HP Series 6400
Models 1300H and 1300S
DDS-Format Tape Drives

CE Service Handbook

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Contents

Contents (continued)

Contents (continued)

Figures and Tables

Product Information 1

This chapter contains general information about the HP Series 6400 Models 1300H and 1300S DDS-Format tape drives. This consists of information about the user interface, accessories for the cassette tape drive, specifications and a table explaining which host systems are compatible with the drives.

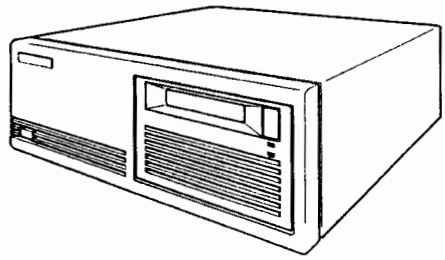


Figure 1-1. The HP Series 6400 Model 1300H/1300S DDS-Format Drive

NOTE Throughout this manual, the following symbols are used to highlight the information which is specific to either the HP-IB or SCSI drive. If no symbol is shown, the information applies to both tape drives.

HP-IB⇒ SCSI⇒

1.1 General Description

The Models 1300H and 1300S are cassette tape drives which are based on Digital Audio Tape (DAT) technology and use a Digital Data Storage (DDS) recording format which has been specifically developed for computer applications.

The drives have a transfer rate of up to 11 megabytes/minute and can store 1.3 gigabytes on a 60 m cassette. The drives' fast-search capability allows data to be accessed within twenty seconds on a standard 1.3 gigabyte tape (this feature is not currently supported on MPE or HP-UX, although future support is planned).

The drives have the following features:

- read-after-write capability for data verification
- three levels of Error Correction Code (ECC), which include additional third-level error detection and correction circuitry
- a 512 kilobyte data buffer to maintain host transfer rate

HP-IB ⇒
- the 1300H supports the HP-IB interface

SCSI ⇒
- the 1300S supports the SCSI interface

1.2 Compatibility

The drives are designed for use with HP 3000 and HP 9000 low-end to mid-range computer systems. They store data on tape using the Digital Data Storage (DDS) format which has been adopted by numerous other tape drive manufacturers.

For a description of the DDS format, refer to "Digital Data Storage (DDS)—A Description and Glossary for Customer Engineers", part number C1500-90903, and "Using the Drive with a Series 300 HP-UX System", part number C1511-90905.

Table 1-1 shows the host support matrix for the tape drives, and is subject to change. Refer to Support Update for the latest support information.

Table 1-1. Host Support Matrix

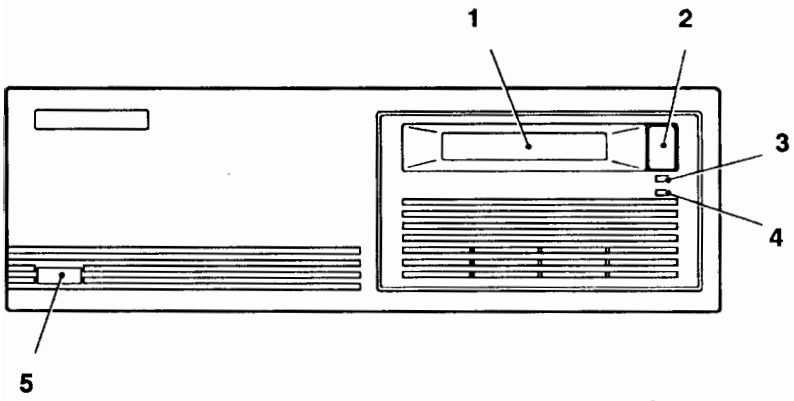
	Host	Series	Operating System	Notes
HP-IB ⇒	HP 9000	300	HP-UX 7.0	Fast-Search is not yet supported on these operating systems
		500	HP-UX 8.0	
		800	HP-UX 8.0	
	HP 3000	900	MPE-XL 2.05	
		Others	MPE-V V/E delta 10*	
	HP 1000			Support planned
SCSI ⇒	Personal Computers	RS and QS		Support planned

* A patch tape will be available to give support on MPE-V delta 8

1.3 User Interface

1.3.1 Front Panel

The front panel of the drive is used for inserting and removing cassettes (see **figure 1-2**). It also displays tape drive and cassette status, and diagnostic information. Further explanation of the drive's front panel displays can be found in **Chapter 3**.



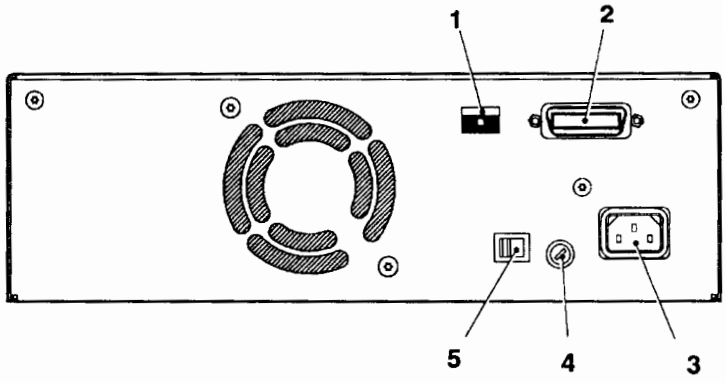
1..... Cassette Slot
2.....Unload Button
3..... Cassette LED
4..... Drive LED
5..... AC Line Switch

Figure 1-2. The Front Panel

HP-IB ⇒

1.3.2 Rear Panel of the 1300H

The rear panel switches include the HP-IB Device Address switch and the Voltage Select slide-switch. These are shown in **figure 1-3**.



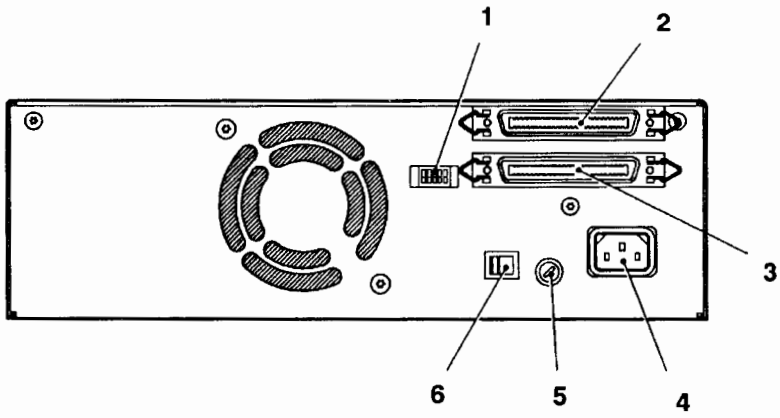
1..... Device Address Switch
2..... HP-IB Connector
3..... Power Connector
4..... Fuse and Fuseholder
5..... Voltage Select Switch

Figure 1-3. The Rear Panel of the 1300H

SCSI ⇒

1.3.3 Rear Panel of the 1300S

The rear panel switches include the SCSI ID switch and Voltage Select Switch. These are shown in **figure 1-4**.



1..... SCSI ID Switch
2..... SCSI Connector 1
3..... SCSI Connector 2
4..... Power Connector
5..... Fuse and Fuseholder
6..... Voltage Select Switch

Figure 1-4. The Rear Panel of the 1300S

1.4 Accessories

1.4.1 Power Cords

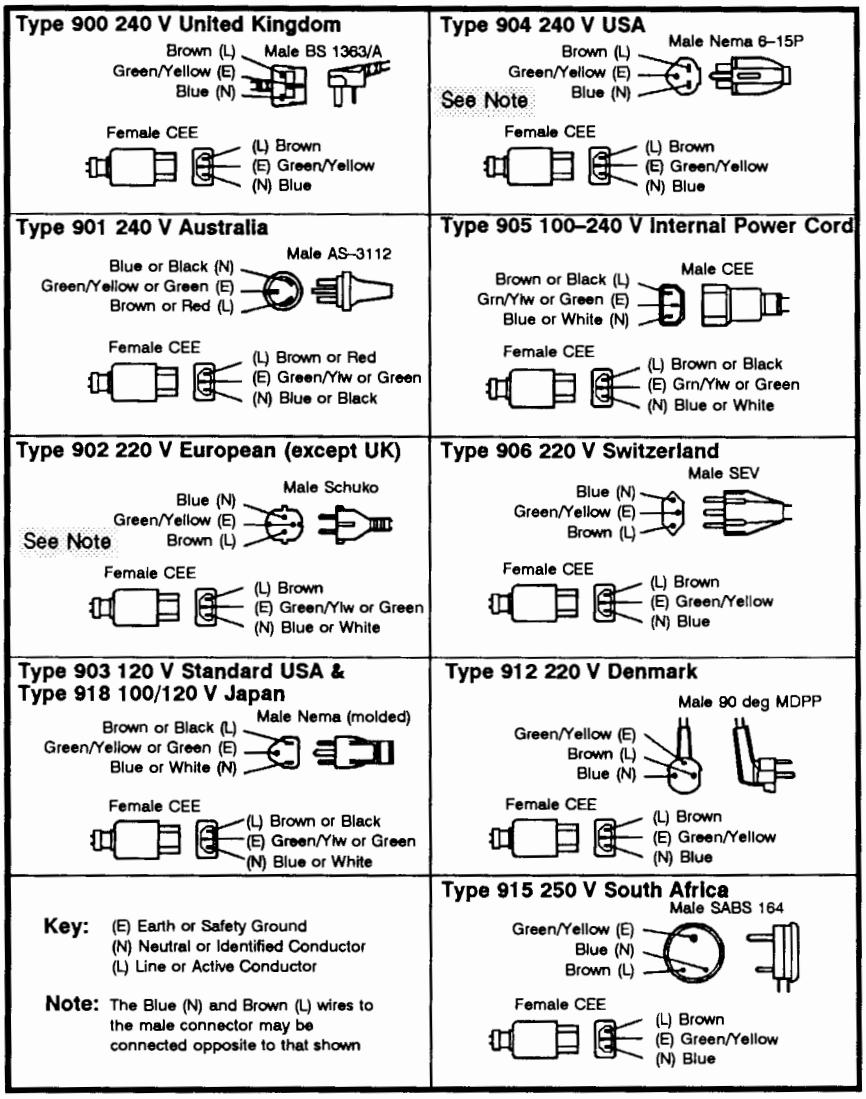


Figure 1-5. Available Power Cords

1.4.2 Accessories Supplied

When the tape drive is received, the shipping container should contain the following items:

- Tape Drive: Model 1300H or Model 1300S
- Power Cord: applicable to country
- User's Manual: applicable to drive
- Two spare fuses for USA
- A fuseholder and three fuses for Europe
- A blank tape
- A cleaning cassette

1.4.3 Accessories Available

The following accessories may be purchased separately to supplement those which are supplied:

- Cleaning cassette: HP 92283K
- Box of 5 cassettes: HP 92283A

HP-IB ⇒
- 0.5 m HP-IB cable: HP 10833D

HP-IB ⇒
- 1 m HP-IB cable: HP 10833A

HP-IB ⇒
- 2 m HP-IB cable: HP 10833B

HP-IB ⇒
- TurboSTORE:

SCSI ⇒
- SCSI Terminator: 1252-3251

SCSI ⇒
- 0.5 m SCSI Interface Cable: HP 92222A

SCSI ⇒
- 1 m SCSI Interface Cable: HP 92222B

SCSI ⇒
- 2 m SCSI Interface Cable: HP 92222C

SCSI ⇒
- 1 m SCSI Extender Cable: HP 92222D

1.4.4 Rack Mounting

The drive can be mounted in a standard 19-inch EIA rack. To do this you need the 19-inch Rack Mount Kit (HP 19500B).

1.4.5 Mini Rack Mounting

The drive can also be mounted in a mobile mini-rack system cabinet (HP 92211R) as a desktop unit.

To fit the drive into the HP 92211R cabinet you will require a mounting rail kit (HP 92211S) and a filler panel kit (HP 92211T).

1.5 Safety Certification

The 1300H and 1300S comply with the following requirements:

- UL 478 – "Information Processing and Business Equipment" (Fifth Edition). UL 1950 – "Information Processing and Business Equipment" (First Edition)
- CSA C22.2 No. 220, M1986 – "Information Processing and Business Equipment".
- IEC 950 – "Safety of Information Technology Equipment including Electrical Business Equipment" (First Edition).

Units shipped will meet the requirements of the country of destination.

1.6 Performance Specification

The tape drive has the following performance specifications.

1.6.1 Data Capacity

Up to 1.3 gigabytes per 60 m cassette.

1.6.2 Data Transfer Rate

Maximum sustained – 11 megabytes per minute (host dependent).

The drive must be streaming to achieve this sustained rate.

1.6.3 Load Time

The load procedure takes 25 seconds from the time the cassette is inserted into the tape drive to the time the drive is ready to start acting upon the first command from the host.

1.6.4 Retries Limits on Read-After-Write

For Read-After-Write error correction, each frame can be rewritten up to a maximum of 127 times (giving 128 writes of the frame).

1.6.5 Limits on N-Group Writing

With N-Group writing, where every group is written a fixed number of times, the upper limit is 8, which includes the original and up to 7 repeats.

1.6.6 Power-Fail Handling

If there is a power-fail, the drive performs the following actions when power is restored, and reverts to its default configuration:

1. The drive executes the Power-Up sequence of self-tests.
2. It loads the tape, if one was previously loaded.

HP-IB ⇒ **3(a)** The drive remains offline, preventing the host from accessing the tape. It is up to the user or software to put the drive back online.

SCSI ⇒ **3(b)** The host must send a SCSI LOAD command to the drive before it can access the tape.

1.7 Physical Specification

1.7.1 Crated Dimensions and Weight

	Height	310 mm (12.5 in.)
	Width	500 mm (20.8 in.)
	Depth	460 mm (15.8 in.)
HP-IB ⇒	**Weight**	9.4 kg (20.7 lb)
SCSI ⇒	**Weight**	9.2 kg (20.3 lb)

1.7.2 Uncrated Dimensions and Weight

	Height	107 mm (4.2 in.)
	Width	325 mm (12.8 in.)
	Depth	290 mm (11.4 in.)
HP-IB ⇒	**Weight**	7.9 kg (17.4 lb)
SCSI ⇒	**Weight**	7.7 kg (17.0 lb)

1.8 Environmental Specification

1.8.1 Temperature

Operating Temperature (media limited) +5°C to 40°C (40°F to 104°F)

Storage Temperature (without media) -40°C to +70°C (-40°F to 158°F)

1.8.2 Relative Humidity

Operating humidity, non-condensing . . . . . 20 to 80% (maximum 26°C wet bulb)

Operating (mech.) . . . . . 15 to 95%

Non-Operating . . . . . .5 to 95%

1.8.3 Altitude

Operating Altitude . . . . . .0 km to 4.6 km (0 to 15,000 ft)

Non-Operating Altitude . . . . . 0 km to 15.2 km (0 to 50,000 ft)

1.8.4 Vibration

Operating Limit . . . . . .0.21 g rms

Non-Operating Limit . . . . . 2.1 g rms

1.8.5 Mechanical Shock

Non-Operating Shock Survival . . . . . 90 g for 3 ms duration

Transportation Test on Bare Product . . . . . 30 g for 26 ms

1.8.6 Susceptibility to Electrostatic Discharge

No performance change . . . . . 0 to 15 kV

No permanent damage . . . . . 0 to 25 kV

1.8.7 Magnetic Emissions

Operating (at product surface) . . . . . <0.5 millitesla @ 3 ft

Non-Operating (at any surface) . . . . . <0.525 microtesla @ 3 ft

1.8.8 Heat Generated

Typical . . . . . .24 kcals/h (95 BTU/h)

Maximum . . . . . 48 kcals/h (190 BTU/h)

1.8.9 Noise

Noise Level (media limited) . . . . . <5 bel

1.9 Electrical Specifications

1.9.1 Input Voltage/Frequency

Nominal . . . . . 115 V, 60 Hz or 230 V, 50 Hz (switch selectable)

Voltage Range . . . . . 90 V to 132 V
. . . . . 198 V to 264 V

Frequency Range . . . . . 47 Hz to 63 Hz

1.9.2 Power Consumption

Typical . . . . . 35 W rms

Maximum . . . . . 40 W rms

1.9.3 Power Line Susceptibility to Line Transients

Voltage Transients . . . . . ±30% for 10 ms

Frequency Transients . . . . . ±10% for 10 ms

Spike Transients . . . . . 1000 V for 50 ms

1.10 Serial Number Information

The serial number has a four digit prefix, a letter, and a five digit suffix (0000 E 00000). The first four digits are a date code which indicate when design changes were made. The letter designates the country in which the unit was manufactured ("E" indicates England). The five digit suffix is a number which increments with each tape drive shipped. This label is located below the self-test displays on the rear panel.

In addition to the serial number label on the rear panel, there is a similar label on the Tape Drive Module. The serial numbers should be quoted when ordering parts.

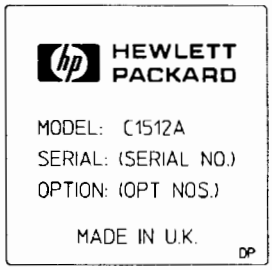


Figure 1-6. The Serial Number Label

Site Preparation and Installation 2

2.1 Customer's Responsibility

If the tape drive is not part of a coordinated shipment, it is the customer's responsibility to unpack the drive, check it, and connect it to the host computer.

Chapter 1 of the User's manual, part number C1511-90901 for the 1300H or C1512-90901 for the 1300S, provides the information required to choose a suitable site for the tape drive and to install it.

Some of the information in the User's Manual is repeated in this chapter to assist you where you suspect that incorrect installation may be causing a customer's problem.

2.1.1 Positioning the Drive

The tape drive should be placed so that it has adequate ventilation. The ventilation slots at the front of the drive and the grille at the rear must not be obstructed.

Place the tape drive in a position where the temperature is relatively stable, away from fans, doors and windows. This helps to maintain data integrity when the drive is in use.

If possible, the shortest cable run between the host computer and the tape drive should be used. The drive should be sited in accordance with the specifications contained in **section 1.8**.

For additional information on site environmental specifications, refer to the HP publication CEO Site Prep Handbook (HP 5958-2370).

2.2 Connections

HP-IB ⇒

2.2.1 Connections to the Model 1300H

There are only two connections for the Model 1300H tape drive—the HP-IB connection to the host computer and a connection to the power source. A typical setup is shown in **figure 2.1**, where the tape drive is connected to an HP 9000 computer.

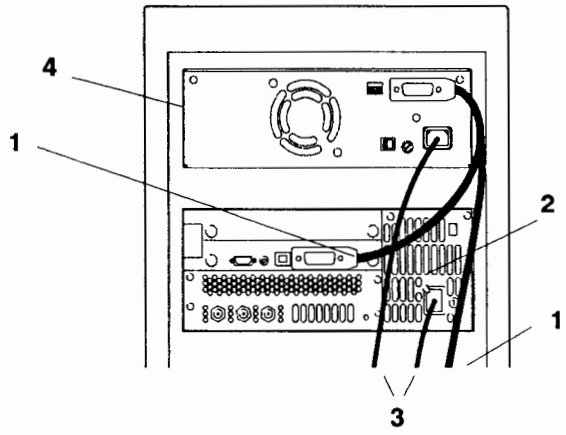


Figure 2-1. Connections to Host and Power

1..... HP-IB Cables
2..... HP 9000 Series 300 Computer
3..... AC Line Cables
4..... 1300H Tape Drive

When connecting the tape drive to a host computer, the following rules should be observed:

- Turn off all the AC line switches when connecting and disconnecting devices to the system.
- Do not power on or off any devices while there is activity on the bus.
- All devices must be powered on during any bus transaction with a high transfer rate peripheral. When the host is talking to a lower transfer rate peripheral, such as a printer, at least two-thirds of the devices connected to the HP-IB must be powered-on.
- The maximum length for a single cable is two meters.
- The total length of cable permitted in one bus system must be less than or equal to two meters multiplied by the number of devices connected together.
- Connections should be in a linear configuration. **Star configuration must not be used.**
- The maximum number of devices that can be interconnected in one bus system is eight.

- Do not stack more than three of the connector blocks one on top of another.
- Do not use a screwdriver to tighten the lock screws on the connector blocks; they are designed for tightening by fingers only. The screwdriver slots are provided to assist removal.
- Only use RFI shielded HP-IB cables. (These generally have metal bodied connectors.)

The tape drive power cable supplied should be the correct type for the country of destination. Those available are shown in **figure 1-5.**

SCSI ⇒

2.2.2 Connections to the Model 1300S

There are only two connections for the Model 1300S tape drive – the SCSI connection to the host computer and a connection to the power source. A typical setup is shown in **figure 2-2**, where the tape drive is connected to an HP 9000 computer.

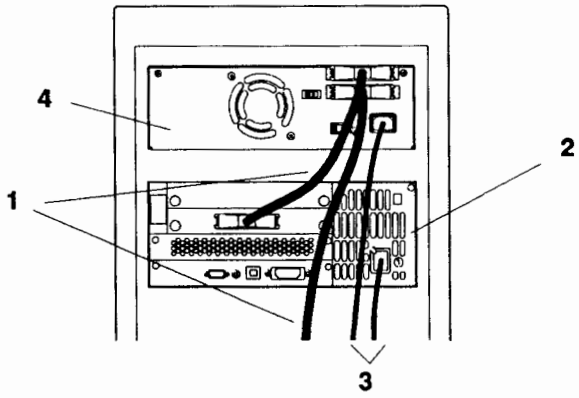


Figure 2-2. Connections to Host and Power

1..... SCSI Cables
2..... HP 9000 Series 300 Computer
3..... AC Line Cables
4..... 1300S Tape Drive

When connecting the tape drive to a host computer, the following rules should be observed:

- Only a single-ended SCSI configuration is supported.
- Turn off all the AC line switches when connecting and disconnecting devices to the system.
- The total length of a single cable must be less than six meters. This includes the drive's internal cabling which is equivalent to 0.55 m.
- Connections should be in a chain, with the computer at one end and a terminator at the other. **Star configuration must not be used.**

To ensure compliance with the SCSI standard, the drive must be daisy-chained, using both connectors. If the drive is at the end of the chain, the SCSI cable is attached to connector 1 and a terminator to connector 2. If the drive is in the middle, the cable should run in through connector 1 and out through connector 2.

- The maximum number of devices that can be interconnected in one bus system is eight.
- Only use RFI shielded SCSI cables. (These generally have metal bodied connectors.)

The tape drive power cable supplied should be the correct type for the country of destination. Those available are shown in **figure 1.5**.

Warning **If it is necessary to replace the 1300H or 1300S power cable, the replacement must have a suitable grounding conductor. Otherwise an internal failure of the drive could result in a safety hazard.**

2.3 Line Voltage and Fusing

The voltage select switch on the rear panel must be set to the appropriate nominal line voltage for the area in which the tape drive is used. This switch is normally set to the appropriate voltage prior to shipping. The choice is either 115 VAC or 230 VAC. Use an F3A-250V Fast-Blow fuse for the USA and Canada, or a T3.15A-250V Slow-Blow fuse for outside the USA and Canada. The switch-mode supply should only be protected by a fuse of the given rating.

2.4 Device Address

The device address can be set to any value from 0 through 7. If you want to change the address, you must power-cycle the drive to register the new address.

HP-IB ⇒

2.4.1 HP-IB Device Address

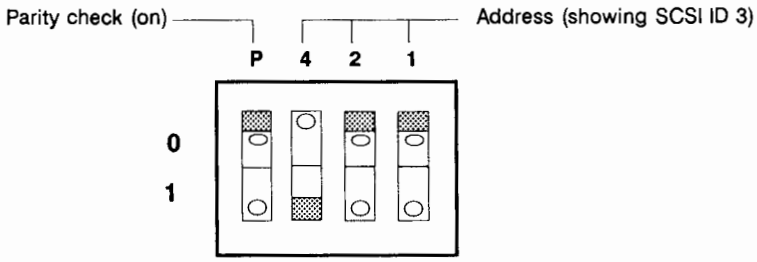
The HP-IB device address wheel is set to give the unit the address 3, by which the host can identify it. The HP-IB address is shown on the Device Address Switch, located on the rear panel of the drive.

SCSI ⇒

2.4.2 SCSI ID

The drive reads the SCSI ID at power-up and during self-test in order to determine the selected target ID on the interface bus.

As the SCSI ID is preset to 3, you may need to change the address if another device already exists with that number. Switch off the drive when you change the address and examine the Options Switches on the rear panel. These are shown in **figure 2-3.**



SCSI ID	4	2	1
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

Figure 2-3. The SCSI ID

SCSI ⇒

2.4.3 Parity Checking

The 1300S can be set to check parity on commands and data, or not to check parity. The parity check provides extra data reliability and should be used if the host supports it.

If you want the tape drive to check parity on commands and data, set the switch marked P on the Options Switch to 1. With the switch in position 0, the drive does not check parity, although the parity bits will still be generated.

Operation 3

The front panel of the drive is used for the following:

- Inserting and removing cassettes
- Displaying drive and cassette status
- Displaying diagnostic information

The front panel has two bi-colour (green/yellow) LEDs and an Unload button. The LEDs are green for normal status display and switch to yellow to display fault information. A yellow display on the 1300H also indicates whether a cassette is write-protected.

3.1 Normal Status Display

The upper LED represents Cassette status and the lower LED represents Drive status. Each LED can be off, each can display a constant green or constant yellow, they can flash green at a variable rate, and they can pulse green (on for 0.25 seconds, off for 0.25 seconds). The following tables list all the possibilities for normal front panel light displays and their meanings.

For information on how the LEDs display diagnostic information, refer to **Chapter 4**.

Table 3-1. Status Display for Cassettes not Write-Protected

Lights	HP-IB Meaning	SCSI Meaning
Off Off	No cassette present or no power	No cassette present or no power
Off Flash Green	HP-IB/DDS activity, no cassette	SCSI/DDS activity, no cassette
Pulse Green Pulse Green	Loading or unloading	Loading or unloading
Steady Green Off	Cassette loaded and drive offline	Cassette loaded
Steady Green Flash Green	HP-IB/DDS activity, with cassette loaded	SCSI/DDS activity, with cassette loaded
Steady Green Steady Green	Cassette loaded and drive online	

Table 3-2. Status Display for Write-Protected Cassettes

Lights	Meaning
Pulse Yellow Pulse Green	Loading or unloading—cassette write-protected
Steady Yellow Off	Cassette write-protected and loaded, with the drive offline
Steady Yellow Flash Green	HP-IB/DDS or SCSI/DDS activity with write-protected cassette
Steady Yellow Steady Green	Cassette write-protected and loaded, with the drive online

Table 3-3. Warning Displays

Lights	Meaning
Green: 4.5s on, 0.5s off Irrelevant	Caution signal—see section 3.1.1
Steady Yellow Steady Yellow	High humidity—see section 3.1.2
Groups of 1–3 Yellow Pulses Steady Yellow	Part of the drive is not functioning correctly. Refer to section 4.3 for more details.

3.1.1 Caution Signal

If, during normal operation of the drive, an excessive number of read-after-write (RAW) and third level Error Correction (C3 ECC) retries occur, a caution signal is displayed. This indicates one of the following problems:

- The head needs cleaning
- The media has deteriorated
- There is a read-after-write channel failure

The caution signal is displayed by the cassette status LED showing alternating green for 4.5 seconds and OFF for 0.5 seconds. If this occurs, try the following:

1. Clean the heads.
2. Copy the data from the existing cassette onto disk.
3. Insert a new cassette into the drive, and copy the data from disk onto the new cassette.
4. Discard the old cassette.

The status is cleared by unloading the cassette. If these steps are unsuccessful, the fault may be a read-after-write channel failure. Refer to **Chapter 4.**

3.1.2 Humidity Warning

If the drive detects high humidity, a warning is displayed by both LEDs showing steady yellow. Any commands which are currently being executed are aborted. In addition, the tape is unthreaded to prevent head and tape damage.

HP-IB ⇒ As soon as the drive detects that the humidity has returned to an acceptable level, it will perform a power-on reset. The tape will then be loaded, but offline. The drive must be placed on-line before it will again respond to commands which access the tape.

SCSI ⇒ Once humidity has reached an acceptable level, the drive must be reset.

HP-IB ⇒

3.1.3 Online Status

The online status is indicated by the drive LED. The drive goes online and offline under the following conditions:

- If a tape is inserted into the drive, it is loaded and the drive goes online automatically.
- If you press the Unload button on the front panel, the tape is rewound, the drive goes offline, and the tape is ejected. This happens regardless of the state of the drive, so if the drive was online and using the tape, the tape would still be ejected at the end of the unload sequence.
- If there is a device powerfail, the drive rewinds the tape when power is restored, keeps it loaded, and leaves the drive offline. It is up to the user or software to put the drive back online.

- If a REWIND AND GO OFFLINE command is issued by the host, the tape is rewound to LBOT and the drive goes offline. The tape remains loaded in thr drive.

3.2 Operator Action

3.2.1 Inserting Cassettes

The operator inserts a cassette into the slot on the front panel with the arrow-head on the cassette upwards and pointing towards the drive. As the cassette is inserted, the drive automatically loads it into the drive mechanism and performs a tape load sequence (see **section 3.3.1**). After this, the drive is ready to respond to all commands, including those that involve media access.

3.2.2 Removing Cassettes

A cassette can be removed either in reponse to an HP-IB or SCSI REMOTE UNLOAD command or by pressing the Unload button to start the unload sequence (see **section 3.3.2**). The mechanism rewinds the tape to LBOT (Logical Beginning of Tape), unthreads it, and ejects the cassette from the mechanism.

3.2.3 Write-Protecting a Cassette

Cassettes can be write-protected by sliding the tab on the rear of the cassette so that the hole is open. In this state, data can be read from the tape but not written to it.

CAUTION The tape log, which contains a history of usage of the tape, will not be updated when the cassette is write-protected. It follows that the tape log becomes inaccurate if a cassette is used when write-protected.

3.2.4 Head Cleaning

The tape heads should be cleaned after every 25 hours of use, or when the Caution signal is displayed.

NOTE Only use HP Cleaning Cassette (HP 92283K) to clean the tape heads. Do not use swabs or other means of cleaning the heads.

Clean the heads as follows:

1. Insert the Cleaning cassette into the drive.
2. The tape drive automatically loads the cassette and cleans the heads.
3. At the end of the cleaning cycle, the drive ejects the cassette.

The Cleaning cassette should be discarded after being used 25 times.

SCSI ⇒ The 1300S also has a built-in cleaning roller which supplements this manual cleaning.

3.3 Load and Unload

This section describes the various events that occur in the load and unload sequences on the 1300H and 1300S.

3.3.1 The Load Sequence

During the load sequence, the following occurs:

1. The drive mechanism accepts the cassette, threads the tape, accelerates the head drum, and moves the tape to LBOT (Logical Beginning of Tape). The Reference area is checked to find the tape format (DDS, audio, and so on).
2. (a) If the tape is blank or not in the DDS format, the drive winds the tape to LBOT and awaits the next command.

HP-IB ⇒ (b) If the format is not DDS, the drive winds the tape to LBOT and awaits either a write command or an unload command.

(c) If the tape is in DDS format and is not write-protected, write and read tests are performed on the Test area of tape. If the error rate is high the caution signal will be displayed on the front panel LEDs.

3. The System area is then accessed and the tape log read into the drive.

HP-IB ⇒ **4(a)** Finally the drive rewinds the tape to LBOT and goes online.

SCSI ⇒ **4(b)** The drive rewinds to LBOT.

3.3.2 The Unload Sequence

During the unload sequence the following occurs:

1. The tape is rewound to LBOT and, if the tape is write-enabled, the copy of the tape log is updated. The tape is then rewound to BOM (Beginning of Media) and the tape unthreaded from the mechanism.

HP-IB ⇒ **2(a)** At this stage the tape is either retained in the drive or ejected, depending on configuration parameters. The drive then goes offline.

SCSI ⇒ **2(b)** At this stage the tape is either retained in the drive or ejected, depending whether a PREVENT/ALLOW MEDIA REMOVAL command has previously been received.

NOTE If you think the tape is jammed in the mechanism, refer to **section 4.6.12** for instructions on how to remove the cassette.

3.3.3 Power-Cycling

If the cassette has not been ejected from the drive before power-cycling, the tape is retained within the drive but will require a LOAD command to load the tape and put it on-line when the drive is next powered up.

SCSI ⇒ A PREVENT MEDIA REMOVAL command sent before the power-cycle will be reset at power-up, so that the cassette will now be ejected when an UNLOAD command is received.

3.4 General Information

The tape drive consists of three major electronic assemblies:

- Power Supply Unit
- HP-IB Interface or SCSI Interface
- Tape Drive Module

Figure 3.1 shows a block diagram of the Interface and Tape Drive Module.

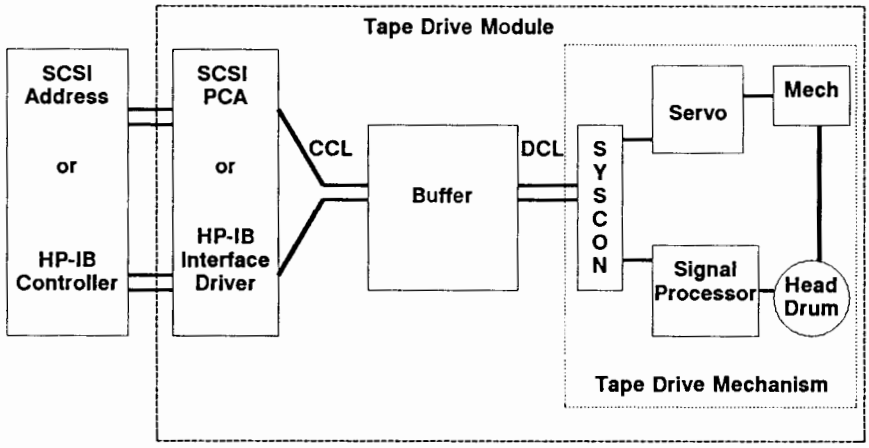


Figure 3-1. The Interface and Tape Drive Module of the 1300H and 1300S

3.4.1 Tape Drive Module

The Tape Drive Module consists of:

- the Tape Drive Mechanism
- the Buffer PCA

HP-IB ⇒ • the HP-IB Interface Driver PCA

SCSI ⇒ • the SCSI PCA

3.4.1.1 Tape Drive Mechanism

The Tape Drive Mechanism consists of:

- The System Controller PCA (Syscon), which
  - —handles the flow of data and commands to and from the buffer across the DCL bus
  - —performs C3 ECC (Third Level Error Correction)
- The Signal Processor, which converts data into an audio format, and generates C1 and C2 ECC
- The RF Amplifier, which amplifies the RF read signal from the tape heads
- The Servo Electronics, which control the operation of the tape read/write mechanism (motors, sensors and so on)
- The Mechadeck Assembly, which
  - —writes to and reads from the tape in a helical fashion, using 4 tape heads (2 write, 2 read)
  - —performs the Read-After-Write (RAW) function

3.4.1.2 Buffer PCA

The Buffer PCA assembly consists of:

- DRAM, which
  - —stores the incoming data from the Interface, and streams the data to the tape drive module (System Controller PCA)
  - —passes read data from the Tape Drive Module to the HP-IB or SCSI Interface
- Dual-port RAM, which forms the interface for commands and status between the HP-IB or SCSI Interface and the System Controller PCA (within the Tape Drive Module)
- 68000 microprocessor, which
  - —monitors the status of the tape drive
  - —interprets the incoming commands
  - —controls the activity of both the DRAM and the dual-port RAM
  - —formats data into groups and adds headers

HP-IB ⇒ **3.4.1.3 HP-IB Interface Driver PCA**

The HP-IB Interface Driver buffers and multiplexes the commands and data between the HP-IB PCA and the Buffer PCA.

3.4.2 Interface

The Interface

- communicates with the host
- converts input from the host to commands and data suitable for the Buffer Controller
- sends commands and data to and from the host and the buffer
- converts output from the tape drive to suitable HP-IB or SCSI protocol

In order to understand how these areas interact, a typical data transaction is explained in **section 3.4.3**.

3.4.3 Typical Data Transaction

1. The host sends a READ RECORD command to the tape drive.
2. The Interface firmware receives and validates the READ RECORD command.
3. The Interface firmware then transmits a READ RECORD command to the Buffer firmware via the dual-port RAM.
4. The Buffer firmware may have the required data in its DRAM buffer, in which case no specific commands are sent to the System Controller PCA firmware except for READ AHEAD. If the required data is not in the buffer DRAM, then a READ GROUP command is transmitted to the System Controller PCA firmware via the dual-port RAM.
5. For each READ GROUP command the Tape Drive (System Controller PCA firmware) will:
   (a) position the tape to read the next group
   (b) read the group using C1 and C2 ECC, sending the data directly to the Buffer via Direct Memory Access (DMA)
   (c) check the group using C3 ECC, and report errors to the Buffer firmware to initiate retries if necessary
   (d) send a report to the Buffer firmware via the dual-port RAM, reporting a SUCCESSFUL READ status
6. If a group has been read successfully, the Buffer firmware extracts records from the data using the index table at the end of the group.
7. If a group is not read successfully, the Buffer firmware commands the System Controller PCA firmware to backspace and re-read the group. The drive is configured to attempt to re-read the group up to seven times. Specific backup programs may reconfigure the drive to a different limit.
8. When the record has been read successfully, the Buffer transmits it to the HP-IB or SCSI Interface. A SUCCESSFUL READ record status is also transmitted via the dual-port RAM.

Troubleshooting and Repair 4

4.1 Introduction

When you are trying to identify why a 1300H or 1300S is not working correctly, you will probably use some or all of the following techniques:

- Manual investigation
- The tape drive's self-test
- Host Initiated Diagnostics

See **section 4.3** for a discussion of which strategy to use.

4.1.1 Fault Categories

A customer's problem fits into one of the following categories:

- Problems with the media
- Dirty tape heads
- A failure associated with the connections to other equipment or to the mains power supply
- A problem with the host system or its software
- A hardware failure on the drive itself

Many of these problems can be overcome by the user, with a customer engineer giving advice over the telephone.

4.2 Terminology

FRA	(Field Replaceable Assembly). An assembly of various parts, all of which should be replaced together if any part fails.
FRU	(Field Replaceable Unit). An assembly, or part, whose failure can be diagnosed using the tape drive's self-test facility.
Replaceable Part	A part which can be ordered and replaced as an individual item (see Parts List table, **section 4.4.3**).
Exchange Assembly	An assembly which, if it fails, must be returned to the factory. See **section 4.4.5** for further details.

4.3 Strategy

The drive's self-tests point to an area of the 1300H or 1300S which may be faulty. You will find a description of the self-tests in **section 4.3.2.**

If the area indicated lies within the tape drive module, **the whole module must be replaced as an exchange assembly.**

HP-IB ⇒ If, however, the HP-IB Interface Assembly is suspect, the fault may lie within the HP-IB Controller PCA (part number C1501-67001). Replace the card with a good one. If the fault persists, the problem lies with the tape drive module. Replace the whole module.

4.3.1 Initial Investigation

This section gives suggestions about the initial stage of troubleshooting. Whenever possible, we suggest ways that you can find out as much as possible about a customer's problem by asking questions on the telephone. Often it will be possible to give customers advice which helps them to fix the problem themselves.

Key Questions

1. Are both the LEDs showing yellow continuously, indicating high humidity?

   If the answer to this question is YES, check that the tape drive is located in an area which conforms to the environmental specifications detailed in **section 1-8.** Make sure that the tape drive's operating conditions have not changed.

2. Is the fault intermittent or repeatable?

   If the fault is intermittent, find out the circumstances in which the unit failed. If the circumstances do not suggest what the problem is, try to identify the problem using Host Initiated Diagnostics. See **section 4.3.3.**

3. Does the problem disappear when the customer uses a different tape cassette?

   If the answer to this question is YES, suspect a problem with the media. You can find out more about the nature of the problem using Host Initiated Diagnostics (see **section 4.3.3**).

   If a customer is having problems with media, check that the tape drive is being used in accordance with the environmental specifications detailed in **section 1-8.** Also check that the cassettes are being handled and stored in accordance with **Chapter 2** of the User Manual.

   If you suspect that the problem relates to the type of media being used, test the tape drive by inserting a new Hewlett-Packard recommended cassette tape.

4. Is the cassette jammed?

   If the answer to this question is YES, try switching the drive on and off twice. If this fails, refer to **section 4.6.12** for instructions on removing the cassette without damaging the tape.

4.3.2 Diagnostic Display

During self-test the diagnostic firmware tests the drive's electronics for functionality. Testing can also be implemented by power-cycling the drive.

If the diagnostic request came from the host through the HP-IB or SCSI interface, the results are reported through HP-IB or SCSI.

If the electronics are not functioning, the diagnostic firmware tries to isolate the failing area of the tape drive. The area of the tape drive is identified and displayed on the front panel in **table 4.1**.

Table 4-1. Front Panel Diagnostic Display

Most Suspect Area	Cassette LED (upper)	Drive LED (lower)
Interface	Three yellow pulses	Yellow
Buffer PCA	Two yellow pulses	Yellow
Tape Drive Mechanism	One yellow pulse	Yellow

Each pulse is ON for 0.25 seconds, OFF for 0.25 seconds. The sequence of pulses is repeated after 1.5 seconds.

If, during the tape load sequence, the Device Area test fails, the Drive LED is lit and the Cassette LED flashes one pulse at a time. This display is cleared when another tape is inserted (at the start of the load sequence).

4.3.3 Host Initiated Diagnostics

Host-initiated diagnostics are displayed as interface and mechanism activity (drive LED flashing green). Failures of these diagnostics are not displayed on the front panel displays.

If you want to use Host Initiated Diagnostics, the packages to be used are set out in the **table 4.2**.

Table 4-2. Host Initiated Diagnostics

Host Computer	HP-IB		SCSI	
HP 3000	Operating System	Diagnostic Utility	Operating System	Diagnostic Utility
	MPE V	DDSUTIL	Not supported	Not supported
	MPE XL	Sherlock	Not supported	Not supported
HP 9000 Series 300	HP-UX		HP-UX	DDSDIAG
HP 9000 Series 800	HP-UX	Sherlock	HP-UX	Sherlock

4.4 Identifying Parts

HP-IB ⇒

4.4.1 Illustrated Parts Breakout – 1300H

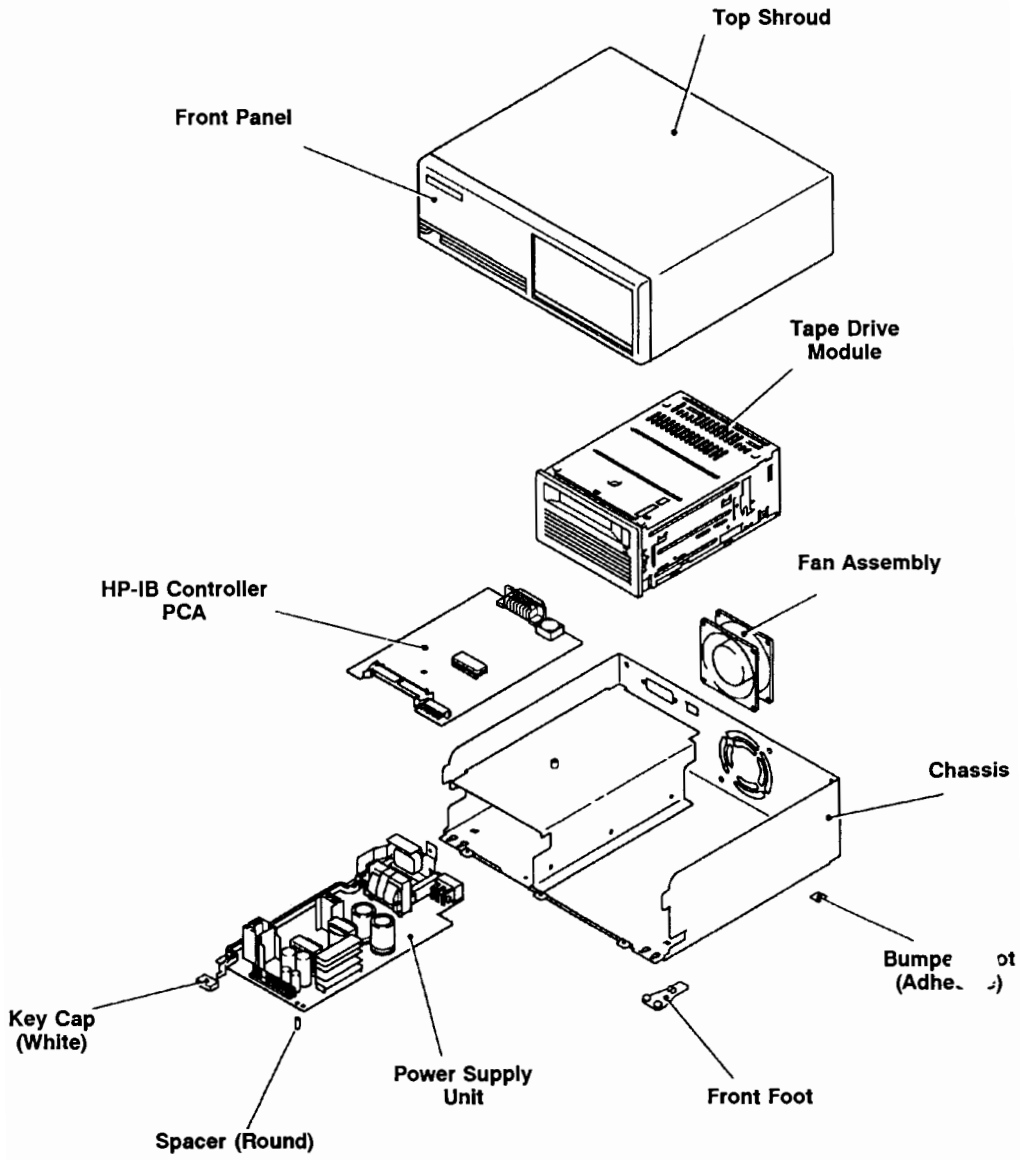


Figure 4-1. 1300H Exploded View

SCSI ⇒ 4.4.2 Illustrated Parts Breakout – 1300S

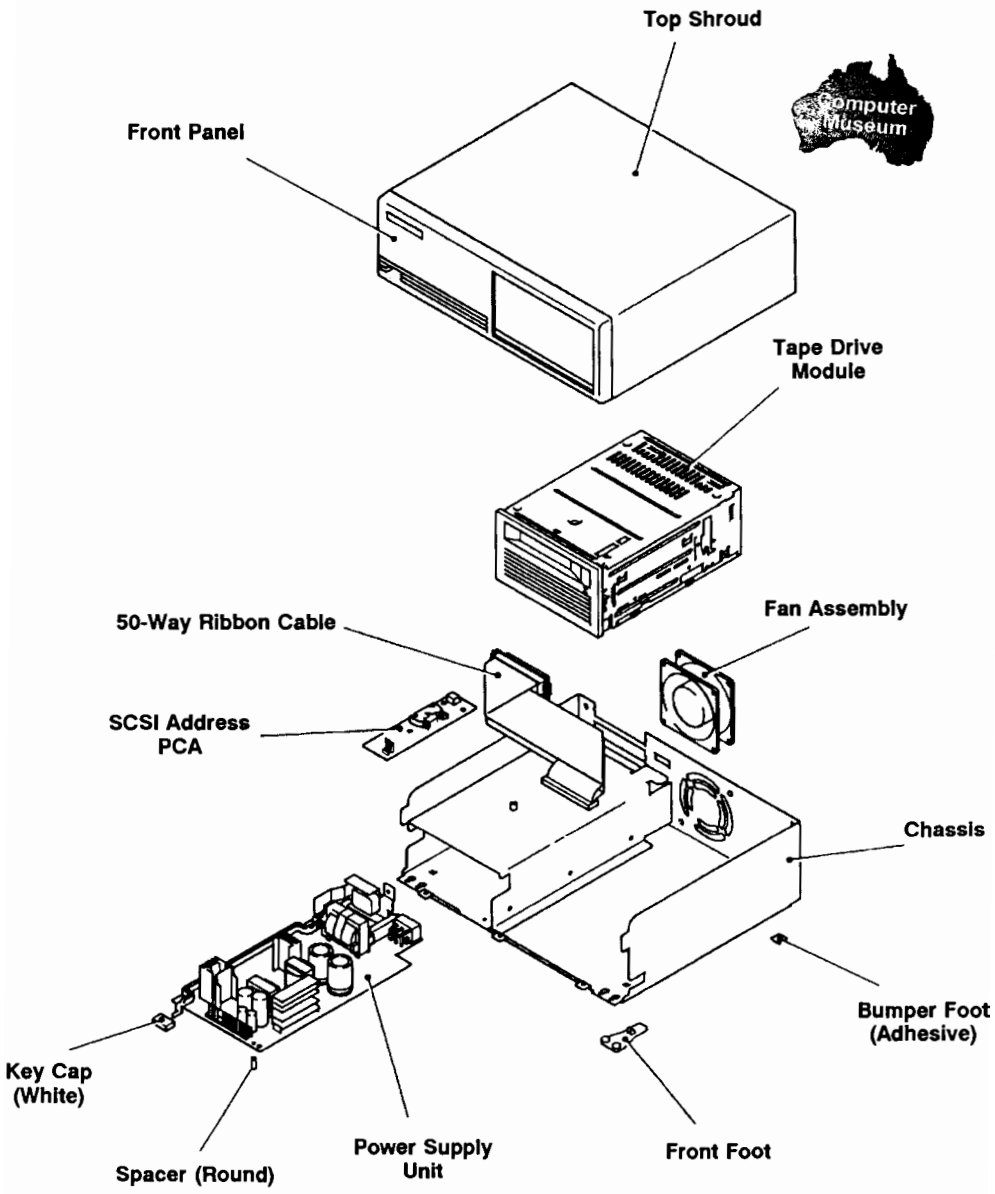


Figure 4-2. 1300S Exploded View

4.4.3 Parts List

Table 4-3. Replaceable Parts

1300H Parts

Key No.	HP Part Number	Description	Units Per Assembly
1	C1511-00001	Chassis	1
2	C1511-80001	Name Plate 1300H	1
17	C1511-61001	Power Cable	1
*18	C1511-61002	50-Way Ribbon Cable	1
21	0380-1332	Stand-Off Hex	2
22	2190-0034	Washer (Lock)	2
30	C1500-80005	HP-IB PCA Carton	1
34	C1501-69201	HP-IB Tape Drive Module	1
36	C1501-67001	HP-IB Controller PCA	1
37	C1501-89001	EPROM – HP-IB	1

* This part is replaced by a shorter cable, part number C1501-61002 when the tape drive is built into an integrated system.

1300S Parts

Key No.	HP Part Number	Description	Units Per Assembly
1S	C1512-00001	Chassis	1
2S	C1512-80001	Name Plate 1300S	1
8S	0515-0664	Screw M3 x 12 mm	4
17S	C1511-61001	Power Cable	1
18S	C1512-61002	SCSI 50-Way Ribbon Cable	1
41	C1512-61003	Address Ribbon Cable	1
34S	C1502-69201	SCSI Tape Drive Module	1
36S	C1512-67001	SCSI Address PCA	1
40	C1500-89001	EPROM – SCSI	1

Table 4-3. Replaceable Parts (continued)

Common Parts

Key No.	HP Part Number	Description	Units Per Assembly
3	09153-04100	Top Shroud Assembly	1
4	C1701-40200	Front Panel Assembly	1
5	0515-0433	Screw M4 x 8 mm T15 Torx (plus 2 screws in PSU section)	6
6	90121-48303	Front Foot	2
7	0403-0427	Bumper Foot (Adhesive)	2
8	0515-0433	Screw M3 x 12 mm	4
9	09133-67120	Power Supply Unit	1
10	09144-45404	Power Guard	1
11	C1701-40202	Pushrod	1
12	0380-0829	Spacer (Round) 0.5 in.	1
13	0380-1655	Spacer (Snap-in)	1
14	5041-1203	Key Cap (White)	1
15	0515-0666	Screw M3 x 18 mm T10 Torx	1
16	0515-0433	Screw M4 x 8 mm T15 Torx	2
19	09144-68503	Fan Assembly	1
20	0624-0661	Screw	2
23	2110-0003	Fuse 3A 250V (US and Canada)	1
24	2110-0638	Fuse 3.15A 250V (outside US)	1
25	2110-0567	Fuseholder Cap (outside US and Canada)	1
26	9211-4903	Carton	1
27	C1500-80006	Inner Sleeve	1
28	C1500-80011	Corrugated Carton	1
29	C1500-80024	Inner Carton/Foam	2
31	C1511-80003	Foam	1
32	09144-84405	Straps – Foam Liner	1
33	9222-0808	Bag (Antistatic)	1
35	0515-2107	Screw for Tape Drive Module (top and bottom covers) and Buffer PCA	14
38	C1500-89011	EPROM – Buffer	1
39	C1500-89411	EPROM – System Controller	1

4.4.4 Field Replaceable Units

The Field Replaceable Units are:

HP-IB ⇒ • Tape Drive Module

HP-IB ⇒ • HP-IB Controller PCA

SCSI ⇒ • Tape Drive Module (including SCSI PCA)

4.4.5 Exchange Assemblies

The following assemblies are included in the current exchange program:

HP-IB ⇒ • C1501-69201 Tape Drive Module

SCSI ⇒ • C1502-69201 Tape Drive Module

4.5 Parts Replacement

This section provides removal and replacement procedures for field replaceable assemblies (FRAs) and parts in the tape drive. Procedures are given in the normal order of disassembly. Each part or assembly which must be removed before access can be gained to another part or assembly is given first, followed by the next assembly which can be removed. The order of disassembly is shown in **figure 4-3.**

CAUTION There are no adjustable parts in the 1300H or 1300S. Each electrical and mechanical part has been precisely adjusted during manufacture. Any attempt to make further adjustments may cause data loss.

4.5.1 Required Tools and Equipment

To repair the unit you need the Customer Engineer toolkit.

4.5.2 Repair Environment

The tape drive does not need to be repaired in clean-room conditions and may be disassembled in the normal operating environment. However, the conditions there must comply with both the operational and non-operational environmental limits of the tape drive. These are to be found in **section 1-8.**

CAUTION The field replaceable assemblies (FRAs) in the tape drive contain electrostatic-sensitive devices. Take appropriate precautions when removing the FRAs from the tape drive. Use of an anti-static pad and wrist strap is required. (These items are contained in the anti-static workstation, part number 9300-0794, normally found in the Customer Engineer toolkit).

Immediately after removal, store the FRAs in anti-static, conductive plastic bags.

4.6 Disassembly

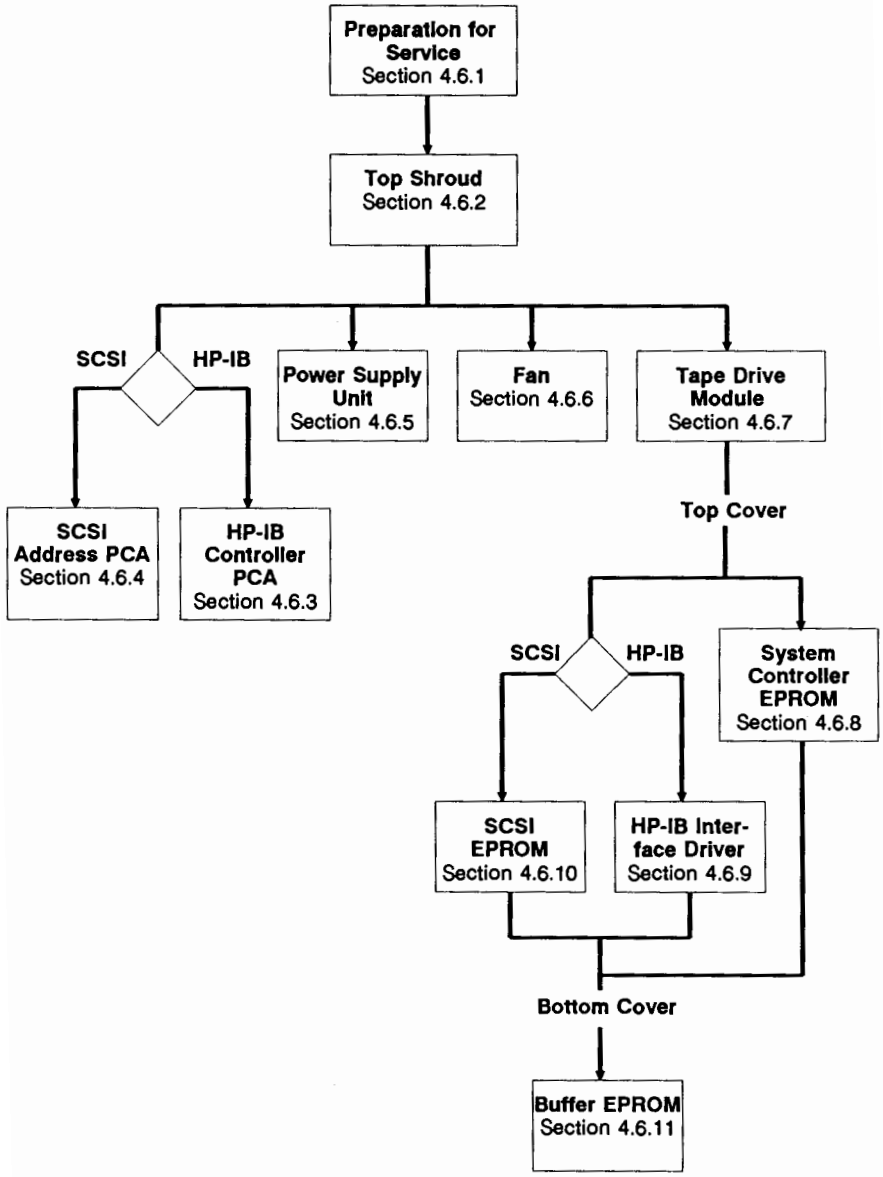


Figure 4-3. Order of Disassembly

4.6.1 Preparation for Service

Before starting any disassembly, take the following steps to prepare the drive for service:

1. Set the AC Line switch to the OFF (push-button out) position. Disconnect the power cord from the AC Line socket on the rear of the tape drive.

IP-IB ⇒ **2(a)** Disconnect the HP-IB cable from the connector on the rear panel.

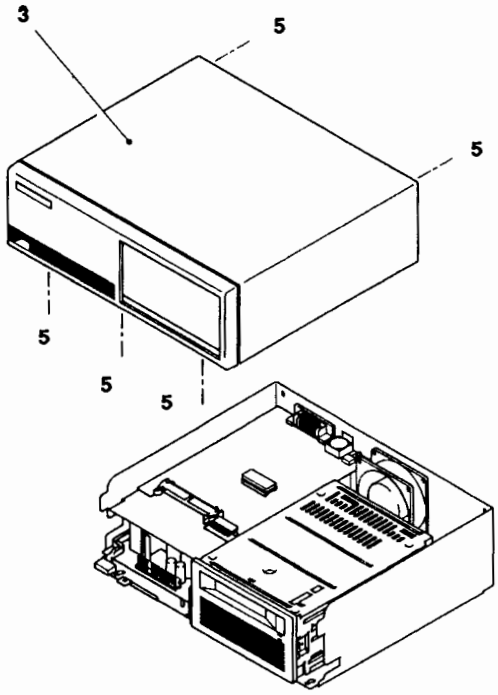
SCSI ⇒ **2(b)** Disconnect both SCSI cables.

3. Place the tape drive on the anti-static mat and connect the wrist strap to the pad. Attach the wrist strap to your wrist. When the top shroud is removed (see **section 4.6.2**), ground the frame of the tape drive to the mat.

Removal instructions for parts in the tape drive are provided in the following sections. Numbers in parentheses refer to figure numbers in **table 4-3** and figures in the disassembly instructions.

Replacement is the reverse of the removal procedure, unless otherwise specified.

4.6.2 Top Shroud



NOTE The figure shows 1300H (1300S similar).

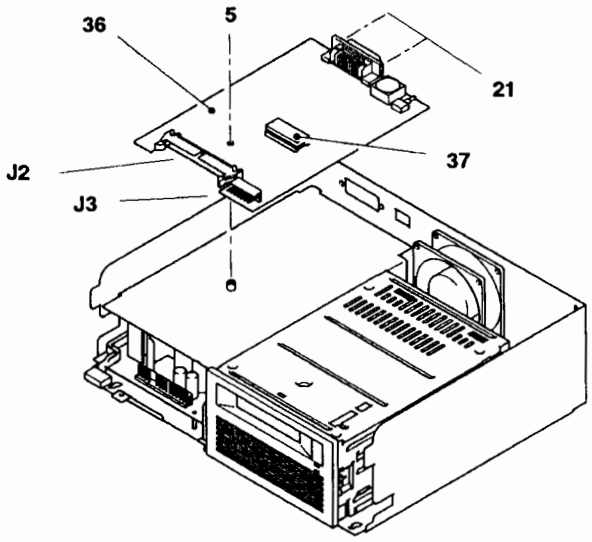
To remove the top shroud (3), proceed as follows:

1. Perform the preparation for service procedure outlined in **section 4.6.1**.
2. Ensure that the power cord is disconnected.
3. Turn the tape drive over onto its top and remove the 3 screws (5) securing the top shroud to the chassis assembly.
4. Turn the drive back onto its feet and remove the 2 screws (5) securing the top shroud to the rear panel.
5. Slide the shroud towards the front of the drive and lift it clear of the chassis assembly.

Key	Part No.	Description	Quantity
3	09153-04100	Top Shroud	1
5	0515-0433	Screw M4 x 8 mm T15 Torx	5

HP-IB ⇒

4.6.3 HP-IB Controller PCA



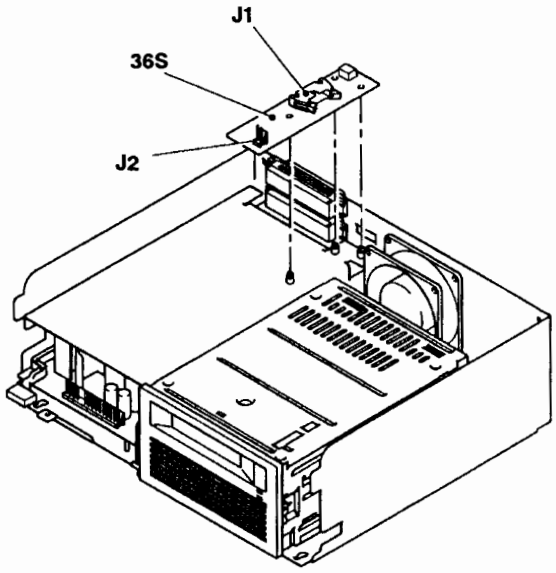
To remove the HP-IB Controller PCA (36), proceed as follows:

1. Remove the top shroud (see **section 4.6.2**).
2. Unplug the power cable (17) from socket J3.
3. Unplug the 50-way ribbon cable (18) from socket J2.
4. Remove the 2 hexagonal stand-offs (21) from the HP-IB connector at the rear of the chassis assembly.
5. Remove the screw (5) securing the HP-IB Controller PCA, and lift the PCA clear of the assembly.

NOTE This board contains an EPROM (37).

Key	Part No.	Description	Quantity
5	0515-0433	Screw M4 x 8 mm T15 Torx	1
17	C1511-61001	Power Cable	1
18	C1511-61002	50-Way Ribbon Cable	1
21	0380-1332	Stand Off Hex	2
36	C1501-67001	HP-IB Controller PCA	1
37	C1501-89001	EPROM – HP-IB	1

SCSI ⇒ 4.6.4 SCSI Address PCA

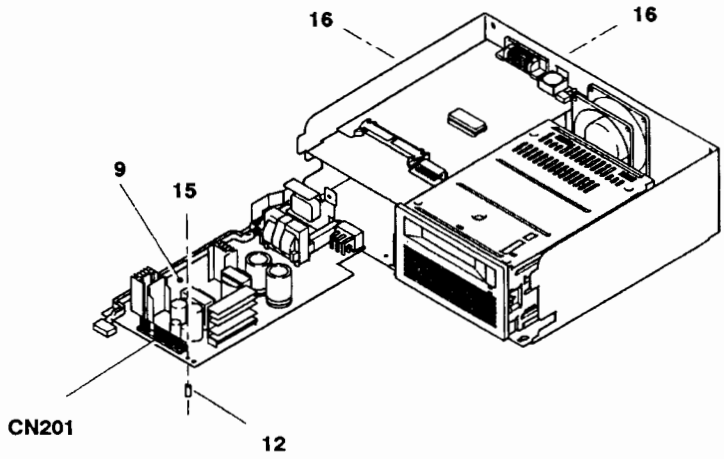


To remove the SCSI Address PCA (36S), proceed as follows:

1. Remove the top shroud (see **section 4.6.2**).
2. Unplug the cable from socket J2 on the SCSI Address PCA.
3. Unplug the SCSI 50-Way Ribbon Cable (18S).
4. Unplug the ribbon cable from socket J1 on the SCSI Address PCA.
5. Remove the SCSI Address PCA by lightly levering it away from each of the three plastic support posts.

Key	Part No.	Description	Quantity
36S	C1512-67001	SCSI Address PCA	1

4.6.5 Power Supply Unit (PSU)



NOTE The figure shows 1300H (1300S similar).

To remove the power supply unit (9), proceed as follows:

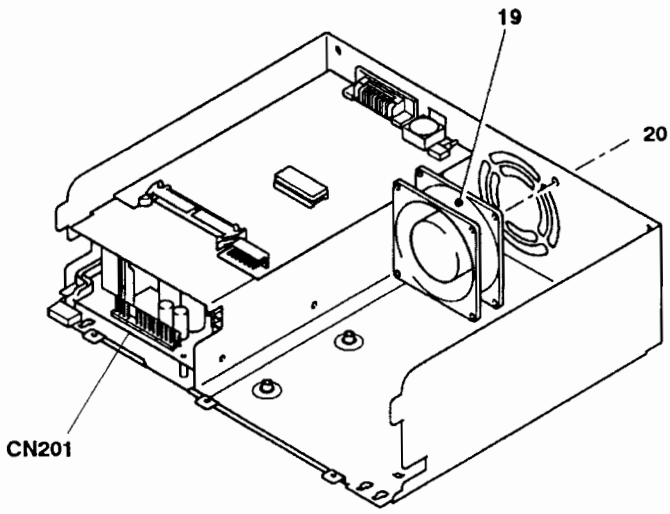
1. Remove the top shroud (see **section 4.6.2**).
2. Unplug the power cable (17) from socket CN201 on the PSU.
3. Unplug the fan power cable from socket CN201 on the PSU.
4. Remove the 3 screws securing the PSU to the chassis assembly in this order – one from the front (15), one from the left-hand side (16), and one from the back (16).
5. Slide the PSU towards the front of the unit and lift it clear of the chassis.

Reassembly: The front screw is applied from the top, down through the board and through the spacer into the chassis. The spacer (12) is positioned beneath the board.

CAUTION The 3 screws (15 and 16) earth-bond the PSU to the chassis.

Key	Part No.	Description	Quantity
9	09133-67120	Power Supply Unit	1
12	0380-0829	Spacer (Round) 0.5 in.	1
15	0515-0666	Screw M3 x 18 mm T10 Torx	1
16	0515-0433	Screw M4 x 8 mm T15 Torx	2
17	C1511-61001	Power Cable	1

4.6.6 Fan Assembly



NOTE The figure shows 1300H (1300S similar).

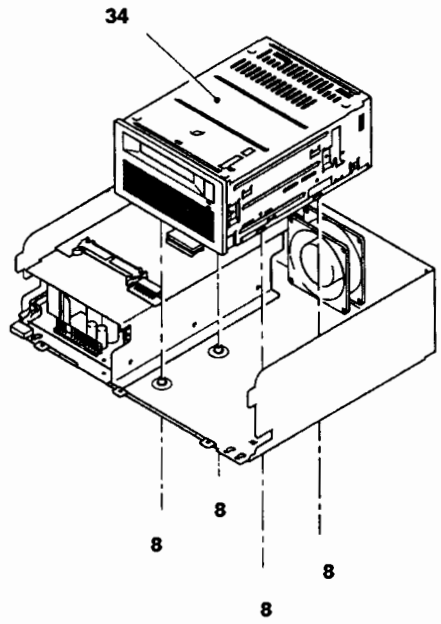
The illustration shows the tape drive with the tape drive module removed. It is not necessary to remove the tape drive module before removing the fan.

To remove the fan assembly (19), proceed as follows:

1. Remove the top shroud (see **section 4.6.2**).
2. Unplug the fan power cable from socket CN201 on the PSU.
3. Remove the 2 screws (20) securing the fan to the rear of the chassis assembly, and lift the fan clear.

Key	Part No.	Description	Quantity
19	09144-68503	Fan Assembly	1
20	0624-0661	Screw	2

4.6.7 Tape Drive Module



NOTE The figure shows the 1300H

To remove the tape drive module (34), proceed as follows:

1. Remove the top shroud (see **section 4.6.2**).
2. Unplug the power cable (17) from the power socket on the module.

HP-IB ⇒ **3(a)** Unplug the 50-way ribbon cable (18) from the HP-IB interface driver socket at the rear of the module.

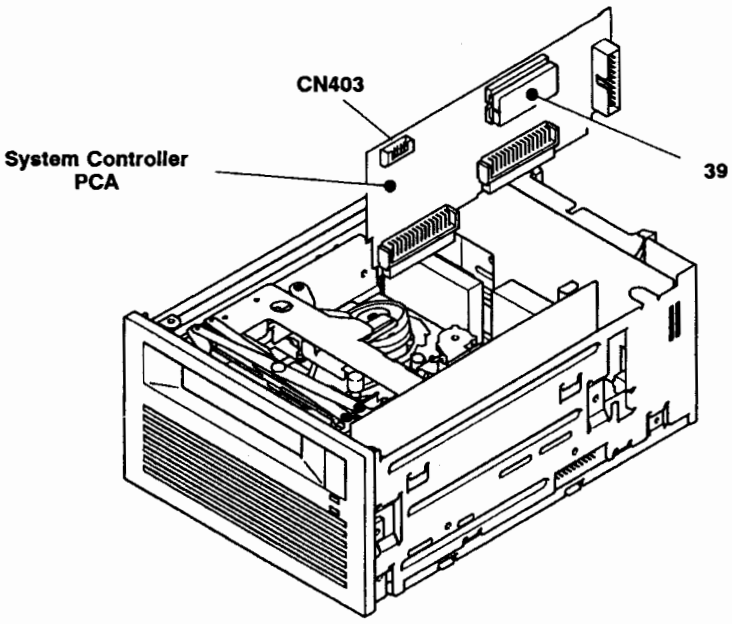
SCSI ⇒ **3(b)** Unplug the SCSI 50-Way Ribbon Cable (18S) from the SCSI interface socket at the rear of the module.

4. Remove the 4 screws (8) securing the tape drive module, and lift the module clear of the chassis.

CAUTION Make sure you support the tape drive module while removing the 4 screws (8) securing the module.

Key	Part No.	Description	Quantity
8	0515-0664	Screw M3 x 12 mm	4
17	C1511-61001	Power Cable	1
18	C1511-61002	HP-IB 50-Way Ribbon Cable	1
18S	C1512-61002	SCSI 50-Way Ribbon Cable	1
34	C1501-69201	HP-IB Tape Drive Module	1
34S	C1502-69201	SCSI Tape Drive Module	1

4.6.8 System Controller EPROM



To remove the system controller EPROM (39), proceed as follows:

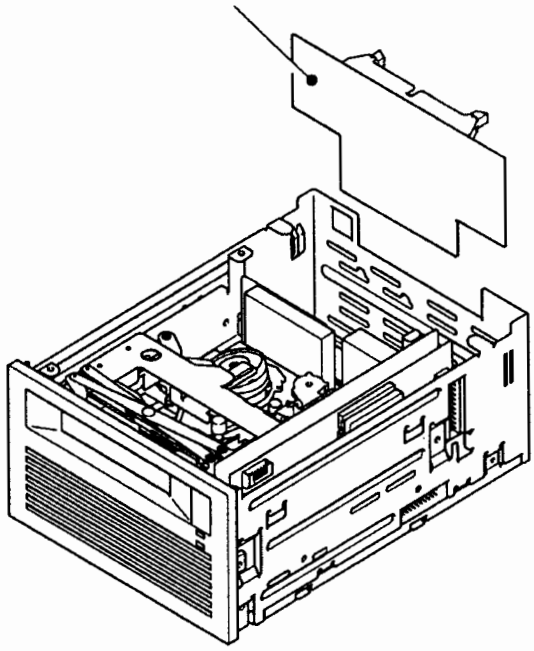
1. Remove the top shroud (see **section 4.6.2**).
2. Remove the tape drive module (see **section 4.6.7**).
3. Remove the 4 screws (35) securing the top cover of the tape drive module, and take the cover off the module.
4. Disconnect the front panel cable from socket CN403 on the system controller PCA (on the right-hand side when viewed from the front), and retain the cable with the module.
5. Slide the system controller PCA out of its slot on the tape drive module, taking care not to damage the connectors.
6. Remove the system controller EPROM.

CAUTION When re-inserting the PCA extreme care must be taken not to damage any of the fragile components.

Key	Part No.	Description	Quantity
35	0515-2107	Screws	4
39	C1500-89411	System Controller EPROM	1

HP-IB ⇒ 4.6.9 HP-IB Interface Driver PCA

HP-IB Interface Driver

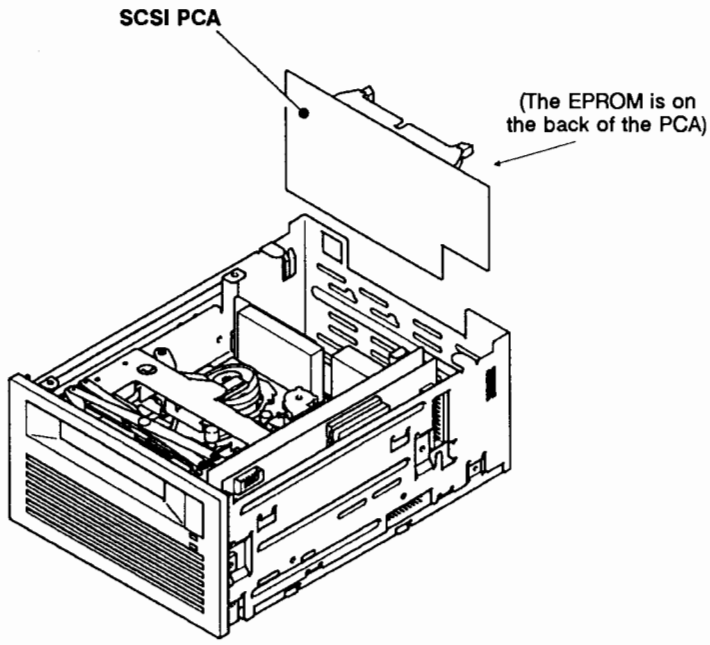


To remove the HP-IB Interface Driver PCA, proceed as follows:

1. Remove the top shroud (see **section 4.6.2**).
2. Remove the tape drive module (see **section 4.6.7**).
3. Remove the 4 screws (35) securing the top cover of the tape drive module, and take the cover off the module.
4. Slide the HP-IB Interface Driver PCA out of its slot at the rear of the tape drive module, taking care not to damage the connector.

Key	Part No.	Description	Quantity
35	0515-2107	Screws	4

SCSI ⇒ 4.6.10 SCSI EPROM

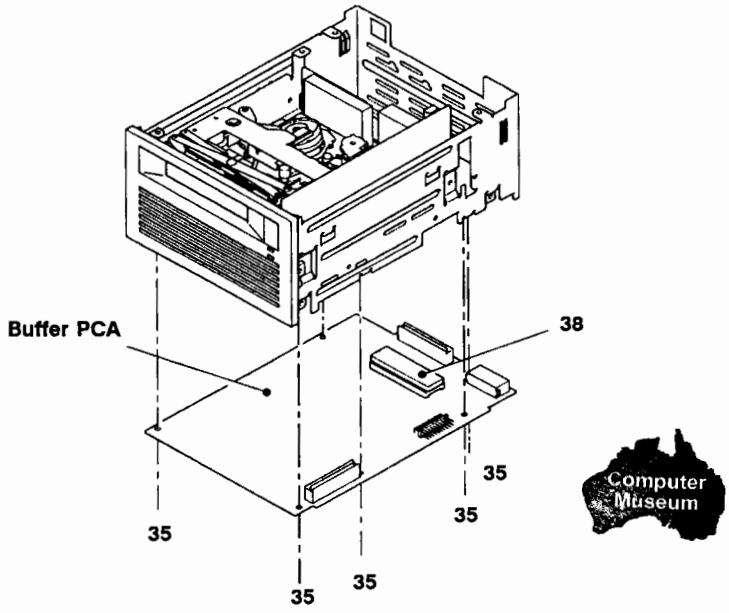


To remove the SCSI EPROM (41), proceed as follows:

1. Remove the top shroud (see **section 4.6.2**).
2. Remove the tape drive module (see **section 4.6.7**).
3. Remove the 4 screws (35) securing the top cover of the tape drive module, and take the cover off the module.
4. Slide the SCSI PCA partially out of its slot and remove the SCSI address cable from socket S1 on the SCSI PCA.
5. Slide the SCSI PCA fully out of its slot at the rear of the tape drive module, taking care not to damage the connector.
6. Remove the SCSI EPROM.

Key	Part No.	Description	Quantity
35	0515-2107	Screws	4
41	C1500-89001	SCSI EPROM	1

4.6.11 Buffer EPROM



To remove the Buffer EPROM (38), proceed as follows:

1. Remove the top shroud (see **section 4.6.2**).
2. Remove the tape drive module (see **section 4.6.7**).
3. Remove the system controller PCA (see **section 4.6.8**).

HP-IB ⇒ **4(a)** Slide the HP-IB interface driver PCA out of its slot, taking care not to damage the connector (see **section 4.6.9**).

SCSI ⇒ **4(b)** Slide the SCSI PCA out of its slot (see **section 4.6.10**).

5. Turn the tape drive module over, and remove the four screws securing the bottom panel (2 on each side).
6. Remove the 6 screws (35) securing the buffer PCA, and lift the PCA clear of the module.
7. Remove the Buffer EPROM.

Replacement is the reverse of the removal procedure, but ensure the serrated edge of the bottom cover is towards the rear of the tape module.

Key	Part No.	Description	Quantity
35	0515-2107	Screws	10
38	C1500-89011	EPROM – Buffer	1

4.6.12 Removing a Jammed Tape Cassette

If a cassette jams in the mechanism and cannot be released by a power-cycle or hard reset, the following steps can be taken to retrieve it.

1. Follow the procedure in **section 4.6.7** to remove the tape drive module.
2. Remove the top cover of the tape drive module.
3. Unthread the tape manually by turning the pulley on the tape threading motor (**see figure 4-4**) until the guide rollers of the tape threading mechanism are fully retracted. At this point, the effort needed to turn the pulley will increase substantially. DO NOT attempt to turn the pulley any further, or you may damage the gears of the motor.

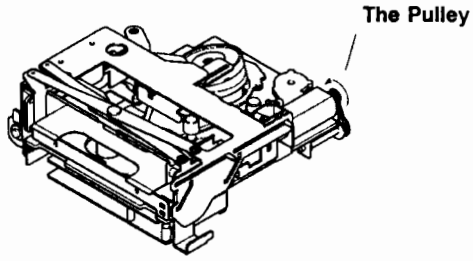


Figure 4-4. Unthreading the tape manually

4. Remove the drive belt from the pulley.
5. Re-connect the power cable to the tape drive module and switch on the power supply. This will re-tension the tape on the cassette.
6. Try ejecting the cassette by pressing the UNLOAD button. If this does not work, switch the power off and use the thumbwheel on the side of the tape drive module to eject the cassette manually (**see figure 4-5**).

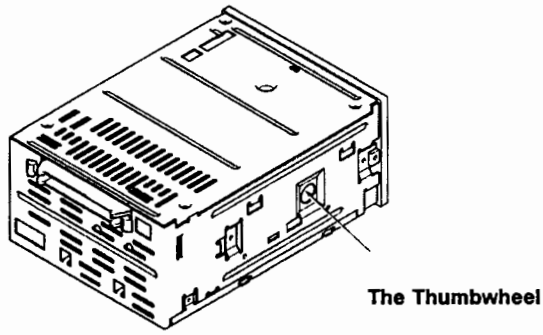


Figure 4-5. Ejecting the cassette manually

7. Replace the drive belt on the pulley of the tape threading motor, and replace the top cover on the tape drive module.