recent entry. The PREV and NEXT keys are used to view other entries in the log. Note that the entry number ("E"DD) of the initial display also indicates the number of entries in the log.

```
Error    | "E"DD  HHH  | "FRU" DD  | "T" DDD | "*P" DDDDD |


      "E"DD  -  indicates the  DD  entry within the Error log.
        HHH  -  is the complete error code.

     Ex.   | E10 010 | : entry 10 in the log, a run time
                         error (0), the error being no tape
                         loaded (10).

      "FRU"  -  DD is the detected Field Replaceable Unit (FRU)
                number (this field may occur 0 to 2 times).

     Ex.   | FRU 40 | : the detected FRU is the EOT/BOT sensor
                        assembly (#40).

      "T"    -  DDD is the test number during which the error
                occurred (if appropriate). This display appears
                only if the error occurred during the
                execution of a diagnostic test.

     Ex.   | T  41 | : the error occurred during the execution
                        of the ROM CHECKSUM test (#41).

     "*P" DDDDD - A two-byte time stamp (in seconds) with "*"
                  indicating that a poweron occurred since the
                  last error was logged (ie. no time correlation
                  with previous entries) and "P" indicating that
```

the error occurred during powerup. The "P" may be replaced by an additional digit in the time stamp.

Ex. - | * 78978| : the error was logged 78978 seconds after the drive was powered on and this is the first entry since the drive was powered on (the clock rolls over approximately every 11.5 days).

NOTE

Two error rate logs are maintained; short term and long term. The short term log, called the ERROR RATE LOG, contains multiple entries, one entry for each LOAD or density change of the tape. Each log entry contains the density at time of entry. The Current Error Rate is based on the data being accumulated for the next ERROR RATE LOG entry. At load time or density change time, the data being accumulated is entered into the log and is then zeroed.

The ERROR RATE LOG is intended for use during normal drive operation, not during the execution of diagnostics. During diagnostic sequences, density changes occur often enough to make the error rate log roll through entries too fast. To prevent entries from being lost, entries are not made in the error rate log during diagnostic sequences -- only a single entry is made and this entry makes no distinction between PE or GCR.

The "CUMULATIVE ERROR RATE LOG" is a long-term history containing a separate PE and GCR log of data and errors. This log does not maintain how recent the information is or on which load of tape the error occurred. The Cumulative Error is useful during normal runtime and is also used during certain diagnostic tests. Before error rate or wellness sequences are run, the CUMULATIVE ERROR RATE LOG may be initialized, allowing the accumulated data to be related to the test at hand.

The side effect of initializing the CUMULATIVE ERROR RATE LOG is that all accumulated data up until that time is lost. The CUMULATIVE ERROR RATE LOG is

updated at least on every load or density change, but may be updated more often. This log does not contain current error rate information as does the error rate log.

INFO 1 - ERROR RATE LOG

Displays current log entries.

An error rate log is maintained which contains a history of hard and soft errors for the past 20 loads of the tape. The results are displayed as two entries with the same log entry number. The initial error rate log display is the most recent entry in the log. The PREV and NEXT keys are used to move from the write to read displays and from one log entry to the next. Note that the entry number ("W"DD or "R"DD) of the initial display also indicates the number of entries in the log.

```
Write displays :
 |"W"DD "NRZ / PE / GCR" | "WH" HH | "WS" HHHH | "WD" DeDD |
Read displays  :
 |"R"DD "NRZ / PE / GCR" | "RH" HH | "RS" HHHH | "RD" DeDD |

"W"DD        - indicates the beginning of write displays for
               entry DD
"R"DD        - indicates the beginning of read displays for
               entry DD
"NRZ/PE/GCR"- the density in which the tape was written
"WH" HHHH    - Hard write errors in hexadecimal (unrecovered
               errors)
"RH" HHHH    - Hard read errors in hexadecimal (unrecovered
               errors)
"WS" HHHH    - Soft write errors in hexadecimal (recovered
               errors)
"RS" HHHH    - Soft read errors in hexadecimal (recovered
               errors)
"WD" DeDD    - Amount of data written in bytes
"RD" DeDD    - Amount of data read in bytes

Ex. - |W17 PE | WH 01 |WS 0003|WD 3e06|
      |R17 PE | RH 02 |RS 0005|RD 4e07|
```

The preceding two lines represent displays that could appear on the front panel display. The entry is number 17 in the error rate log and PE format was used for the operation. One hard write error and three write soft errors occurred and 3x10**6 bytes of data were written. he read displays for the entry indicate that 2

read hard errors and 5 read soft errors occurred while 4x10**7 bytes of data were read.

INFO 2 - CURRENT ERROR RATE

Displays soft error rate of the current tape.

```
    | "W"  DeDD | "R"  DeDD |
```

"W" DeDD - write soft error rate in bytes per write soft error
"R" DeDD - read soft error rate in bytes per read soft error

Ex. - | W 2e07| R 3e06|

The previous line represents displays that indicate that the current write soft error rate is approximately 20 Kbytes of data per error and the current read soft error rate is approximately 3 Kbytes of data per error.

INFO 3 and INFO 4 - CUMULATIVE ERROR DATA

INFO 3 - Displays cumulative GCR error data.
INFO 4 - Displays cumulative PE + NRZI error data.

Cumulative error data logs are maintained containing all past occurrences of hard and soft errors as well as the total amount of data written and read. The PREV and NEXT keys are used to move from the write to the read displays.

```
Write displays : | "WH" HH | "WS" HHHH | "WD" DeDD |
Read displays  : | "RH" HH | "RS" HHHH | "RD" DeDD |
```

"WH" HH - Hard write errors in hexadecimal (uncorrected errors)
"RH" HH - Hard read errors in hexadecimal (uncorrected errors)
"WS" HHHH - Soft write errors in hexadecimal (corrected errors)
"RS" HHHH - Soft read errors in hexadecimal (corrected errors)
"WD" DeDD - Amount of data written in bytes
"RD" DeDD - Amount of data read in bytes

The displays are analogous to those of the error rate log.

INFO 5 - CUMULATIVE ERROR RATE

Displays the cumulative soft error rate in bytes per error.

```
   | "GCR" | "W" DeDD | "R" DeDD | "PE" | "W" DeDD | "R" DeDD |

"GCR"     - indicates that the following two displays are the
            cumulative Write and Read soft error rates for
            operations using GCR density.
"PE"      - indicates that the following two displays are the
            cumulative Write and Read soft error rates for
            operations using PE + NRZI density.
"W" DeDD - write soft error rate in bytes per write soft error
"R" DeDD - read soft error rate in bytes per read soft error
```

The displays are analogous to those of the current error rate.

INFO 10 - ODOMETER

Displays the Odometer.

The odometer is a 6 byte value containing the amount of tape covered in 0.1 foot increments. It requires three displays:

```
     | "1"  DDDDD | "2" DDDDD | "3" DDDDD |
```

The odometer must be initialized at some point from a configuration tape. Until it is initialized, it will display "*****" indicating that it is inoperative.

INFO 12 - SYSTEM SOFTWARE CLOCK

Displays the system clock.

The system clock is four bytes long with a least count of (approx 1/20) sec. The system clock is initialized to zero when the drive is powered up. It is maintained by the drive controller within the drive controller DPR. All time stamps used within machine logs use the system software clock. Time is displayed in hours, minutes, and seconds of operation.

```
      | DDDDD |      DD|     DD|
          (hrs)    (min)   (sec)
```

INFO 13 - POWER CYCLES

Displays the number of times the drive power has been cycled.

```
    | DDDDD |
```

The power cycle log must be initialized at some point from a configuration tape. Until it is initialized, it will display "*****" indicating that it is inoperative.

INFO 15 - BATTERY DATE

Displays last two digits of the year the battery was installed.

```
    |  DD  |
```

INFO 20 - DRIVE REPOSITIONING STATISTICS

Displays drive repositioning statistics.

```
  | "FM"  DD | "FV"  DD | "RM"  DD | "RV"  DD |

  "FM"  DD - forward reposition error mean in mils.
  "FV"  DD - forward reposition error variance in mils squared.
  "RM"  DD - reverse reposition error mean in mils.
  "RV"  DD - reverse reposition error variance in mils squared.
```

INFO 21 - TAPE AUTO LOAD STATISTICS

Displays tape auto load statistics.

```
  | "LS" DDD | "LR" DDD | "LA"DDDDD |

  "LS" DDD  - the percentage of successful loads.
  "LR" DDD  - the percentage of successful loads requiring
              retries.
  "LA"DDDDD - the total number of loads attempted.
```

INFO 24 - INTERFACE OPTION IDENTIFICATION

Displays the interface option identification message.

The identification of the interface option message is displayed.

INFO 25 - FIRMWARE REVISION NUMBER

Displays code revision numbers of all processors.

The revision number of code within each of the processors is be displayed. Four displays are sequenced with each display having the following format.

```
| D DDD |

D     - Processor ID number
DDD   - Version number (D),  Revision number  (DD)
```

INFO 30 - TAPE WRITE COMPRESSION RATE (HP7980XC)

Displays the current tape compression rate as a percentage.

The tape write compression rate for the last compressed (XC format) tape written is displayed. The number displayed shows the amount of tape required for a normal GCR tape compared to the XC format tape generated. A value of 240 would indicate a 2.4 to 1 tape compression.

```
| DDDDD |

DDDDD   - tape compression rate percentage.
```

SYSTEM CONFIGURATIONS

Configurations 40 through 96 are system configuration parameters. These values are stored in non-volatile RAM and a powerup copy is stored in normal RAM. Displaying a configuration displays the powerup copy.

Configurations may be displayed using either the "CONF xx" or "INFO xx" utilities. Configurations can be changed only by using the Configuration utility. Changing a configuration affects the powerup copy and, if the non-volatile RAM Configuration #40 is enabled (Enable Front Panel Non-Volatile RAM Change), changes the Non-Volatile RAM.

AFTER REVISION 3.40 FIRMWARE

The capability to change individual configurations from the front panel can either be enabled or disabled by the use of a password procedure (explained later). Also, the capability to change individual configurations from the front panel may be left active for use by the operator.

Configuration "Lock" information is maintained in Configurations 140 through 196.

If the capability to set a configuration is locked out, "INVALID" is displayed when that configuration number is accessed with the "CONF xx" utility.

CHANGING/UNLOCKING CONFIGURATIONS

Access passwords are in Configuration location numbers 100 and 101. The two passwords for configuration changes are 48 (in CONF 100) and 76 (in CONF 101). With these two passwords entered, access is available to change locked configurations 40 through 96 and to change the locks to ON or OFF (enabling the user to change these configurations at will). Normally, service personnel will be called on to change a particular configuration, but a continuing capability to change that configuration by the user will not be made available. However, the procedure for leaving the customer that capability is also included in the following procedure.

Example: To change CONF 82, which switches the AMIGO ID from that of a 7980A to that of a 7978B, perform the following steps:

1. Select CONF 100 and set it to 48.
2. Select CONF 101 and set it to 76.
3. Select CONF 40 and set it to "ON" (keeps change in NVRAM).
4. Select CONF 82 and set it to "HP7978".

To unlock CONF 82 so the user can change it from the front panel without passwords, do Step 5. Otherwise go to Step 6.

5. Select CONF 182 and set it to "OFF". (Configuration locks are stored in the CONF number plus decimal 100. In this example, 82+100=182.)

6. Cycle the power to OFF to erase the passwords.

To lock CONF 82 again:

7. Select CONF 100 and set it to 48.
8. Select CONF 101 and set it to 76.
9. Select CONF 182 and set it to "ON".
10. Power cycle the drive to enable the lock.

The passwords to clear the Odometer and powercycle logs are 63 for CONF 100 and 21 for CONFIG 101. To clear the Odometer or powercycle log after a NVRAM initialization, use the following example.

Example: To clear and reset the Odometer to zero from "******", do the following:

1. Select CONFIG 100 and set it to 63.
2. Select CONFIG 101 and set it to 21.
3. Select CONFIG 10 and set it to "CLEAR".

Selecting INFO 10 now displays "0" instead of "******".

SELECTING CONFIGURATIONS

The first four configurations are used for clearing logs.

CONF 0 - Allows the ERROR LOG to be cleared.

CONF 1 - Allows the ERROR RATE LOG to be cleared.

CONF 3 - Allows the cumulative GCR data to be cleared.

CONF 4 - Allows the cumulative PE + NRZI data to be cleared.

CONF 40 - ENABLE FRONT PANEL NVRAM CHANGE

Allows setting to OFF or ON.

Allows changes to the non-volatile configurations to be made from the front panel. This configuration is NOT maintained in non-volatile RAM, and is initialized to OFF at powerup.

CONF 41 - AUTO ONLINE

Allows setting to OFF or ON.

Causes the drive to place itself online automatically when the tape has completed loading.

CONF 42 - MEDIA REMOVAL

Allows setting to OFF or ON.

This variable controls the ability of the operator to remove media from the drive. When OFF, only the host can release the media. This configuration is provided for use with the SCSI host interface, and may not be applicable to other interfaces.

CONF 43 - OPERATOR TIMEOUT

Allows setting to OFF, or 1-99 seconds.

This configuration controls the timeout used with interactive operator selections. THIS CONFIGURATION IS ONLY AVAILABLE ON CCL II DRIVES.

CONF 44 - ARCHIVAL REWIND

Allows setting to ATC or REW.

When set to ATC (Archival Tape Rewind), the drive performs all rewinds operations at a slower archive speed which allows precise packing of the tape. This configuration is read each time a tape is loaded. Changing this configuration while a tape is loaded will not change how the current tape rewinds.

CONF 45 - OPERATOR SELECT ARCHIVE

Allows setting to OFF or ON.

When ON, the drive will prompt the operator when loading a new tape to select the archive speed (ATC) or the normal speed (REW) for rewind.

CONF 46 - DENSITY

Allows setting to a value of 800, 1600, OR 6250

This configuration is the default density for a written tape. This density will automatically be written on a tape when a record is written with the drive positioned logically at BOT. The densities are as follows.

800 - 800 BPI NRZI format will be written.
1600 - 1600 BPI PE format will be written.
6250 - 6250 BPI GCR format will be written.

CONF 47 - FP DENSITY CONTROL (non- HP 7980XC)

Allows setting to OPEN, LOCK, I* OPEN, I* LOCK

This configuration controls front panel selection of write density. THIS CONFIGURATION MODE IS ONLY AVAILABLE ON NON-XC DRIVES.

OPEN - Either the host or the front panel can select density

LOCK - Only the front panel can select density.

I* OPEN - Flash the current density in the front panel before loading a tape to allow the operator to select between the density. If the operator timeout elapses, load the tape using the selection presently flashing. This selection can overridden by the host.

I* LOCK - Same as I* OPEN but the host can not override the selection.

CONF 47 - COMPRESSION CONTROL (HP7980XC)

Allows setting to XC OFF, XC ON, IXC OFF, and IXC ON

This configuration controls front panel selection of data compression. THIS CONFIGURATION IS ONLY AVAILABLE ON AN HP 7980XC TAPE DRIVE.

XC ON - Write only 6250 tapes in compressed format unless overridden by the host.

XC OFF - Do not write any tapes in compressed format unless overridden by the host.

IXC ON - Flash XC ON on the front panel before loading a tape to allow the operator to select between XC ON and XC

OFF. If 10 seconds elapse, load the tape using the selection presently flashing. This selection can be overridden by the host.

IXC OFF - Same as IXC ON but flash XC OFF on the front panel. This selection can be overridden by the host.

CONF 48 - LANGUAGE

Allows setting values of 0 - 63.

0 - English
1 - German
2 - French
3 - Spanish

add 4 to language - replaces 'READY ' message with 'NO TAPE'
add 8 to language - replaces 'READY ' message with 'UNIT #'
add 16 to language - replaces 'READING' (during retries) with 'RETRY'
add 32 to language - distributor version of front panel (with DENSITY key)

CONF 49 - RECOVERED ERROR REPORT

Allows setting to OFF, 1, 2.

When configured to OFF, recovered (soft) errors are not reported to the host.

When configured to 1, all soft errors are reported (includes soft errors which required retries or data records corrected "on the fly" during reads).

When configured to 2, only soft errors requiring retries are reported.

CONF 50 - IMMEDIATE RESPONSE ENABLE

Allows setting to OFF or ON.

This variable controls the use of immediate response on write operations by the buffer controller. It must be enabled for the drive to stream writes.

CONF 51 - TAPE MARKS TO DISABLE IMMEDIATE RESPONSE

Allows setting to OFF, or 1 - 99.

This variable contains a tape mark limit. If consecutive tape marks are received equal to or beyond this limit, Immediate response will be disabled for that command.

CONF 52 - WRITE RETRY COUNT

Allows setting values of 0 - 40.

This variable contains the maximum retry count used by write commands.

CONF 53 - PE & NRZI GAP SIZE

Allows setting values of 0 - 15.

This variable sets minimum and maximum PE and NRZI gap sizes (in inches).

PE GAP SIZE SELECTION

	MIN	MAX
0	0.50	0.50
1	0.50	0.60
2	0.50	1.00
3	0.50	1.50
4	0.50	2.00
5	0.60	0.60
6	0.60	1.00
7	0.60	1.50
8	0.60	2.00
9	1.00	1.00
10	1.00	1.50
11	1.00	2.00
12	1.50	1.50
13	1.50	2.00
14	2.00	2.00

15	0.60	6.00

CONF 54 - GCR GAP SIZE

Allows setting to a value of 0 - 22.

This variable sets minimum and maximum GCR gap sizes (in inches).

GCR GAP SIZE SELECTION

	MIN	MAX
0	0.28	0.30
1	0.30	0.30
2	0.30	0.45
3	0.30	0.60
4	0.30	1.00
5	0.30	1.50
6	0.30	2.00
7	0.45	0.45
8	0.45	0.60
9	0.45	1.00
10	0.45	1.50
11	0.45	2.00
12	0.60	0.60
13	0.60	1.00
14	0.60	1.50
15	0.60	2.00
16	1.00	1.00
17	1.00	1.50
18	1.00	2.00
19	1.50	1.50
20	1.50	2.00
21	2.00	2.00
22	0.30	6.00

CONF 55 - STOP AT EOT

Allows setting to OFF or ON.

This variable controls the stopping of writes at EOT. When set, all write data within the buffer when EOT is encountered must be handled manually by the interface.

CONF 56 - WRITE HOLDOFF TIMEOUT

Allows setting to a value of 0 - 20 seconds. (FRU 4 Buffer Controller)

Allows setting to a value of 0 - 99 seconds. (FRU 14 or 24 Buffer Controller)

With immediate response ON, write data will be held within the buffer no longer than this timeout.

CONF 57 - FIXED WRITE STARTUP POINT

Allows setting to OFF,1 - 7 eights of buffer or queue size.

With immediate response ON, the tape will be started up to write data when either the buffered data or the number of queued commands reaches the startup threshold. OFF disables fixed selection allowing the drive to auto select the startup point based on the conditions encountered. The OFF option is only available on units with an FRU 14 or 24 Buffer Controller.

CONF 58 - WRITE SKIP START

Allows setting to 0 - 3 retries.

This configuration will selects the number of write retries to attempt before performing a write skip (gap) operation, except in diagnostics which always uses 3 retries.

CONF 59 - WRITE CONTROL

Allows setting to a value of 0 - 63.

This configuration controls write related functions. The configuration is defined in bits as follows:

B0 - Performs automatic write reposition when the tape is stopped during writes (add 1 to CONFIG value)

B1 - Short trailing erase during writes. Normally about 18 inches are erased when the tape is stopped during writes. (Add 2 to CONFIG value)

B3,B2 - Hard write error control at 10 feet beyond EOT marker

0,0 = Hard write after 10 feet beyond EOT marker and beyond Early EOT point
X,1 = No hard write after 10 feet beyond EOT marker (adds 4 to CONFIG value)
1,0 = Hard write after 10 feet beyond EOT marker (adds 8 to CONFIG value)

B4 - For specific OEM use only. Should be set to zero for normal operations.

B5 - Select data/gap threshold level (firmware revision dependent).

0 = normal head value (revision 3.85), low amplitude head value (revision 6.55 only).

1 = normal head value (revision 6.55 only), low amplitude head value (revision 3.85).

CONF 60 - READAHEAD ENABLE

Allows setting to OFF or ON.

This variable controls the use of readaheads by the buffer controller. It must be enabled for the ~drive to stream reads.

CONF 61 - TAPE MARKS TO TERMINATE READAHEADS

Allows setting to OFF, or 1 - 99.

This variable contains a tape mark limit across which the drive will not readahead. This configuration is inoperative when blocked format is used.

CONF 62 - READ RETRY COUNT

Allows setting to a value of 0 - 40.

This variable contains the maximum retry count used by read commands. NRZI retry count is two times the specified retry count.

CONF 63 - TRAILING BUFFER

Allows setting to a value of 0 - 6.

The drive has the capability of performing electronic backspacing without moving the tape, if there is data within the buffer that can be recovered. A portion of the buffer may be reserved as a trailing buffer, guaranteeing that electronic backspacing can always be performed. This configuration is inoperative when blocked format is used. The amount reserved is as follows:

0 - No trailing buffer. The entire buffer is used for readaheads
1 - Up to 1 record or 16K bytes reserved
2 - Up to 2 records or 32K bytes reserved
3 - Up to 3 records or 48K bytes reserved
4 - Up to 4 records or 64K bytes reserved
5 - Up to 5 records or 80K bytes reserved
6 - Up to 6 records or 96K bytes reserved

CONF 64 - READ STARTUP POINT

Allows setting to 1 - 7 eighths of buffer or queue size.

With readaheads ON, the tape will be started up to read additional data when either the buffered data or the number of queued commands decreases to the startup threshold.

XC OPTION CONFIGURATIONS

CONF 65 - PHYSICAL RECORD SIZE

Allows setting to 1 - 32.

In XC format, all records and tape marks from the host are put into data records on the tape. These data records are termed "Physical" records. The nominal size of them is specified in multiples of 4K bytes as follows:

1 - 4K bytes

N - N*4K bytes

32 - 128K bytes

CONF 66 - MAXIMUM FILES PER PHYSICAL RECORD

Allows setting to OFF, or 1 - 99.

This configuration specifies the limit to the number of files or parts of files allowed within a single physical record. For example, if a value of 3 is specified, a physical record may contain up to three complete files and no more.

CONF 67 - MAXIMUM BYTES PER PHYSICAL RECORD

Allows setting to OFF, or 1 - 99.

This configuration specifies the limit to the number of bytes from the host that is allowed within a single physical record. It is specified in multiples of 16K bytes.

CONF 70 - EXPANSION PROTECTION

Allows setting to ON or OFF.

The data compression hardware can expand data that has already been compressed. If this occurs, the benefits of compressing the data are lost. The drive has the ability to watch for expansion and turn it off until it sees it compress. It is enabled or disabled by this configuration.

CONF 73 - DATA COMPRESSION OPTIMIZATION SAMPLE PERIOD

Allows setting to OFF, or 1 - 4.

The drive has the ability to monitor the compression rate of the data as it is being received. A significant degradation in this rate indicates that the type of data has changed. If this occurs, the drive can adapt to the new data. This process of monitoring and adapting is called "optimization".

This configuration enables or disables the optimization feature as follows:

OFF - No optimization will be performed.
1 - The compression rate will be sampled every 512 bytes.
2 - The compression rate will be sampled every 1K bytes.
3 - The compression rate will be sampled every 2K bytes.
4 - The compression rate will be sampled every 4K bytes.

CONF 74 - DATA COMPRESSION OPTIMIZATION THRESHOLD

Allows setting to OFF or 0 - 63.

The sensitivity of the optimization feature to changes in data may be specified by a threshold. If the compression rate ever falls below this threshold, the drive will adapt to the new data. The threshold is specified as follows:

Where N is the value of configuration 74,

threshold = (64/(64-N))

FRONT PANEL CONFIGURATIONS

CONF 75 - GAGE USAGE

Allows setting to 0 - 3

The gage at the bottom of the front panel may be used to indicate the one of three things:

0 - Relative position between BOT and EOT. (uses BOT,EOT and 10 lights)
1 - Amount of data in the buffer (64K per light - uses 8 lights)
-revision 6.0 and later firmware (50K per light - uses 10 lights)
2 - Number of commands/reports in the queue (10 per light - uses 10 lights)
-revision 6.0 and later firmware (24 per light - uses 10 lights)
3 - Tape write compression ratio (7980XC only) (# of lights = compression ratio)

CONF 76 - NO BREAK ON FAILURE

Allows setting to OFF or ON.

Failures which occur while looping diagnostic tests or running a test sequence will not cause the test to terminate, The errors will be logged in the error log and the test continued. Each individual test, will however only run until a single error occurs.

CONF 77 - ACTIVITY INDICATOR

Allows setting to OFF, 1 - 3.

Displays an indicator in the right most digit of the front panel when there are host commands being processed during drive idle time.

1 - indicator = '-'
2 - indicator = '--'
3 - indicator = '*'

CONF 78 - LOCK HOST DENSITY CHANGE

Allows setting to OFF or ON.

This configuration determines whether the host can change the configured density of the drive. If this configuration is ON the host cannot change the tape drive's configured write density.

This configuration is supported by the PERTEC and SCSI interfaces only. This configuration is NOT supported by HP-IB.

CONF 79 - LOCK INTERFACE ADDRESS/ID

Allows setting to OFF or ON.

This configuration determines whether the interface address (or ID) can be changed from the front panel. If this configuration is ON the interface address (or ID) is locked. When locked, the interface address (or ID) can be viewed from the front panel, but attempts to change it with the NEXT and PREV keys will display "INVALID".

CONF 80 - ENABLE INTERFACE NV CHANGE

Allows setting to OFF or ON.

Not available from the front panel. This configuration allows the interface to make changes to the non-volatile configurations.

HP-IB INTERFACE CONFIGURATIONS

CONF 81 - UNLOAD AFTER REWIND OFF LINE

Allows setting to OFF or ON

The tape will be unloaded when an offline rewind command is issued.

CONF 82 - 7978/7980 AMIGO ID

Allows setting to 7974 or 7979 on a HP7979A
Allows setting to 7978 or 7980 on a HP7980A
Allows setting to 7978, 7980 or 7980XC on a HP7980XC

This configuration determines the AMIGO ID which the host system can read. When configured to HP7978 (or HP7974) the device will also write density ids immediately upon receiving a Set density command. NO other compatibilities between the products are guaranteed besides those provided by their HP-IB protocol specifications, and specifically, the ability to run 7978 diagnostic sequences is NOT supported. The AMIGO IDS are: HP7974=0174H, HP7978=0178H, HP7979=0179H, HP7980=0180H, HP7980XC=0181H.

CONF 96 - RETURN LOGS SELECT (HP7980XC only)

Allows setting to 0 thru 4.

This configuration determines what information is returned by a read logs secondary command from the host when issued to a HP7980XC. The possible values are:

0 - return all logs
1 - return error log only
2 - return error rate log only

3 - return controlled Non-volatile RAM only
4 - return drive controller logs only

The HP7979A and HP7980A only support "return all logs"

PERTEC INTERFACE CONFIGURATIONS

CONF 81 - COMPATIBILITY

Allows setting to 1 - 2.

The interface may be set to use either CIPHER or CDC PERTEC commands.

1 - CIPHER 990 compatible
2 - CDC compatible (or CIPHER 880)

CONF 82 - READ REVERSE

Allows setting to 1 - 2.

The configuration controls the function of read reverse. This configuration is only supported by A HP88780A REV B interface.

1 - Read reverse with forward data
2 - Read reverse with NO data transfer (space reverse)

CONF 83 - FAST READ

Allows setting to 1 - 2.

1 - uses a shorter internal command sequence to implement the read request
2 - uses a longer internal command sequence to implement the read request

CONF 84 - HARD ERROR OFFLINE

Allows setting to 1 - 2.

1 - A hard error during writes will cause the drive to go offline

A "BAD TAPE" or "HARD ERROR" message will flash in the display.
2 - A hard error during writes will NOT cause the drive to go offline

CONF 85 - REPORT BOT WRITE

Allows setting to OFF or ON.

OFF - A write command at BOT will not report until the write is completed to tape
ON - A write command at BOT can be "Immediate Responsed" (if enabled)

CONF 86 - WRITE TRANSFER RATE

Allows setting to 0 thru 25.

The write transfer rate controls the data transfer rate during writes. The duty cycle is defined relative to down time of the IWSTR line.

NOTE

Transfer rates above 1.6 Mhz are for future designs. They will not work with the current implementation.

#	rate (Mhz)	duty cycle
0	2.67	33%
1	2.00	50%
2	2.00	25%
3	1.60	40%
4	1.60	20%
5	1.33	50%
6	1.33	33%
7	1.14	42%
8	1.14	28%
9	1.00	50%
10	1.00	25%
11	.889	44%
12	.889	22%
13	.800	40%
14	.800	20%
15	.727	36%

16	.727	27%
17	.667	50%
18	.667	33%
19	.571	42%
20	.571	28%
21	.500	50%
22	.500	25%
23	.400	40%
24	.400	20%
25	.333	33%

CONF 87 - READ TRANSFER RATE

Allows setting to 0 thru 25.

The read transfer rate controls the data transfer rate during reads. The duty cycle is defined relative to down time of the IRSTR line.

(See WRITE TRANSFER RATE, CONFIG 86, for values of transfer rates)

CONF 88 - WRITE DELAY

Allows setting to 0 - 3

This configuration controls the write delay which is time from rising edge of IWSTR to the data strobe that latches the data into the buffer.

0 = + 40 nsec
1 = 0 nsec
2 = - 70 nsec
3 = -130 nsec

CONF 89 - READ DELAY

Allows setting to 0 - 2.

This configuration controls the read delay which is the hold time for data after the rising edge of IRSTR.

0 = 10 nsec
1 = 130 nsec
2 = 250 nsec

CONF 90 - DENSITY ON NRZI LINE

Allows setting to 0 - 7.

0 = NRZI line will only reflect if the drive is host or front panel selected to write NRZI.

1 = NRZI line will reflect if the drive is host or front panel selected to write NRZI OR the current tape density is NRZI (see NOTE after this list).

2 = NRZI line will only reflect if the drive is host or front panel selected for GCR.

3 = NRZI line will reflect if the drive is host or front panel selected to write GCR OR the current tape density is GCR (see NOTE after this list).

4 = NRZI line will only reflect if the drive is selected to write NRZI/GCR.

5 = NRZI line will reflect if the drive is host or front panel selected to write NRZI/GCR OR the current tape density is NRZI/GCR.

6 = NRZI line will only be asserted if the tape has been identified as NRZI. Density changes either host or front panel will update the NRZI line during the Ident phase of the first write at BOT.

7 = NRZI line will only be asserted if the tape has been identified as GCR. Density changes either host or front panel will update the NRZI line during the Ident phase of the first write at BOT.

8 = NRZI line will only be asserted if the tape has been identified as NRZI/GCR. Density changes either host or front panel will update the NRZI line during the Ident phase of the first write at BOT.

NOTE

If the drive is configured to write in a density other than one which is selected to be shown on the NRZI line, then the NRZI line will be de-asserted during the Ident phase of the first write at BOT.

CONF 91 - EOT AT EARLY EOT

Allows setting to OFF or ON.

OFF = EOT during writes is reported after the physical EOT marker is detected
ON = EOT during writes is reported when there is about 50 feet of tape left

CONF 92 - HARDWARE DENSITY SELECTION

Allows setting to OFF, 1 or 2.

OFF = Hardware lines do not select density

1 = IDEN line (P2 pin 50) selects density:
logic 0 = PE, 1 = GCR

2 = IHIDEN line (P1 pin 36) selects density:
logic 0 = PE, 1 = GCR

CONF 93 - SPECIAL OPTIONS

Allows setting to 0 or 1.

0 = Transfer write data as soon as hardware is ready

1 = Wait 100 uS after IDBY is asserted to transfer data (PERTEC specification).

SCSI INTERFACE CONFIGURATIONS

CONF 81 - BLOCK LENGTH

Allows setting to 0 - 9.

The block length is the size that records will be written to the tape.

Configuration value	Block length (in bytes)
0	0 (variable length blocks)

1	8
2	256
3	512
4	1K
5	4K
6	16K
7	32K
8	128K
9	256K

CONF 82 - BUS INACTIVITY LIMIT

Allows setting to 0 - 9.

The bus inactivity limit indicates the maximum time that the target is allowed to maintain the bus busy without handshakes until it must disconnect.

For firmware revisions up to (but not including) 3.78:

Config value	Bus inactivity limit (in 200 usec)
0	0FFFFH (default value)
1	0100H
2	0200H
3	0400H
4	0800H
5	1000H
6	4000H
7	6000H
8	8000H
9	0H (always disconnect as soon as possible)

For firmware revisions 3.78/6.30 and beyond:

Config value	Limit Word (in 240 msec)	Bus inactivity limit (in msec)
0	0FFFFH	15000
1	00008H	2
2	00020H	8
3	00080H	30
4	00200H	125
5	00400H	250
6	00800H	500
7	01000H	1000

8	04000H	4000
9	Auto disconnect	

CONF 83 - DISCONNECT TIME LIMIT

Allows setting to 0 - 9.

The disconnect time limit indicates the minimum time that the target should remain disconnected until it attempts to reselect.

Config value	Time limit (in 100 usec)
0	0 (reselect immediately)
1	1
2	8
3	256
4	512
5	1K
6	4K
7	16K
8	32K
9	64K-1

CONF 84 - DISCONNECT LENGTH

Allows setting to 0 - 9.

The disconnect length indicates the amount of data that is to be transferred between SCSI bus disconnects.

Config value	Length (bytes)
0	0 (no limit on data transferred)
1	512
2	1K
3	2K
4	4K
5	16K
6	32K
7	64K
8	128K
9	256K

CONF 85 - INQUIRY FIELD

Allows setting to 0 - 127.

The inquiry field allows the user to set a seven bit user specified code in the device-type qualifier field of the inquiry data.

CONF 86 - INTERFACE ONLY RESET

Allows setting to OFF or ON.

OFF - full poweron reset when bus reset is received

ON - interface only reset when bus reset is received

CONF 87 - READ EOM REPORTED

Allows setting to OFF or ON.

OFF - no EOM reported

ON - EOM reported

CONF 88 - SCSI II COMPATIBLE

Allows setting to OFF or 1.

OFF - not SCSI II compatible

1 - SCSI II compatible

CONF 89 - EOT REPORTING MODES

Allows setting to 0 - 3.

Bit map

B0 = 0	report EOT at EOT marker
B0 = 1	report EOT at Early EOT point
B1 = 0	set only EOM bit in sense data at EOT
B1 = 1	set EOM and volume_overflow sense key at EOT

CONF 90 - SCSI PARITY CHECKING

Allows setting to OFF or ON.

OFF - SCSI bus parity is not checked

ON - SCSI bus parity is checked

CONF 91 - VENDOR-UNIQUE DENSITY REPORTING

Allows setting to OFF or ON.

OFF - Vendor unique density not reported (bits 6 & 7 of density code cleared)

ON - Vendor unique density reported (in bits 6 & 7 of density code)

CONF 92 - SUPPRESS ILLEGAL LENGTH6

Allows setting to OFF, 1, 2.

OFF - Normal operation of SILI/ILI bits.

1 - Automatically suppress ILI on underlength (blocksize<requestsize) and SILI=0 (variable block mode only)

2 - Do not suppress ILI on overlength (blocksize>requestsize) and SILI=1 (variable block mode only).

CONFIGURATION PASSWORDS

Configuration 100 and 101 must be set to their proper values to enable access to the configuration locks (configuration 140 thru 196), or to allow clearing of certain system information (CONFIG 10 and CONFIG 13).

NOTE

Configurations 100 and 101 must be set to their proper values to enable access to the configuration locks (located in Configurations 140 through 196) or to allow clearing of PROTECTED CONFIGURATIONS

(Configuration 10, Odometer and Configuration 13, Power Cycle Log). See "CHANGING/UNLOCKING CONFIGURATIONS" on page 8-53 for procedure -- use the appropriate password.

CONF 100 - CONFIG LOCK PASSWORD #1

Allows setting to 0 - 99.

48 - proper password to access configuration locks

63 - proper password to access clearing protected configurations

CONF 101 - CONFIG LOCK PASSWORD #2

Allows setting to 0 - 99.

76 - proper password to access configuration locks

21 - proper password to access clearing protected configurations

CONFIGURATION LOCKS

Configuration 140 thru 196 represent the configuration locks for configuration 40 thru 96 respectively. A value of "ON" indicates that the configuration is locked. If the configuration password is not set these configurations will return as "INVALID" when accessed with the "CONFIG" utility.

[8] UTILITY REFERENCE TABLE

Each of the configurations/data structures are tabulated together with the mechanisms for accessing them from the front panel.

The poweron value of each item is listed. The symbol "nv" indicates the information is retained in non-volatile RAM.

The HP-IB interface default for each configuration is listed. Any configuration labeled "LCK" cannot be changed by the operator.

Data structure	#	CONFIG type	CONFIG poweron	INFO display
LOGS 0 - 29				
Error log	0	Clear/Save	nv	Error entry
Error rate log	1	Clear/Save	nv	Rate entry
Last error rate	2	-	nv	Rate
Cum GCR error data	3	Clear/Save	nv	Rate entry
Cum PE error data	4	Clear/Save	nv	Rate entry
Cumulative error rate	5	-	nv	Rate
Odometer	10	-	nv	Odometer
System clock	12	-	0	Sys clock
Power cycles	13	-	nv	Count
Power fail info	14	-	nv	
Battery date	15	0-99	nv	Date
Drive statistics	20	Clear/Save	nv	Drive stats
Auto load statistics	21	Clear/Save	nv	Load stats
DRIVE INFO 25 - 29				
Firmware revisions	25	-	ROM	revision

SYSTEM CONFIGURATION 40 - 96

Configuration	#	type	HPIB DEFLT		SCSI/PERT	
Enable FP change	40	OFF/ON	OFF	LCK	OFF	LCK
Auto online	41	OFF/ON	OFF		OFF	LCK
Media removal	42	OFF/ON	ON	LCK	ON	LCK
Archival rewind	44	OFF/ON	OFF		OFF	LCK
Operator select archive	45	REW/ATC	REW		REW	LCK
Density	46	1600 ..	6250	LCK	6250	LCK
FP density control	47	OPEN..	OPEN	LCK	OPEN	LCK
Language	48	0-99	0		0	LCK
Recovered error rpt	49	OFF/ON	ON	LCK	ON	LCK
Immediate response	50	OFF/ON	ON	LCK	ON	LCK
TM to disable IR	51	OFF/1-99	2	LCK	2	LCK
Write retry count	52	0-99	17	LCK	17	LCK
1600 PE gap size	53	0-15	6	LCK	6	LCK
6250 GCR gap size	54	0-22	4	LCK	4	LCK
Stop at EOT	55	OFF/ON	0	LCK	0	LCK
Write holdoff timeout	56	0-20	5	LCK	5	LCK
Write startup point	57	1-7	2	LCK	2	LCK
Readaheads	60	OFF/ON	ON	LCK	ON	LCK
TMs to terminate RA	61	OFF/1-99	2	LCK	2	LCK
Read retry count	62	0-99	9	LCK	9	LCK
Trailing buffer	63	0-6	0	LCK	0	LCK
Read startup point	64	1-7	2	LCK	2	LCK
Gage usage	75	0/1/2	0	LCK	0	LCK
No break on failure	76	OFF/ON	OFF	LCK	OFF	LCK
Activity Indicator	77	OFF/1-3	OFF	LCK	OFF	LCK
Enable INT NV change	80	OFF/ON	ON	LCK	ON	LCK
HP-IB specific						
Unload after rewind	81	OFF/ON	OFF		---	
HP7978/7980 hpib ID	82	7978/7980	7980	LCK	---	
PERTEC specific						
Compatibility	81	1 - 2	---		1	LCK

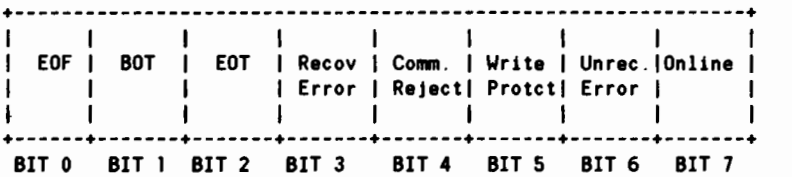
SCSI specific					LCK
Block length	81	0 - 9	---	0	LCK
Bus inactivity limit	82	0 - 9	---	0	LCK
Disconnect time limit	83	0 - 9	---	0	LCK
Disconnect length	84	0 - 9	---	0	LCK
Inquiry field	85	0 - 127	---	0	LCK
Interface only reset	86	OFF/ON	---	ON	LCK
Read EOM reported	87	OFF/ON	---	ON	LCK
SCSI II compatible	88	0 - 1	---	0	LCK

[9] I/O STATUS DECODE FROM LISTLOG

The following status values are returned by the tape driver and are found in the PCB/STAT word of a LISTLOG listing. (% = octal)

GENERAL STATUS (13:3)	QUALIFYING STATUS (8:5)	OVERALL VALUE
0 - Pending	1 - completion wait	%10
	3 - "Not Ready" Wait	%30
	4 - "No Write Ring" Wait	%40
1 - Successful	0 - no errors	%1
	2 - retry was necessary	%21
	3 - EOT after write	%31
2 - End-of-file	1 - A tape mark was read or P1 was non-zero and the last record read was a tape mark	%12
3 - Unusual Condition	3 - request aborted	%33
	4 - prior'ERR'abort	%43
	5 - pass'EOV'abort	%53
	6 - powerfail abort	%63
	7 - BOT and backspace requested	%73
	%10 - tape runaway	%103
	%11 - EOT and write requested	%113
	%21 - device powered up	%213
	%23 - set density and not at load point	%233
4 - Irrecoverable Error	0 - invalid request	%4
	1 - transmission error	%14
	3 - timing error	%34
	4 - SIO Failure	%44
	5 - unit failure	%54
	%12 - system error	%124
	%14 - channel failure	%144

Word 0, Byte 1 (Status Register #1)



BIT 7: 1 = Online
0 = Offline

This bit indicates the current status of the tape drive. It is set after the operator has loaded a tape and pressed the ONLINE Button. It is cleared when the operator presses the RESET Button, upon acceptance of the rewind-offline command, or when a tape has lost tension.

The tape drive must be online in order to accept tape commands. This condition is only checked when the command is being validated. If a tape command is issued when this bit is cleared, then the command rejected bit will be set, the command reject error class will indicate device reject, and register #5 will indicate drive not online.

Corrective action for this condition should be to prompt the user to bring the drive online and wait.

BIT 6: 1 = Unrecovered data/format error
0 = No unrecovered data/format error

This bit is set for any unrecovered recording error encountered during read or write operations. This condition can only exist after all retries have been exhausted. These errors include tape velocity or tension out of spec, formatter errors, multiple tracks in error, failure to verify a write, data format error, gap before end of data, redundancy check error. The highest priority cause for the setting of this bit is contained in the contents of status register #5.

The multiple tracks in error condition occurs when two or more tracks were in error for a PE read or write, when two or more tracks were in error for GCR write, or when three or more tracks were in error for a GCR read.

Corrective action for this condition would be replacement of the tape, and the job run again. When this error occurs data is written or read the best the drive can.

BIT 5: 1 = Write protected
0 = Write enabled

This bit indicates that the write enable ring is missing. This bit is set when the operator has loaded a tape which has no write enable ring and is cleared when this tape is unloaded. If a write operation is attempted when this bit is set, then the command rejected bit will be set, the command rejected error class will indicate device reject, and register #5 will indicate tape is write protected.

Corrective action for this condition should be to issue a rewind offline command and request that the operator insert a write enable ring or load another tape.

BIT 4: 1 = Command rejected
0 = Command accepted

This bit is set when a command has been rejected by the drive due to a device setup error, protocol error, or selftest failure. The reason the command was rejected can be found in status register #4. Register #5 will have further error description.

Corrective action for these conditions are discussed under register #4's description.

BIT 3: 1 = Recovered error
0 = No recovered errors

This bit is used to indicate that error correction and/or retries have taken place during a tape read or write operation.

No corrective action is needed. The host may wish to log the state of this bit along with the retry count.

BIT 2: 1 = Beyond End of tape (EOT)
0 = Not beyond end of tape

This bit indicates whether the tape is currently positioned beyond the end of tape marker. This bit is set when the EOT marker is detected during the processing of a forward motion tape command. This bit is cleared when the EOT marker is detected during the processing of a reverse motion tape command. This status bit is a warning that there is 10 feet of usable recording area left and 25 feet to the end of tape.

Corrective action for this condition is to inform the user's program of this condition. If writing to tape, the user's program should write an end of volume mark (two tape marks) and then rewind the tape. If reading from tape, the user's program should continue until an end of volume mark is read and then rewind the tape.

BIT 1: 1 = At load point (BOT)
0 = Not at load point

This bit indicates whether the tape is currently positioned at load point (beginning of tape). It is set upon the loading of the tape or after a rewind operation. It is cleared when a forward motion command is processed or when the tape is unloaded. When this bit is set the drive will reject backspace record and backspace file commands. When this bit is not set the drive will reject write format commands. If either of these conditions occur the command reject bit will be set, the command reject error class will indicate device reject, and register #5 will indicate either drive at BOT or drive not at BOT.

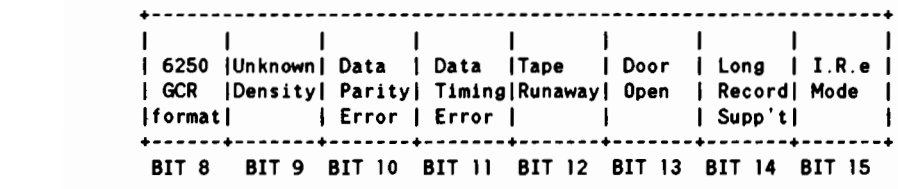
Corrective action for this condition is to inform the user's program.

BIT 0: 1 = At end of file (EOF)
0 = Not at end of file

This bit is set when the drive has detected an EOF on the tape during a read record, forward space record, or backspace record operation. This bit is also set upon successful completion of write file mark, forward space file, or backspace file operations. The end of file is also known as a tape mark or a file mark.

Corrective action for this condition should be to inform the user's program.

Word 0, Byte 2 (Status Register #2)



BIT 15: 1 = Immediate response mode.
0 = Non-immediate response mode.

This bit indicates whether immediate response to write operations is enabled. This bit is set when an enable_immediate_response mode command is received and accepted. This bit is cleared when a disable_immediate_response mode command is received and accepted, or when a tape is unloaded. The default mode at power up is that this bit is cleared.

BIT 14: 1 = Long records supported
0 = Long records not supported

This bit indicates that records up to 32K in PE and 60K in GCR are supported. If not set the maximum is 16K. The HP 7978B, 7979A, and 7980 set this bit, all other drives do not.

BIT 13: 1 = Door open
0 = Door not open

This bit is set when the tape path door is open. It is cleared when the door is closed. This bit will only be set in a transparent status message (DSJ = 2).

BIT 12: 1 = Tape runaway
0 = Not tape runaway

This bit indicates that the drive has read approximately 4.6 meters (15 ft) GCR tape, or 7.6 meters (25 ft) of PE or NRZI tape, without detecting a recorded block. At this point tape motion will stop. Tape runaway is detected for read record and on all space type commands.

Corrective action for this condition should be to inform the user's program. The user's program should issue the appropriate commands to move the tape where data is

recorded. This is normally done with either the rewind, the backspace record, or the backspace file command.

BIT 11: 1 = Data timing error
0 = No data timing error

This bit indicates when a read or write timing error (overrun/underrun) has occurred. Because of the tape drive's data buffer this condition should never occur.

BIT 10: 1 = Data parity error
0 = No data parity error

This bit indicates when data parity error on the drive's internal data bus has been detected. This error can exist on any read record or write record operation. The drive will have completed all possible retries.

Corrective action for this condition should be to issue a backspace record command and then reissue the failed command. If this error persists then there is a hardware problem and the service man should be called.

BIT 9: 1 = UNKNOWN density detected
0 = not UNKNOWN density

This bit will be set when the drive cannot identify the tape as GCR, PE, or NRZI, and the tape is not blank. This bit will be also be set if the density on the tape is not available on the drive. This bit will be cleared when the tape is unloaded or by setting the drive to GCR, PE or NRZI with a valid wrote mode command while at load point. This bit will also be set along with the GCR format bit when reporting a hard error on a data compressed tape.

BIT 8: 1 = GCR (6250 BPI) format
0 = Not GCR format

This bit is set upon the identification of a GCR tape or the setting of the tape drive into the GCR format at load point.

When this bit is cleared there could be no tape loaded or the tape loaded is PE, NRZI, blank, or an unknown density. This bit can only be set by the HP 7978A, 7978B, and 7980.

Word 1, Byte 1 (Status Register #3)

1600 PE format	800 NRZI format	Power Just Rst'ord	HP-IB Command Parity Error	Posit'n Unrecov ered .	F'mattr Error	Servo Error	Cntrl'r Error
BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7

BIT 7: 1 = Controller error
0 = No controller error

This bit indicates that the drive has detected an error in its controller. Register #5 will elaborate on this error condition.

Corrective action for this condition should be to log this error and call service if the failure persists.

BIT 6: 1 = Servo error.
0 = No servo error.

This bit indicates that the drive has detected an error in its servo subsystem. Register #5 will elaborate on this error condition.

Corrective action for this condition should include a visual inspection of the drive by the operator. A poorly loaded tape or defective could cause this error. This error should be logged and the service called if necessary.

BIT 5: 1 = Formatter error.
0 = No formatter error.

This bit indicates that a hardware error has been detected on the drive's formatter board or subsystem. Register #5 will elaborate on this error.

Corrective action for this condition should be to log this error and call service if the error persists.

BIT 4: 1 = Position unrecovered
0 = Position known and correct

This bit will be set when position on the tape (media) is no longer known. Normally, even on an error

condition, the tape is positioned to a known place. However, it is possible for the drive to lose its place in which case this bit will be set. The tension shutdown circuitry will also cause this error. If tape tension is lost the drive will go offline.

BIT 3: 1 = HP-IB command parity error
0 = Correct parity

This bit indicates that the drive's ABI chip has detected a parity error in a HP-IB command byte. These commands include primary bus commands, secondary address bus commands, and universal bus commands. Normal command parity is an odd number of 1's on the DIO lines 1 thru 8.

Corrective action for this condition should be to log the condition. If this error persists, the service man should be called.

BIT 2: 1 = Power has been restored
0 = Normal power condition

This bit is set to 1 whenever power is applied to the drive, either during the normal power up sequence with the on/off switch or during a power fail/recovery sequence. This bit is also set immediately following the execution of a device clear.

Corrective action should be to undergo the power up protocol sequence.

BIT 1: 1 = NRZI (800 BPI) format
0 = Not NRZI format

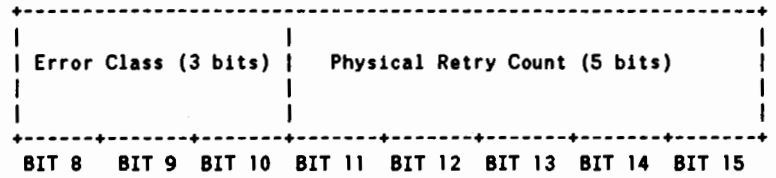
This bit is set upon the identification of a NRZI tape or the setting of the tape drive into the NRZI format at load point. When this bit is cleared, no tape is loaded or the tape loaded is GCR, PE, blank, or an unknown density. This bit can only be set by an HP 7974A with the 800 NRZI option.

BIT 0: 1 = PE (1600 BPI) format
0 = Not PE format

This bit is set upon the identification of a PE tape or the setting of the tape drive into the PE format at load

point. When this bit is cleared, no tape is loaded or the tape loaded is GCR, blank, or an unknown density.

Word 1, Byte 2 (Status Register #4)



BITS 11-15: Retry Count

These five status bits indicates the number of retries performed by the tape drive. These bytes are the same as for the 7976.

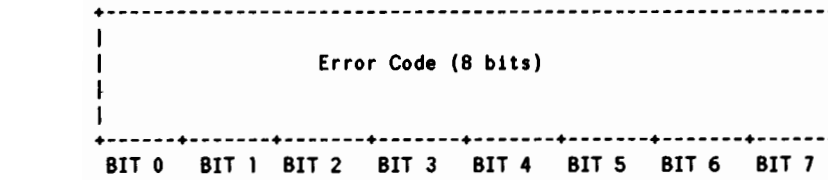
0 = Successful operation complete on first try.
1 = Correctable error detected on first try.
>1 = Number of tries to finally complete the operation, where the success or failure is indicated elsewhere.

BITS 8-9: Error class

These status bits indicate the reason for a command reject error.

0 = No command reject.
1 = Reserved.
2 = Device reject (register #5 contains the reject code).
3 = Protocol reject (register #5 contains the reject code).
4 = Reserved.
5 = Reserved.
6 = Reserved.
7 = Selftest failure.

Word 2, Byte 1 (Status Register #5)



The contents of this register is dependent on the particular error being reported.

If command reject (STATUS REG. #1, BIT 4) is asserted and register #4 indicates a device reject, this register defines the specific error condition as follows:

5 = Device is write protected when a write type command was initiated.

6 = Tape was not loaded when the command was received.

7 = Write density command given but the requested density is not available.

9 = The tape to be read was unidentifiable as to format. The density read may not be available, or the tape may have an unreadable density ID, or may be blank.

10 = The tape to be written is unidentifiable as to format. A Write Record, Write File Mark, or Write Gap command was received but cannot be processed without a Write Format command if the tape was unidentified at load point.

11 = Drive not online.

16 = A write format command was issued but the tape is not positioned at BOT.

19 = A backward type command (except rewind) was just initiated but the tape was already positioned at BOT.

23 = Protocol not synced (Host issued a tape command prior to responding to the device's power-on parallel poll).

24 = The tape command byte received was unknown to the drive.

31 = The length of a write record requested exceeded the maximum record size supported by the drive.

32 = Tape is beyond 10 feet past EOT. Cannot write to tape.

33 = Selftest failure. Drive will not accept tape commands.

37 = Tape positioning failure while removing readaheads.

40 = Door open reject. The door was opened during a long gap while the tape was beyond the end of tape marker. This condition is non-retriable to prevent unspooling of the tape.

If unrecovered data/format error (STATUS REG. #1, BIT 6) is asserted this register specifies the particular error encountered. The status is defined as:

41 = The tape velocity was out of specification.

45 = Multiple tracks were in error. Either two or more tracks were in error for a PE or NRZI write, or two or more tracks were in error for a GCR write.

47 = Failure to verify a tape mark or density ID just written.

48 = Noise on detect. Indistinguishable flux transitions were detected while attempting to detect a recorded block.

49 = Data format error. Flux transitions were found or were missing in the appropriate tracks for a block detect.

50 = Failure to identify tape following a rewind command.

51 = Gap detected before end of data. The read formatter detected a full tape width dropout within the data portion of a data block.

52 = Data block dropout. A full tape width dropout was detected within the preamble or postamble of a data block.

53 = Redundancy check error. The read formatter detected either a CRC, ACRC, LRC, or residual error while reading or verifying a data block.

54 = Read parity error. The read formatter detected an unrecovered parity error within a data block. For PE this error could include multiple tracks in error, and for GCR this error could also include a redundancy check error. (7978B, 7979A, 7980 only).

55 = Abnormal command abort, door opened.

57 = (HP 7974A only) Maximum skew exceeded.

58 = (HP 7974A only) False preamble or postamble detected.

59 = Corrected data error on write.

60 = Buffer overrun. The record size exceeded the maximum record size supported on a read.

61 = Data block timeout. Could not detect the gap following a data block. Could be caused by a record length longer than what the drive supports on read.

62 = Tape mark dropout. A full tape width dropout was detected within a tape mark.

63 = Tape mark unverified. A tape mark was detected which does not meet ANSI specifications in terms of flux transitions and erasure in the appropriate tracks.

64 = Tape mark timeout. Could not detect the gap following a detected tape mark.

If position unrecovered (STATUS REG. #3, BIT 4) or Servo error (STATUS REG. #3, BIT 6) is asserted, this register will define the specific error condition as follows:

81 = Servo controller unresponsive. The servo will not take data from the master controller.

82 = Servo failed to reach the desired state requested by the master controller.

83 = Servo shutdown. The servo system lost tape tension unexpectedly.

84 = Servo controller hard failure. The servo controller has detected a hard failure within itself.

85 = Servo protocol error. An invalid byte was received by the servo from the master controller.

86 = A run time error was detected by the servo.

87 = In position interrupt not received. Master controller did not get the in position interrupt it expected.

88 = No gap detected by the servo after reading or writing a data block or tape mark.

89 = Safety shutdown of motor driver.

90 = No BOT detected on load or rewind.

91 = Speed out of specifications.

92 = The desired state requested by the master controller was invalid for the current context.

94 = Tape positioning failure.

If a Formatter error (STATUS REG. #3, BIT 5) is asserted this register defines the specific error condition as follows:

101 = 7978 Read Formatter unresponsive. The read formatter did not respond with end of record status after a data block was detected.

102 = 7978 Read Formatter hardware error.

103 = Bad block type detected on a write operation.

104 = Erase failure. Flux transitions were detected in a portion of tape currently being erased.

105 = No data detected after write.

106 = Tracks out of sync on write verify.

107 = (HP 7974A only) Formatter hardware error.

108 = (HP 7974A only) Formatter unresponsive.

109 = No gap timeout. The gap timer did not count down, or was never started.

110 = Formatter byte count mismatch with data buffer.

If controller error (STATUS REG. #3, BIT 7) is asserted this register indicates the specific error condition as follows:

121 = Transaction ID mismatch between command sent to Device program and the returned report.

122 = No pending command found for report received from Device program.

123 = Invalid report message received from Device program.

124 = Report queue overflow.

125 = Unknown command received by Device program.

126 = Command queue overflow.

128 = Missing End Of Record flag in data buffer.

129 = Data buffer parity error.

130 = Data buffer underrun during a write operation

131 = Byte count mismatch between putting a record into the data buffer and removing it.

132 = Bad message type received by channel program from device program.

133 = Processor handshake abort between HP-IB interface board and channel program.

134 = Unknown HP-IB interface exception detected.

137 = Illegal access to the servo controller registers detected.

138 = Device program firmware error.

139 = Hardware utilities firmware error.

140 = Channel program firmware error.

141 = One line encoder inoperative.

150 = Tape position synchronization error (HP7980XC only).

151 = Tape deblocking error (HP7980XC only).

152 = Compression/decompression hardware/firmware error (HP7980XC only).

If command reject (STATUS REG. #1, BIT 4) is asserted and Status Register #4 indicates a protocol error, this register defines the specific error condition as follows:

161 = Command queue not empty. Cannot accept new tape command or diagnostic request.

162 = Request DSJ expected

163 = Request status expected

165 = Unknown unit select.

166 = Tape command secondary expected.

167 = Data byte expected.

168 = Missing EOI on tape command data byte, selftest number, or END command data byte.

170 = Command phase protocol error for write record.

172 = Read record report phase protocol error.

173 = Report phase protocol error.

174 = Cold load sequence protocol error.

175 = HP-IB protocol sequence error.

176 = END "COMPLETE" or "COMPLETE-IDLE" expected.

178 = END "DATA" expected.

180 = Unknown interface secondary command.

181 = Misplaced data byte.

184 = Interface loopback protocol error.

185 = Run selftest protocol error.

188 = HP-IB command parity error.

189 = Reset by operator during a protocol sequence.

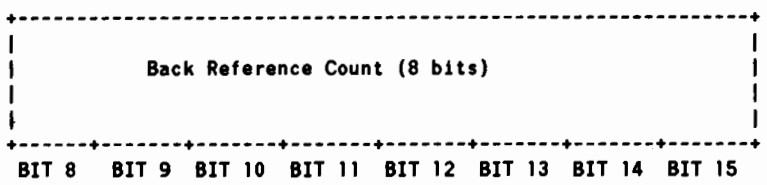
190 = Device clear received. (Internal error code only).

254 = All reserved CCL error codes (see "7979A/7980A/7980XC Error Cross-Reference" after these Status Decodes)

(254) = CCL Error Codes 94,95 *** revision 3.40 and earlier firmware return these errors here. They should be mapped to HP-IB error #47, and will be fixed in the future.

255 = CCL Error Codes 3, 5, 7, 8, 9, 14, 18, 19, 20, 21, 23, 28, 29, 30, 31, 117 (see "7979A/7980A/7980XC CCL Errors" after these Status Decodes)

Word 2, Byte 2 (Status Register #6)



This register is used only when reporting transparent status of hard and soft errors while in immediate response mode. When an immediate reported write has a soft error (retries were necessary) or a hard error (write failure) this register indicates which command had the error. It contains the number of commands sent and reported since the command in question was issued. If the immediate reported write had a hard error all of the commands issued after the failure also fail (they will be aborted). Thus on a hard error this register actually indicates the number of preceding commands that failed.

[10] 7979A/7980A/7980XC

ERROR CROSS-REFERENCE

The following is a list of the HP-IB reported error codes and their corresponding HP7979A/7980A/7980XC internal (CCL) error codes which could have occurred. For descriptions of the HP-IB error codes see the description of Status Register #5. For descriptions of the CCL error codes see "7979A/7980A/7980XC CCL Errors."

HB-IB ERROR	POSSIBLE 7979A/7980A/7980XC INTERNAL (CCL) ERROR CODES (all errors in decimal)
0	0
5	4
6	1
7	22
9	10
10	11
11	02
16	12
19	13
24	16, 17, 240
31	24
33	241
45	34, 35, 36, 66, 67
47	81, 82, 83, 84, 85, 86, 87, 88, 89, 90
48	49, 91
49	44, 50, 76
51	33, 45, 65, 77
53	37, 38, 39, 69, 70, 71
55	118
59	68
60	32
61	43, 47, 75
63	51
82	98
83	96, 116
88	46, 48, 78, 79
90	120
91	97
94	52, 53, 125, 126, 127
95	110, 111, 112, 113, 114, 115

HB-IB ERROR	POSSIBLE 7979A/7980A/7980XC INTERNAL (CCL) ERROR CODES
102	42, 74
104	80
105	93
123	166
125	165
129	92, 160, 161, 220
130	64
131	162
140	25, 26, 163, 164
141	128
150	168
151	169, 170, 171, 172, 173, 174, 175
152	176, 177, 178, 179, 180, 181, 182
162	192
167	197
168	198
170	200
174	204
175	205
176	206
178	208
180	210
181	211
184	214
185	215
188	218
189	219
254	All reserved CCL error codes
*	94,95 *** revision 3.40 and earlier firmware return these errors here. They should be mapped to HP-IB error #47, and will be fixed in the future.
255	3, 5, 7, 8, 9, 14, 18, 19, 20, 21, 23, 28, 29, 30, 31, 117

[11] 7979A/7980A/7980XC CCL ERRORS

The following table lists the Internal CCL error code definitions of the HP 7979A, 7980A, and 7980XC. These errors are NOT the error codes returned to the host within the 6-byte status report. The HP-IB error codes are described in the description of status register #5. This table describes the CCL compared to the HP-IB codes in the previous table, "7979A/7980A/7980XC Error Cross Reference."

COMMAND REJECT ERROR CODES (1 - 31)

1 (01H) = No tape is loaded.

2 (02H) = Drive is not online.

3 (03H) = Drive is not offline.

4 (04H) = Drive is write protected.

5 (05H) = Tape loaded prevents access to test.

6 (06H) = Front door or top cover is open.

7 (07H) = Controller is currently in diagnostic/options mode.

8 (08H) = Controller is not in diagnostic mode.

9 (09H) = Drive not streaming (when streaming command was received).

10 (0AH) = Cannot read tape with unidentified or unsupported format.

11 (0BH) = Cannot write tape with unidentified or unsupported format.

12 (0CH) = Tape not positioned at BOT for write density ID command.

13 (0DH) = Tape already at BOT when backspace command was issued.

14 (0EH) = Tape past EOT.

15 (0FH) = Tape is beyond 10 feet past EOT. Cannot write to tape.

16 (10H) = Unknown or unsupported command received.

17 (11H) = Invalid parameter for requested command.

18 (12H) = Invalid test/info number.

19 (13H) = Test not remotely accessable.

20 (14H) = Test aborted by reset.

21 (15H) = User defined sequence is full, can't add test to sequence.

22 (16H) = Requested density is not available.

23 (17H) = Invalid target id for command.

24 (18H) = Requested write record length exceeded maximum supported.

25 (19H) = Write record request did not precede write record transfer

26 (1AH) = Write record transfer did not follow write record request.

27 (1BH) = Command rejected due to poweron selftest failure.

28 (1CH) = Buffer is empty, cannot retrieve record from buffer.

29 (1DH) = Buffer is full, cannot place record in buffer.

30 (1EH) = Invalid header on non-volatile memory read.

31 (1FH) = Record length or checksum error on non-volatile memory load.

TAPE READ ERRORS (32 - 63)

32 (20H) = Buffer overrun.

33 (21H) = Gap detected before end of data on read.

34 (22H) = Two or more tracks in error on read.

35 (23H) = Two tracks in error on read.

36 (24H) = Single track in error on read (NRZI only).

37 (25H) = CRC error on read.

38 (26H) = ACRC error on read.

39 (27H) = residual error on read.

40 (28H) = syndrome detected single track in error on read.

41 (29H) = formatter CRC error on read.

42 (2AH) = Unknown formatter error on read.

43 (2BH) = Data block timeout.

44 (2CH) = Block detect error.

45 (2DH) = End block detect error.

46 (2EH) = Bad gap after ID.

47 (2FH) = Gap check timeout.

48 (30H) = Short gap after block.

50 (32H) = False ID block detected.

51 (33H) = Bad tape mark read.

52 (34H) = Hitch into a block failed.

53 (35H) = Hitch into a gap failed.

58 (3AH) = Tracks with gain too low during autocal.

59 (3BH) = Tracks with gain too high during autocal.

60 (3CH) = Tracks with gain too low and too high during autocal.

TAPE WRITE ERRORS (64 - 95)

64 (40H) = Buffer underrun.

65 (41H) = Gap detected before end of data on write.

66 (42H) = Two or more tracks in error on write.

67 (43H) = Two tracks in error on write.

68 (44H) = One track in error on write.

69 (45H) = CRC error on write.

70 (46H) = ACRC error on write.

71 (47H) = residual error on write.

72 (48H) = syndrome detected single track in error on write.

73 (49H) = formatter CRC error on write.

74 (4AH) = Unknown formatter error on write.

75 (4BH) = Data block timeout.

76 (4CH) = Data block detect error.

77 (4DH) = End data block detect error.

78 (4EH) = Bad gap after ID.

79 (4FH) = Gap check timeout.

80 (50H) = Erase verify error.

81 (51H) = PE density ID detect error.

82 (52H) = PE density ID verify error.

83 (53H) = GCR density ID detect error.

84 (54H) = GCR density ID verify error.

85 (55H) = GCR ARA burst detect error.

86 (56H) = GCR ARA burst verify error.

87 (57H) = GCR ARA ID detect error.

88 (58H) = GCR ARA ID verify error.

89 (59H) = tape mark detect error.

90 (5AH) = tape mark verify error.

91 (5BH) = Bad pregap on write.

92 (5CH) = Buffer data parity error during write record.

93 (5DH) = No block detected during write record verify.

94 (5EH) = No block detected during write tape mark verify.

95 (5FH) = No block detected during write ID verify.

TAPE POSITIONING/SERVO ERRORS (96 - 127)

96 (60H) = Tension shutdown.

97 (61H) = Tape speed out of specifications.

98 (62H) = Tape ramping error.

110 (6EH) = No reel found.

111 (6FH) = Hub lock failure.

112 (70H) = Reel will not seat.

113 (71H) = Reel inverted.

114 (72H) = Tape stuck to reel.

115 (73H) = Tape stuck in path.

116 (74H) = Unable to establish tension.

117 (75H) = Tape eject timeout.

118 (76H) = Door open abort.

119 (77H) = Failure to re-identify tape on a rewind.

120 (78H) = No BOT marker detected.

121 (79H) = Operator reset abort.

122 (7AH) = Host reset abort.

125 (7DH) = Last block not found.

126 (7EH) = Gap recapture position error.

127 (7FH) = Block recapture position error.

DRIVE CONTROLLER ERRORS (128 - 159)

128 (80H) = Reel size detector failure.

131 (83H) = Unable to thread tape into tape path.

132 (84H) = Open loop motor control error.

133 (85H) = Gap timer circuitry check failed.

BUFFER CONTROLLER ERRORS (160 - 191)

160 (A0H) = Interface data parity error.

161 (A1H) = Drive data parity error.

162 (A2H) = Byte count mismatch on write or read.

163 (A3H) = Prior error reject.

164 (A4H) = Write stopped at EOT.

165 (A5H) = Zero byte record read, or requested.

166 (A6H) = Final report message was not valid.

167 (A7H) = Tape runaway during manual diagnostic commands.

168 (A8H) = Tape position syncronization mismatch.

169 (A9H) = Physical data record too small to deblock

170 (AAH) = Invalid pointer found during deblocking of physical record

171 (ABH) = Access table contents were invalid

172 (ACH) = Access table contents were incomplete

173 (ADH) = Improper byte count sum of access table entries

176 (B0H) = Hardware error detected in data compression (XC) circuitry

177 (B1H) = Bad parity detected from Data compression circuitry

178 (B2H) = Data compression circuitry not properly flushed of data

179 (B3H) = Bad parity detected from interface into data compresssion hardware

180 (B4H) = Bad parity detected from buffer into data compression hardware

181 (B5H) = Data compression-to-interface byte count mismatch

182 (B6H) = Data compression-to-buffer byte count mismatch

191 (BFH) = Fatal error detected by the firmware.

HP-IB DETECTED ERRORS (192 - 255)

192 (C0H) = Request DSJ expected

196 (C4H) = Tape command secondary expected.

197 (C5H) = Data byte expected.

198 (C6H) = Missing EOI on tape command data byte, selftest number, or END command data byte.

200 (C8H) = Command phase protocol error for write record.

204 (CCH) = Cold load sequence protocol error.

205 (CDH) = HP-IB protocol sequence error.

206 (CEH) = END "COMPLETE" or "COMPLETE-IDLE" expected.

208 (D0H) = END "DATA" expected.

210 (D2H) = Unknown interface secondary command.

211 (D3H) = Misplaced data byte.

214 (D6H) = Interface loopback protocol error.

215 (D7H) = Run selftest protocol error.

218 (DAH) = HP-IB command parity error.

219 (DBH) = Reset by operator during a protocol sequence.

SECTION 6

ADJUSTMENTS

[1] INSTALLING FIRMWARE KITS

Materials Required

- Electrostatic Discharge (ESD) groundstrap
- ESD mat
- Torx™ T25 screwdriver
- #2 Pozidriv™ screwdriver
- (if HP-IB interface) 7mm hex driver
- (if SCSI interface) #1 Pozidriv™ screwdriver

SAVE THE DRIVE LOGS AND CONFIGURATIONS IN NON-VOLATILE RAM

1. Apply power to the drive.

2. Select INFO 0.

3. Write down the drive logs.

   There may be up to 30 drive logs. The next steps save the NVRAM to tape, but the drive logs must be recorded manually.

4. Load a scratch tape.

5. Run TEST 150 to write a GCR ID on the scratch tape.

6. Run TEST 128 to store the configurations on the scratch tape.

7. "DOWN" the drive from the system console.

REMOVE POWER FROM THE DRIVE

1. Remove power cord from the drive.

2. Remove the interface cable from the drive (HP-IB, SCSI, PERTEC-compatible).

CAUTION

During the next part of the installation, observe ESD precautions. Do not lay the PCAs on the plastic top cover. This cover is not electrically conductive and may hold a charge.

REPLACE EPROMS ON THE DATA BUFFER PCA

1. Remove the RFI cover.
2. Remove the Data Buffer PCA from the card cage
3. Change the EPROMs.

   For the Data Buffer PCA **07980-69004**:

   a) Remove the two EPROMS from sockets U603 and U803.

   b) Install the EPROM labeled U602-504 in socket U603.

   c) Install EPROM labeled U803-504 in socket U802.

   d) Re-insert the Data Buffer PCA in the card cage.

   For the Data Buffer PCAs **07980-69014** and **07980-69024**:

   a) Remove the two EPROMS from sockets U502 and U602.

   b) Install the EPROM labeled U502-524 in socket U502.

   c) Install EPROM labeled U602-503 in socket U602.

   d) Re-insert the Data Buffer PCA in the card cage.

REPLACE EPROMS ON THE DRIVE CONTROLLER PCA

1. Remove the Drive Controller PCA from the card cage.
2. Change the EPROMs.

a) Remove the three EPROMS from sockets U1, U4, and U19.

b) Install EPROM labeled U1-503 in socket U1.

c) Install EPROM labeled U4-503 in socket U4.

d) Install EPROM labeled U19-503 in socket U19.

d) Re-insert the Drive Controller PCA into the card cage.

REPLACE EPROMS ON THE INTERFACE PCA

1. Remove the Interface Assembly from the rear of the drive.

   a) Remove the two Torx™ screws that hold the interface to the rear panel of the drive (either side of the top of the interface).

   b) Rotate the interface plate out and disconnect the two cable connectors (2-pin and 50-pin) from the PCA.

   c) Place the Interface Assembly on the ESD mat.

2. Detach the interface cable connections from the metal panel (HP-IB and SCSI only).

   a) If HP-IB, remove the two 7mm hex nuts from each end of the connector.

   b) If SCSI, use a #1 Pozidriv™ to remove the four screws holdng the two connectors. See Figure 6-1, next page.

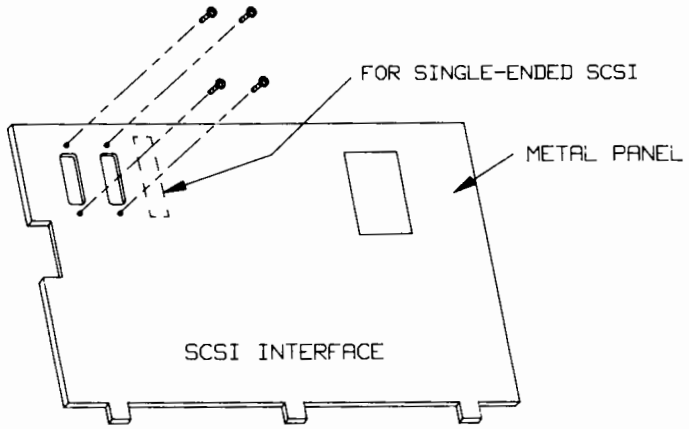


Figure 6-1. Screws on the SCSI Connectors.

3. Remove the interface PCA from the metal panel.

   a) Turn the assembly over (metal panel facing down towards the mat). Use a #2 Posidriv™ screwdriver to remove the five screws (HP-IB, SCSI interface) or 6 screws (Pertec-compatible interface) that hold the printed circuit board to the metal panel.

      If you are working with a SCSI interface, DO NOT REMOVE the four #1 Pozidriv™ screws holding the SCSI connectors to the circuit board.

      Refer to Figure 6-2 for the SCSI and HP-IB interface mounting screws. Refer to Figure 6-3 for the mounting screws on the Pertec-compatible interface.

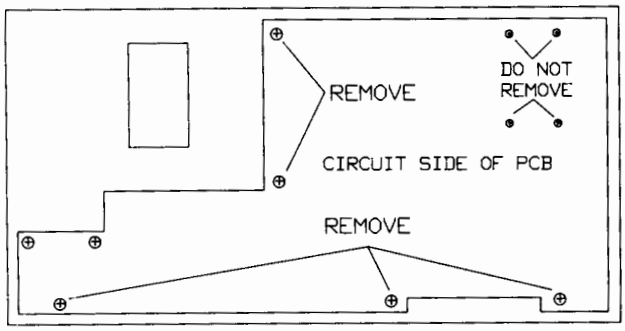


Figure 6-2. SCSI and HP-IB PCA Mounting Screws.

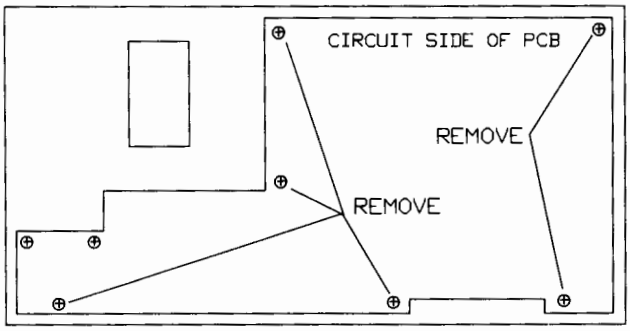


Figure 6-3. Pertec-compatible Interface PCA Mounting Screws.

4. Lift the printed circuit board up off the metal panel. Move the metal panel aside.

5. Turn the printed circuit board over, placing the circuit side on the ESD mat. Place the board on the mat so that the interface connectors are facing away from you. See Figure 4.

   When the board is properly oriented, the internal bus cable connector is on the lower right side.

   The large integrated circuit on the lower left side is the MC68B09 microprocessor. Just off the upper left corner of the microprocessor is the 28-pin socket U12 that will hold the EPROM.

   6. Remove the current EPROM from:

      -socket U12 (on HP-IB) or
      -socket U51 (on SCSI) or
      -socket U13 (on Pertec-compatible).

   7. Install the new EPROM

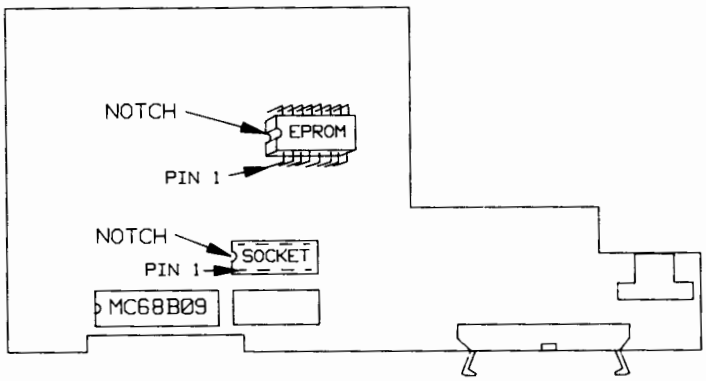


Figure 6-4. EPROM location on all interfaces.

CAUTION

Insert the EPROM into its socket correctly. The 28-pin socket for the EPROM has a notch on its left side (the end facing the microprocessor). The EPROM also has a notch on one end. Be sure to have these notches line up when inserting the EPROM.

6. Install the interface EPROM in the 28-pin socket.

7. **(HP-IB)** If the interface is HP-IB, this would be a good time to verify that the loads are correct for the system. An explanation of HP-IB loading is in Section 3 under "GENERAL DRIVE PREPARATION."

8. Install the interface assembly metal panel.

   a) Place the metal panel on the component side of the interface board.
   b) Hold the metal panel and interface board together and turn them over. When layed back down on the mat, the circuit side of the board is on top.
   c) Re-attach the interface board to the metal panel using the #2 Pozidriv™ screws removed during disassembly.

9a. **(HP-IB)** Re-install the two 7mm hex nuts that hold the connector to the metal plate.

9b. **(SCSI)** Re-install the four #1 Pozidriv™ screws that hold the SCSI connectors to the metal plate.

9c. **(Pertec-compatible)** Inspect the connectors. The two rows of connectors should line up with the slots at the ends of the connector holes (see Figure 6-4). Apply gentle pressure as necessary to line up the connectors into the slots.

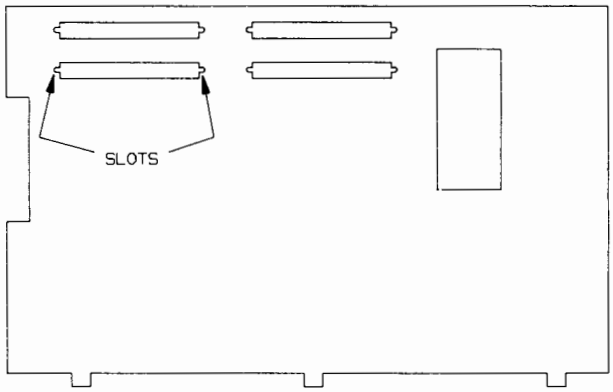


Figure 6-4. Pertec-compatible interface metal cover plate.

10. Bring the new interface close enough to the chassis to connect the 50-pin ribbon interface cable to the bottom of the interface PCA. The interface assembly is positioned correctly when the three metal tabs on the interface assembly are pointing down.

12. Rotate the interface close enough to rear of the chassis so that the power connector (2-pin) can be connected to the right side of the interface.

13. Put the metal tabs at the bottom of the interface panel into the slots on the back panel of the drive. Rotate the interface assembly up flat against the rear panel.

14. Fasten the interface to the back panel with the two Torx™ screws.

15. On the Data Buffer PCA, connect a Jumper between the 2 test holes located above and to the right of the battery. (On the 07980-66504 PCA) use the two holes on the far right of the five holes at this location.)

16. Re-install the power cord.

17. Power the drive on. FAIL 0 should appear in the display after a few seconds.

18. Switch off the drive and remove the jumper installed in Step 15.

19. Switch the drive on and load the scratch tape used in Step 4 (on the first page of this Section).

20. Run TEST 129. (This reloads the configurations stored in Step 6 (on the first page of this Section).

21. Run TEST 99 to set up the Preamp gain levels (do for 6250 cpi and 1600 cpi). Use a tape that is a TYPICAL brand and condition used by the customer. The tape should preferably NOT BE brand new, very old, or damaged.

22. Reset the Error Log by setting CONF 0 to CLEAR.

23. Run TEST 2 to verify drive operation (a 600 ft tape is adequate).

24. Reconnect the interface cable to the drive.

25. "UP" the drive from the system console.

26. Do a system test/store and observe tape motion.

SECTION 7

PERIPHERALS

There are no peripherals to this drive.

SECTION 8

REPLACEABLE PARTS

[1] PCA PART NUMBERING

Purchased parts have a four-by-four number and may be anything. This is a manufacturing number only.

Example:

xxxx-xxxx

Service designations of a part number will be a five-by-five number. The second five numbers of the number show whether a PCA is original equipment, a replacement part, or sometimes indicate a revision.

Depending on the service history of the device, all of these numbers may be seen on a PCA. The following explains the meaning of the different sequences of numbers that may be on a PCA.

If the PCA is fabricated by Greeley, the number will be a five-by-five number and the second set of five numbers start with "665"

Example:

xxxxx-66509

If the PCA is an assembly, this is indicated by either "677" or "679"

Example:

xxxxx-67709
xxxxx-67909

Service Designations, the numbers that will most likely been seen in the field, are:

"60xxx" for a NEW PART
"69xxx" for an EXCHANGE PART.

Example:

xxxxx-60x09
xxxxx-69x09

If the PCA has a major revision it may be indicated by a number in the third position

Example:

xxxxx-60109
xxxxx-69109

OPTIONS AND THE MAIN PCAs

CARDCAGE SLOT #1
(4-PCA Versions)

READ/WRITE/PLL PCA - 07980-6xx01 (for 4 PCA versions - prior to serial number prefix 2805A for the 7979A and 2806A for the 7980A)

Replacement
07980-69001

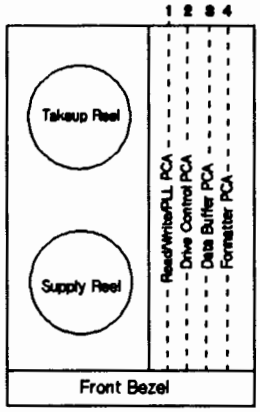


Figure 8-1. Four PCA Version of the Drive (earlier version)

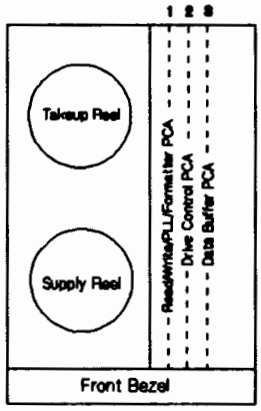


Figure 8-2. Three PCA Version of the Drive (later version)

CARDCAGE SLOT #1
(3-PCA Versions)

READ/WRITE/FORMATTER/PLL PCA - 07980-6xx21 (for 3-PCA versions - serial number prefix 2805A and later for the 7979A, and 2806A and later for the 7980A)

	Replacement
IF GCR,PE	07980-69121
IF Option 800	07980-69031

CARDCAGE SLOT #2

DRIVE CONTROLLER PCA - 07980-6xxx3

	Replacement	Being Changed To:
IF 6250 bpi -7980A -7980XC	07980-69003	07980-69103
IF 1600 bpi -7979A	07979-69013	07979-69113

CARDCAGE SLOT #3

DATA BUFFER PCA - 07980-6xxx4

	Replacement
IF 7980A	07980-69004
IF Option 800 -7979A -7980A	07980-69014
IF 7980XC or Option 400	07980-69024

IF 1 Mbyte Cache 07980-69034

CARDCAGE SLOT #4
(4-PCA Versions)

READ FORMATTER PCA - 07980-6xx02 (for 4-PCA versions - prior to serial number prefix 2805A for the 7979A and 2806A for the 7980A)

Replacement
07980-69002

[2] PARTS LIST

NOTE

In the following list "x"s are used as placemarkers in PCA numbers. At time of publication, all "x"s are either 0 or 1. To determine a part number at the time you are servicing the unit, look up the part number with a "0" in place of the "x". If a NEW part number exists, it will be cross-referenced.

7979A/7980A/7980XC

Exchange Parts

FRU No.	Dwg No.	Part Number	Description
01	1	07980-69x01	Rd/Wrt/PLL PCA*
02	4	07980-69x02	Read Formatter PCA*
21		07980-69121	Rd/Wt/PLL/Format PCA (* replaces 07980-69x01 and 07980-69x02)
03	2	07980-69x03	7980A/88780A/B Controller PCA
04	3	07980-69x04	Data Buffer PCA
05	5	07980-69x05	Motor/Power PCA
07	9	07980-69x07	HP-IB Interface PCA
13		07979-69x13	7979A Controller PCA

FRU No.	Dwg No.	New Part Number	Description
14		07980-69x14	Data Buffer PCA - SMT
24		07980-69x24	Data Buf.PCA w/Data Comp.
31		07980-60x31	800 cpi Rd/Wrt/PLL PCA
34		07980-69x34	Data Buffer, 1 Mbyte

Non-Exchange Parts

	6	07980-21701	Buffer Arm Bearing
	7	07980-61616	Standby Power Switch Assembly
	8	07980-44111	Standby Power Switch Button
08	10	07980-60x08	Front Panel PCA
09	11	07980-60x09	Tape Sensor Assembly
41	12	07980-60x41	Speed Sensor Assembly
		07980-60x48	NRZI Speed Encoder
40	13	07980-60040	EOT/BOT Sensor Assembly
42	14	07980-60042	Head Plate Assembly
		07980-60043	Fan
44		07980-60144	Hub Lock
	15	07980-60053	Supply Hub Assembly
45	16	07980-60045	Buffer Arm Assembly
51	17	07980-60051	Tape Displacement Unit
62		07980-60062	Speed Sensor Cable
64		07980-60064	Front Panel Cable
65		07980-60065	Motor Control Cable
67		07980-61617	Interface Cable
70		07980-60070	Wiring Harness
71		07980-60071	Read Head Cable
72		07980-60072	Write Head Cable
	18	07980-65000	Door Latch Assembly
	19	1390-0776	Cover Latch
	20	1420-0314	3-volt Battery
		2680-0305	Screw, Torx #10-24x.625 in Power Switch Assembly
		2680-0308	Motor Hub Screw-- Screw,machine,10-24x0.50,T25, 82-degree pan, hardened *Older drives may have 10-24x0.625,T20, 82-degree flathd. Use new screw.
		2680-0305	Screw,10-24x0.625,T25,pan Taptite
	24	3110-0178	Cover Hinge
	25	3160-0517	DC Cooling Fan
		3101-2923	Door Microswitch

FRU No.	Dwg No.	New Part Number	Description
	27	1460-2180	Buffer Spring
	28	07980-67919	Power Module
	29	07980-60x00	Motherboard PCA
	30	07980-60144	Hub Lock Assembly
		07980-61614	Hub Lock Ass. Adapter Cable
	31	07980-60047	Front Bezel Assembly
	32	07980-60052	Takeup Hub Assembly (hub and flange)
50	33	07980-60050	Takeup/Supply Reel Motor
50	33	88780-60049	Takeup/Supply Reel Motor (soft brush - use with 07980-6xx14, -6xx24, and -6xx34 PCAs)
		07980-48312	Reel Encoder Flag (for Supply Hub)
		07980-48313	Write Encoder Flag (for Supply Hub)
		07980-48311	Foot Pad (for Reel Lock Feet)
	34	07980-86500	Blower Motor (Load Fan)
	21	07980-48316	Blower Fan Duct
	35	9100-4637	Transformer
	36	07980-44105	Top Cover
	37	2110-0056	6-Amp Fuse
	38	2110-0003	3-Amp Fuse
	39	07980-40600	Shroud
		0515-0951	Screw,M2.5x0.45x16,Posidriv, pan
		3101-2917	Front Panel Function Switches (8)
		07980-05001	Latch Arm (for Drive Slide Release)
			Miscellaneous Screws
		0515-1125	Screw,M3.0x0.50x10,Pozidriv, 90-degree flathead, w/patch lock
		0515-0459	Screw,M4.0x0.70x12,Pozidriv, pan,w/tooth washer
		0515-0935	Screw,socket,M4.0x0.70x40,hexhd cap
		0624-0615	Screw,2-28x0.562,T7,pan
		0624-0620	Screw,4-20x0.25,T9,pan, plastic tapping

2200-0139	Screw,4-40x0.250,Pozidriv,pan, w/sq.cone washer
0624-0690	Screw,tapping,4-40x0.250,T10, Taptite
2200-0757	Screw,4-40x0.688,Pozidriv,pan
2360-0113	Screw,6-32x0.250,Pozidriv,pan w/tooth washer
2360-0119	Screw,6-32x0.438,Pozidriv,pan, w/tooth lockwasher
2360-0297	Screw,6-32x0.438,Pozidriv,pan, (card cage, interface assys)
3030-0969	Screw,shoulder,10-24x1.0,hexhd, w/patch lock
2680-0281	Screw,10-32x0.375,T25,pan w/lockwasher
2680-0278	Screw,10-32x0.50,T25,pan, w/lockwasher

Cabinet Hardware

07980-00210	Standard Door
07980-00206	Slide Rails (pair)
07980-84400	Cabinet
07980-67191	Cabinet Side Panel
07980-67192	Cabinet Back Door
07980-67193	Cabinet Top Cover
07980-67194	Cabinet Lock and Key
07980-00207	Dual-drive rack filler panel
07980-60490	7979/7980 FW Kit
07980-60591	Data Compression FW Kit

----- 88780A/B -----

88780-6xx25	Motor/Power PCA
88780-6xx15	SCSI single-ended interface
88780-6xx16	SCSI differential interface
88780-6xx35	SCSI single-ended interface (use only to replace a -66535 PCA)
88780-6xx36	SCSI differential interface (use only to replace a -66536 PCA)
88780-6xx22	Pertec interface
88780-60066	Slave Connector
2110-0688	Fuse, 3A Subminiature
88780-60095	Loopback Conn. SCSI Sgl-end.

88780-60096	Loopback Conn. SCSI Diff.
88780-60290	88780/SCSI CCLI FW Kit
88780-60292	88780/PERTEC CCLI FW Kit
88780-60093	88780/SCSI CCLII FW Kit
88780-04400	Desktop Enclosure cabinet (used with HP 88780A, full kit is HP 88706A)
88780-04710	Desktop Enclosure cabinet (hidden hinge, used with HP 88780B)

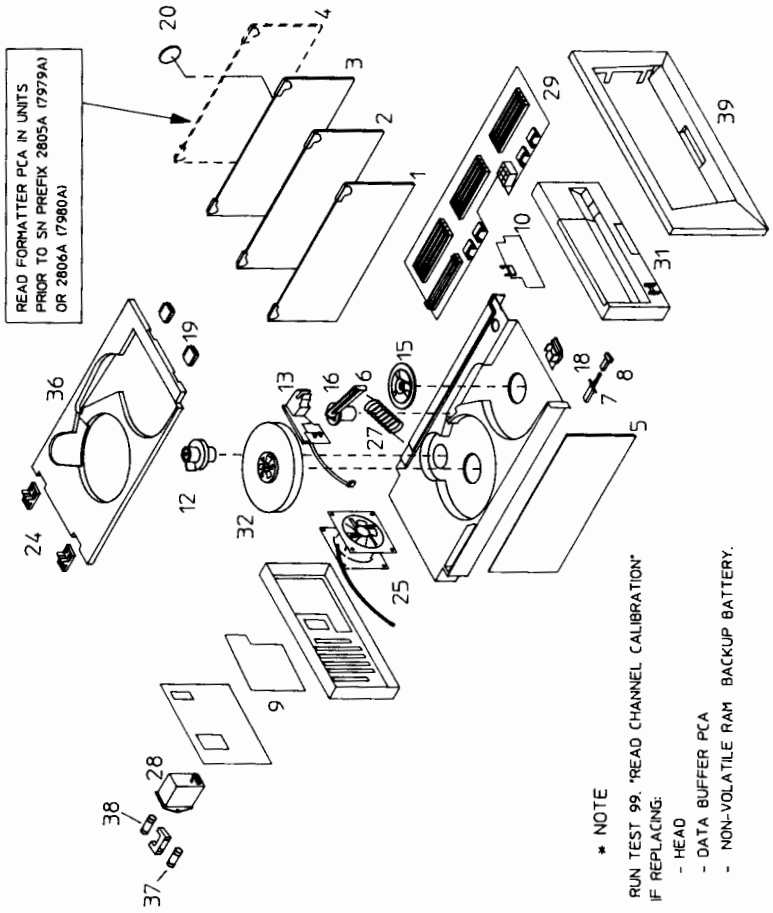


Figure 8-3. Exploded View (1 of 2)

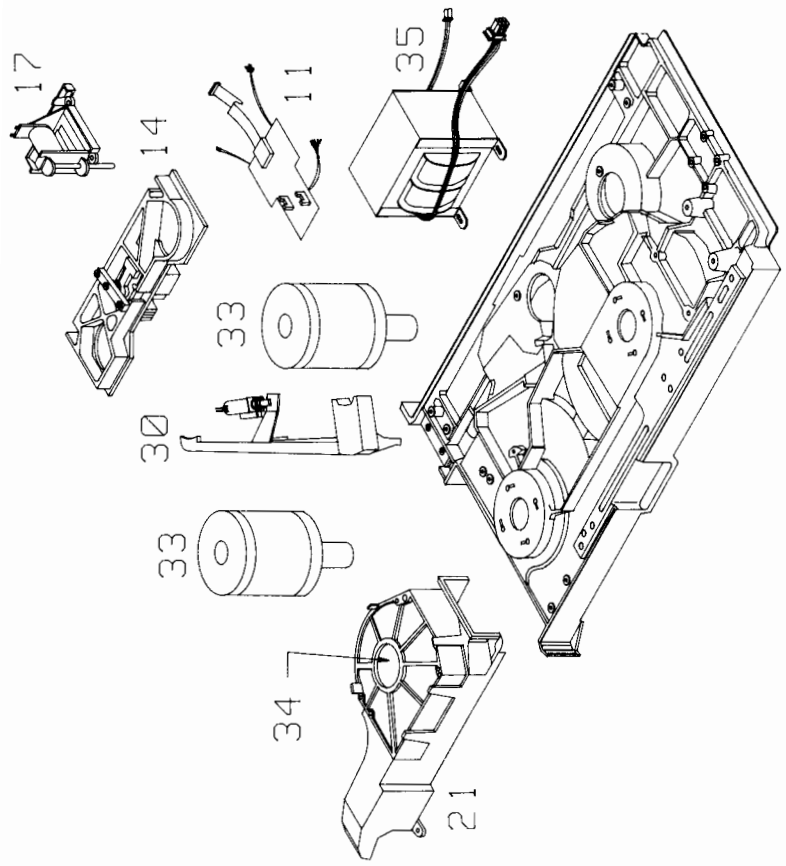


Figure 8-4. Exploded View (2 of 2)

SECTION 9

DIAGRAMS

[1] TROUBLESHOOTING DIAGRAMS

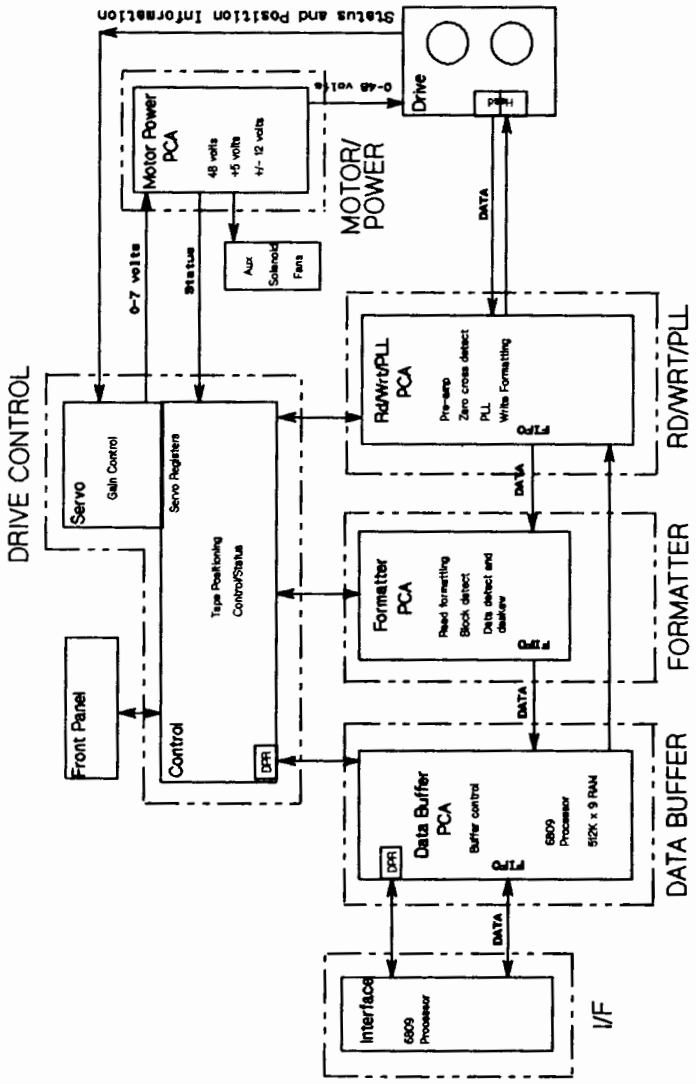


Figure 9-1
Overall Block Diagram (4-PCA Version)

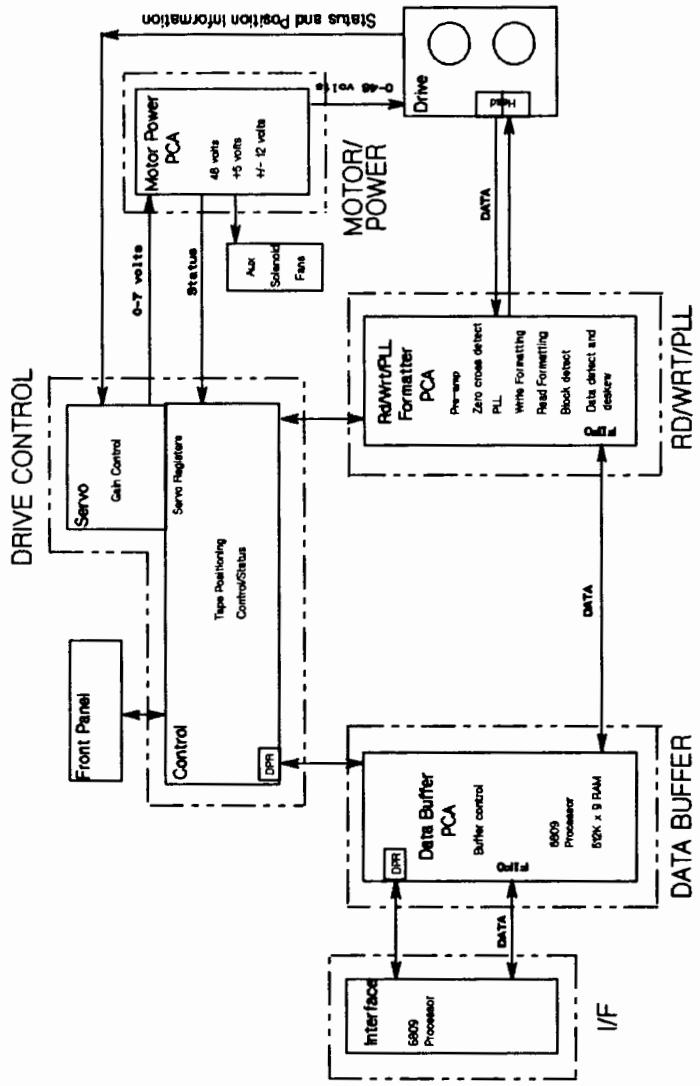


Figure 9-2
Overall Block Diagram (3-PCA Version)

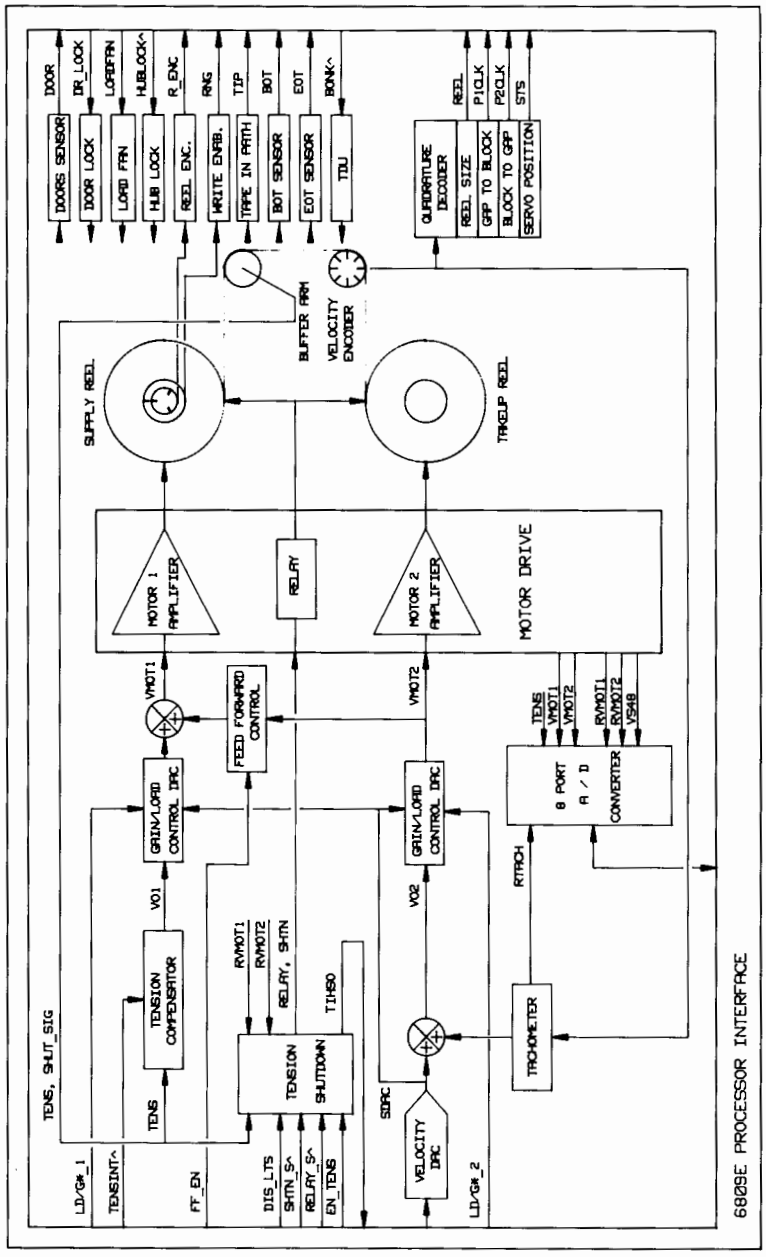


Figure 9-3
Servo Controller Block Diagram

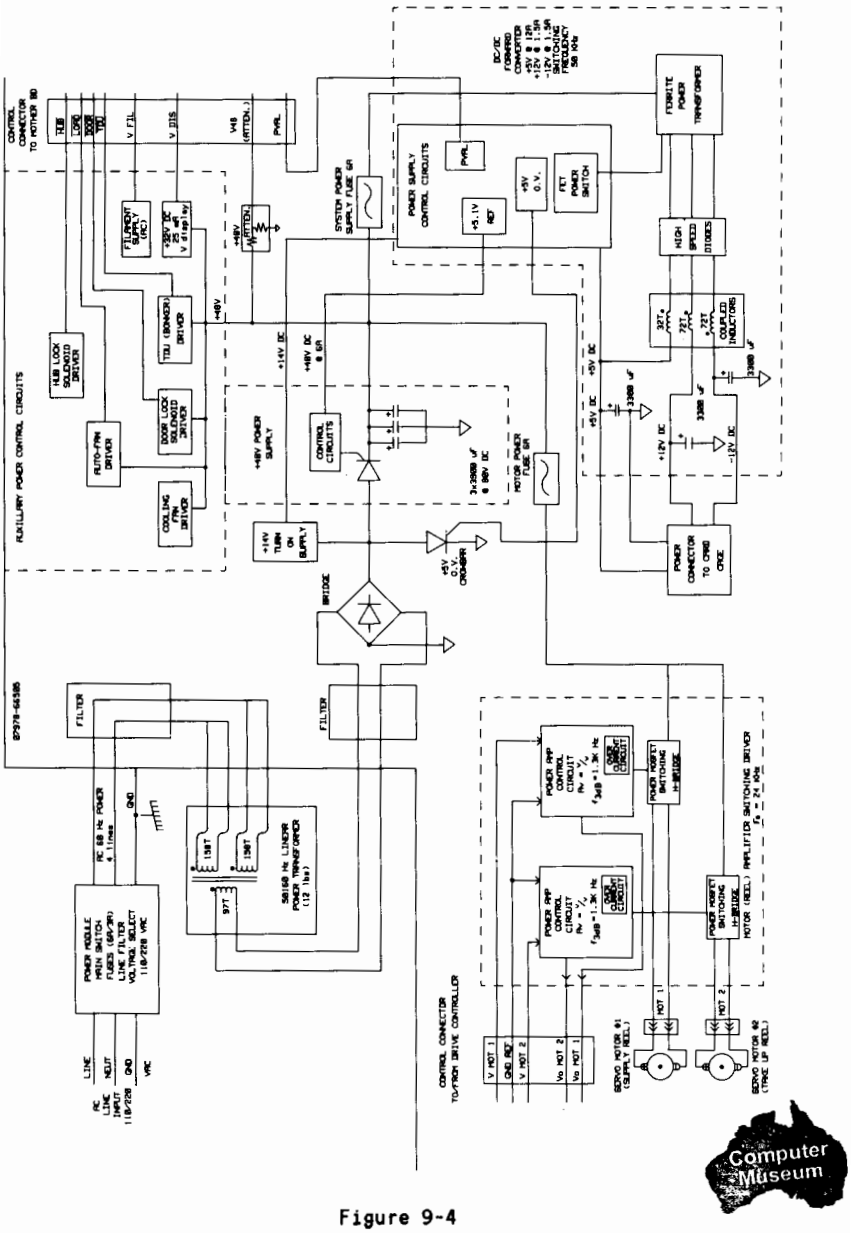


Figure 9-4
Power Distribution Block Diagram (-6xx05)

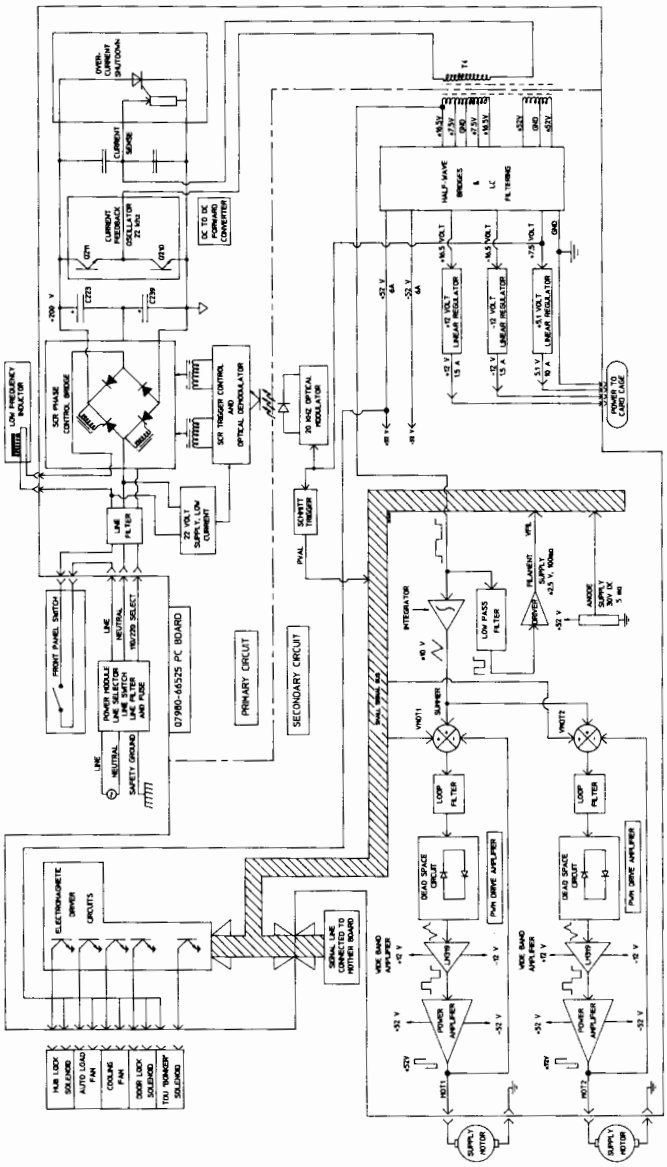


Figure 9-5
Power Distribution Block Diagram (-6xx25)

Motherboard PCA (External cabling lists follow these drawings)
07980-6xx00

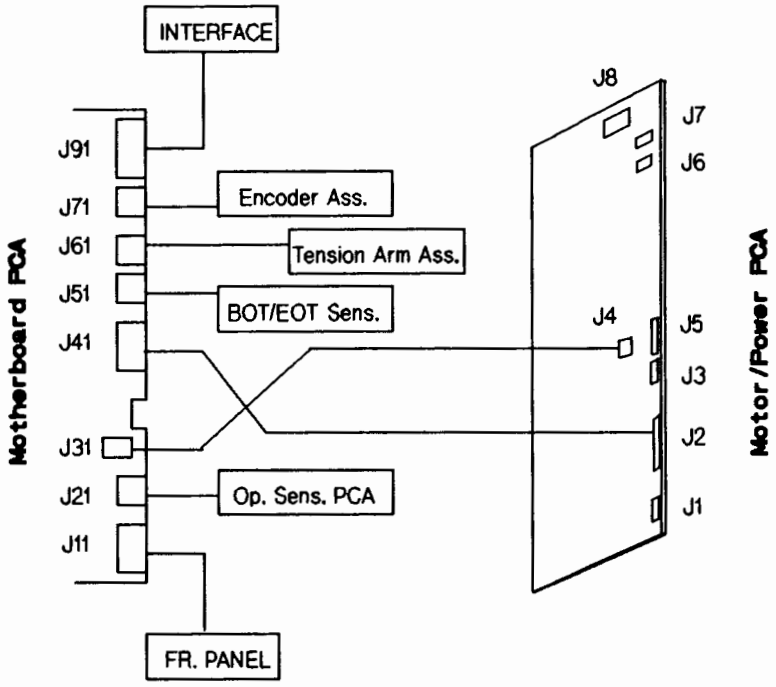


Figure 9-6
Motherboard PCA External Cabling (with -6xx05 Motor/Power PCA)

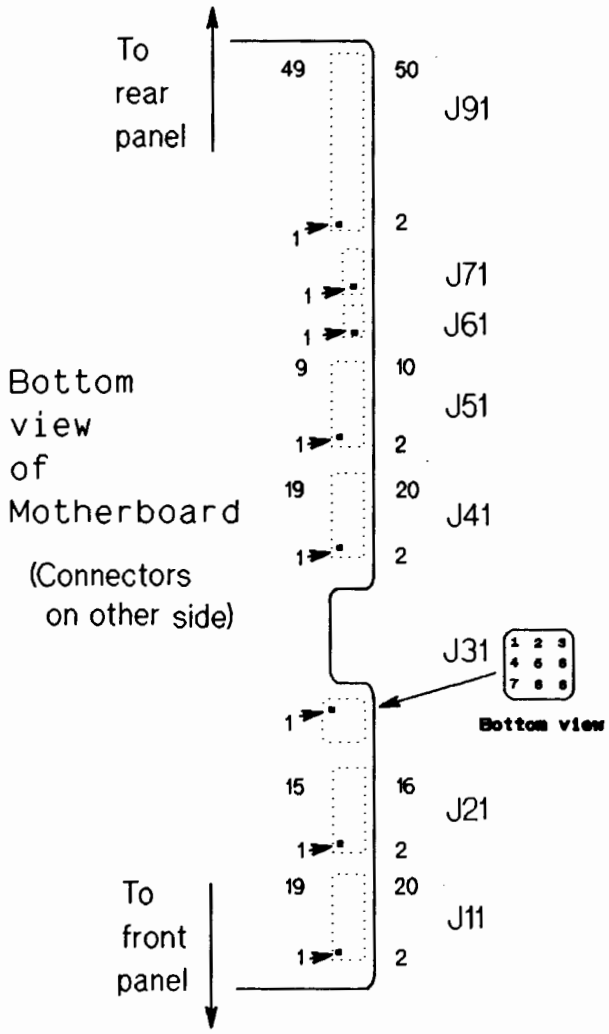


Figure 9-7
Motherboard PCA External Connector Pin Positiions

Motherboard PCA (Drawings on preceding pages)
07980-6xx00

Connectors

J11 (Front Panel)

J21 (Op-Sens)

J31 (Power)

J41 (Motor Drive)

J51 (BOT/EOT)

J61 (Tension)

J71 (Speed Encoder)

J91 (Interface)

J11 -Front Panel (20-pin RIBBON)

	Signal, etc.		Connects to Front Panel J1
Pin 1	+5V		pin for pin
Pin 2	SW 1 (OPTION)		.
Pin 3	SW 5 (ONLINE)		.
Pin 4	SW 2 (PREV)		.
Pin 5	SW 6		.
	REWIND	7979A	
		7980A	
		7980XC	
	UNLOAD/REWIND	88780A	
Pin 6	SW 3 (NEXT)		.
Pin 7	GND		.
Pin 8	SW 4 (ENTER)		.
Pin 9	GND		.
Pin 10	FILAMENT 2		.
Pin 11	SW 7 (RESET)		.
Pin 12	FILAMENT 1		.
Pin 13	not used		-
Pin 14	+31 VDC		.

Pin 15	SW 8		.
	UNLOAD	7979A	
		7980A	
		7980XC	
	DENSITY	88780A/B	
Pin 16	SCLK		.
Pin 17	GND		.
Pin 18	SDATA		.
Pin 19	DSTROBE		.
Pin 20	BLANK DISPLAY		.

J21 - Op-Sens (16-pin RIBBON)

	Signal, etc.	Connects to Sensor PCA J2
Pin 1	DOOR_LED+	pin for pin
Pin 2	DOOR_LED-	.
Pin 3	DOOR_VCC	.
Pin 4	DOOR_SIG	.
Pin 5	RW_LED+	.
Pin 6	RENC_LED-	.
Pin 7	RW_VCC	.
Pin 8	RENC_SIG	.
Pin 9	WREN_LED-	.
Pin 10	WREN_SIG	.
Pin 11	TIP_LED+	.
Pin 12	TIP_LED-	.
Pin 13	TIP_COLL	.
Pin 14	TIP_SIG	.
Pin 15	GND4	.
Pin 16	OPT_CON	.

J31 -Power (9-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	+12V	grn	Motor/Power PCA J4(1)
Pin 2	GND	wht	Motor/Power PCA J4(2)
Pin 3	+5V	red	Motor/Power PCA J4(3)
Pin 4	-12V	blu	Motor/Power PCA J4(4)
Pin 5	GND	wht	Motor/Power PCA J4(5)
Pin 6	+5V	red	Motor/Power PCA J4(6)
Pin 7	GND	grn	Casting (Main Power Switch mounting screw)

Pin 8	GND	wht	-HP-IB Intf. J2(2) -SCSI Sngl-End Intf. J4(2) -SCSI Diff. Intf. J4(2) -Pertec-comp. Intf. P4(2)
Pin 9	+5V	red	-HP-IB Intf. J2(1) -SCSI Sngl-End Intf. J4(1) -SCSI Diff. Intf. J4(1) -Pertec-comp. Intf. P4(1)

J41 -Motor Drive (20-pin RIBBON)

	Signal, etc. (active low = *)	Connects to Motor/Power PCA J2
Pin 1	SHTN	pin for pin
Pin 2	RELAY*	.
Pin 3	PVALID	.
Pin 4	DOOR LOCK*	.
Pin 5	LOAD FAN*	.
Pin 6	HUB LOCK*	.
Pin 7	SYSGROUND	.
Pin 8	BONKER* (TDU)	.
Pin 9	GND	.
Pin 10	+10V DISPLAY FILAMENT (FIL2)	.
Pin 11	Vs48(returned, divided 48V)	.
Pin 12	+5V DISPLAY FILAMENT (FIL1)	.
Pin 13	not used	.
Pin 14	30V FLUORESCENT DISPLAY	.
Pin 15	GND	.
Pin 16	RETURNED TAKEUP MOTOR VOLTAGE	.
Pin 17	INPUT TAKEUP MOTOR VOLTAGE	.
Pin 18	RETURNED SUPPLY MOTOR VOLTAGE	.
Pin 19	INPUT SUPPLY MOTOR VOLTAGE	.
Pin 20	+5V	.

J51 -BOT/EOT (10-pin RIBBON)

	Signal, etc.	Connects to BOT/EOT Sensor (direct connect)
Pin 1	SHUT_LED-	.
Pin 2	SHUT_SIG	.
Pin 3	EBS_EMM	.

Pin 4	EOT_COLL	.
Pin 5	EOT_LED-	.
Pin 6	BOT_COLL	.
Pin 7	BOT_LED-	.
Pin 8	EBS_LED+	.
Pin 9	GND2	.
Pin 10	TEN_CON	.

J61 -Tension (3-pin RIBBON)

	Signal, etc.	Connects to Tension Sensor Assembly (direct connect)
Pin 1	VR4+	.
Pin 2	TEN_SIG	.
Pin 3	VR4-	.

J71 -Speed Encoder (5-pin CLIP)

	Signal, etc.	Color	Connects to Speed Encoder Assembly
Pin 1	GND1	grn	pin for pin.
Pin 2	SPD_CON	pur	.
Pin 3	PH_A	org	.
Pin 4	+5V	blu	.
Pin 5	PH_B	blk	.

J91 -Interface (50-pin RIBBON)

	Signal, etc. (active low = *)	Connects to interfaces: -HP-IB J1 -SCSI Single-Ended J3 -SCSI Differential J3 -Pertec-compatible P3
Pin 1	GND	pin for pin on
Pin 2	IF_CON (GND)	applicable intf.
Pin 3	GND	connector
Pin 4	IF_HIGH	.
Pin 5	IA[9]	.
Pin 6	IA[8]	.

Pin 7	IAD[7]
Pin 8	IAD[6]
Pin 9	IAD[5]
Pin 10	IAD[4]
Pin 11	IAD[3]
Pin 12	IAD[2]
Pin 13	IAD[1]
Pin 14	IAD[0]
Pin 15	ISEL*
Pin 16	GND
Pin 17	SYSRESET
Pin 18	GND
Pin 19	IR/W*
Pin 20	GND
Pin 21	IM/S*
Pin 22	GND
Pin 23	IINTA
Pin 24	GND
Pin 25	IADS
Pin 26	GND
Pin 27	ID/A*
Pin 28	GND
Pin 29	GND
Pin 30	GNDS1
Pin 31	IWS*
Pin 32	GND
Pin 33	IWRGA
Pin 34	GND
Pin 35	IRSA
Pin 36	GND
Pin 37	IRRQ*
Pin 38	GND
Pin 39	IEOD
Pin 40	IPAR
Pin 41	ID[7]
Pin 42	ID[6]
Pin 43	ID[5]
Pin 44	ID[4]
Pin 45	ID[3]
Pin 46	ID[2]
Pin 47	ID[1]
Pin 48	ID[0]
Pin 49	GND
Pin 50	GND

Motor/Power PCA (External cabling lists follow these drawings)
07980-6xx05

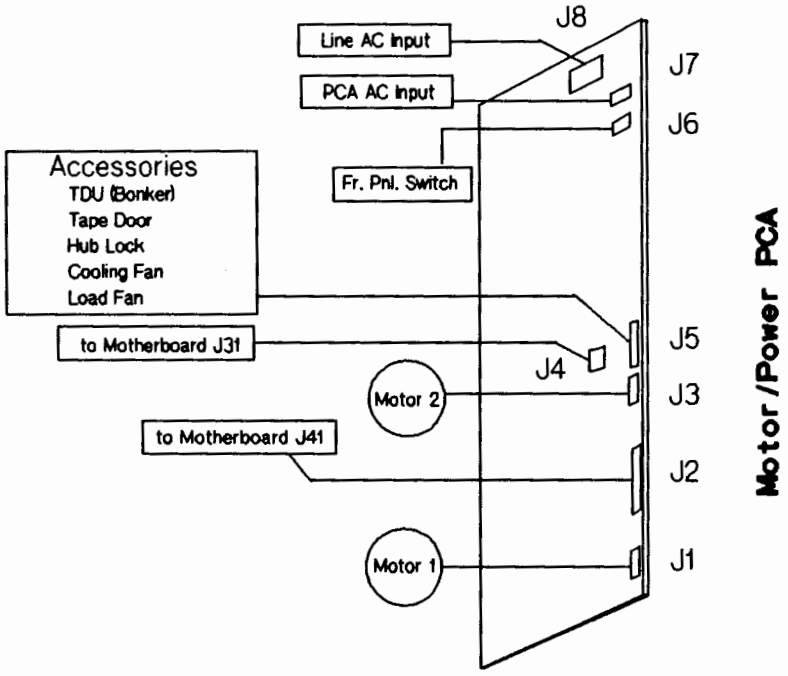


Figure 9-8
Motor/Power External Cabling (07980-6xx05)

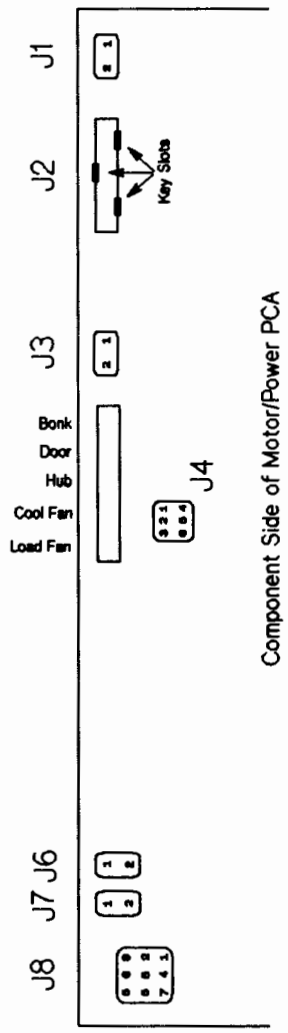


Figure 9-9
Motor/Power Pin Positions (07980-6xx05)

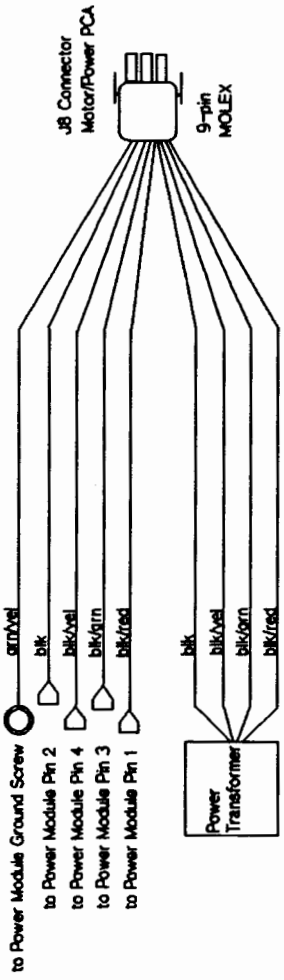


Figure 9-10
Power Cable to 07980-6xx05 PCA

Motor/Power PCA (Drawings on preceding pages)
07980-6xx05

Connectors

J1 (Supply Motor)

J2 (to Motherboard)

J3 (Takeup Motor)

J4 (System Power Supply)

J5 (Accessories Drive)

J6 (Front Panel Switch Power)

J7 (Motor/Power PCA AC Input)

J8 (Line AC Input)

J1 -Supply Motor (2-pin MOLEX™)

	Signal, etc.	Color	Connects to Supply Motor (direct connect)
Pin 1	Neutral	blk	.
Pin 2	Hot	red	.

J2 -Interface to Motherboard (20-pin RIBBON)

	Signal, etc. (active low = *)	Connects to Motherboard J41
Pin 1	SHTN	pin for pin
Pin 2	RELAY*	.
Pin 3	PVALID	.
Pin 4	DOOR LOCK*	.
Pin 5	LOAD FAN*	.
Pin 6	HUB LOCK*	.
Pin 7	SYSGROUND	.
Pin 8	BONKER* (TDU)	.

Pin 9	GND	.
Pin 10	+10V DISPLAY FILAMENT (FIL2)	.
Pin 11	Vs48(returned, divided 48V)	.
Pin 12	+5V DISPLAY FILAMENT (FIL1)	.
Pin 13	not used	.
Pin 14	30V FLUORESCENT DISPLAY	.
Pin 15	GND	.
Pin 16	RETURNED TAKEUP MOTOR VOLTAGE	.
Pin 17	INPUT TAKEUP MOTOR VOLTAGE	.
Pin 18	RETURNED SUPPLY MOTOR VOLTAGE	.
Pin 19	INPUT SUPPLY MOTOR VOLTAGE	.
Pin 20	+5V	.

J3 -Takeup Motor (2-pin MOLEX™)

	Signal,etc.	Color	Connects to Takeup Motor (direct connect)
Pin 1	Neutral	blk	.
Pin 2	Hot	red	.

J4 -System Power Supply (6-pin MOLEX™)

	Signal, etc.	Color	Connects to Motherboard PCA J31
Pin 1	+12V	grn	pin for pin
Pin 2	-12V	wht	.
Pin 3	GND	red	.
Pin 4	GND	blu	.
Pin 5	+5V	wht	.
Pin 6	+5V	red	.
			pins 7,8,9 not used

J5 -Accessories Drive (15-post Bergstrip™)

	Signal, etc.	Color	Connects to
Pin 1	BONKER (TDU)	blk	TDU 24V Solenoid
Pin 2	BONKER	brn	"
Pin 3	not used		
Pin 4	DOOR	blk	Door 24V Solenoid

Pin 5	DOOR	yel	"
Pin 6	not used		
Pin 7	HUB LOCK	blk	Hub Lock Solenoid
Pin 8	HUB LOCK	grn	"
Pin 9	not used		
Pin 10	COOLING FAN	blk	clip -then cooling fan
Pin 11	COOLING FAN	red	"
Pin 12	not used		
Pin 13	LOAD FAN	blk	clip - then load fan
Pin 14	LOAD FAN	pur	"
Pin 15	not used		

J6 -Front Panel Switch Power (2-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	Line Out/Open	blu	Front Panel Power Switch
Pin 2	Line In	wht	Front Panel Power Switch

J7 -Motor/Power PCA AC Input (2-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	Main Power	brn	Transformer Secondary
Pin 2	Main Power	brn	Transformer Secondary

J8 -Line AC Input (9-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	Hot	blk/red	Power Module (Figure 9-14)
Pin 2	Hot	blk/red	Linear Power Transformer
Pin 3	Earth GND	grn/yel	Power Module (Figure 9-14)
Pin 4	Line Select/ Neutral	blk/grn	Power Module (Figure 9-14)
Pin 5	"	blk/grn	Linear Power Transformer
Pin 6	Line Select/ Hot	blk/yel	Power Module (Figure 9-14)
Pin 7	Neutral	blk	Power Module (Figure 9-14)
Pin 8	Neutral	blk	Linear Power Transformer

Pin 9	Line Select/ Hot	blk/yel	Linear Power Transformer

Motor/Power PCA (External cabling lists follow these drawings) 07980-6xx25

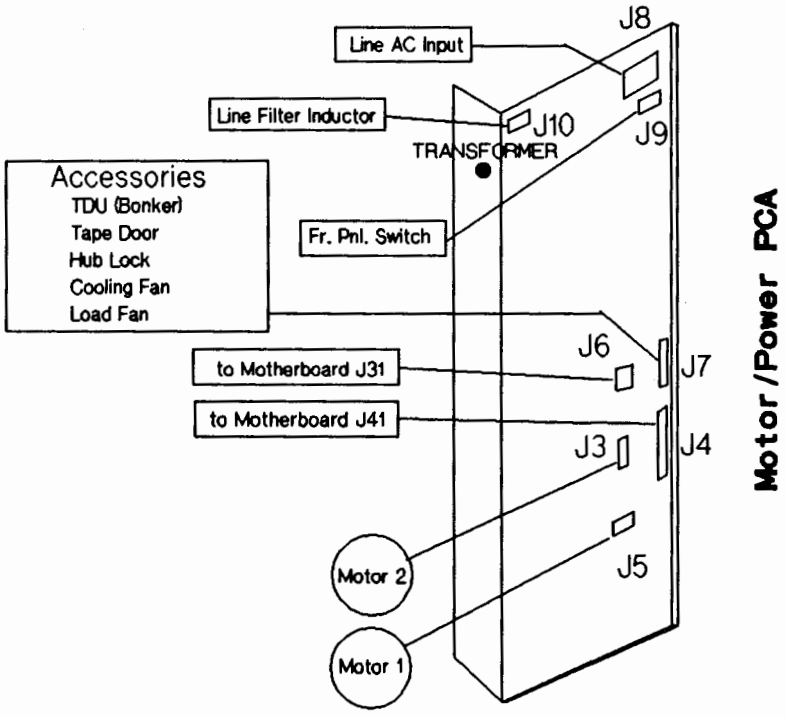


Figure 9-11
Motor/Power External Cabling (07980-6xx25)

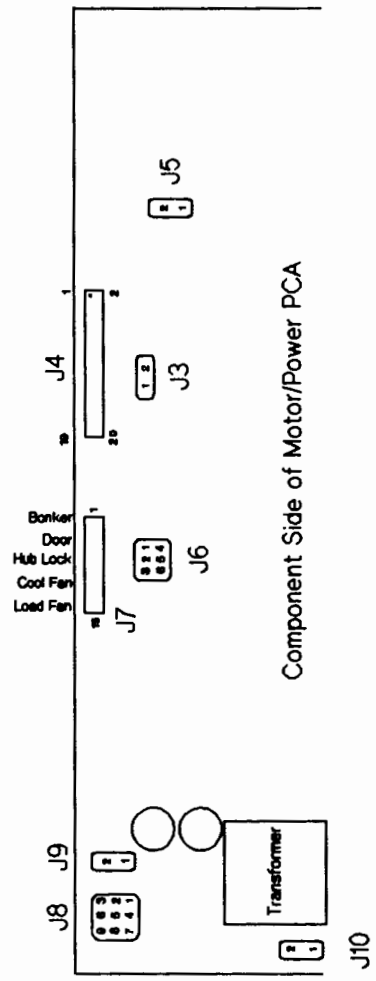


Figure 9-12
Motor/Power Pin Positions (07980-6xx25)

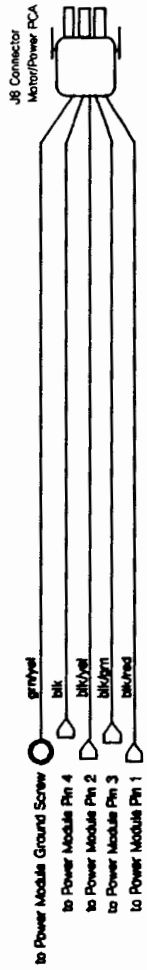


Figure 9-13
Power Cable to 07980-6xx25 PCA

Motor/Power PCA (Drawings on preceding pages)
07980-6xx25

Connectors

J3 (Motor 2)

J4 (to Motherboard)

J5 (Motor 1)

J6 (System Power Supply)

J7 (Accessories Drive)

J8 (Line AC Input)

J9 (Front Panel Switch Power)

J10 (Line Filter Inductor)

J3 (Motor 2) (2-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	Neutral	blk	Takeup Motor
Pin 2	Hot	red	Takeup Motor

J4 (Interface to Motherboard) (20-pin RIBBON)

	Signal, etc. (active low = *)	Connects to Motherboard J41
Pin 1	SHTN	pin for pin
Pin 2	RELAY*	.
Pin 3	PVALID	.
Pin 4	DOOR LOCK*	.
Pin 5	LOAD FAN*	.
Pin 6	HUB LOCK*	.
Pin 7	SYSGROUND	.
Pin 8	BONKER* (TDU)	.

Pin 9	GND	.
Pin 10	+10V DISPLAY FILAMENT (FIL2)	.
Pin 11	Vs48(returned, divided 48V)	.
Pin 12	+5V DISPLAY FILAMENT (FIL1)	.
Pin 13	not used	.
Pin 14	30V FLUORESCENT DISPLAY	.
Pin 15	GND	.
Pin 16	RETURNED TAKEUP MOTOR VOLTAGE	.
Pin 17	INPUT TAKEUP MOTOR VOLTAGE	.
Pin 18	RETURNED SUPPLY MOTOR VOLTAGE	.
Pin 19	INPUT SUPPLY MOTOR VOLTAGE	.
Pin 20	+5V	.

J5 (Motor 1) (2-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	Neutral	blk	Supply Motor
Pin 2	Hot	red	Supply Motor

J6 (System Power Supply) (6-pin MOLEX™)

	Signal, etc.	Color	Connects to Motherboard J31
Pin 1	+12V	grn	pin for pin
Pin 2	-12V	wht	.
Pin 3	GND	red	.
Pin 4	GND	blu	.
Pin 5	+5V	wht	.
Pin 6	+5V	red	.
			pins 7,8,9 not used

J7 (Accessories Drive) (15-post Bergstrip™)

	Signal, etc.	Color	Connects to
Pin 1	BONKER (TDU)	blk	TDU 24V Solenoid
Pin 2	"	brn	"
Pin 3	not used		
Pin 4	DOOR SOLEN.	blk	Door 24V Solenoid
Pin 5	"	yel	"
Pin 6	not used		

Pin 7	HUB LOCK	blk	Hub Lock Solenoid
Pin 8	"	grn	"
Pin 9	not used		
Pin 10	COOLING FAN	blk	clip -then cooling fan
Pin 11	"	red	"
Pin 12	not used		
Pin 13	LOAD FAN	blk	clip -then load fan
Pin 14	"	pur	"
Pin 15	not used		

J8 (Line AC Input) (9-pin MOLEX™)

	Signal, etc.	Color	Connects to Rear Panel Power Module
Pin 1	Hot	blk/red	Pin 1
Pin 2	not used		
Pin 3	not used	grn/yel	Earth GND Pin
Pin 4	Line Select	blk/grn	Pin 3
Pin 5	not used		
Pin 6	not used	blk/yel	Pin 4
Pin 7	Neutral	blk	Pin 2
Pin 8	not used		
Pin 9	not used		

J9 (Front Panel Switch Power) (2-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	Line Out/Open	blu	Front Panel Power Switch
Pin 2	Line In	wht	Front Panel Power Switch

J10 (Line Filter Inductor) (2-pin MOLEX™)

	Signal, etc.	Color	Connects to
Pin 1	Line In	blk	Line Filter Transformer
Pin 2	Line Out	blk	"

Power Module
07980-67919

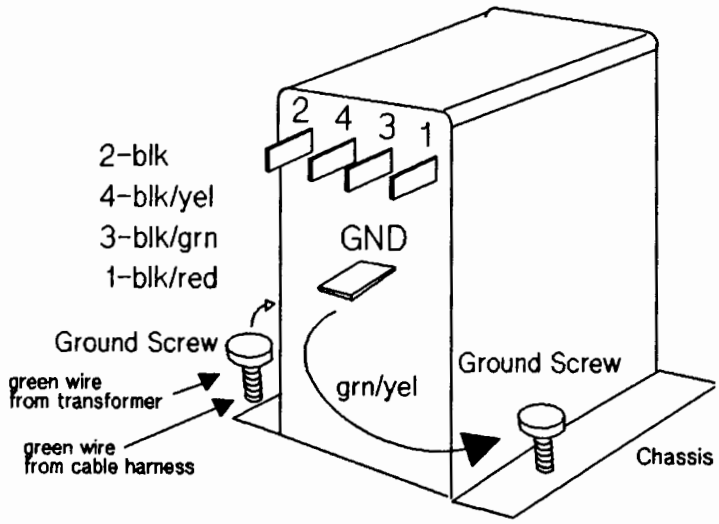


Figure 9-14
Rear Panel Power Module

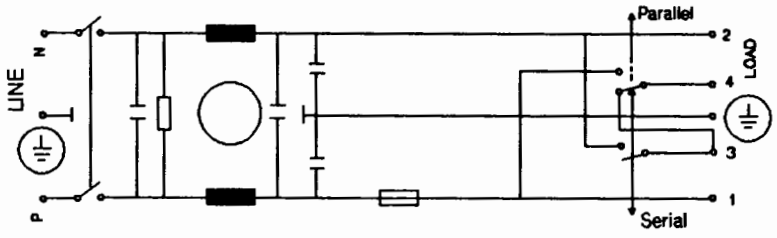


Figure 9-15
Rear Panel Power Module Schematic/Pinout

Wiring Harness
07980-60070

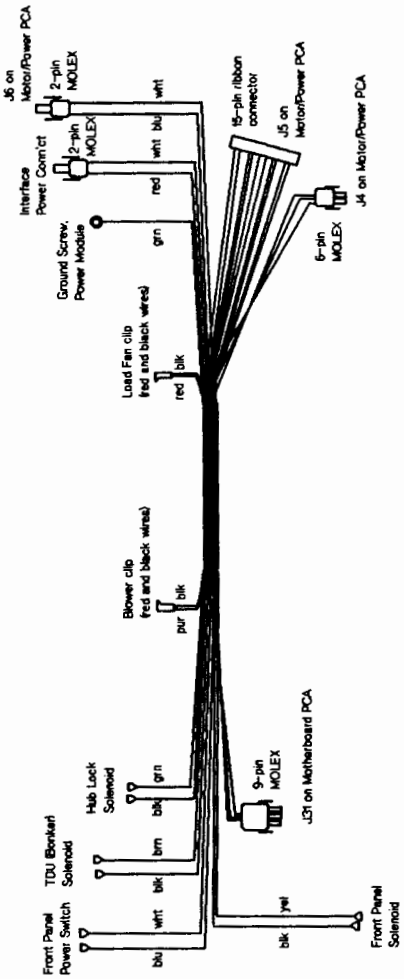


Figure 9-16
Wiring Harness

Sensor PCA (External cabling list on following page)
07980-6xx09

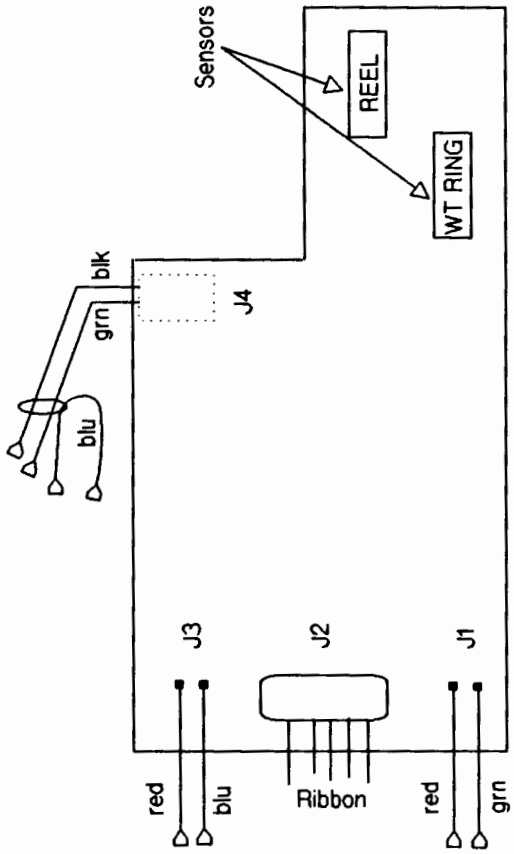


Figure 9-17
Sensor PCA Cabling

Sensor PCA (Drawing on preceding page)
07980-6xx09

Connectors

J1 (to tape-in-path LED detector)

J2 (Interface)

J3 (to tape-in-path LED)

J4 (to front panel microswitches)

J1 -to tape-in-path LED detector (2 direct-connect wires)

	Signal, etc.	Color	Connects to tape-in-path detector
Pin 1	TIP_LED-	blu	.
Pin 2	TIP_LED+	red	.

J2 -Interface (16-pin RIBBON)

	Signal, etc.	Connects to Motherboard PCA J21
Pin 1	DOOR_LED+	pin for pin
Pin 2	DOOR_LED-	.
Pin 3	DOOR_COLL	.
Pin 4	DOOR-SIG	.
Pin 5	RW_LED+	.
Pin 6	RENC_LED-	.
Pin 7	RW_COLL	.
Pin 8	RENC_SIG	.
Pin 9	WREN_LED-	.
Pin 10	WREN_SIG	.
Pin 11	TIP_LED+	.
Pin 12	TIP_LED-	.
Pin 13	TIP_COLL	.
Pin 14	TIP_SIG	.

Pin 15	GND4	.
Pin 16	OPT_CON	.

J3 -to tape-in-path LED (2 direct-connect wires)

	Signal, etc.	Color	Connects to tape-in-path LED
Pin 1	TIP_LED-	blu	.
Pin 2	TIP_LED+	red	.

J4 -to front panel microswitches (2 direct-connect wires)

	Signal, etc.	Color	Connects to
Pin 1	GND	blk	front panel "tape door open/closed" microswitch
Pin 2	OUT	grn	front panel "top cover open/closed" microswitch
Pin 3	VCC		not used, open hole
Pin 4	LED-		not used, open hole
Pin 5	VCC		not used, open hole

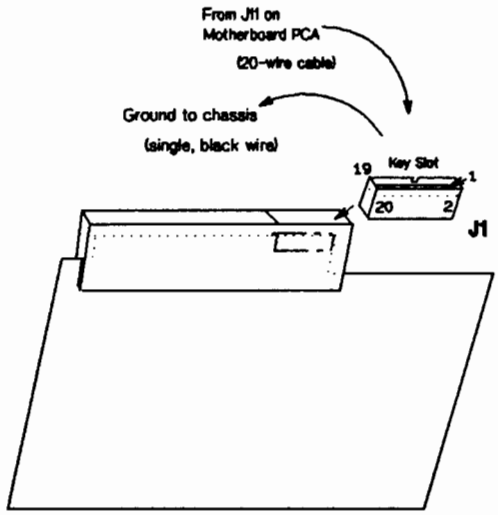


Figure 9-18
Front Panel Display Connector Pins

Front Panel PCA
07980-66508

Connectors

J1 (Motherboard to Front Panel)

J1 -Front Panel (20-pin RIBBON)

	Signal, etc.		Connects to Motherboard PCA J11
Pin 1	VCC		pin for pin
Pin 2	SW 1 (OPTION)		.
Pin 3	SW 5 (ONLINE)		.
Pin 4	SW 2 (PREV)		.
Pin 5	SW 6		.
	REWIND	7979A	
		7980A	

		7980XC	
	UNLOAD/REWIND	88780A	
Pin 6	SW 3 (NEXT)		.
Pin 7	GND		.
Pin 8	SW 4 (ENTER)		.
Pin 9	GND		.
Pin 10	FILAMENT 2		.
Pin 11	SW 7 (RESET)		.
Pin 12	FILAMENT 1		.
Pin 13	not used		.
Pin 14	+31 VDC		.
Pin 15	SW 8		.
	UNLOAD	7979A	
		7980A	
		7980XC	
	DENSITY	88780A	
Pin 16	SCLK		.
Pin 17	GND		.
Pin 18	SDATA		.
Pin 19	DSTROBE		.
Pin 20	BLANK DISPLAY		.
Foil Shield grounding cable			chassis

Read/Write//PLL PCA
07980-6xx01

Read/Write/Formatter/PLL PCA
07980-6xx21
07980-6xx31

Connectors

J1 (from write head)

J2 (from read head)

J1 -to Write Head (26-pin RIBBON)

	Signal, etc.	Connects to Write Head
Pin 1	ERASE_LO	.
Pin 2	ERASE_HI	.
Pin 3	CHANNEL 1	.

Pin 4	"
Pin 5	CHANNEL 2
Pin 6	"
Pin 7	CHANNEL 3
Pin 8	"
Pin 9	CHANNEL 4
Pin 10	"
Pin 11	CHANNEL 5
Pin 12	"
Pin 13	WRITE CURRENT
Pin 14	"
Pin 15	CHANNEL 6
Pin 16	"
Pin 17	CHANNEL 7
Pin 18	"
Pin 19	CHANNEL 8
Pin 20	"
Pin 21	CHANNEL 9
Pin 22	"
Pin 23	not used
Pin 24	not used
Pin 25	GND
Pin 26	GND

J2 -to Read Head (26-pin RIBBON)

	Signal, etc.	Connects to Read Head
Pin 1	GND	
Pin 2	GND	
Pin 3	GND	
Pin 4	GND	
Pin 5	GND	
Pin 6	GND	
Pin 7	READ CHANNEL 1	
Pin 8	"	
Pin 9	READ CHANNEL 2	
Pin 10	"	
Pin 11	READ CHANNEL 3	
Pin 12	"	
Pin 13	READ CHANNEL 4	
Pin 14	"	
Pin 15	READ CHANNEL 5	
Pin 16	"	
Pin 17	GND	
Pin 18	GND	

Pin 19	READ CHANNEL 6	.
Pin 20	"	.
Pin 21	READ CHANNEL 7	.
Pin 22	"	.
Pin 23	READ CHANNEL 8	.
Pin 24	"	.
Pin 25	READ CHANNEL 9	.
Pin 26	"	.

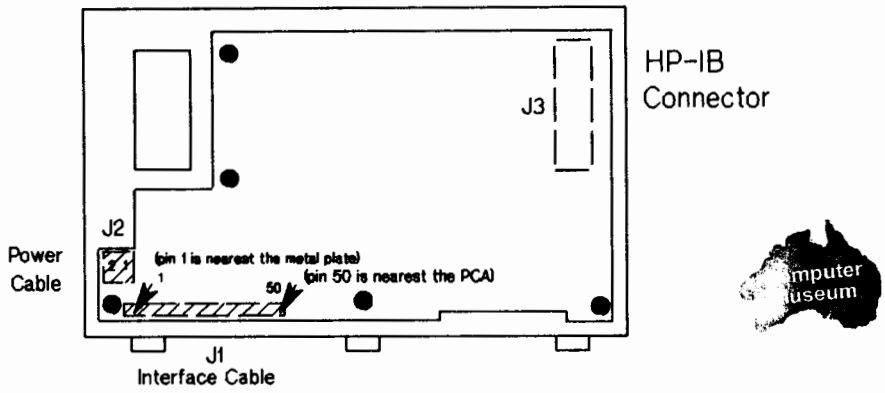


Figure 9-19
HP-IB Interface Pin Positions
(PCA shown mounted)

HP-IB Interface PCA
07980-6xx07

Connectors

J1 (Interface cable to Motherboard)
J2 (Power from Motherboard)
J3 (HP-IB Connector)

J1 -Interface-to-Motherboard (50-pin RIBBON)

	Signal, etc. (active low = *)	Connects to Motherboard PCA J91
Pin 1	GND	pin for pin
Pin 2	IF_CON (GND)	.
Pin 3	GND	.
Pin 4	IF_HIGH	.
Pin 5	IA[9]	.
Pin 6	IA[8]	.
Pin 7	IAD[7]	.
Pin 8	IAD[6]	.
Pin 9	IAD[5]	.

Pin 10	IAD[4]
Pin 11	IAD[3]
Pin 12	IAD[2]
Pin 13	IAD[1]
Pin 14	IAD[0]
Pin 15	ISEL*
Pin 16	GND
Pin 17	SYSRESET
Pin 18	GND
Pin 19	IR/W*
Pin 20	GND
Pin 21	IM/S*
Pin 22	GND
Pin 23	IINTA
Pin 24	GND
Pin 25	IADS
Pin 26	GND
Pin 27	ID/A*
Pin 28	GND
Pin 29	GND
Pin 30	GNDSI
Pin 31	IWS*
Pin 32	GND
Pin 33	IWRGA
Pin 34	GND
Pin 35	IRSA
Pin 36	GND
Pin 37	IRRQ*
Pin 38	GND
Pin 39	IEOD
Pin 40	IPAR
Pin 41	ID[7]
Pin 42	ID[6]
Pin 43	ID[5]
Pin 44	ID[4]
Pin 45	ID[3]
Pin 46	ID[2]
Pin 47	ID[1]
Pin 48	ID[0]
Pin 49	GND
Pin 50	GND

J2 -Power from Motherboard (2-pin MOLEX™)

	Signal, etc.	Color	Connects to Motherboard PCA J31
Pin 1	+5 V	red	J31(9)
Pin 2	GND	wht	J31(8)

J3 -HP-IB connector (24-pin)

	Signal		Signal
Pin 1	DI/O 1	Pin 13	DI/O 5
Pin 2	DI/O 2	Pin 14	DI/O 6
Pin 3	DI/O 3	Pin 15	DI/O 7
Pin 4	DI/O 4	Pin 16	DI/O 8
Pin 5	EOI	Pin 17	REN
Pin 6	DAV	Pin 18	DAV GND
Pin 7	NRFD	Pin 19	NRFD GND
Pin 8	NDAC	Pin 20	NDAC GND
Pin 9	IFC	Pin 21	IFC GND
Pin 10	SRQ	Pin 22	SRQ GND
Pin 11	ATN	Pin 23	ATN GND
Pin 12	SHIELD	Pin 24	LOGIC GND

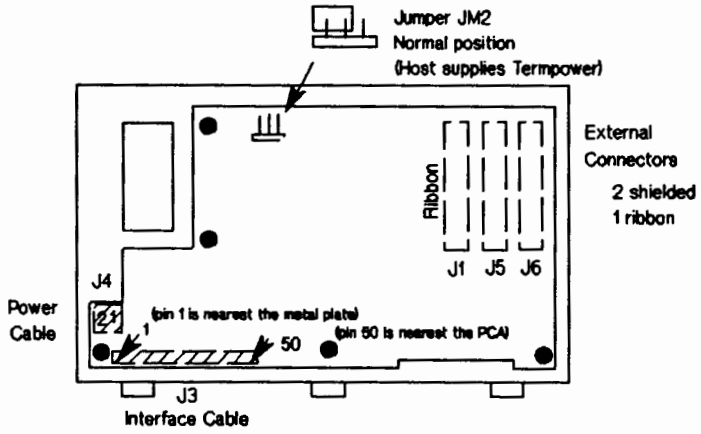


Figure 9-20
Single-Ended SCSI Interface Pin Positions
(PCA shown mounted)

SCSI Single-Ended Interface PCA
88780-6xx15

Connectors

J1 (Ribbon SCSI bus connector)
J3 (Interface cable to Motherboard)
J4 (Power from Motherboard)
J5 (Shielded SCSI bus connector)
J6 (Shielded SCSI bus connector)
JM2 (Termpower jumper)

J1, J5, J6 -SCSI bus connector (50-pin RIBBON)

	Signal		Signal
Pin 1	GND	Pin 26	Termpower (+5V)
Pin 2	-Data Bit 0	Pin 27	GND
Pin 3	GND	Pin 28	GND
Pin 4	-Data Bit 1	Pin 29	GND
Pin 5	GND	Pin 30	GND
Pin 6	-Data Bit 2	Pin 31	GND

Pin 7	GND	Pin 32	-ATN
Pin 8	-Data Bit 3	Pin 33	GND
Pin 9	GND	Pin 34	GND
Pin 10	-Data Bit 4	Pin 35	GND
Pin 11	GND	Pin 36	-BSY
Pin 12	-Data Bit 5	Pin 37	GND
Pin 13	GND	Pin 38	ACK
Pin 14	-Data Bit 6	Pin 39	GND
Pin 15	GND	Pin 40	-RST
Pin 16	-Data Bit 7	Pin 41	GND
Pin 17	GND	Pin 42	-MSG
Pin 18	-Data Bit P	Pin 43	GND
Pin 19	GND	Pin 44	-SEL
Pin 20	GND	Pin 45	GND
Pin 21	GND	Pin 46	-C/D
Pin 22	GND	Pin 47	GND
Pin 23	GND	Pin 48	-REQ
Pin 24	GND	Pin 49	GND
Pin 25	OPEN	Pin 50	-I/O

J3 -Interface to Motherboard (50-pin RIBBON)

See HP-IB Interface PCA J1 description earlier in this section for signals going to this connector.

J4 -Power from Motherboard (2-pin MOLEX™)

	Signal, etc.	Color	Connects to Motherboard PCA J31
Pin 1	+5 V	red	J31(9)
Pin 2	GND	wht	J31(8)

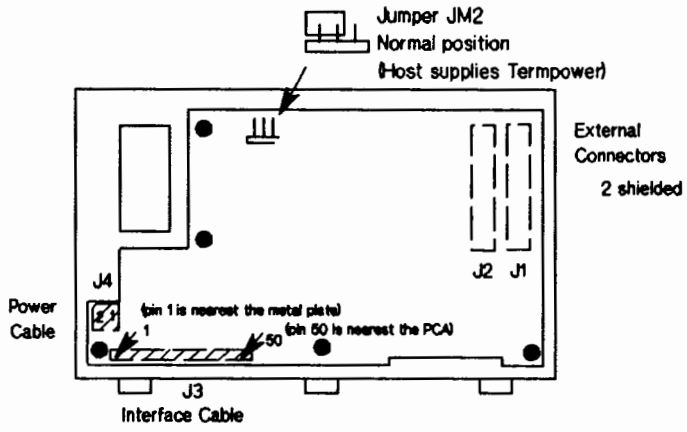


Figure 9-21
Differential SCSI Interface Pin Positions
(PCA shown mounted)

SCSI Differential Interface PCA
88780-6xx16

Connectors

J1 (Shielded SCSI bus connector)
J2 (Shielded SCSI bus connector)
J3 (Interface cable to Motherboard)
J4 (Power from Motherboard)
JM2 (Termpower jumper)

J1, J2 -Shielded SCSI bus connectors (50-pin RIBBON)

	Signal		Signal
Pin 1	SHIELD GND	Pin 26	TERMPWR (+5V)
Pin 2	GND	Pin 27	GND
Pin 3	+Data Bit 0	Pin 28	GND
Pin 4	-Data Bit 0	Pin 29	+ATN
Pin 5	+Data Bit 1	Pin 30	-ATN
Pin 6	-Data Bit 1	Pin 31	GND
Pin 7	+Data Bit 2	Pin 32	GND

Pin 8	-Data Bit 2	Pin 33	+BSY
Pin 9	+Data Bit 3	Pin 34	-BSY
Pin 10	-Data Bit 3	Pin 35	+ACK
Pin 11	+Data Bit 4	Pin 36	-ACK
Pin 12	-Data Bit 4	Pin 37	+RST
Pin 13	+Data Bit 5	Pin 38	-RST
Pin 14	-Data Bit 5	Pin 39	+MSG
Pin 15	+Data Bit 6	Pin 40	-MSG
Pin 16	-Data Bit 6	Pin 41	+SEL
Pin 17	+Data Bit 7	Pin 42	-SEL
Pin 18	-Data Bit 7	Pin 43	+C/D
Pin 19	+Data Bit P	Pin 44	-C/D
Pin 20	-Data Bit P	Pin 45	+REQ
Pin 21	DIFFSENS	Pin 46	-REQ
Pin 22	GND	Pin 47	+I/O
Pin 23	GND	Pin 48	-I/O
Pin 24	GND	Pin 49	GND
Pin 25	TERMPWR (+5V)	Pin 50	GND

J3 -Interface cable to Motherboard (50-pin RIBBON)

See HP-IB Interface PCA J1 description earlier in this section for signals going to this connector.

J4 -Power from Motherboard (2-pin MOLEX™)

	Signal, etc.	Color	Connects to Motherboard PCA J31
Pin 1	+5 V	red	J31(9)
Pin 2	GND	wht	J31(8)

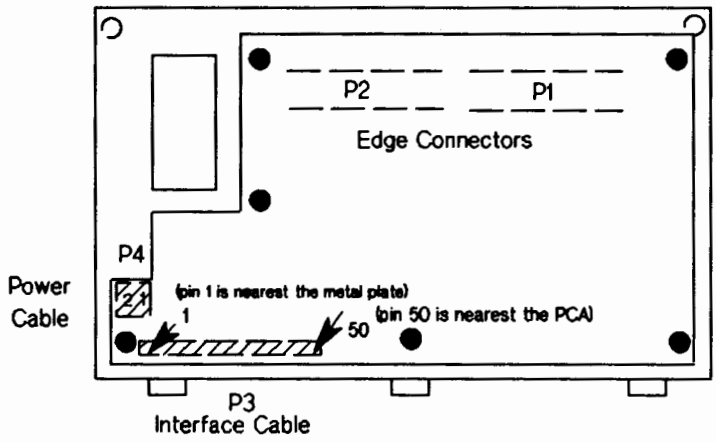


Figure 9-22
Pertec-Compatible Interface Pin Positions
(PCA shown mounted)

Pertec-Compatible Interface PCA
88780-6xx22

Connectors

P1 (Pertec-compatible connector)
P2 (Pertec-compatible connector)
P3 (Interface cable to Motherboard)
P4 (Power from Motherboard)

For P1 and P2, bus definition and protocol are configurable for the following modes:

- CDC 92185-compatible mode
- CIPHER F880-compatible mode
- PERTEC FS1000-compatible mode

P1 pin #	88780A/B CIPHER	CIPH.	88780A/B CDC	CDC -	PERTEC -------
14	n/a	n/a	n/a	n/a	SGL(unit check)
16	n/a	n/a	LOL	LOL	LOL(load/onl'n)
36	n/a	n/a	LGAP	LGAP(gap size)	RTH2(3200/1600)
44	n/a	n/a	RTHR	RTHR(hi thresh)	RTH1 (gap size)
P2 pin #					
24	OFL	REW/ UNL	OFL	OFL	OFL(offl/Rw/unl)
26	n/a	n/a	GCR	GCR	NRZ(diag ack)
40	n/a	n/a	HSPD	HSPD	SPEED(speed)
50	n/a	n/a	HISP	HISP	DEN(25/100 ips)

P1 -Pertec-compatible connector (50-pin RIBBON)

Live Pin	Ground Pin	Signal Description	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 0	IW0
12	11	Write Data 1	IW1
14	13	(see preceding table)	definable
16	15	Load / Online	ILOL
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	(see preceding table)	definable
38	37	Edit	IEDIT
40	39	Erase	IERASE
42	41	Write File Mark	IWFM
44	43	(see preceding table)	definable
46	45	Transport Address 0	ITAD0

48	47	Read Data 2	IR2
50	49	Read Data 3	IR3

P2 - Pertec-compatible connector (50-pin RIBBON)

Live Pin	Ground Pin	Signal Description	Signal Name
1	-	Read Data Parity	IRP
2	-	Read Data 0	IR0
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	IDENT
18	17	Formatter Enable	IFEN
20	19	Read Data 5	IR5
22	21	End of Tape	IEOT
24	23	Rewind/Unload	IRWU
26	25	(see preceding table)	definable
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	(see preceding table)	definable
42	41	Corrected Error	ICER
44	43	Online	IONL
46	45	Transport Address 1	ITAD1
48	47	Formatter Address	IFAD
50	49	(see preceding table)	definable

P3 -Interface to Motherboard (50-pin RIBBON)

See HP-IB Interface PCA J1 description earlier in this section for signals going to this connector.

P4 -Power from Motherboard (2-pin MOLEX™)

	Signal, etc.	Color	Connects to Motherboard PCA J31
Pin 1	+5 V	red	J31(9)
Pin 2	GND	wht	J31(8)

SECTION 10

REFERENCE

HP 7979A/7980A/7980XC Tape Drive User's Guide	07980-90000
HP 88780B Tape Drive User's Guide	88780-90000
HP 7979A/7980A/7980XC/88780A/B Service Manual	07980-90030

SECTION 11

SERVICE NOTES/IOSMs

This section of the handbook may be used to file service notes.

Sequence Number	Publication Date	Title
		HP 7979A
7979A-1	10/87	New RFI Paint on Front Bezel
7979A-2	10/87	Firmware Update
7979A-3	10/87	Hub Lock Assembly Changed
7979A-4	10/87	Standby Switch Replaced by Assembly
7979A-5	03/88	Rd/Wrt/PLL combined w/Rd Formatter PCA
7979A-6	03/88	Rev. 3.5 FW for Rd/Wrt/PLL/Fmttr PCA
7979A-7	03/88	Takeup Hub Assembly modification
7979A-8	05/88	New rotating slide rails
7979A-9	06/88	Motor/Power PCA modified for RFI
7979A-10	07/88	Rd/Wrt/PLL/Fmttr P/N changed
7979A-11B-S	11/88	Possible hazard with rotating slides
7979A-12	08/88	Possible shock with 7936/37
7979A-13	09/88	800 density supported (Option 800)
7979A-14	11/88	New interface cable for noise immunity
7979A-15	11/88	New Buffer Arm friction clip available
_____	_____	_____
_____	_____	_____
_____	_____	_____
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_____	_____	_____

Sequence Number	Publication Date	Title
		HP 7980A
7980A-1	10/87	New RFI Paint on Front Bezel
7980A-2	10/87	Firmware Update
7980A-3	10/87	Hub Lock Assembly Changed
7980A-4	10/87	Standby Switch Replaced by Assembly
7980A-5	02/88	Rd/Wrt/PLL combined w/Rd Formatter PCA
7980A-6	02/88	Rev. 3.5 FW for Rd/Wrt/PLL/Fmttr PCA
7980A-7	03/88	Takeup Hub Assembly modification
7980A-8	05/88	New rotating slide rails
7980A-9	06/88	Motor/Power PCA modified for RFI
7980A-10	07/88	Rd/Wrt/PLL/Fmttr P/N changed
7980A-11B-S	11/88	Possible hazard with rotating slides
7980A-12	08/88	Possible shock with 7936/37
7980A-13	09/88	800 density supported (Option 800)
7980A-14	11/88	New interface cable for noise immunity
7980A-15	11/88	New Buffer Arm friction clip available

Sequence Number	Publication Date	Title
		HP 7980XC
7980XC-1	05/88	New compression buffer available
7980XC-2	05/88	New firmware supports compression
7980XC-3	05/88	Introductory compression information
7980XC-4B-S	11/88	Possible hazard with rotating slides
7980XC-5	08/88	Possible shock with 7936/37
7980XC-6	11/88	New interface cable for noise immunity
7980XC-7	11/88	New Buffer Arm friction clip available
7980XC-8A-S	11/88	Possible hazard with rotating slides

Sequence Number	Publication Date	Title
		HP 88780A
88780A-1	11/87	Interface PCAs renumbered
88780A-2	03/88	SCSI interfaces replaced
88780A-3	03/88	Firmware kits revised to FW Rev. 3.51
88780A-4	03/88	Pertec-compatible interface replaced
88780A-5	11/88	Possible miswire on Power Module

Sequence Number	Publication Date	Title
	HP88780B	