
HP Series 6000 Mass Storage Systems Owner's Manual

Models 330S and 660S



**HP Part No. C2212-90901
Printed in U.S.A. February 1990**

**First Edition
E0290**

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New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

Many product updates do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

February 1990

First Edition

The table below shows the part numbers for this manual in several foreign languages.

If you want:	Order part number:
English	C2212-90901
French	C2212-91901
German	C2212-92901
Japanese	C2212-94901

Safety Symbols and Conventions

The following conventions are used throughout this manual:

Bold words in the text indicate a term defined in the Glossary in the back of this manual.

Italic is used for emphasis or manual titles.

Numbers in the text, such as ③, refer to corresponding numbers on the figure being referenced.

Notes contain important information set off from the text.

Caution messages indicate procedures which, if not observed, could result in damage to equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Warning messages indicate procedures or practices which, if not observed, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

Scope of This Manual

This manual provides installation and operating instructions for the HP Series 6000 Models 330S and 660S Mass Storage Systems, and is divided into the following chapters:

Chapter 1 describes the mass storage system in general, such as accessories, installation, power requirements, and SCSI interface connection.

Chapter 2 describes operation and installation of the Hard Disk Drive (includes options 001, 002, 022 and upgrade kits C2290A, C2291A).

Chapter 3 describes operation and installation of the Rewritable Optical Disk Drive (includes option 005 and upgrade kit C2294A).

Chapter 4 describes operation and installation of the CD-ROM Drive (includes options 004, 024, and upgrade kit C2293A).

Chapter 5 describes operation and installation of the Digital Audio Tape Drive (includes option 003 and upgrade kit C2292A).

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FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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If this equipment is to be operated with a system, and if the General License is being claimed, the complete system must comply with the General Licensing requirements. If this equipment is to be operated with a system which has its own FTZ-Serial-License, and for which an operating license has been submitted or applied, usually no further steps are necessary.

VCCI Statements (For Japan Only)

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Communications Statement (For Canada Only)

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

Laser Safety Statement (For U.S.A. Only)

This mass storage system is certified as a Class 1 laser product under the U.S. Department of Health and Human Services (DHHS) Radiation Performance Standard according to the *Radiation Control for Health and Safety Act* of 1968.

This means that the mass storage system does not produce hazardous laser radiation. Since laser light emitted inside the mass storage system is completely confined within protective housings and external covers, the laser beam cannot escape from the machine during any phase of user operation.

CDRH Regulations (For U.S.A. Only)

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States. The label shown below indicates compliance with CDRH regulations, and must be attached to laser products marketed in the United States.

Made in U.S.A.

This product conforms with CDRH Radiation

Performance Standard, 21 CFR Chapter 1 Subchapter J.

CDRH Regulations Continued (For U.S.A. Only)

Use of controls, adjustments, or performing procedures other than those specified in this manual may result in hazardous invisible laser radiation exposure. None of the mechanisms within the mass storage system contain customer or field-replaceable parts.

The CD-ROM drive becomes a Class 3B laser mechanism when disassembled. If the CD-ROM disk drive is disassembled, exposure to the invisible laser beam and hazardous invisible laser radiation could result in blindness. Do NOT disassemble the CD-ROM drive for any reason.

The rewritable optical disk drive becomes a Class 3B laser mechanism when disassembled. If the rewritable optical disk drive is disassembled, exposure to the invisible laser beam and hazardous invisible laser radiation could result in blindness. Do NOT disassemble the rewritable optical disk drive for any reason.

Please observe the following warning label, which is located on the top of the rewritable optical disk drive:

DANGER - Invisible laser radiation when open. Avoid direct exposure to beam.

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Mass Storage System

The HP Series 6000 Models 330S and 660S Mass Storage Systems contain a power supply and slots for storage devices such as hard disk drives, backup devices, or I/O (input/output) devices. All of these fit into a convenient box that is ideal for either rackmount or desktop operation. The HP Series 6000 Models 330S and 660S Mass Storage Systems have been designated for use with Hewlett-Packard 9000 Series 300 technical workstations on HP-UX 7.0 (or higher).

The HP Series 6000 Models 330S and 660S Mass Storage Systems adhere to the Small Computer System Interface (SCSI) standard bus, designed for use with small computer systems and workstations. The formatted storage capacity of the HP Series 6000 Model 330S is 332 megabytes; the formatted storage capacity of the HP Series 6000 Model 660S is 664 megabytes. The **mass storage system** can be used in either stand-alone desktop fashion, or can be installed into standard rackmount cabinets.

This manual provides the information needed to install and operate the mass storage system. Details of the control functions provided by the host computer are described in the computer's documentation.

The base product structure of the HP Series 6000 Models 330S and 660S Mass Storage Systems is a **power supply** with one **hard disk drive**. The left rear slot always contains the power supply. The other slots may contain a variety of embedded peripherals, such as a **rewritable optical disk drive**, **CD-ROM drive**, or **DAT drive**. The following table shows the product structures allowed for add-on peripherals. Other chapters in this manual describe the add-on peripherals that can be ordered for the mass storage system.

Table 1-1. Product Structures

Slot	Position	Device Allowed
1	Right Front	Full-Height Hard Disk, Digital Audio Tape Drive, or Rewritable Optical Disk Drive.
2	Right Rear	Full-Height Hard Disk Only.
3	Left Front	Full-Height Hard Disk, Digital Audio Tape Drive, or
3	Left-Front Top	Half-Height CD-ROM Drive.
3	Left-Front Bottom	Half-Height CD-ROM Drive.

The following accessories are available from your Hewlett-Packard Sales and Support office:

HP 92222A 0.5-meter SCSI Peripheral Interface Cable.

HP 92222B 1-meter SCSI Peripheral Interface Cable.

HP 92222C 2-meter SCSI Peripheral Interface Cable.

HP 92222D 1-meter SCSI Extender Cable.

SCSI Single Ended Terminator, part number 1252-2297.

HP 92211-Series Design Plus Cabinets. A desk-height stand-alone cabinet series for the mass storage system and other desktop stackable peripherals and systems.

HP 35199C Rack Adapter Kit. Allows the mass storage system to be mounted in a standard 19-inch EIA equipment rack.

HP 9300-0794 Anti-Static Work Station. Conductive sheet and wrist ground strap kit.

Hewlett-Packard Headquarter Offices are listed at the back of this manual.

Included with your mass storage system is a power cord and the Owner's Manual. The following available factory-installed options are described fully in chapters at the back of this manual:

Model 330S (HP C2212A)

Option:	Description:
Option 001	Adds one 332 Megabyte SCSI Hard Disk Drive.
Option 003	Adds one 1.3 Gigabyte SCSI Digital Audio Tape Drive. Includes one 1.3 Gigabyte DAT cassette and a cleaning cassette.
Option 004	Adds one 600 Megabyte SCSI CD-ROM Half-Height Drive. Includes one CD-ROM disk caddy.
Option 005	Adds one 650 Megabyte SCSI Rewritable Optical Disk Drive. Includes one 650 Megabyte rewritable optical disk.
Option 024	Adds two 600 Megabyte SCSI CD-ROM Half-Height Drives. Includes two CD-ROM disk caddies.
Option 303	Installed HP-UX 7.0 with 50 Megabytes of swap space, configured for a Hewlett-Packard 9000 Series 300. Includes AXE, PE, NS-ARPA, NFS, and X11.

Model 660S (HP C2213A)

Option:	Description:
Option 001	Adds one 332 Megabyte SCSI Hard Disk Drive.
Option 002	Adds one 664 Megabyte SCSI Hard Disk Drive.
Option 003	Adds one 1.3 Gigabyte SCSI Digital Audio Tape Drive. Includes one 1.3 Gigabyte DAT cassette and a cleaning cassette.
Option 004	Adds one 600 Megabyte SCSI CD-ROM Half-Height Drive. Includes one CD-ROM disk caddy.
Option 005	Adds one 650 Megabyte SCSI Rewritable Optical Disk Drive. Includes one 650 Megabyte rewritable optical disk.
Option 022	Adds two 664 Megabyte SCSI Hard Disk Drives.
Option 024	Adds two 600 Megabyte SCSI CD-ROM Half-Height Drives. Includes two CD-ROM disk caddies.
Option 306	Installed HP-UX 7.0 with 75 Megabytes of swap space, configured for a Hewlett-Packard 9000 Series 300. Includes AXE, PE, NS-ARPA, NFS, and X11.

The following documents pertain to the HP Series 6000 Models 330S and 660S Mass Storage Systems:

HP Series 6000 Models 330S and 660S Mass Storage Systems Owner's Manual, part number C2212-90901 (this manual), provides operating and installation instructions for your mass storage system and all options, accessories, and upgrade kits.

HP Series 6000 Models 330S and 660S Mass Storage Systems CE Service Handbook, part number C2212-90905, contains technical reference information about your mass storage system. This manual is intended for Hewlett-Packard Customer Engineers, or others who are trained to service and repair your mass storage system.

SCSIDISK Diagnostic Reference Manual, part number 5959-3935, describes the diagnostic program used to troubleshoot problems with your mass storage system.

The following kits are available as add-on peripherals, and are described fully in chapters at the back of this manual.

- | | |
|--------|--|
| C2290A | Adds one 332 Megabyte SCSI Hard Disk Drive. This kit includes a 332 Megabyte SCSI hard disk drive, a mounting bracket and screws, and a power cable. |
| C2291A | Adds one 664 Megabyte SCSI Hard Disk Drive. This kit includes a 664 Megabyte SCSI hard disk drive, a mounting bracket and screws, and a power cable. |
| C2292A | Adds one 1.3 Gigabyte SCSI Digital Audio Tape Drive. This kit includes a 1.3 Gigabyte SCSI DAT drive, a mounting bracket and screws, a power cable, DAT cassette and a cleaning cassette, and a SCSI cable adapter. |
| C2293A | Adds one 600 Megabyte SCSI CD-ROM half-height Drive. This kit includes a 600 Megabyte SCSI CD-ROM drive, a mounting bracket and screws, a dual power cable, a SCSI cable adapter and one CD-ROM disk caddy. |
| C2294A | Adds one 650 Megabyte SCSI Rewritable Optical Disk Drive. This kit includes a 650 Megabyte SCSI rewritable optical disk drive and SCSI controller PCA and cables, a mounting bracket and screws, a dual power cable, a media eject tool, and a SCSI cable adapter. |

This section provides instructions on how to place your mass storage system in operation. These instructions include unpacking instructions, a check of equipment supplied, and how to connect the mass storage system to a power source and the Small Computer System Interface (SCSI) bus.

Unpacking

The mass storage system is shipped in a reusable shipping container. (See Figure 1-1.) Remove the mass storage system from this container and inspect it for any mechanical damage that may have occurred during shipment. If any damage is observed, you should immediately notify your dealer or Hewlett-Packard Sales and Support Office.

Handling

Although the mass storage system has been designed to withstand a certain shock level, it is still a delicate device. The following precautions should be observed when handling or transporting the mass storage system. Failure to observe these handling precautions could result in loss of data or damage to the product.

Avoid sharp shocks to the mass storage system.

Always repackage the mass storage system in approved packaging when transporting the product from one area to another. Use the original packaging material or a similar substitute.

Static Control

A static charge of 39,000 volts can be generated on a carpeted floor. This exceeds the limits of this product and can cause unsuccessful operation.

To ensure continuously successful operation of this product in a carpeted office environment, Hewlett-Packard recommends the use of anti-static mats and anti-static carpets with this product. Refer to the *Hewlett-Packard Computer Users Catalog*, part number 5953-2450D, for a complete listing of static control equipment, including anti-static mats and carpets.

See Figure 1-2 for the location of the controls and connectors identified by numbers in this chapter; for example: address switches (3).

Check to ensure that all of the standard equipment supplied with the mass storage system has been received. This equipment is listed below.

Power Cord (part number depends upon location).

HP Series 6000 Models 330S and 660S Mass Storage Systems Owner's Manual (this manual), part number C2212-90901.

If any items are missing, contact your dealer or Hewlett-Packard Sales and Support Office.

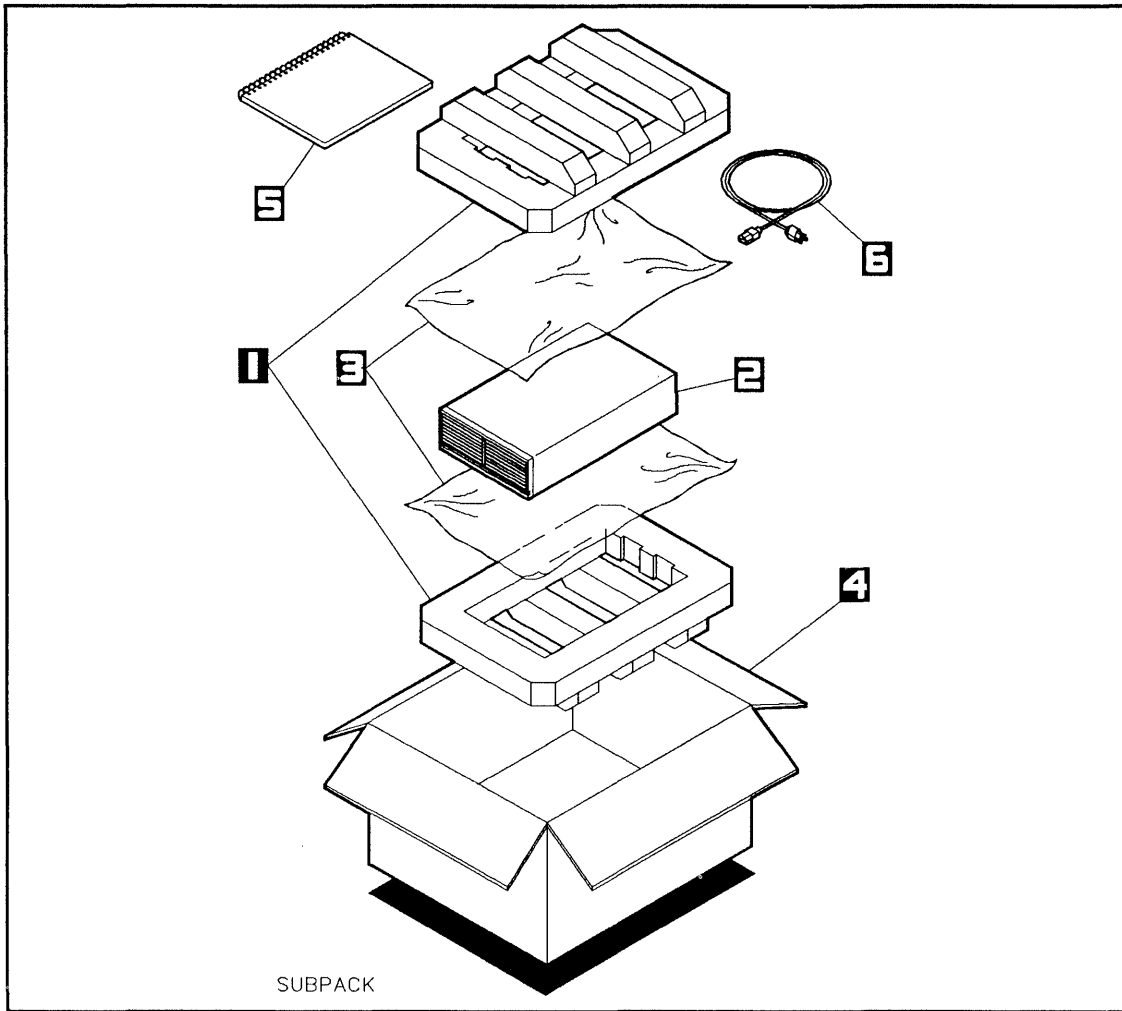


Figure 1-1. Packaging Details

- 1 - Foam Cushions (C2200-80016)
- 2 - Mass Storage System
- 3 - Antistatic Sheets (5180-0574)

- 4 - Shipping Carton (C2200-80017)
- 5 - Manual (C2212-90901)
- 6 - Power Cord (part number depends upon location)

The various power cords available are shown in the *Disk Product Specifications and Site Environmental Requirements Handbook*, part number 5955-3456.

The ac branch service must be properly current protected by either a fuse or a circuit breaker.

Use only a UL/CSA approved power cord, SVT type, rated for suitable voltage and current. These power cords have two conductors plus a ground. Failure to use the proper power cord could result in a shock or fire hazard.

The power supply in your mass storage system has an automatic ranging power supply, which makes a voltage selector switch and external fuse unnecessary. Automatic ranging power supplies have internal fuses that only fail if the power supply itself malfunctions. For more information regarding power requirements, refer to the specifications at the end of this chapter.

Do not open the power supply. The power supply contains no customer serviceable parts.

To attach the power cord:

1. Set the **LINE** switch **1** to the 0 (out) position.
2. Plug the female end of the power cord into the ~AC LINE connector **5** at the rear of the mass storage system.

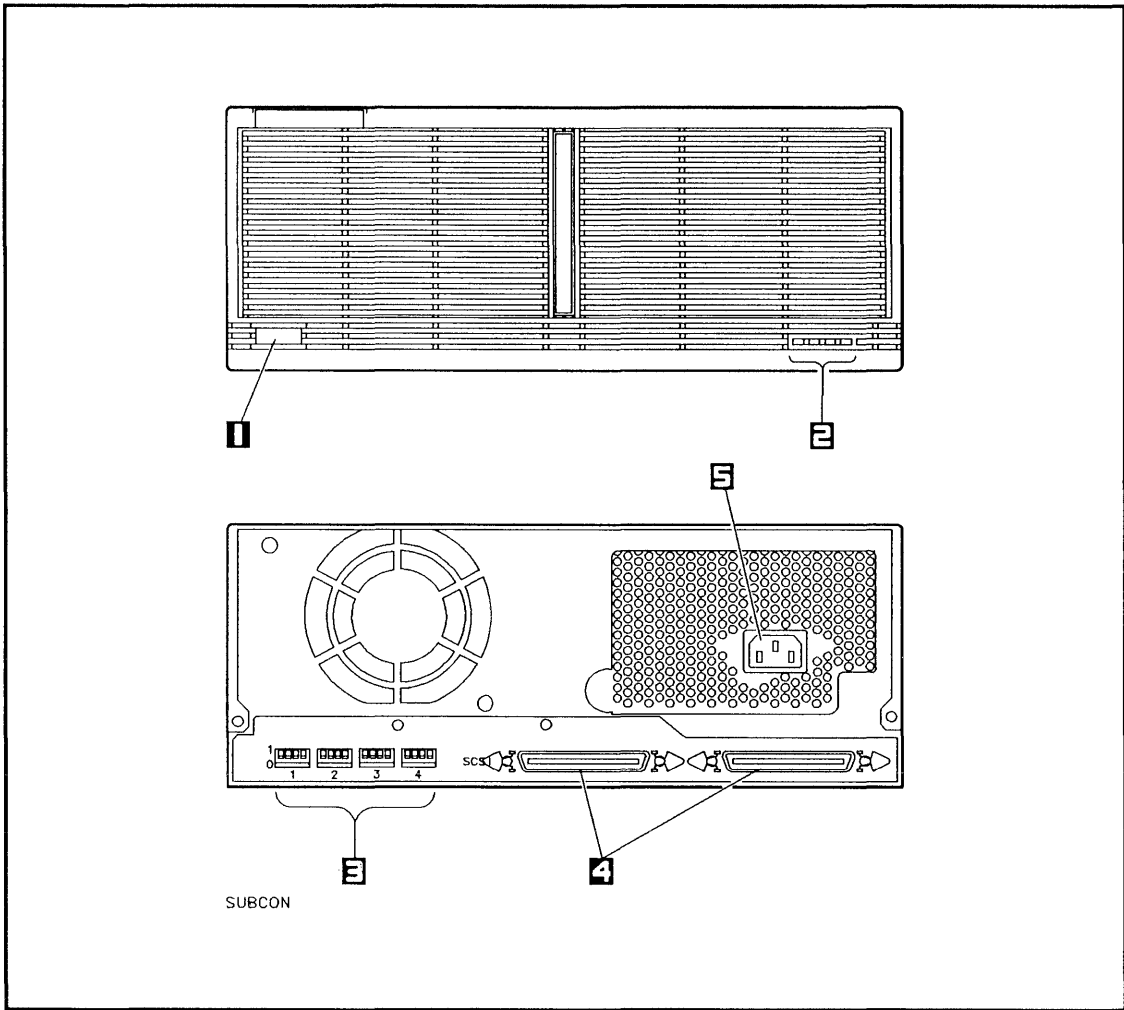


Figure 1-2. Controls and Connectors

1- (LINE) Switch

2- Hard Disk Drive Status Indicators

3- Hard Disk Drive Address Switches

4- SCSI Connectors

5- AC LINE Connector

Ensure that power is removed from all units of your host computer before connecting (or disconnecting) the mass storage system.

A Hewlett-Packard 92222 Series SCSI Peripheral Interface Cable must be used to connect the mass storage system to the SCSI bus. Failure to use these shielded cables may cause the mass storage system to not meet its Radio Frequency Interference (RFI) specifications.

When you are ready to return power to your system, apply power to the mass storage system before applying power to the host computer.

For host computer system configuration information, please refer to the *Peripheral Installation Guide*, part number 97005-90000. Additional configuration information can be found in the *Application Execution Environment User's Manual*, part number 98515-90002, and in Volume 1 of the *HP-UX System Administrator Manual*, part number 98594-90060.

The mass storage system is connected to the computer via a SCSI interface cable plugged into the SCSI connector **(4)** on the rear panel of the mass storage system. This cable and a SCSI **terminator** are supplied with the computer's SCSI interface hardware. (Additional SCSI interface cables, extender, and terminator are available as mass storage system accessories.) It is also necessary to set the **address switches (3)** for the desired SCSI device address. Details of SCSI bus connection and address selection are provided in the following paragraphs.

Connecting the SCSI Cable

One or more mass storage systems can be connected to the host computer via SCSI interface cables plugged into the SCSI connectors on the rear panel of the drive. Before connecting the mass storage system to the host computer, ensure that the cabling conforms with the following SCSI cabling standards.

The SCSI bus allows a maximum of eight devices, including the host computer system. Since your mass storage system can contain from one to four SCSI devices, you must make sure you know the number of SCSI devices within your mass storage system before connecting it to the system bus, since it is possible that two fully loaded mass storage systems could exceed the SCSI device limit.

The maximum length of the SCSI cables when totaled must not exceed six meters. In addition to the cables between the host computer and the mass storage system(s), each mass storage system contains 1.5 meters of internal SCSI cabling. This dimension must be included in maximum cable length calculations.

The last mass storage system on the bus must have a SCSI terminator (part number 1252-2297) fitted on its unused SCSI connector. A SCSI terminator is supplied with the host computer SCSI interface.

1. Check that power to the host computer and the mass storage system has been disconnected.
2. Connect the SCSI cable from the host computer to either of the two SCSI connectors (4) on the rear panel of the mass storage system. Ensure that the connector retaining clips are locked in place.
3. Connect the next SCSI device or the SCSI terminator to the other SCSI connector on the mass storage system.

Setting the Hard Disk Address Switches

For altering SCSI address settings of devices other than the hard disk drives, refer to the appropriate chapter in this manual. The address switches on the back of your mass storage system are for hard disk drives only. Your system disk should always be set to address number 6.

Each device on a SCSI bus requires a unique device address (0-6). (The SCSI interface card in the host computer is normally set to 7.) The SCSI hard disk address switches ⁽³⁾ on the rear panel of the mass storage system allow these addresses to be selected for each hard disk drive installed in your mass storage system. Set the switch for each hard disk drive as desired, making sure that no two devices have the same address. See Table 1-2.

The address switch labeled "X" is not connected and will not affect the SCSI address setting.

Table 1-2. Hard Disk SCSI Address Switches

SCSI Address	SCSI-ID X	SCSI-ID 4	SCSI-ID 2	SCSI-ID 1
0	X	0	0	0
1	X	0	0	1
2	X	0	1	0
3	X	0	1	1
4	X	1	0	0
5	X	1	0	1
6	X	1	1	0
7	X	1	1	1

This section contains operating instructions for the mass storage system. Included are operating precautions, a description of the operating controls, **self-test** information, and power application and removal procedures.

Warnings and Precautions

Do not operate your mass storage system if it has been exposed to extreme temperatures, such as being left in an automobile overnight in cold weather. The mass storage system must stabilize at room temperature for two hours before operation. Operating your mass storage system when it is very cold or very hot could cause damage to your mass storage system.

Do not turn the **LINE~** switch **1** on or off when your host computer is transferring data over the SCSI bus.

Do not cycle the **LINE~** switch **1** on and off unnecessarily.

Do not connect or disconnect the SCSI cable(s) from the mass storage system when your host computer is transferring data on the SCSI bus.

Environmental Limits

To ensure proper operation, the mass storage system should be operated within the environmental limits specified at the end of this chapter.

Switching the Power On

The **LINE~** switch **1** controls the application of power to the mass storage system. The **LINE~** switch is located in the lower left corner of the front panel. The power status is indicated by the position of the switch. The power is on when the switch is pushed in, and the power is off when the switch is fully extended or out. To apply power, set the **LINE~** switch to the on (in) position.

Hard Disk Drive Status Indicators

The **hard disk drive status indicators** **2** are front panel lights that show the status of the power-on diagnostics and hard disk drive activity. The hard disk drive status indicators located in the lower right-hand corner of the front panel are for hard disk drives only (see Figure 1-2). The first indicator from the left is connected to the hard disk drive in slot 1 (right front), the next indicator is connected to the hard disk drive in slot 2 (right rear), and the third indicator is connected to the hard disk drive in slot 3 (left front). The fourth indicator (on the right) is not used and is therefore always off.

If slots 1 or 3 (the front slots) contain devices other than hard disk drives or are empty, the hard disk drive status indicators for these slots are not connected and will remain off. When devices other than hard disk drives are installed, they will have their own status indicators on their front panels. Refer to the Hard Disk Drive chapter in this manual for more information about the hard disk drive status indicators.

Switching the Power Off

Set the **LINE~** switch **1** to the off (out) position.

This section describes how to maintain the mass storage system and return it if it requires service.

Serial Number

Each mass storage system has a serial number recorded on the rear panel. It is a good idea to keep a record of this serial number. Should your mass storage system be stolen or lost, the serial number is often necessary for tracing and recovery, as well as any insurance claims.

Shipping

If it becomes necessary to ship the mass storage system for repair, use the original container and packaging material supplied. Before shipment, the container should have an attached tag identifying your name and address and the service or repair needed. Include the equipment model number and full serial number. The serial number is located on the back of the mass storage system. Pack the mass storage system as shown in Figure 1-1.

Remove all cables from the mass storage system before shipping. Seal the container securely with adhesive tape. Also, we recommend that all shipments be insured.

If the original container is not available, consult your local dealer or Hewlett-Packard Sales and Support Office for information about how to obtain replacement packaging material.

Preventive Maintenance

There are no operator serviceable parts inside the mass storage system. Refer servicing to qualified personnel.

No regularly scheduled preventive maintenance is required for the mass storage system, however, peripherals installed within the mass storage system (other than the hard disk)

may require periodic maintenance; check the appropriate chapter in this manual for these procedures.

Warranty

The mass storage system is covered by a standard Hewlett-Packard warranty. However, this warranty is void if any of the sealed devices, such as the head-disk assembly, has been opened or otherwise tampered with.

Following are the HP Series 6000 Models 330S and 660S Mass Storage Systems specifications. Refer to the end of each chapter for specifications for a particular SCSI device. For general information regarding environmental requirements, refer to the *Disk Product Specifications and Site Environmental Requirements Handbook*, part number 5955-3456.

Operating Specifications

The following information stipulates the specifications and characteristics of this product when installed and operated within the limits specified under “Environmental Requirements,” found later in this chapter.

HARD DISK DRIVE PERFORMANCE

Rotational speed:	4,002 rpm \pm 0.05%
Average seek time (including settling):	16.5 ms
Average rotational delay:	7.5 ms \pm 0.5%
Average time to transfer 1 kilobyte:	0.7 ms
Average controller overhead time:	<0.5 ms
Total average transaction time:	25.1 ms
Disk performance index:	39.8 I/Os per second ¹

¹Maximum disk transactions per second, for 1 kilobyte transfers, less system overhead. Refers to fundamental disk performance; true I/O rates are application dependent and must take into account system overhead, including the individual host computer system configuration specifications.

HARD DISK DRIVE TRANSFER RATE

Data transfer rate (synchronous burst):	4.0 Megabytes per second
Data transfer rate (asynchronous burst):	1.5 Megabytes per second

HARD DISK DRIVE FUNCTIONAL CHARACTERISTICS

Average spin-up time (from start of spin-up to ready for access):	19 seconds
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HARD DISK DRIVE FORMATTED CAPACITY

Item	Data Bytes Per	Sectors Per	Tracks Per	Heads Per
Sector	512			
Track	28,672	56*		
Surface:	41,488,384	81,032	1,447**	1
Model 330S	331,907,072	648,256	11,576	8
Model 660S	663,814,144	1,296,512	23,152	16
<p><i>* There are 57 physical sectors per track. One is reserved for a spare, 56 are user accessible sectors.</i></p> <p><i>** There are 1,457 physical tracks per surface. Eight are reserved for use as spares, one is used to store defect lists, one is used as a maintenance track, 1,447 are user accessible tracks.</i></p>				

Physical Characteristics

DIMENSIONS

Height:	129 mm (5.1 in.)
Width:	325 mm (12.8 in.)
Depth:	571 mm (22.50 in.)

WEIGHT

Net:	
Package with one hard disk drive:	14.8 kg (32.7 lb)
Each additional SCSI mechanism:	3.6 kg (7.9 lb)
Shipping:	
Package with one hard disk drive:	19.1 kg (42.1 lb)

Operating Characteristics

HEAT DISSIPATION

Maximum:

Three hard disk drives: 147 W (502 Btu/hr; 126 kcals/hr)

Typical:

One hard disk drive: 65 W (222 Btu/hr; 56 kcals/hr)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

For U.S.A., designed to meet FCC docket 20780 for Class A computing peripheral devices. These products comply with the limits for a Class A computing device pursuant to Subpart J of part 15 of the FCC Rules. See instructions if interference to radio reception is suspected.

For Europe, designed to meet EMI level FTZ 1046/84 and provides a Manufacturer's Declaration. Refer to your local sales representative for more information.

Magnetic interference:

Magnetic operating: <5 gauss on all surfaces

Magnetic nonoperating: <2 milligauss at 2 m (7 ft) on all surfaces

POWER CHARACTERISTICS

The power supply in your mass storage system has an automatic ranging power supply, which makes a voltage selector switch and external fuse unnecessary. Automatic ranging power supplies have internal fuses that only fail if the power supply itself malfunctions.

Voltages (true rms):

120 V:	100 V, 115 V, 120 V, single phase
240 V:	220 V, 240 V, single phase
Inclusive Range:	88 V to 268 V

Frequency: 47.5 to 63 Hz (single phase)

Maximum Power:

Three hard disk drives:	120 V; 147 W (120 V, 60 Hz)
	240 V; 145 W (240 V, 50 Hz)

Typical Power:

One hard disk drive:	120 V; 65 W (120 V, 60 Hz)
	240 V; 65 W (240 V, 50 Hz)
Two hard disk drives:	120 V; 88 W (120 V, 60 Hz)
	240 V; 87 W (240 V, 50 Hz)
Three hard disk drives:	120 V; 118 W (120 V, 60 Hz)
	240 V; 116 W (240 V, 50 Hz)

Maximum Current (occurs during spin-up):

Three hard disk drives: 120 V; 2.45 A (true rms at 120 V, 60 Hz)
240 V; 1.36 A (true rms at 240 V, 50 Hz)

Typical Current:

Three hard disk drives: 120 V; 1.96 A (true rms at 120 V, 60 Hz)
240 V; 1.09 A (true rms at 240 V, 50 Hz)

Line Dropout:

No effect on performance; no operator intervention required for dropout equal to or less than 20 ms.

ACOUSTIC EMISSIONS

Average sound pressure level (L_{pA}): 44 dB(A)
Sound power level (one hard disk drive) (L_{wA}): 56 dB(A) maximum

SAFETY

CSA certified to CSA 22.2 No. 220-M1986.

Meets all applicable safety standards of IEC 950.

UL listed to UL 478, 5th edition.

Complies with DHHS 21 CFR for Class 1 Laser Products.

Meets the general approval NS/G/1234/J/100003 requirements.

Environmental Requirements

These are the specifications for the mass storage system with a hard disk drive only; check the appropriate chapter in this manual for optional peripherals.

The environmental specifications listed herein apply when this product is not connected to a Hewlett-Packard (HP) system. When this product is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisfaction. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range: 20°C to 25.5°C (68°F to 78°F)

Operating range: 0°C to 45°C (32°F to 113°F)

Nonoperating range: -40°C to 65°C (-40°F to 149°F)

Maximum rate of change: 20°C (36°F) per hour

HUMIDITY

Operating: 8% to 80% relative humidity,
noncondensing

Nonoperating: 5% to 80% relative humidity,
noncondensing

COOLING REQUIREMENTS

Allow 76.2 mm (3 in.) in front and behind for adequate air flow.

VIBRATION

Operating:	Random vibration with power spectral density (PSD) of $0.0001 \text{ g}^2/\text{Hz}$ from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of $0.00005 \text{ g}^2/\text{Hz}$ at 500 Hz at approximately 0.21 g rms.
Nonoperating:	Random vibration with power spectral density (PSD) of $0.015 \text{ g}^2/\text{Hz}$ from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; PSD of $0.008 \text{ g}^2/\text{Hz}$ from 137 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of $0.0039 \text{ g}^2/\text{Hz}$ at 500 Hz at approximately 209 g rms swept sine from 5 to 500 Hz; 1 octave per minute, 5 minute dwell at 4 resonances per axis 0.5 g (0-peak).

SHOCK
Recommended operating range: <1 g

Operating:	<2 g maximum at 11 ms, half sine waveform
Nonoperating:	<24 g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	minimum -305 m (-1000 ft) maximum 3 046 m (10,000 ft)
Nonoperating:	minimum -305 m (-1000 ft) maximum 15 240 m (50,000 ft)
Maximum rate of change:	<1 524 m/minute (5000 ft/minute)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

Radiated (14 kHz to 1 GHz):

Recommended operating limit: 0.5 V/m
Operating limit: 3 V/m

Conducted (30 Hz to 50 kHz):

Recommended operating limit: 1 V rms
Operating limit: 3 V rms

Conducted (50 kHz to 400 MHz):

Recommended operating limit: 0.5 V rms
Operating limit: 1 V rms

Electrostatic Discharge:

Recommended operating limit: 5 kV
Operating limit: 15 kV

Magnetic:

<4 gauss, 47.5 to 198 Hz

Power line transients (oscillatory wave and unidirectional wave tests per IEEE Standard P587.1/F):

Oscillatory wave (100 kHz ringing wave):

Recommended operating limit: 500 V (open circuit voltage)
Operating limit: 3.0 kV (open circuit voltage)

Unidirectional wave (one 50 μ s wide pulse):

Recommended operating limit: 100 V (open circuit voltage)
Operating limit: 250 V (open circuit voltage)

Fast rise time transients:

Recommended operating limit: 500 V (into 50 ohm load)
Operating limit: 1 kV (into 50 ohm load)

POWER REQUIREMENTS

The power supply in your mass storage system has an automatic ranging power supply, which makes a voltage selector switch and external fuse unnecessary. Automatic ranging power supplies have internal fuses that only fail if the power supply itself malfunctions.

Voltages (true rms):

120 V:	100 V, 115 V, 120 V, single phase
240 V:	220 V, 240 V, single phase
Inclusive Range:	88 V to 268 V

Frequency: 47.5 to 63 Hz (single phase)

Maximum Power:

Three hard disk drives:	120 V; 147 VA (120 V, 60 Hz)
	240 V; 145 VA (240 V, 50 Hz)

Typical Power:

Three hard disk drives:	120 V; 118 VA (120 V, 60 Hz)
	240 V; 116 VA (240 V, 50 Hz)

Maximum Current (occurs during spin-up):

Three hard disk drives:	120 V; 2.45 A (true rms at 120 V, 60 Hz)
	240 V; 1.36 A (true rms at 240 V, 50 Hz)

Typical Current:

Three hard disk drives: 120 V; 1.96 A (true rms at 120 V, 60 Hz)
240 V; 1.09 A (true rms at 240 V, 50 Hz)

Distortion: <10% flat-topped harmonic distortion

Line Surge and Sag:

Transparent surge: 120% nominal line voltage for 0.5 sec
Recoverable surge/sag: 120 V; 70% and 125% typical line voltage for 0.5 second (per MIL-T-28800)

Line Dropout: Must not exceed 20 ms

TILT

The mass storage system shall meet all performance specifications when mounted in an upright orientation which maintains the horizontal plane of the device to within ± 15 degrees of parallel to the horizon.

Hard Disk Drive

This chapter provides information about operating the hard disk drive (options 001, 002, 022) within your HP Series 6000 Models 330S and 660S Mass Storage Systems. This chapter also describes how to install additional hard disk drives, which are included in the C2290A and C2291A upgrade kits (refer to “Installing the Hard Disk Drive Upgrade Kit” in this chapter).

The hard disk drive is a random access mass storage device that contains 5.25-inch nonremovable sputtered thin-film disk media. The hard disk drive uses a rotary actuator to move read/write heads over the media. The read/write heads are used for reading and writing data, and for reading embedded servo information on the data tracks. Embedded servo information enables the hard disk drive to maintain head alignment during changes in operating temperature.

The C2290A upgrade kit contains a hard disk drive with a formatted capacity of 332 megabytes. The C2291A upgrade kit contains a hard disk drive with a formatted capacity of 664 megabytes. Each hard disk drive includes an embedded hard disk drive controller with a single-ended SCSI interface.

Do not operate your hard disk drive if it has been exposed to extreme temperatures, such as being left in an automobile overnight in cold weather. Your hard disk drive must stabilize at room temperature for two hours before operation. Operating your hard disk drive when it is very cold or very hot could cause damage to your hard disk drive. Refer to chapter 1 for limits on temperature and humidity for your mass storage system.

The following paragraphs describe how to operate your hard disk drive with your host computer.

Switching on Power

To switch on power to your hard disk drive, push in the **LINE~** switch on the mass storage system front panel (see Figure 2-1). To switch off power to your hard disk drive, push in the **LINE~** switch, then release it until it is fully extended out.

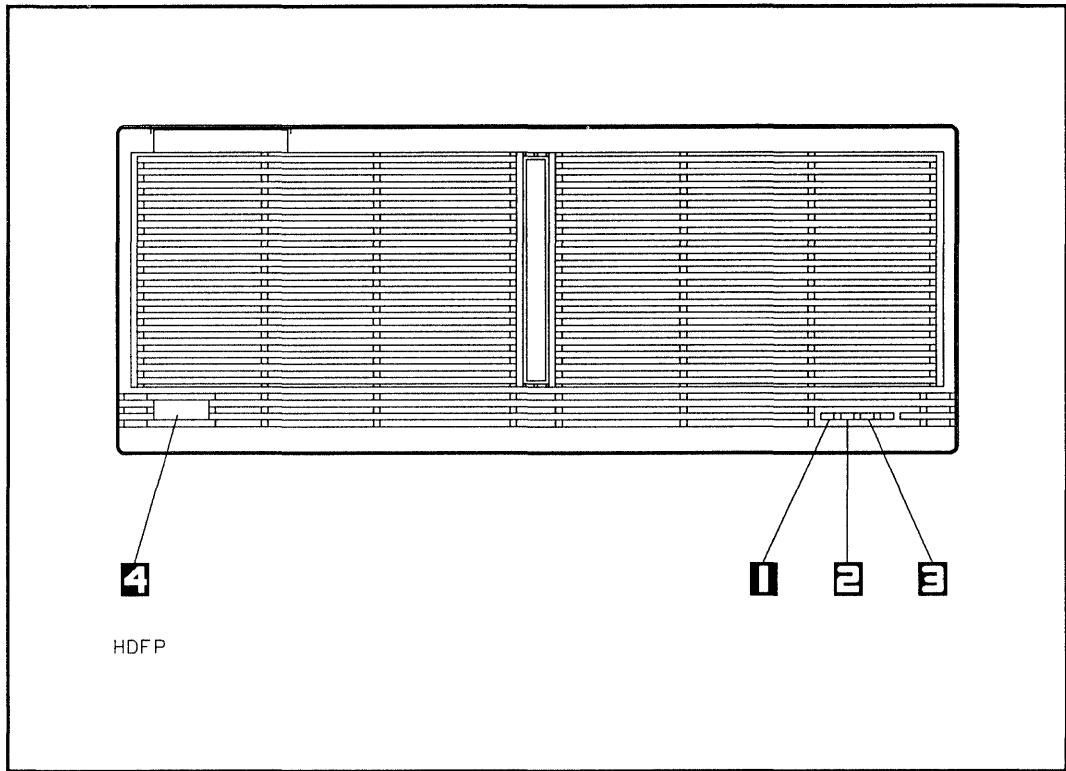


Figure 2-1. Mass Storage System Front Panel

1-Slot 1 Hard Disk Drive Status Indicator

2-Slot 2 Hard Disk Drive Status Indicator

3-Slot 3 Hard Disk Drive Status Indicator

4- LINE Switch

Checking the Status Indicator

When the mass storage system power is switched on, the hard disk drive automatically performs a self-test. The hard disk status indicator shows the status of the hard disk drive during the self-test and during activity with the host computer. The hard disk status indicator is a light-emitting diode (LED) located on the mass storage system front panel. Figure 2-1 shows the indicator position that corresponds to the mass storage system slot for each hard disk drive. The first indicator from the left is connected to the hard disk drive in slot 1 (right front), the next indicator is connected to the hard disk drive in slot 2 (right rear), and the third indicator is connected to the hard disk drive in slot 3 (left front). The fourth indicator (on the right) is not used and is therefore always off.

Each hard disk status indicator displays the following sequence when the mass storage system is switched on:

1. ON

When the mass storage system power is switched on, the hard disk status indicator goes on momentarily as the hard disk drive controller is being tested.

2. OFF

The hard disk status indicator goes off for 1 second after the hard disk drive controller passes self-test.

3. ON

The hard disk status indicator goes on when the spindle motor starts, and stays on for about 10 seconds until the spindle reaches maximum speed.

4. OFF

The hard disk status indicator goes off when the spindle reaches maximum speed.

After the spindle reaches maximum speed, the hard disk status indicator will flash randomly during hard disk drive activity with the host computer. If the spindle is at maximum speed and the hard disk status indicator is off, that hard disk drive is idle.

The following table shows the status of the hard disk status indicator during normal operation and fault conditions:

If the hard disk drive fails the self-test, contact your local Hewlett-Packard Sales and Support Office.

Table 2-1. Hard Disk Drive Status Indicators

Status	Explanation
OFF	No mass storage system power, or no hard disk drive in mass storage system slot, or hard disk drive idle on SCSI bus.
ON	Self-test failed if indicator stays on 20 seconds after mass storage system power switched on. Probable cause is hard disk drive controller.
FLASHING (1 Hz)	Self-test failed if indicator flashing at 1 Hz rate 20 seconds after mass storage system power switched on. Probable cause is hard disk drive controller.
FLASHING (10 Hz)	Hard Disk Drive Controller performing diagnostic tests.
FLASHING (random)	Normal SCSI bus activity.

The following paragraphs describe how to install a hard disk drive into your mass storage system. Your mass storage system can contain up to three hard disk drives. The C2290A upgrade kit includes a 332-megabyte hard disk drive, and the C2291A upgrade kit includes a 664-megabyte hard disk drive.

Hard disk drives can be installed into slot 1, slot 2, or slot 3. The first hard disk drive upgrade kit should be installed in slot 2 (rear slot) if it is empty. This leaves slot 3 (the front slot) open for another device that might need front panel access for media insertion.

This installation procedure is written for personal computer dealers, technicians, and others who are familiar with setting up mass storage devices. If you are not experienced with such tasks, please find an experienced person to help you or contact your local Hewlett-Packard Sales and Support Office.

After a hard disk drive is installed in the mass storage system, the mass storage system must be carefully reassembled to ensure compliance with RFI emission requirements, and to provide adequate protection against electrical shock and fire hazards.

Handling Precautions

If you do not protect your hard disk drive against electrostatic discharge, you may damage your hard disk drive and void your warranty.

A static charge of 39,000 volts can be generated on a carpeted floor. Such a voltage exceeds the limits of the hard disk drive and can cause unsuccessful operation of the product.

To ensure continuously successful operation of the hard disk drive in a carpeted office environment, Hewlett-Packard recommends the use of anti-static mats and anti-static carpets with this product. Refer to the *Hewlett-Packard Computer Users Catalog*, part number 5953-2450D, for a complete listing of static control equipment, including anti-static mats and carpets.

Handle the hard disk drive with care. The hard disk drive is susceptible to mechanical shock and vibration until it is secured into the mass storage system chassis. Never set the hard disk drive upside-down or it may be damaged.

The mass storage system contains a BEND/flex* cable that is used to distribute signals to the drives in the mass storage system. When handling the BEND/flex cable, *do not* crease, twist, or stress the cable or its connectors. Also, make sure that the BEND/flex cable is at room temperature when connecting or disconnecting any of its cables. The BEND/flex cable tears easily when it is twisted. When connecting a BEND/flex connector to another connector, push directly from the back of the BEND/flex connector and carefully push it onto the other connector.

* *BEND/flex is a product of Rogers Corporation.*

Unpacking the Upgrade Kit

The first step when installing a hard disk drive into your mass storage system is to unpack and identify the contents of the C2290A or C2291A upgrade kit. Figure 2-2 shows the contents of the C2290A and C2291A upgrade kits.

TORX* hardware is used in the upgrade kit. This hardware requires the use of special drivers. In this manual, any reference to this type of hardware will be accompanied by the required driver size (for example, "T25").

**TORX is a product of the Camcar Division of Textron, Inc.*

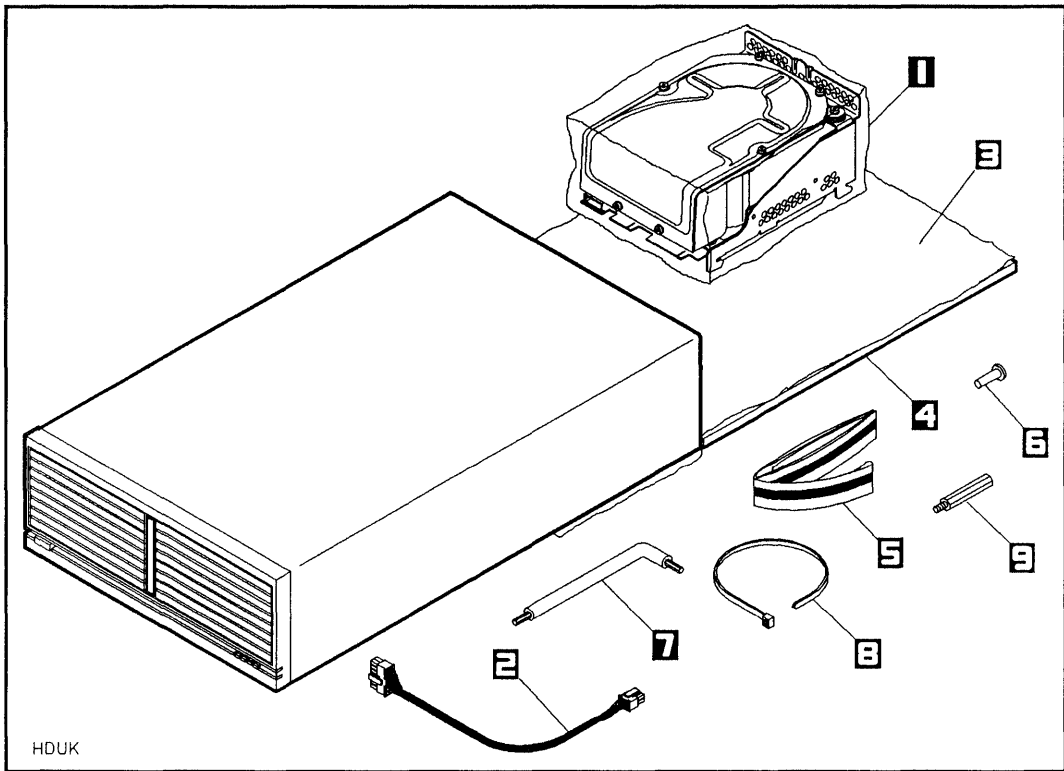


Figure 2-2. Hard Disk Drive Upgrade Kit Contents

1—Hard Disk Drive, 332-Mbyte (C2212-60061) or 664-Mbyte (C2213-60061)

2—Power Cable (C2201-60122)

3—Conductive Sheet (07961-80021)

4—Foam Pad (07961-80022)

5—Wrist Ground Strap (9300-1408)

6—T25, 10 mm Screw (0515-0386)

7—TORX Tools

8—Cable Tie (1400-0249)

9—Hex Standoff (C2212-20001)

Learning About Upgrade Kit Parts

The following paragraphs describe the characteristics and functions of the parts in the C2290A and C2291A upgrade kits.

Hard Disk Drive

See “Product Description” in this chapter.

Power Cable

The power cable is a 4-pin connector that provides dc power to the hard disk drive.

Conductive Sheet

The conductive sheet is an anti-static mat that is placed under the hard disk drive to prevent electrostatic damage.

Foam Pad

The foam pad is placed under the hard disk drive to prevent mechanical shock and vibration damage to the hard disk drive when the hard disk drive is not mounted in the mass storage system chassis.

Wrist Ground Strap

The wrist ground strap is used to ensure that the hard disk drive, the conductive sheet, and your hand are all at the same electrical potential.

T25 Screw

The T25 screw is used to secure the hard disk drive to the mass storage system chassis.

Hex Standoff

The hex standoff is use when a hard disk drive is installed (or moved) into slot 2.

Cable Tie

The cable tie is for wrapping the power cables in place once the new SCSI device is installed.

TORX Tools

The TORX tools are used to drive TORX screws.

Preparing to Install the Hard Disk Drive

Before installing a hard disk drive, make sure you have access to all sides of the mass storage system, and that the mass storage system is near an ac power outlet.

1. Shut down the host computer.
2. Turn off power to both the host computer and the mass storage system.
3. Disconnect the SCSI cable from the mass storage system.
4. With the **LINE** switch in the 0 (out) position, connect the power cord from the mass storage system rear panel to an ac power outlet.
5. Place the rear of the mass storage system chassis on the conductive sheet as shown in Figure 2-2.
6. Wrap one end of the wrist ground strap around your wrist and apply the copper end to a flat, unpainted area of the mass storage system chassis. The mass storage system chassis, the conductive sheet, and your hand are now at the same electrical potential.

Keep the wrist strap on until you have performed all the steps in the installation procedure.

7. Slide the foam pad beneath the conductive sheet, while making sure the mass storage system chassis maintains contact with the conductive sheet.

8. Place the anti-static bag containing the hard disk drive on the conductive sheet. Open the bag, remove the hard disk drive, and place the hard disk drive on the conductive sheet.
9. Disconnect the ac power cord from the mass storage system rear panel.

Ensure that the **LINE** switch on the mass storage system front panel is in the 0 (out) position, and that the power cord is disconnected from the mass storage system rear panel. Electrical shock may result if the power cord is connected and the **LINE** switch is in the 1 (in) position while the top cover is off.

Removing the Front Panel and Top Cover

Remove the front panel and top cover as follows (see Figure 2-3):

1. Slide the front of the mass storage system chassis beyond the edge of the table top until the front panel locking tabs are exposed. The tabs are located on the underside of the chassis.
2. Press up on the front panel locking tabs until the front panel releases from the mass storage system chassis.
3. Pull the bottom of the front panel forward, rotate the front panel up, and lift the front panel mounting tabs out of the slots in the front edge of the top cover.
4. Remove the two T15 top cover screws.
5. Slide the rear of the top cover one-half inch beyond the rear of the mass storage system chassis, then lift the front of the top cover up and off of the mass storage system chassis.

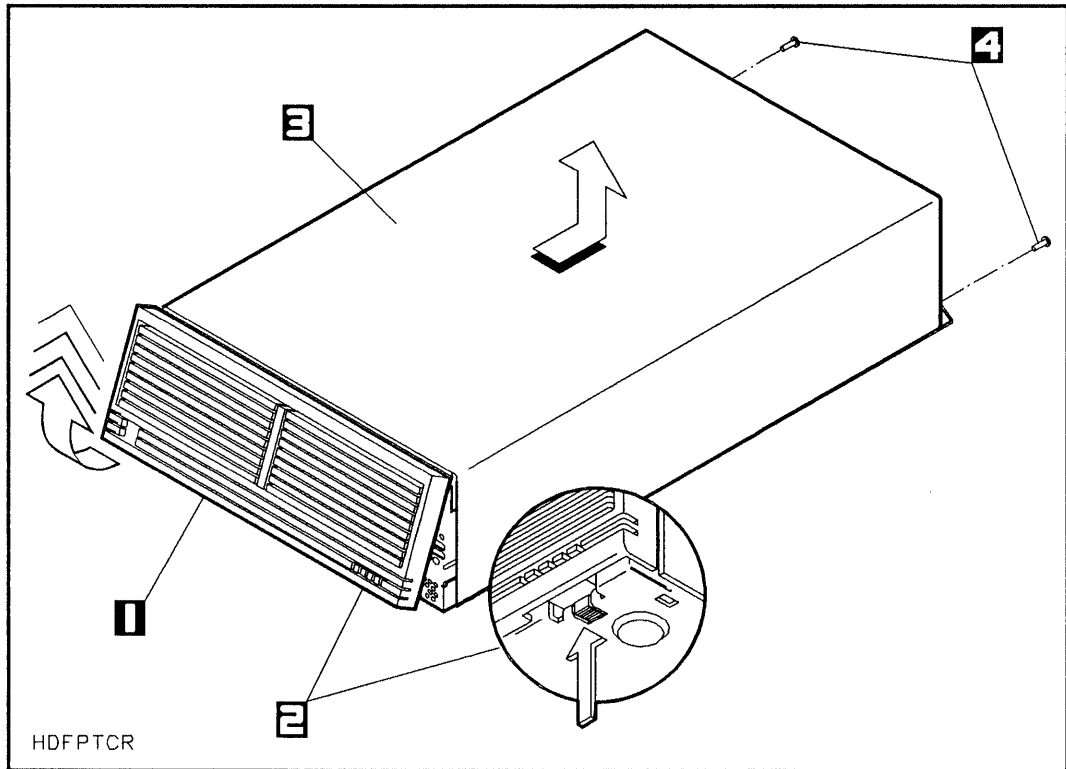


Figure 2-3. Removing the Front Panel and Top Cover

1-Front Panel

3-Top Cover

2-Front Panel Locking Tabs

4-T15 Top Cover Screws

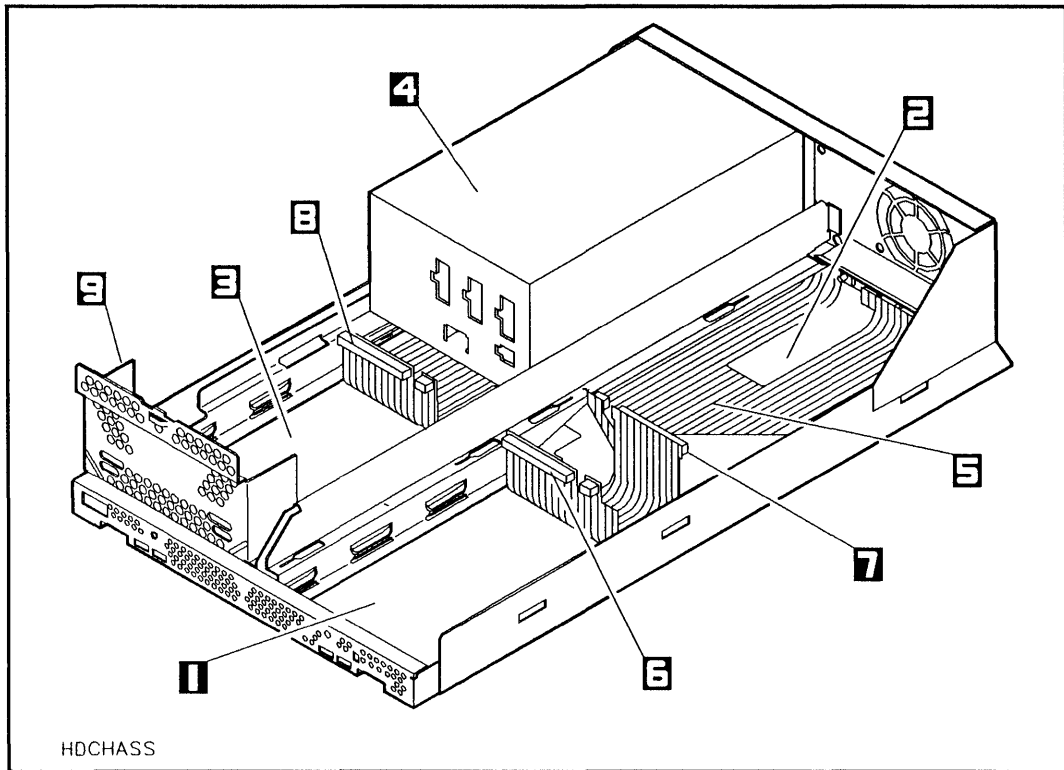


Figure 2-4. Mass Storage System Chassis

- | | |
|-------------------|------------------------------|
| 1-Slot 1 | 6-Slot 1 BEND/flex Connector |
| 2-Slot 2 | 7-Slot 2 BEND/flex Connector |
| 3-Slot 3 | 8-Slot 3 BEND/flex Connector |
| 4-Power Supply | 9-RFI Bracket |
| 5-BEND/flex Cable | |

Removing the RFI Bracket from Slot 3

If you are not installing a hard disk drive into slot 3, proceed to the next section.

The mass storage system chassis is shipped with a radio frequency interference (RFI) bracket in slot 3. The RFI bracket ensures the compliance of your mass storage system with RFI emission requirements whenever there is no device in slot 3.

If you are installing a hard disk drive into slot 3, you must first remove the RFI bracket as follows (see Figure 2-5):

1. Remove the T25 screw from the front of the mass storage system chassis.
2. Use a flat-bladed screwdriver to pry the RFI bracket toward the rear of the mass storage system chassis.
3. Slide the RFI bracket on the chassis rails toward the center of the mass storage system chassis until the mounting tabs stop against the ends of the mounting slots.
4. Lift the RFI bracket out of the chassis.
5. Discard the RFI bracket.

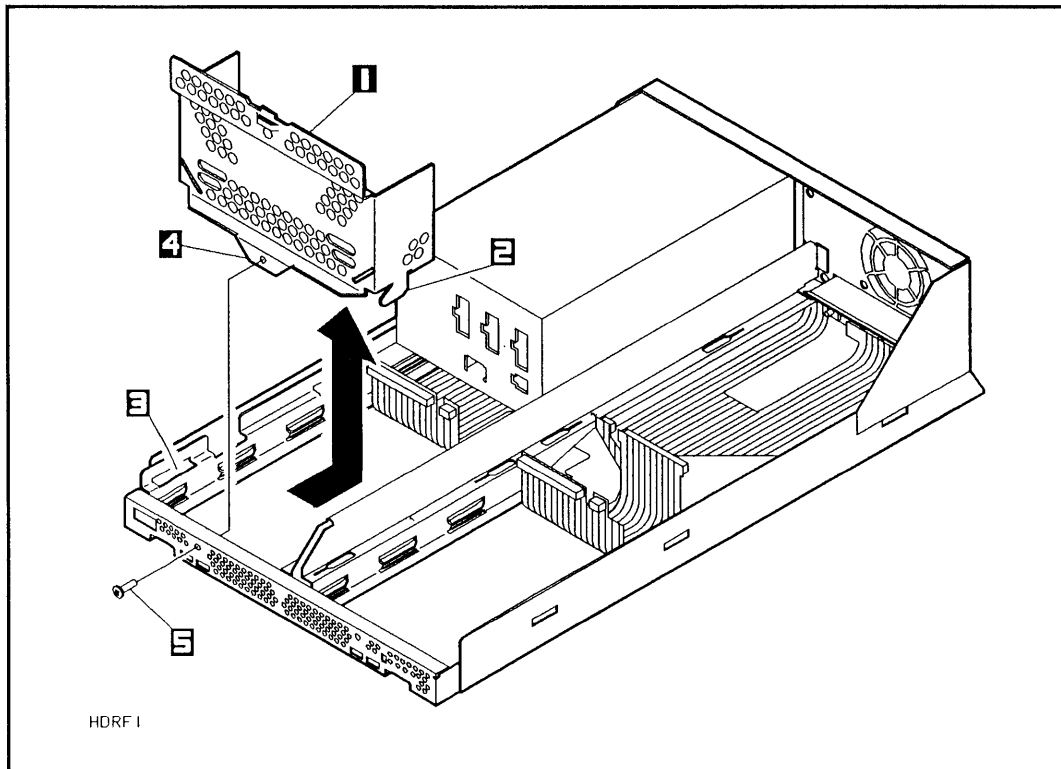


Figure 2-5. Removing the RFI Bracket

- | | |
|---------------------------|--------------------------|
| 1 - RFI Bracket | 4 - Bracket Securing Tab |
| 2 - Mounting Tab (1 of 2) | 5 - T25 Screw |
| 3 - Mounting Slot | |

Using the Hex Standoff in Slot 2

If you are not installing a hard disk drive into slot 2, proceed to the next section.

The upgrade kits are shipped with a T25 screw and a hex standoff for slot 2 (see Figure 2-7). If you are installing a hard disk drive into slot 2, hand tighten the standoff into the securing tab of the hard disk drive before installing it into slot 2.

Connecting the Cables

Connect cables to the hard disk drive as follows (see Figure 2-9 and Figure 2-10):

1. Lift the hard disk drive from the conductive sheet, then gently push the BEND/flex cable connectors toward the center of the chassis, and lower the mounting tabs into the mounting slots in the chassis rails.
2. Before securing the hard disk drive in place, connect the hard disk status indicator cable to the corresponding BEND/flex status indicator connector for the proper slot number.
3. Connect the BEND/flex address connector to the address connector on the hard disk drive.
4. Connect the BEND/flex SCSI connector to the SCSI connector on the hard disk drive.
5. Connect one end of the dc power cable to the dc power connector on the hard disk drive.
6. Connect the other end of the dc power cable to any of the unused dc power connectors on the power supply (see Figure 2-11).
7. Secure the dc power cable with the cable tie next to the power supply (see Figure 2-4).

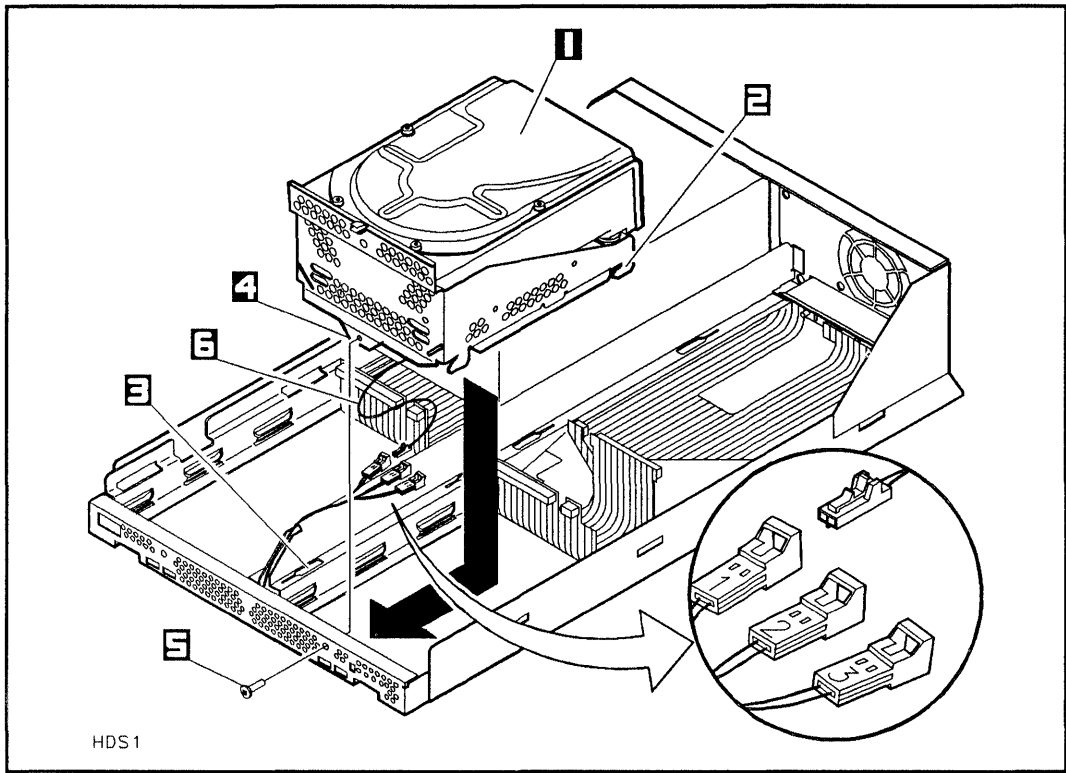


Figure 2-6. Installing the Hard Disk Drive into Slot 1

1-Hard Disk Drive

4-Securing Tab

2-Mounting Tab (1 of 4)

5-T25 Screw

3-Mounting Slot (1 of 4)

6-Status Cable

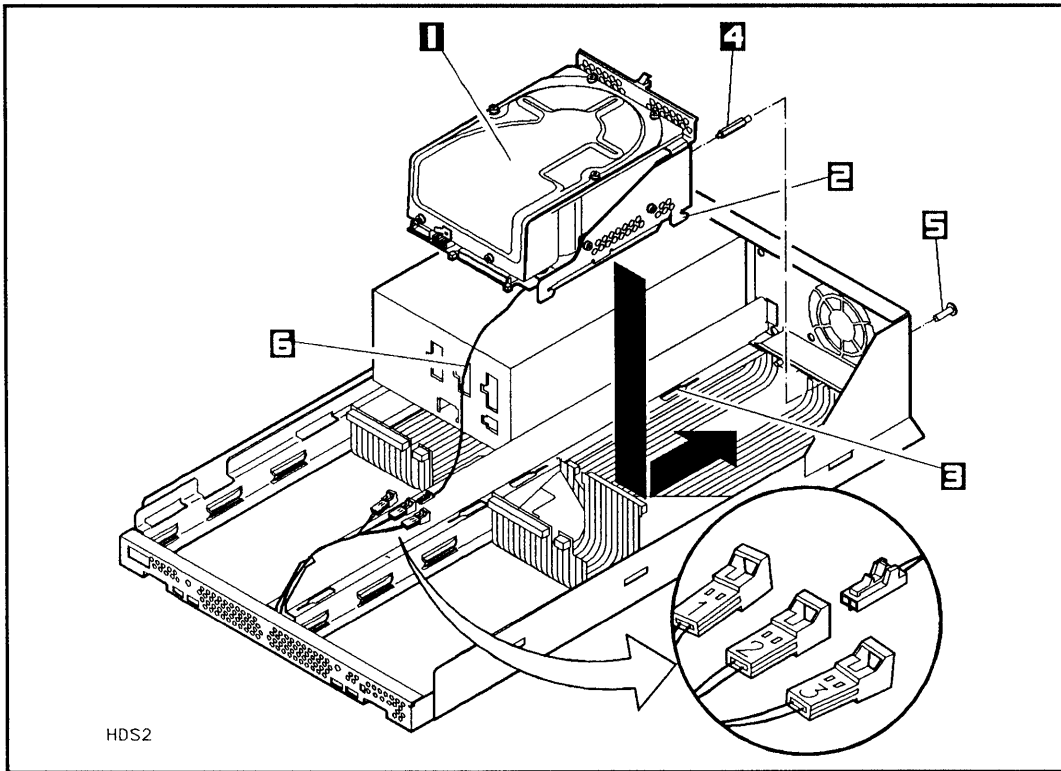


Figure 2-7. Installing the Hard Disk Drive into Slot 2

1-Hard Disk Drive

2-Mounting Tab (1 of 4)

3-Mounting Slot (1 of 4)

4-Standoff

5-T25 Screw

6-Status Cable

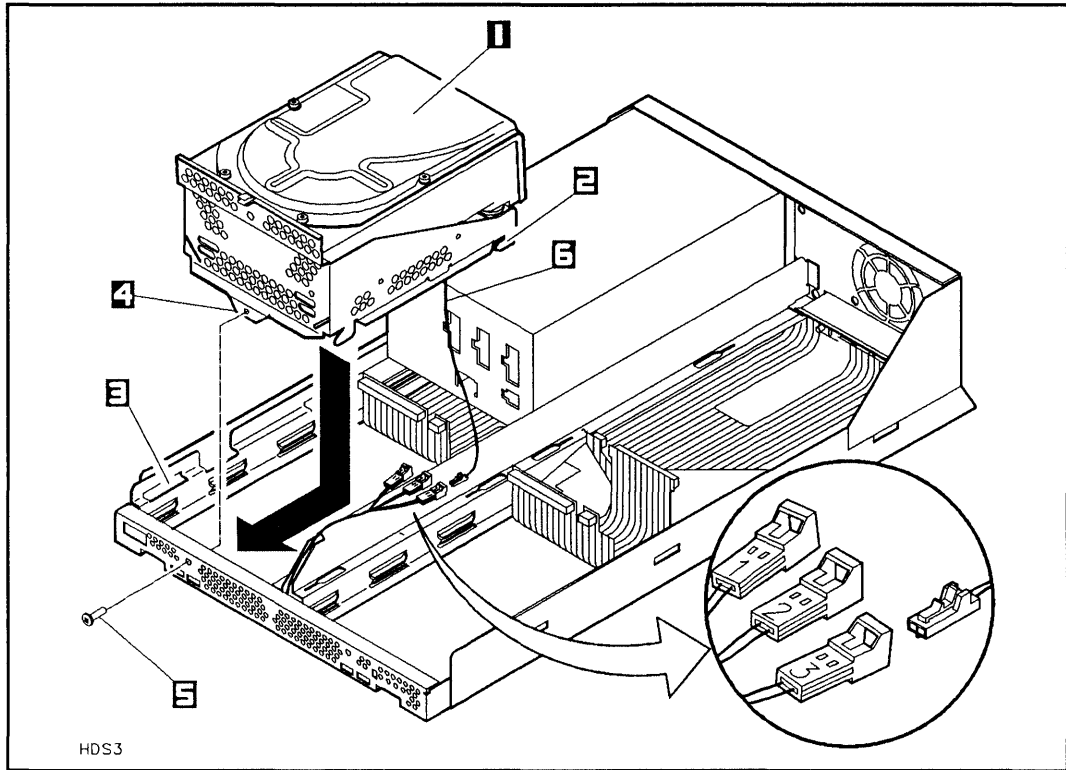


Figure 2-8. Installing the Hard Disk Drive into Slot 3

- 1-Hard Disk Drive
- 2-Securing Tab (1 of 4)
- 3-Securing Slot (1 of 4)

- 4-Securing Tab
- 5-T25 Screw
- 6-Status Cable

Installing the Hard Disk Drive

To finish installing a hard disk drive into your mass storage system:

1. If you are installing a hard disk drive into slot 1 or slot 3, push down on the hard disk drive and slide it on the chassis rails toward the front of the mass storage system chassis until the mounting tabs lock into the mounting slots and the hard disk drive stops against the front of the chassis (see Figure 2-6 or Figure 2-8).

If you are installing a hard disk drive into slot 2, push down on the hard disk drive and slide it toward the rear of the mass storage system chassis until the mounting tabs lock into the mounting slots and the hard disk drive standoff stops against the rear of the chassis (see Figure 2-7).

2. If you are installing a hard disk drive into slot 1 or slot 3, tighten the T25 screw through the hole in the front of the mass storage system chassis and into the hard disk drive securing tab.

If you are installing a hard disk drive into slot 2, tighten the T25 screw through the hole in the rear of the mass storage system chassis and into the standoff.

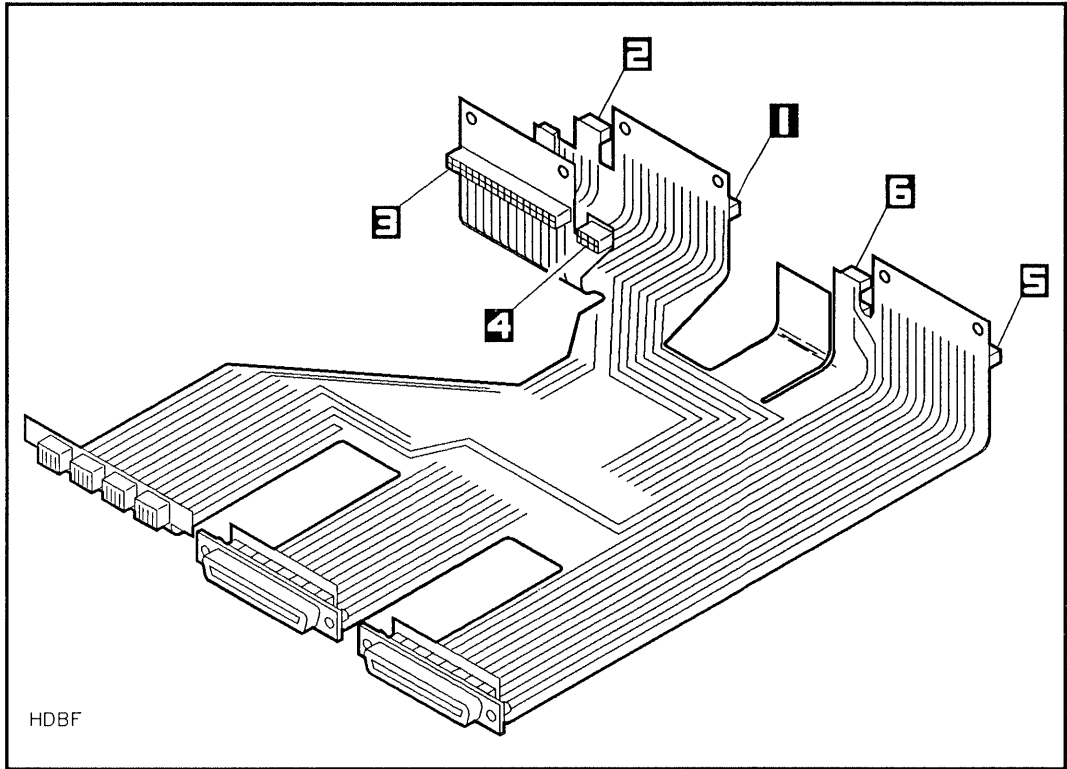


Figure 2-9. BEND/flex Cable Connectors

1-Slot 1 SCSI Connector

2-Slot 1 Address Connector

3-Slot 2 SCSI Connector

4-Slot 2 Address Connector

5-Slot 3 SCSI Connector

6-Slot 3 Address Connector

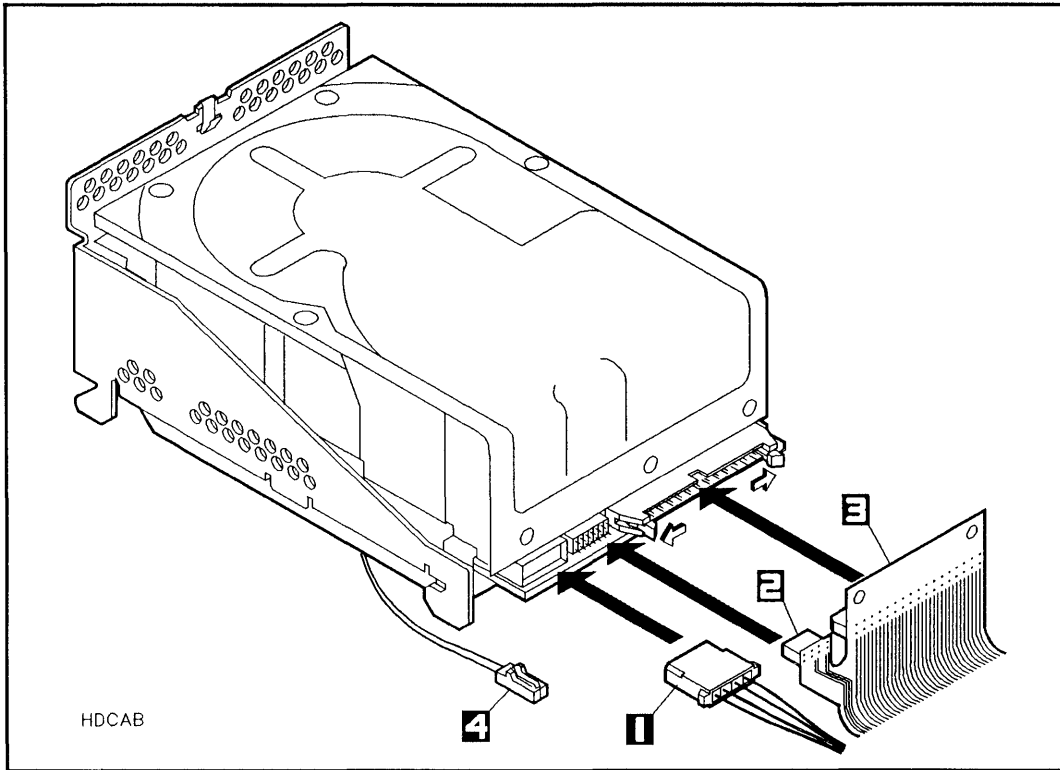


Figure 2-10. Connecting Cables to the Hard Disk Drive

1—DC Power Cable

3—BEND/flex SCSI Cable

2—BEND/flex Address Cable

4—Status Cable

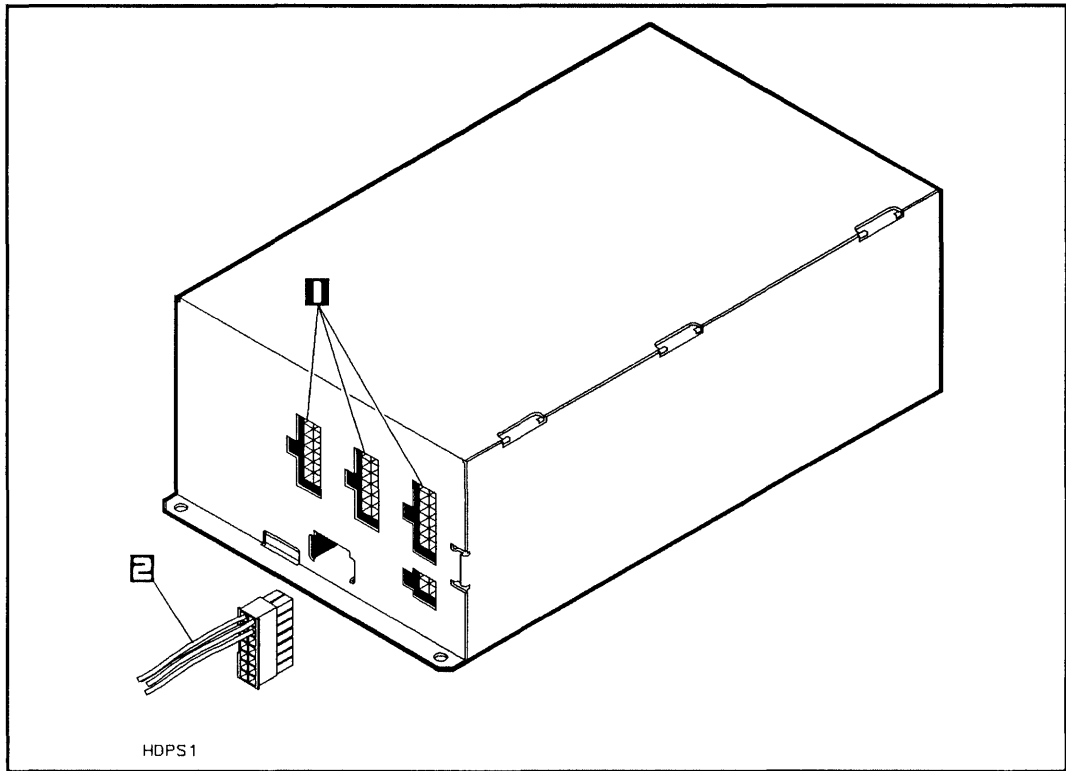


Figure 2-11. Connecting the DC Power Cable

1-DC Power Connectors

2-DC Power Cable

Reinstalling the Front Panel and Top Cover

Install the front panel and top cover as follows (see Figure 2-3):

1. Slide the top cover down over the mass storage system chassis so that the rear of the top cover extends one-half inch beyond the rear of the mass storage system chassis, then slide the top cover forward into place.
2. Install and tighten the T15 top cover screws.
3. Insert the front panel mounting tabs into the slots in the top cover and swing the front panel down until the **LINE** switch comes through the opening in the front panel.
4. Push the bottom edge of the front panel into the front of the chassis until the front panel locking tabs engage.
5. Remove the wrist strap from the mass storage system chassis and your wrist.
6. Reconnect the SCSI cable and the power cord to the mass storage system rear panel.

Setting the Address Switches

The system disk should always be set to SCSI address number 6. To set the SCSI address switches for the hard disk drive(s) to the desired address, refer to chapter 1.

This section describes how to remove a hard disk drive from your mass storage system. The hard disk drive in slot 1 must be removed and reinstalled into slot 2 if you are upgrading your mass storage system with a SCSI device that requires access for inserting and removing media.

This removal procedure is written for personal computer dealers, technicians, and others who are familiar with setting up mass storage devices. If you are not experienced with such tasks, please find an experienced person to help you or contact your local HP Sales and Support Office for service.

After a hard disk drive is removed from the mass storage system, the mass storage system must be carefully reassembled to ensure compliance with RFI emission requirements and to provide adequate protection against electrical shock and fire hazards.

Handling Precautions

Electrostatic discharge (ESD) can damage the hard disk drive and its associated electronics. The installation procedure should be performed in areas with carpeting treated for ESD protection or in areas with conductive flooring. If you do not protect the hard disk drive against ESD, you may damage the hard disk drive and void your warranty.

The hard disk drive is susceptible to mechanical shock and vibration when it is not secured in the mass storage system chassis. Place the hard disk drive on the foam pad included in the upgrade kit to prevent damage from mechanical shock and vibration. *Do not* set the hard disk drive upside-down or the hard disk drive will be damaged.

Preparing to Remove the Hard Disk Drive

Before removing the hard disk drive, perform a full disk backup. If your hard disk drive is damaged while removing it from the mass storage system chassis, loss of valuable data may occur.

1. Shut down the host computer.
2. Turn off power to both the host computer and the mass storage system.
3. Disconnect the SCSI cable from the mass storage system rear panel.
4. Set the **LINE** switch to the 0 (out) position and connect the power cord from the mass storage system rear panel to an ac power outlet.
5. Wrap one end of the ground strap around your wrist and apply the copper end to a flat, unpainted area of the mass storage system chassis. The mass storage system chassis, the conductive sheet, and your hand are now at the same electrical potential.

Keep the wrist strap on until you have performed all the steps in the removal procedure.

6. Place the rear of the mass storage system chassis on the conductive sheet as shown in Figure 2-2.
7. Slide the foam pad beneath the loose end of the conductive sheet, while making sure the mass storage system chassis maintains contact with the conductive sheet.
8. Disconnect the ac power cord from the mass storage system rear panel.

Ensure that the **LINE** switch on the mass storage system front panel is in the 0 (out) position, and that the power cord is disconnected from the mass storage system rear panel. Electrical shock may result if the power cord is connected and the **LINE** switch is in the 1 (in) position while the top cover is off.

9. Remove the front panel and top cover from the mass storage system chassis (refer to “Removing the Front Panel and Top Cover” in this chapter).

Disconnecting the Cables

1. Disconnect the proper dc power cable from the dc power connector on the power supply (see Figure 2-11) and from the dc power connector on the hard disk drive, then cut the power cable tie wrap.
2. Disconnect the proper hard disk status indicator cable from the BEND/flex status indicator connector. Press to release the locking connector.
3. Disconnect the BEND/flex cable address connector from the hard disk drive address connector.
4. Disconnect the BEND/flex SCSI connector from the hard disk drive SCSI connector by pressing both cable ejectors outwards as shown in Figure 2-10 until the cable is removed.

Removing the Hard Disk Drive

1. Remove the T25 screw from the front of the mass storage system chassis.
2. If you are removing a hard disk drive from slot 1 or slot 3, remove the T25 screw from the hole in the front of the mass storage system chassis (see Figure 2-6 or Figure 2-8).

If you are removing a hard disk drive from slot 2, remove the T25 screw from the hole in the rear of the mass storage system chassis (see Figure 2-7).

3. Use a flat-bladed screw driver to pry the front of the hard disk drive toward the center of the mass storage system.
4. Slide the hard disk drive toward the center of the mass storage system chassis until the mounting tabs stop against the ends of the mounting slots.
5. Gently push the BEND/flex cable connectors toward the center of the chassis with one hand and lift the hard disk drive out of the mass storage system chassis and onto the conductive sheet.

If you are relocating your hard disk drive within your mass storage system, proceed now to “Installing a Hard Disk Drive” in this chapter.

6. If the hard disk drive is not being relocated into another slot, place the hard disk drive into a conductive bag.
7. Install the front panel and top cover on the mass storage system chassis (refer to “Installing the Front Panel and Top Cover” in this chapter).
8. Remove the wrist strap from the mass storage system chassis and from your wrist.

Due to the self-contained design of the hard disk drive, it does not require regular maintenance. However, the performance and reliability of the hard disk drive depend upon its operating environment. Make sure the hard disk drive operates within the environmental restrictions listed in chapter 1.

If the hard disk drive requires service, perform the following steps:

1. Contact your local Hewlett-Packard Sales and Support Office.
 2. Explain the problem you are having with the hard disk drive.
 3. State the serial number of the hard disk drive.
-

If you have any questions about the warranty on your hard disk drive, please contact your local Hewlett-Packard Sales and Support Office.

For a complete list of technical specifications for your hard disk drive, refer to chapter 1.

Rewritable Optical Disk Drive

This chapter provides information about operating the rewritable optical disk drive (option 005) within your HP Series 6000 Models 330S and 660S Mass Storage Systems. This chapter also describes how to install the rewritable optical disk drive, which is included in the C2294A upgrade kit (refer to “Installing the Rewritable Optical Disk Drive Upgrade Kit” in this chapter).

The rewritable optical disk drive is a random access mass storage device that stores data on removable 5.25-inch magneto-optical (MO) media. The optical head in the rewritable optical disk drive contains a laser diode that is used for reading, writing, and erasing data. The rewritable optical disk drive includes a separate controller Printed Circuit Assembly (PCA) with a single-ended SCSI interface.

Rewritable optical disks are 5.25 inches in diameter and are made from a polycarbonate material coated with a magnetic layer on both sides, where data is stored in digital format. The disk is mounted in a rigid plastic case similar to a 3.5-inch magnetic flexible disk (see Figure 3-1). Rewritable optical disks have two recording sides, with a data capacity of 325 megabytes per side, for a total capacity of 650 megabytes per disk. Because the rewritable optical disk drive contains only one read/write head, a disk must be ejected, turned over, and loaded into the disk port again to access the other side.

Data is stored and retrieved through a window beneath the shutter (see Figure 3-1). When you load rewritable optical disk into the disk port, the shutter opens automatically to expose the disk surface. When you eject the disk from the disk port, the shutter closes over the window to protect the disk surface.

Do not open the shutter manually. Opening the shutter will expose the surface of the disk to dust, which will reduce the reliability of the read/write head in the rewritable optical disk drive.

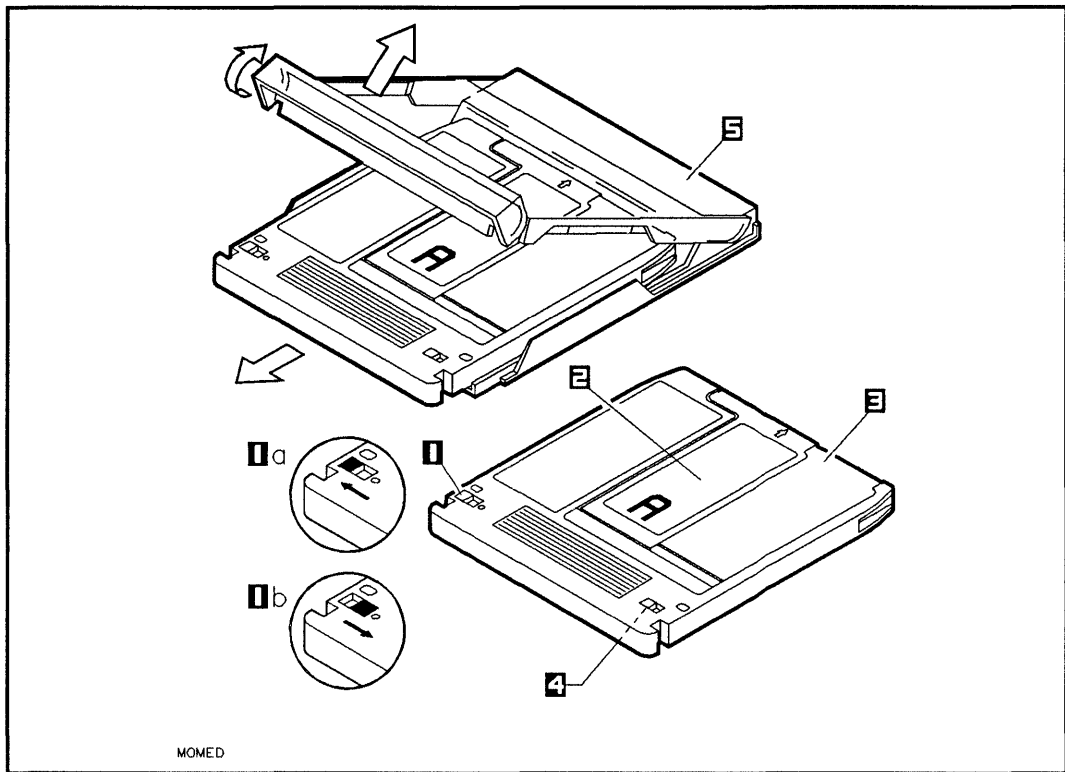


Figure 3-1. Rewritable Optical Disk and Case, Side A

1- Write-protect Tab, Side A

1a- Write-protect position

1b- Write-enable position

2- Shutter

3- Plastic Case

4- Write-protect Tab, Side B

5- Protective Storage Case

Write-protecting a Disk

The write-protect tab on either side of the magneto-optical (MO) disk can be switched between the write-protect and write-enable positions. The write-protect position protects valuable programs and data from being over-written (see Figure 3-1). When a rewritable optical disk is write-protected, data can only be read from the disk; no data can be written onto the disk.

To write-protect a rewritable optical disk, perform the following steps:

1. Place your thumbnail in the slot on the write-protect tab.
2. Slide the write-protect tab to the left-hand side of the plastic case.

When the write-protect tab is in the write-protect (left-hand) position, an empty round hole will be exposed on the right-hand side of the write-protect tab.

Write-enabling a Disk

The write-enable position enables data to be written on the rewritable optical disk. When a rewritable optical disk is write-enabled, valuable programs and data may be over-written on the side or sides that are not write-protected.

To write-enable a rewritable optical disk, perform the following steps:

1. Place your thumbnail in the slot on the write-protect tab.
2. Slide the write-protect tab to the right-hand side of the plastic case.

Caring for Disks

The plastic case and metal shutter make magneto-optical (MO) disks very reliable. However, because rewritable optical disks contain valuable data and programs, you should treat them with care. Follow these guidelines to prevent data loss and prolong the life of your rewritable optical disks and your rewritable optical disk drive:

Use rewritable optical disks in a clean environment to prevent dust particles from scratching disk surfaces.

Keep rewritable optical disks away from appliances with magnetic fields. A very strong magnet can erase data on a rewritable optical disk.

Store rewritable optical disks in a cool, dry place to prevent moisture and heat damage.

Do not try to clean the surface of a rewritable optical disk. Some cleaning solvents may damage the disk.

Ordering Rewritable Optical Disks

Table 3-1 lists rewritable optical disk products you can order from Hewlett-Packard.

Table 3-1. Ordering Rewritable Optical Disk Media

Part Number	Quantity	Description
92280A	1	One, 650-megabyte rewritable optical disk with protective case and label.

The following paragraphs describe how to operate your rewritable optical disk drive with a rewritable optical disk and your host computer.

Do not operate your rewritable optical disk drive if it has been exposed to extreme temperatures, such as being left in an automobile overnight in cold weather. Your rewritable optical disk drive must stabilize at room temperature for two hours before operation. Operating your rewritable optical disk drive when it is very cold or very hot could cause damage to your rewritable optical disk drive. Refer to the end of this chapter and also to chapter 1 for limits on temperature and humidity for your mass storage system.

Switching on Power

To switch on power to your rewritable optical disk drive, push in the **LINE** switch on the mass storage system front panel. To switch off power to your rewritable optical disk drive, push in the **LINE** switch then release it until it is fully extended out. (See Figure 1-2 in chapter 1 for the location of the **LINE** switch.)

Inserting a Rewritable Optical Disk

To insert a rewritable optical disk, grasp the edge of the disk opposite the shutter and slide the disk in the direction of the arrow (see Figure 3-2) all the way into the disk port, until the disk drops and locks into place. The rewritable optical busy light displays the following sequence when a rewritable optical disk is inserted into the disk port:

1. ON

When a rewritable optical disk is inserted into the disk port, the rewritable optical busy light goes on and stays on until the load sequence completes. If the load sequence fails, the rewritable optical busy light stays on.

2. OFF

The rewritable optical busy light goes off if the load sequence ends without a failure.

Ejecting a Rewritable Optical Disk

To eject a rewritable optical disk, press the disk eject button on the front panel of the rewritable optical disk drive, wait for the disk to eject part way, and pull the disk straight out of the disk port (see Figure 3-3). The rewritable optical busy light displays the following sequence when a rewritable optical disk is ejected from the disk port:

1. ON

The rewritable optical busy light goes on when the eject sequence starts, and stays on for 5 seconds until the rewritable optical disk spins down and the tray is in the eject position. (The rewritable optical busy light stays on for only 1 second if the rewritable optical disk has already spun down.)

2. OFF

The rewritable optical busy light goes off and the rewritable optical disk ejects.

To eject a rewritable optical disk after a power failure or if the normal eject switch fails, push the tip of an emergency eject tool, part number C1701-88800, into the emergency disk eject access hole (see Figure 3-3). (If you don't have an eject tool, use a paper clip.)

The rewritable optical disk cannot be inserted after being removed with the emergency eject tool until power is cycled on the mass storage system.

Some application software may prohibit the ejection of a disk until the user exits the application program.

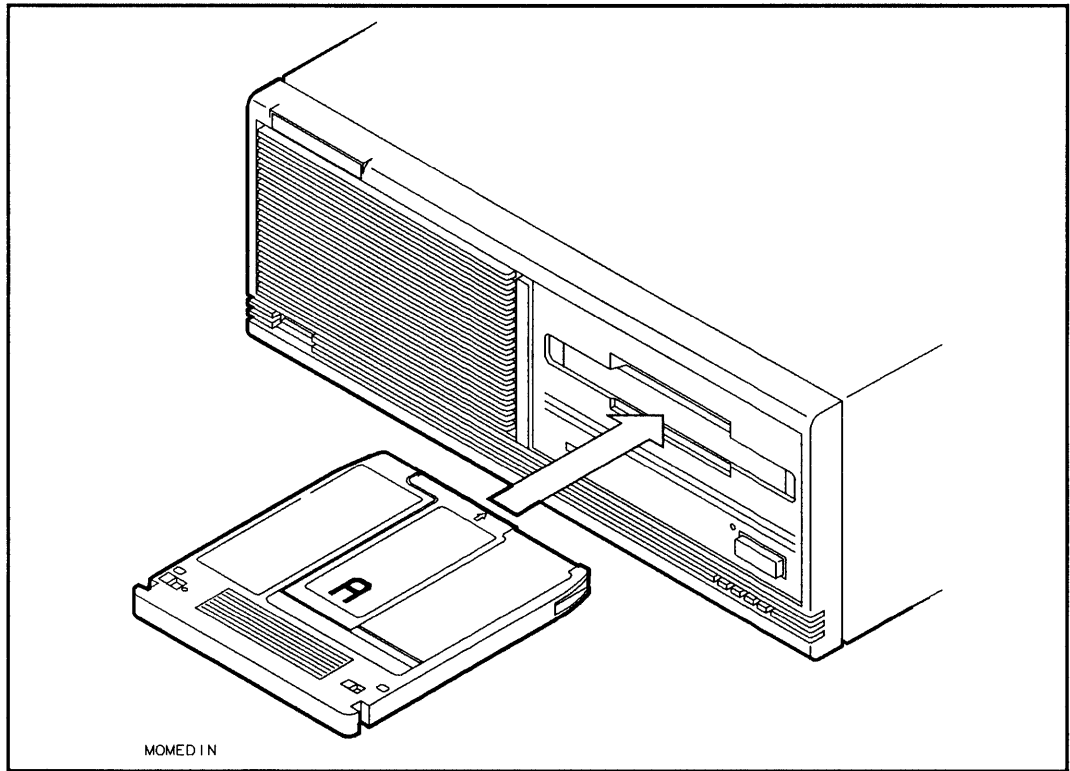


Figure 3-2. Inserting a Rewritable Optical Disk

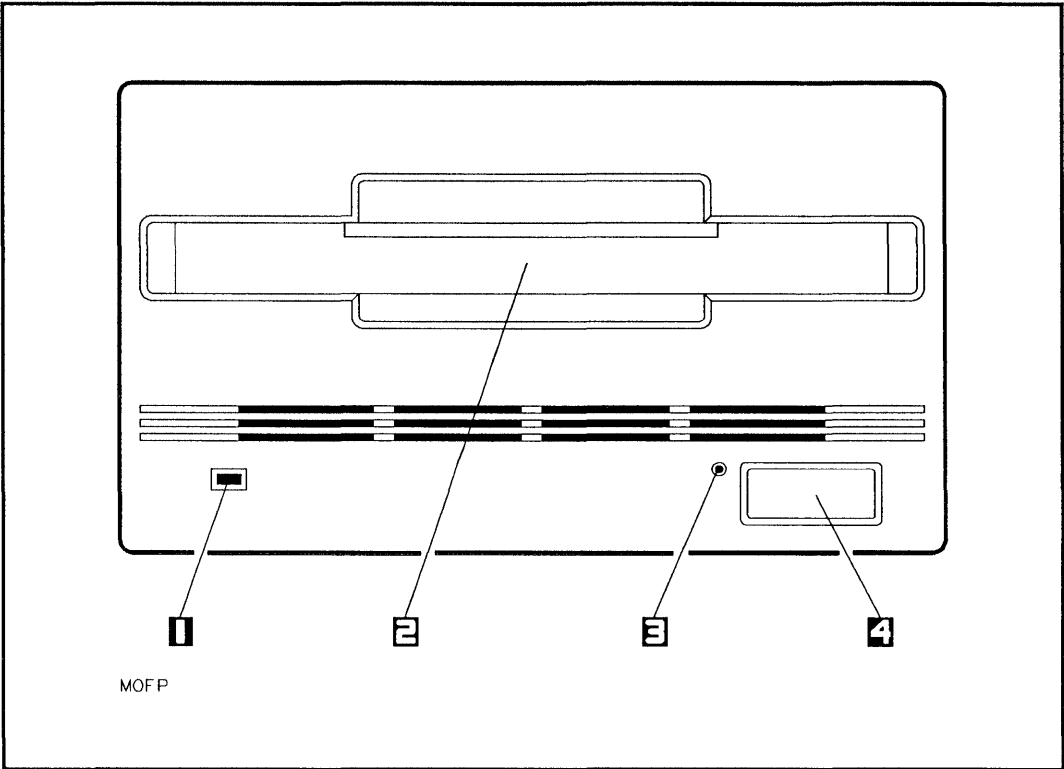


Figure 3-3. Rewritable Optical Disk Drive Front Panel

- 1-Rewritable Optical Busy Light
- 2-Rewritable Optical Disk Port
- 3-Emergency Disk Eject Access
- 4-Disk Eject Button

Checking the Busy Light

When the rewritable optical disk drive power is switched on, the rewritable optical disk drive automatically performs a self-test. The rewritable optical busy light shows the status of the rewritable optical disk drive during the self-test and during activity with the host computer. The rewritable optical busy light is an amber light-emitting diode (LED) located on the front panel of the rewritable optical disk drive (see Figure 3-3).

The rewritable optical busy light displays the following sequence when the mass storage system power is switched on:

1. ON

The rewritable optical busy light goes on when the self-test sequence starts. If there is a rewritable optical disk in the disk port, read/write tests are performed on the rewritable optical disk and the rewritable optical busy light stays on until the self-test sequence has completed. If there is no rewritable optical disk in the disk port, the rewritable optical busy light stays on until the self-test has completed.

2. OFF

The rewritable optical busy light goes off when the self-test has completed.

After the self-test successfully completes, the rewritable optical busy light shows rewritable optical disk drive activity with the host, and will appear to flash randomly. If the rewritable optical busy light is off, the rewritable optical disk drive is idle.

The following table shows the status of the rewritable optical busy light during normal operation and fault conditions:

If the rewritable optical disk drive fails the self-test, contact your local Hewlett-Packard Sales and Support Office.

**Table 3-2.
Rewritable Optical Busy Light Status**

Status	Explanation
ON	Self-test failed if indicator stays on 40 seconds after mass storage system power switched on.
OFF	No rewritable optical disk drive power, or rewritable optical disk drive idle on SCSI bus.
FLASHING	Normal activity: rewritable optical disk drive reading, writing, or seeking.

Initializing a Disk

A new rewritable optical disk must be initialized before it can be used to store data. Initialization takes approximately 25 minutes per side or 50 minutes per disk. (Initialization information can be found in Volume I of the *HP-UX System Administrator Manual*, part number 98594-90060.)

Writing and Reading Data

After the rewritable optical disk has been initialized, data can be written to and read from the rewritable optical disk. (Refer to Volume I of the *HP-UX System Administrator Manual*, part number 98594-90060.)

The following paragraphs describe how to install a rewritable optical disk drive into your mass storage system. A rewritable optical disk drive can be added to your mass storage system as an upgrade kit. The C2294A upgrade kit includes a rewritable optical disk drive and a rewritable optical controller PCA.

A rewritable optical disk drive and a rewritable optical controller PCA can only be installed into slot 1. If you try to install a rewritable optical controller PCA into slot 3, you may damage the rewritable optical controller PCA.

This installation procedure is written for personal computer dealers, technicians, and others who are familiar with setting up mass storage devices. If you are not experienced with such tasks, please find an experienced person to help you or contact your local Hewlett-Packard Sales and Support Office.

After the rewritable optical disk drive is installed into the mass storage system, the mass storage system must be carefully reassembled to ensure compliance with RFI emission requirements and to provide adequate protection against electrical shock and fire hazards.

Laser Safety

Use of controls, adjustments, or performing procedures other than those specified in this manual may result in hazardous invisible laser radiation exposure. None of the mechanisms within the mass storage system contain customer or field-replaceable parts.

The rewritable optical disk drive becomes a Class 3B laser mechanism when disassembled. If the rewritable optical disk drive is disassembled, exposure to the invisible laser beam and hazardous invisible laser radiation could result in blindness. Do NOT disassemble the rewritable optical disk drive for any reason.

Please observe the following warning label, which is located on the top of the rewritable optical disk drive:

DANGER - Invisible laser radiation when open. Avoid direct exposure to beam.

Handling Precautions

If you do not protect your rewritable optical disk drive and controller against electrostatic discharge, you may damage them and void your warranty.

A static charge of 39,000 volts can be generated on a carpeted floor. Such a voltage exceeds the limits of the rewritable optical disk drive and controller and can cause unsuccessful operation of the product.

To ensure continuously successful operation of the rewritable optical disk drive in a carpeted office environment, Hewlett-Packard recommends the use of anti-static mats and anti-static carpets with this product. Refer to the *Hewlett-Packard Computer Users Catalog*, part number 5953-2450D, for a complete listing of static control equipment, including anti-static mats and carpets.

Handle the rewritable optical disk drive and controller with care. The rewritable optical disk drive and controller are susceptible to mechanical shock and vibration until they are secured into the mass storage system chassis. Never set the rewritable optical disk drive upside-down or it will be damaged.

The mass storage system contains a BEND/flex* cable that is used to distribute signals to the drives in the mass storage system. When handling the BEND/flex cable, *do not* crease, twist, or stress the cable or its connectors. Also, make sure that the BEND/flex cable is at room temperature when connecting or disconnecting any of its cables. The BEND/flex cable tears easily when it is twisted. When connecting a BEND/flex connector to another connector, push directly from the back of the BEND/flex connector and carefully push it onto the other connector.

* *BEND/flex is a product of Rogers Corporation.*

Unpacking the Upgrade Kit

The first step when installing a rewritable optical disk drive into your mass storage system is to unpack and identify the contents of the 2294A upgrade kit. Figure 3-4 shows the contents of the 2294A upgrade kit.

TORX** hardware is used in the upgrade kit. This hardware requires the use of special drivers. In this manual, any reference to this type of hardware will be accompanied by the required driver size (for example, "T25").

***TORX is a product of the Camcar Division of Textron, Inc.*

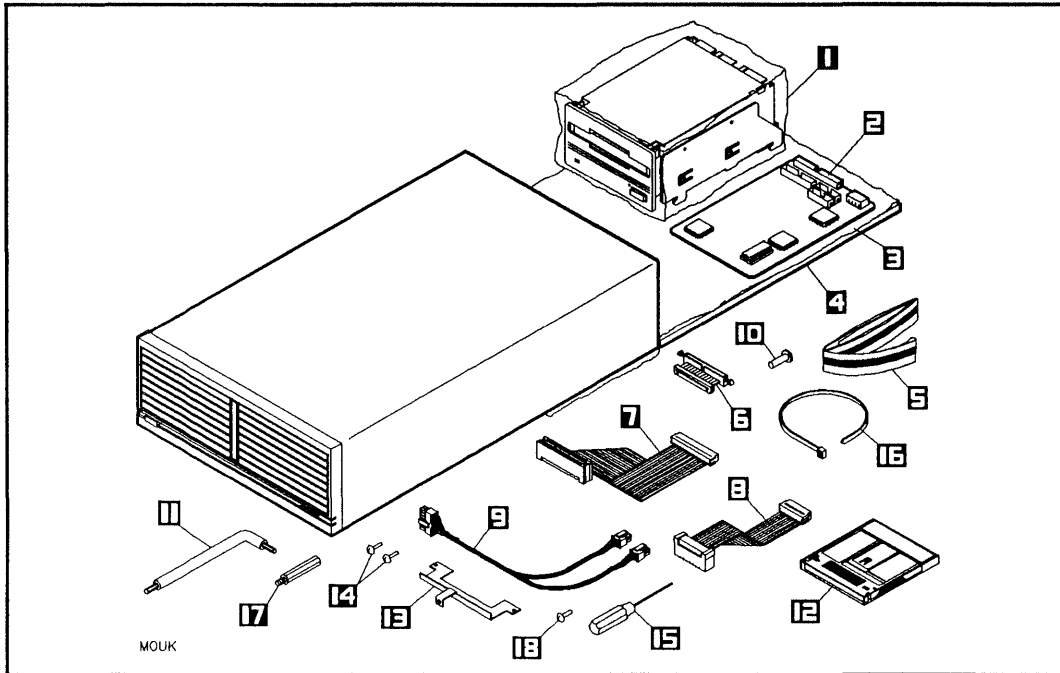


Figure 3-4. Rewritable Optical Disk Drive Upgrade Kit Contents

1-Rewritable Optical Disk Drive, 650-Mbyte (C1701-60020)

2-Rewritable Optical Controller PCA (C1701-60005)

3-Conductive Sheet (07961-80021)

4-Foam Pad (07961-80022)

5-Wrist Ground Strap (9300-1408)

6-BEND/flex Cable Adapter (C2294-60003)

7-Control Cable (C2294-60001)

8-Data Cable (C2294-60002)

9-Dual DC Power Cable (C2212-60054)

10-T25, 10 mm Screw (0515-0386)

11-TORX Tools

12-Rewritable Optical Disk Media (92280A)

13-PCA Mounting Bracket (C2294-00001)

14-Bracket-to-PCA Screws (0515-0430)

15-Emergency Media Eject Tool (C1701-88800)

16-Cable Tie (1400-0249)

17-Hex Standoff (C2212-20001)

18-Bracket-to-Chassis Screw (0515-2111)

3-18 Rewritable Optical Disk Drive

Learning About Upgrade Kit Parts

The following paragraphs describe the characteristics and functions of the parts in the 2294A upgrade kit.

Rewritable Optical Disk Drive and Controller PCA

See “Product Description” in this chapter.

DC Dual Power Cable

The dc dual power cable is a 4-pin split cable that passes dc power from the mass storage system power supply to the rewritable optical disk drive and the rewritable optical controller PCA.

Control Cable

The control cable is a 34-pin ribbon cable that enables read/write control signals to pass between the rewritable optical disk drive and the rewritable optical controller PCA.

Data Cable

The data cable is a 20-pin ribbon cable that enables read/write data signals to pass between the rewritable optical disk drive and the rewritable optical controller PCA.

BEND/flex Cable Adapter

The BEND/flex cable adapter is a 50-pin cable with two connectors that adapt the Small Computer System Interface (SCSI) connector on the rewritable optical disk drive to the SCSI connector on the BEND/flex cable. The BEND/flex cable SCSI connector enables the rewritable optical disk drive to communicate with the host computer (initiator) over an industry-standard single-ended SCSI bus.

PCA Mounting Bracket and Screws

The mounting bracket and three T10 screws are used to hold the rewritable optical controller PCA in place in the mass storage system chassis. The one larger screw holds the mounting bracket in place, and the two smaller screws hold the controller PCA in place.

Emergency Media Eject Tool

This tool allows you to eject a rewritable optical disk if power fails or if the normal eject sequence does not work.

T25 Screw

The T25 screw secures the rewritable optical disk drive to the mass storage system chassis.

Cable Tie

The cable tie is for wrapping the power cables in place once the new SCSI device is installed.

Conductive Sheet

The conductive sheet is an anti-static sheet that is placed under the rewritable optical disk drive to prevent electrostatic damage.

Foam Pad

The foam pad is placed under the conductive sheet to prevent mechanical shock and vibration damage to the rewritable optical disk drive before it is mounted into the mass storage system chassis.

Wrist Ground Strap

The wrist ground strap is used to ensure that the rewritable optical disk drive, the conductive sheet, the mass storage system chassis, and your hand are all at the same electrical potential.

TORX Tools

The TORX tools are used to drive TORX screws.

Hex Standoff

The hex standoff is use when a hard disk drive is installed (or moved) into slot 2.

Rewritable Optical Disk Media

See “Product Media” in this chapter.

Preparing to Install the Rewritable Optical Disk Drive

Before installing a rewritable optical disk drive, make sure you have access to all sides of the mass storage system, and that the mass storage system is near an ac power outlet.

1. Shut down the host computer.
2. Turn off power to both the host computer and the mass storage system.
3. Disconnect the SCSI cable from the mass storage system rear panel.
4. Set the **LINE** switch on the mass storage system front panel to the 0 (out) position.
5. Connect the power cord from the mass storage system rear panel to an ac power outlet.
6. Place the rear of the mass storage system chassis on the conductive sheet as shown in Figure 3-4.
7. Wrap one end of the wrist ground strap around your wrist and apply the copper end to a flat, unpainted area of the mass storage system chassis. The mass storage system chassis, the conductive sheet, and your hand are now at the same electrical potential.

Keep the wrist strap on until you have performed all the steps in the installation procedure.

8. Slide the foam pad beneath the loose end of the conductive sheet, while making sure the mass storage system chassis maintains contact with the conductive sheet.

9. Place the anti-static bag containing the rewritable optical disk drive on the conductive sheet. Open the bag, remove the rewritable optical disk drive, and place the rewritable optical disk drive on the conductive sheet.
10. Place the anti-static bag containing the rewritable optical controller PCA on the conductive sheet. Open the bag, remove the controller PCA, and place the controller PCA on the conductive sheet.
11. Set the address switch on the controller PCA to the desired address (refer to “Setting the Address Switch”).
12. Disconnect the ac power cord from the mass storage system rear panel.

Ensure that the **LINE** switch on the mass storage system front panel is in the 0 (out) position, and that the power cord is disconnected from the mass storage system rear panel. Electrical shock may result if the power cord is connected and the **LINE** switch is in the 1 (in) position while the top cover is off.

Setting the SCSI Address Switches

The address switches on the back of your mass storage system are for hard disk drives only.

The address switch on the rewritable optical controller PCA (see Figure 3-5) enables you to select a unique SCSI address for your rewritable optical disk drive. The address switch is set to address 0 at the factory. Switches 1 through 8 on the address switch should be in the OFF (down) position when you pull the rewritable optical controller PCA out of the anti-static bag.

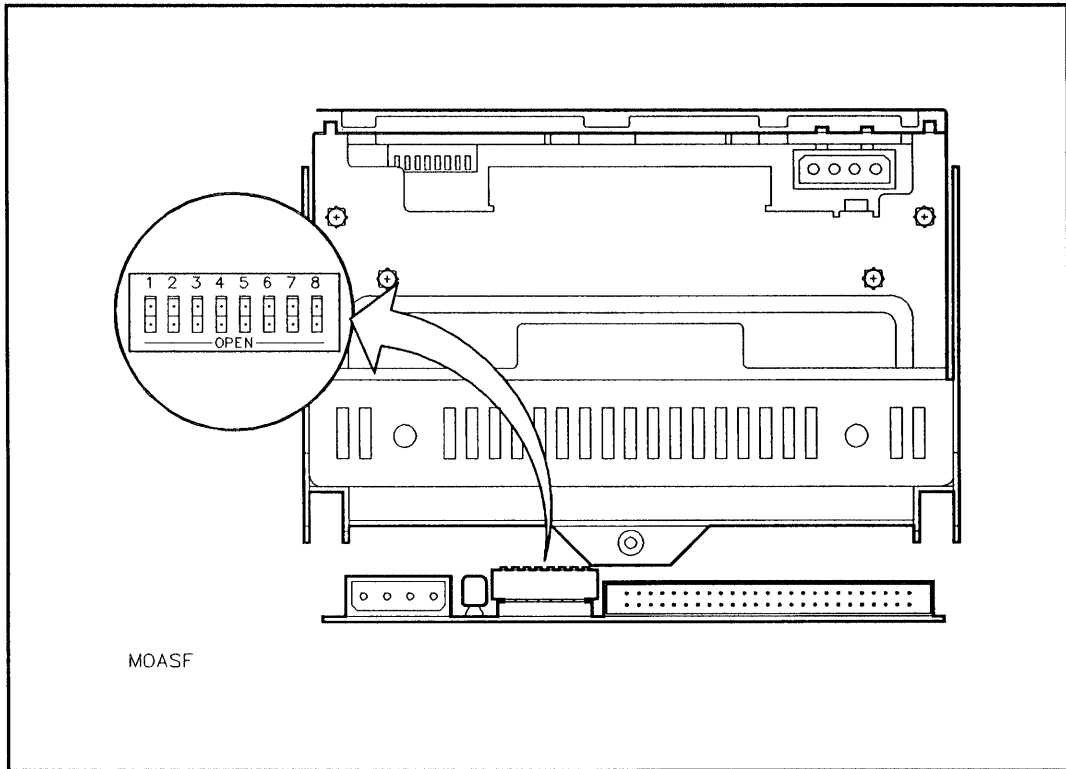


Figure 3-5. Rewritable Optical Disk Drive Address Switch

Make sure the address switch on the rewritable optical controller PCA is set to a unique SCSI address relative to the other devices on the SCSI bus. The mass storage system will not function properly if two devices in the mass storage system have the same SCSI address.

Switches 1 through 5 should stay in the OFF (down) position. If any of the switches 1 through 5 are set to the ON (up) position, the mode of operation of the rewritable optical disk drive will *not* be supported.

To set the address switch to a different address before installing the rewritable optical controller PCA into the mass storage system, perform the following steps:

1. Verify that switches 1 through 5 are set to the OFF (down) position.
2. Set switches 6 through 8 to the ON (up) or OFF (down) position for the desired address (refer to Table 3-3).

Table 3-3.
Rewritable Optical Disk Drive Address Switch

SCSI Address	Switch 6	Switch 7	Switch 8
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

To set the address switch to a different setting after the rewritable optical disk drive and rewritable optical controller PCA have been installed into the mass storage system, perform the following steps:

1. Set the mass storage system **LINE** switch to the 0 (out) position.
2. Disconnect the power cord from the mass storage system rear panel.
3. Remove the front panel and top cover (refer to “Removing the Front Panel and Top Cover” in this chapter).
4. Verify that switches 1 through 5 are set to the OFF (down) position.
5. Set switches 6 through 8 to the ON (up) or OFF (down) position for the desired address (see Figure 3-5 and refer to Table 3-3).
6. Install the front panel and top cover (refer to “Installing the Front Panel and Top Cover” in this chapter).
7. Connect the power cord to the mass storage system rear panel.
8. Set the mass storage system **LINE** switch to the 1 (in) position.

Removing the Front Panel and Top Cover

Remove the front panel and top cover as follows (see Figure 3-6):

1. Slide the front of the mass storage system chassis beyond the edge of the table top until the front panel locking tabs are exposed. The tabs are located on the underside of the chassis.
2. Press up on the front panel locking tabs until the front panel releases from the mass storage system chassis.
3. Pull the bottom of the front panel forward, rotate the front panel up, and lift the front panel mounting tabs out of slots in the front edge of the top cover.
4. Remove the two T15 top cover screws.
5. Slide the rear of the top cover one-half inch beyond the rear of the mass storage system chassis, then lift the front of the top cover up and off of the mass storage system chassis.

Removing the Front Panel Bezels

Remove the front panel bezels as follows (see Figure 3-7):

1. Position your thumbs in front of the bezel on the right-hand and left-hand edges of the bezel.
2. Gently push the bezel out with your thumbs.

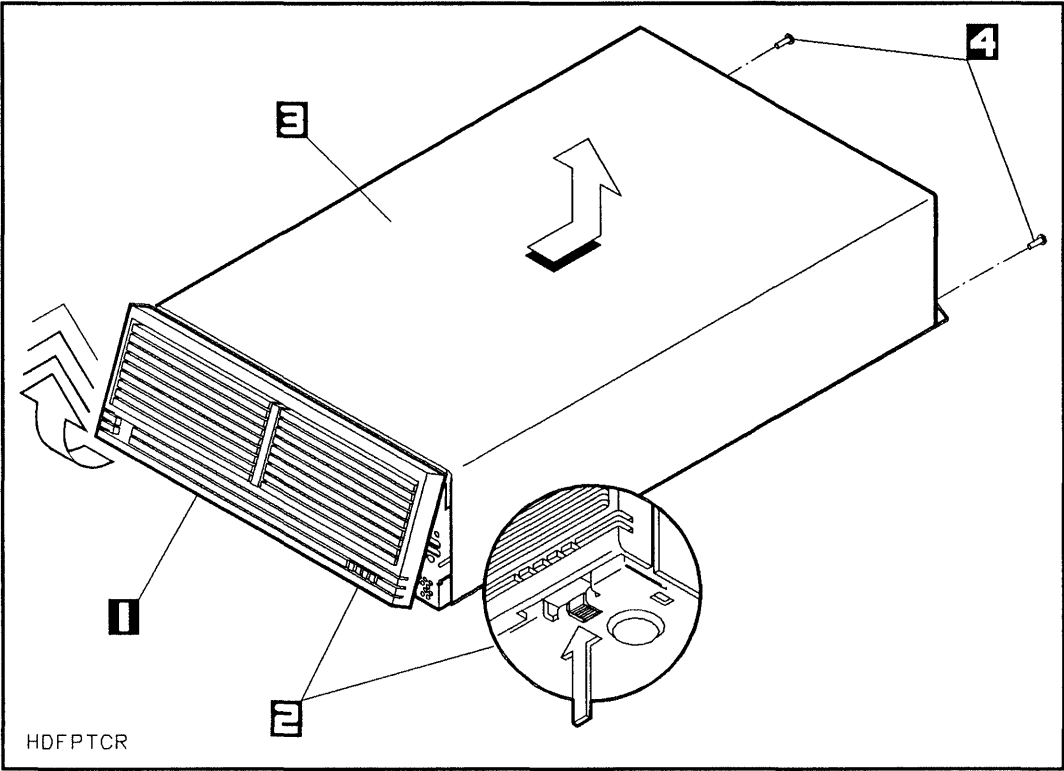


Figure 3-6. Removing the Front Panel and Top Cover

- 1-Front Panel
- 2-Front Panel Locking Tabs

- 3-Top Cover
- 4-T15 Top Cover Screws

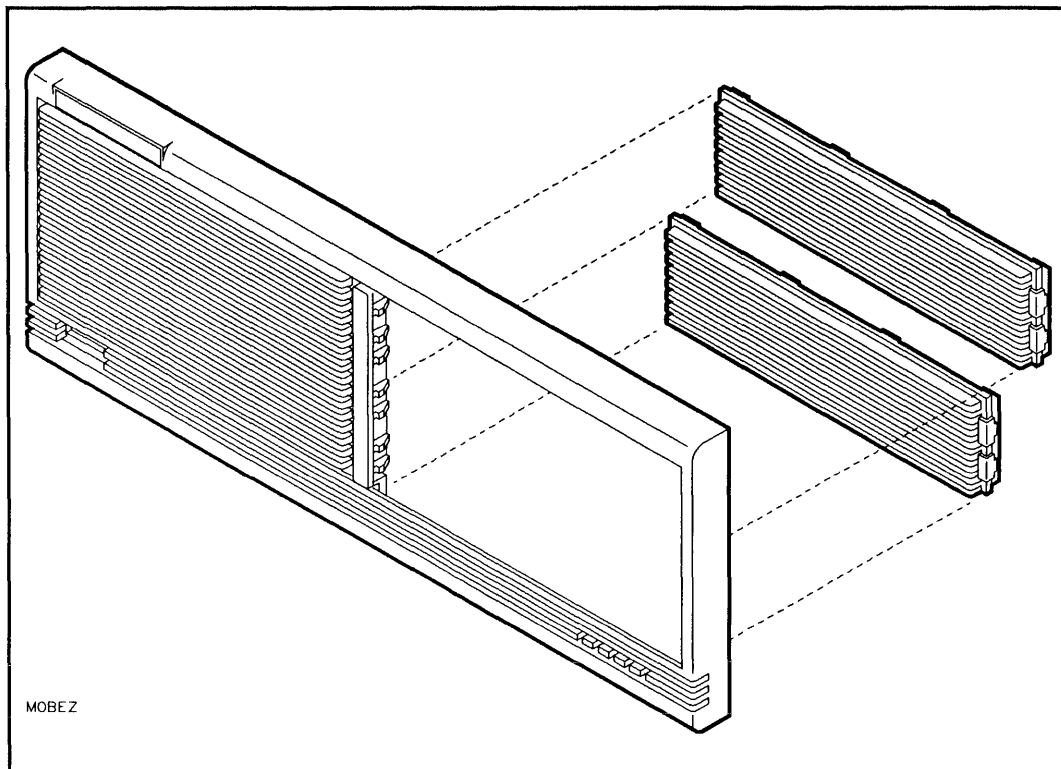


Figure 3-7. Removing the Front Panel Bezels

Removing the Hard Disk Drive from Slot 1

The rewritable optical disk drive and the rewritable optical controller PCA can ONLY be installed into slot 1. If your mass storage system was shipped with a hard disk drive in slot 1, you must remove the hard disk drive from slot 1 (refer to chapter 2). Figure 3-8 shows the mass storage system chassis after the hard disk drive has been removed.

Removing the Digital Audio Tape Drive from Slot 1

The rewritable optical disk drive and the rewritable optical controller PCA can only be installed into slot 1. If your mass storage system was shipped with a digital audio tape drive in slot 1, you must remove the digital audio tape drive from slot 1 (refer to chapter 5). Figure 3-8 shows the mass storage system chassis after the digital audio tape drive has been removed.

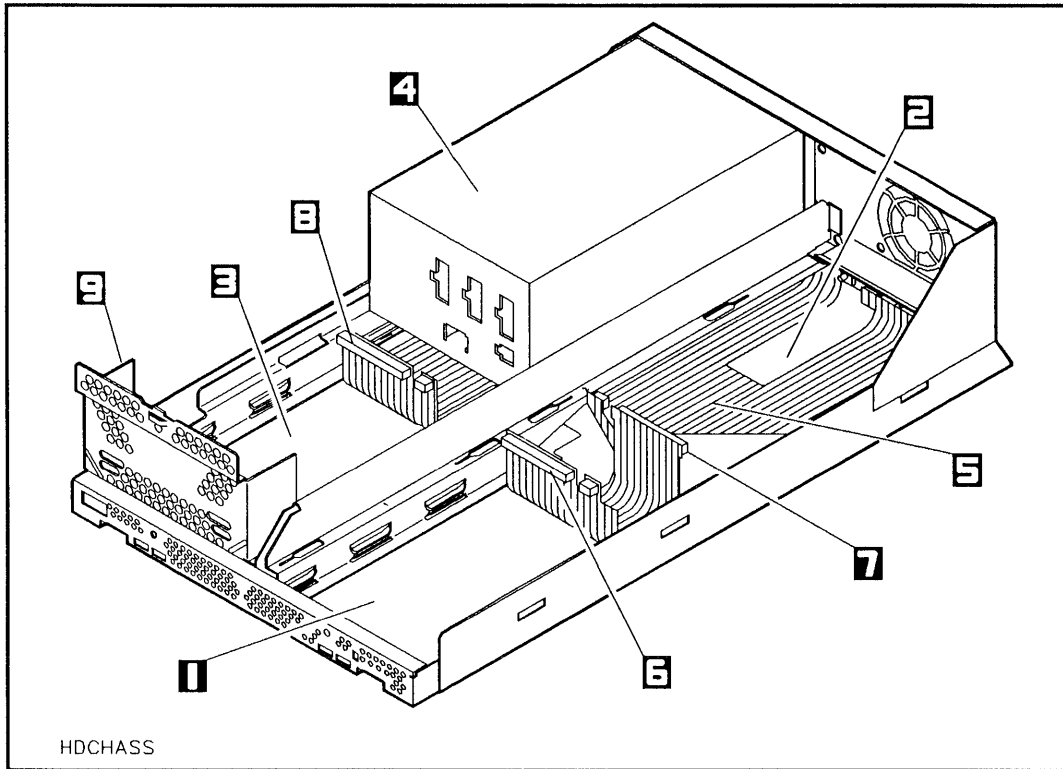


Figure 3-8. Mass Storage System Chassis

- | | |
|---------------------|--------------------------------|
| 1 - Slot 1 | 6 - Slot 1 BEND/flex Connector |
| 2 - Slot 2 | 7 - Slot 2 BEND/flex Connector |
| 3 - Slot 3 | 8 - Slot 3 BEND/flex Connector |
| 4 - Power Supply | 9 - RFI Bracket |
| 5 - BEND/flex Cable | |

Removing the BEND/flex Cable

In order to install the rewritable optical controller PCA into your mass storage system, the BEND/flex cable must temporarily be removed.

When handling the BEND/flex cable, *do not* crease, twist, or stress the cable or its connectors. Also, make sure that the BEND/flex cable is at room temperature when connecting or disconnecting any of its cables. The BEND/flex cable tears easily when it is twisted. When connecting a BEND/flex connector to another connector, gently push directly from the back of the BEND/flex connector and carefully push it onto the other connector.

To remove the BEND/flex cable, proceed as follows (see Figure 3-8 and Figure 3-9):

1. Remove the hard disk status indicator cable for each hard disk drive from the BEND/flex status indicator connectors.
2. Disconnect the BEND/flex SCSI adapter from each device's SCSI connector by pressing both cable ejectors outwards until the adapter cable is removed.
3. Remove the BEND/flex cable adapters from each SCSI device in the mass storage system by pressing both cable ejectors outwards until the cable is removed.
4. Remove the three T15 screws from the rear SCSI I/O plate (one is in the top-center of the plate, and the other two face downward into the chassis).
5. Gently push the BEND/flex connectors down before removing the BEND/flex cable. This prevents the tabs on the cable from getting caught on the hard disk drive and power supply.
6. Slide the BEND/flex cable and the SCSI I/O plate out the rear of the chassis (see Figure 3-9).

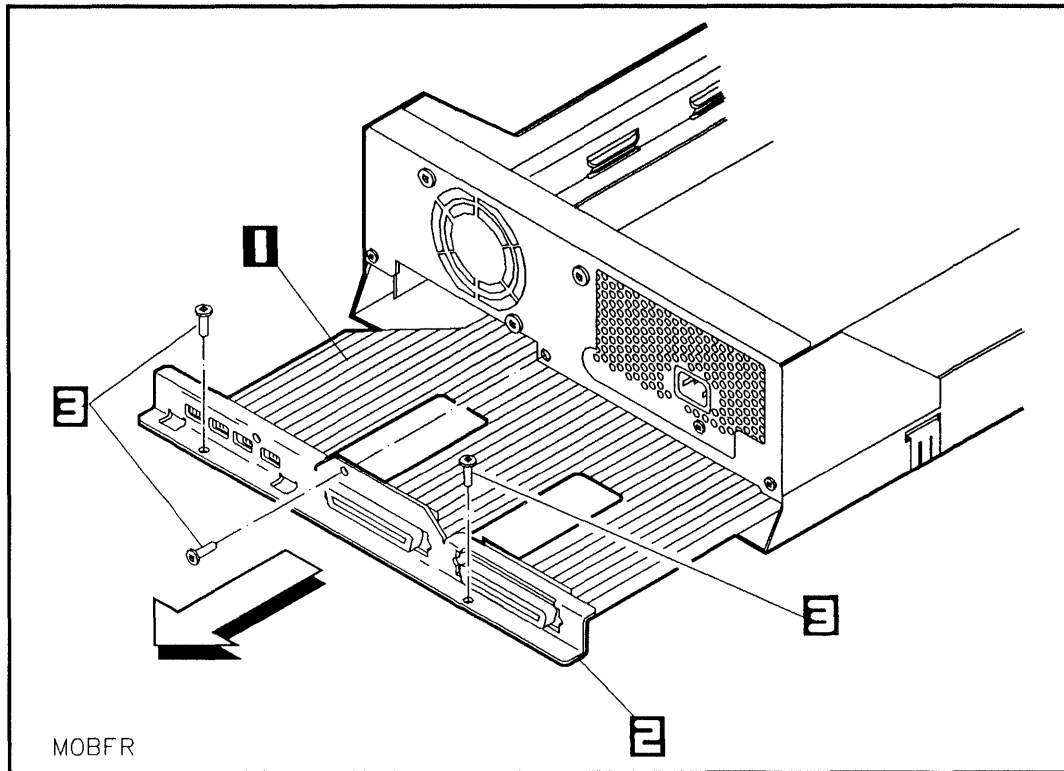


Figure 3-9. Removing the BEND/flex Cable

1-BEND/flex Cable

3-T15 Screws

2-SCSI I/O Plate

Installing the Rewritable Optical Controller PCA into Slot 1

1. Install the PCA mounting bracket into the mass storage system chassis with the bracket-to-chassis screw as shown in Figure 3-10.
2. Lift the rewritable optical controller PCA from the conductive sheet and slide it into the PCA guides in slot 1 (see Figure 3-10 and Figure 3-11). Make sure that the two holes in the controller PCA toward the front of the mass storage system align with the holes in the mounting bracket beneath the controller PCA.
3. Attach the two bracket-to-PCA screws through the controller PCA into the mounting bracket (see Figure 3-11). Do not over-tighten these screws.

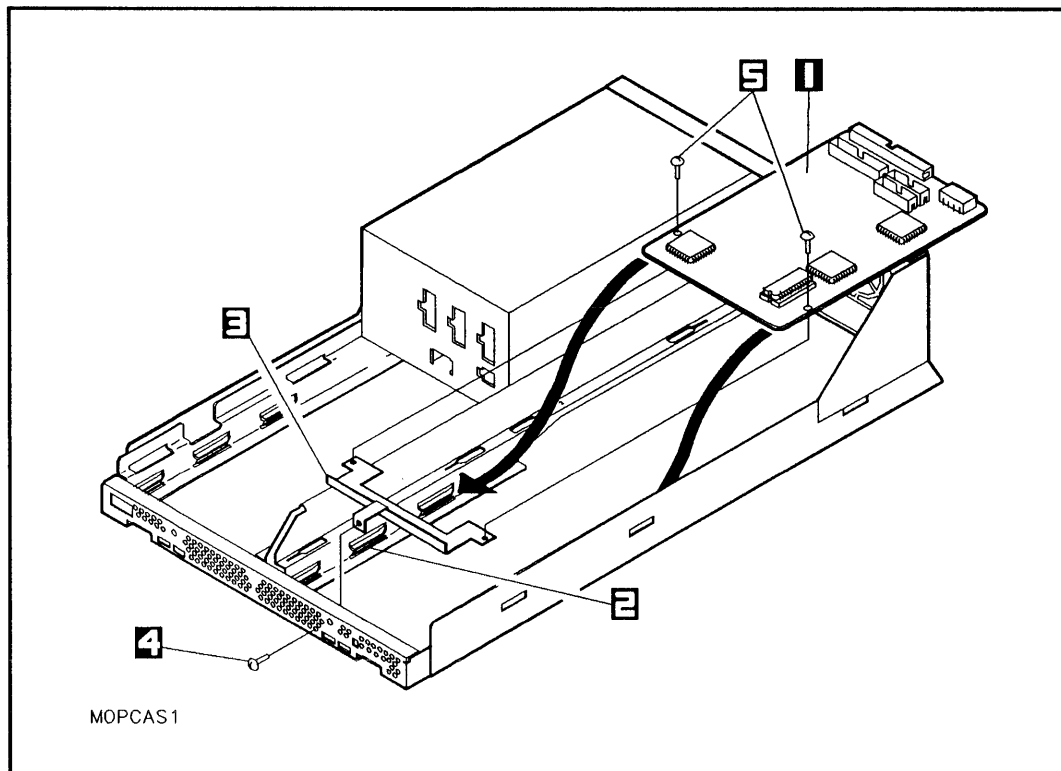


Figure 3-10. Installing the Rewritable Optical Controller PCA

1 - Rewritable Optical Controller

4 - Bracket-to-Chassis Screw

2 - Controller PCA Guides

5 - Bracket-to-PCA Screws

3 - Mounting Bracket

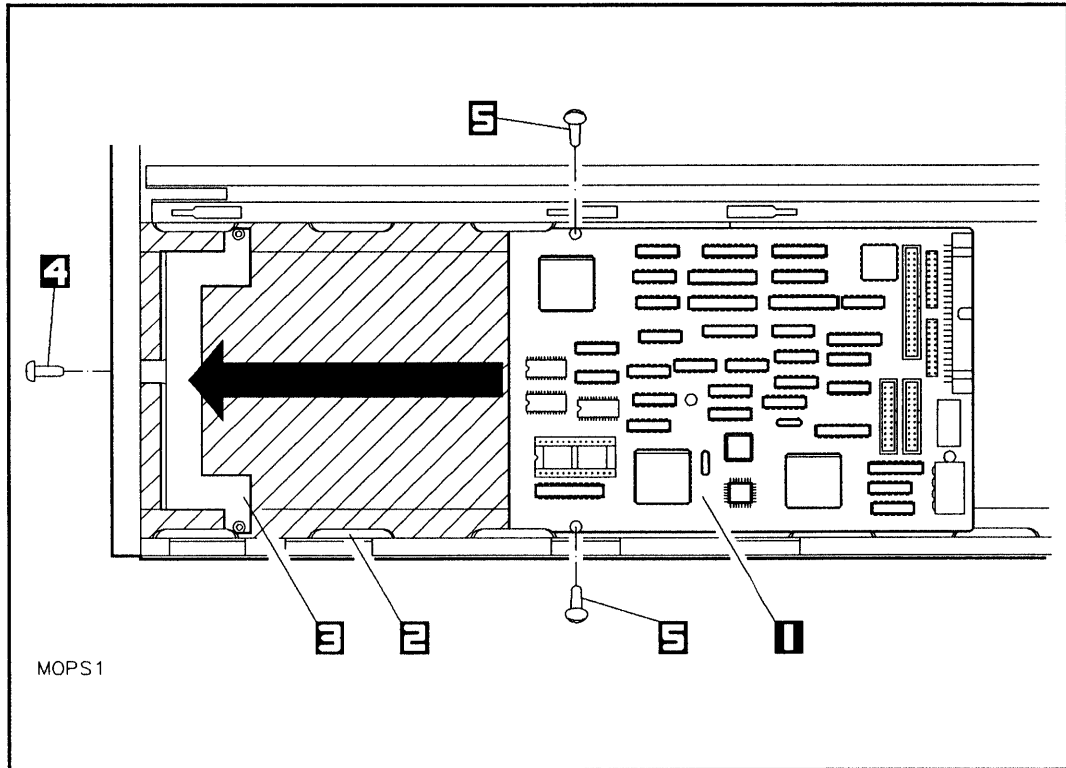


Figure 3-11. Sliding the Rewritable Optical Controller PCA into the PCA Guides

1-Rewritable Optical Controller

4-Bracket-to-Chassis Screw

2-Controller PCA Guides

5-Bracket-to-PCA Screws

3-Mounting Bracket

Reinstalling the BEND/flex Cable

To reinstall the BEND/flex cable, perform the steps in “Removing the BEND/flex Cable” in reverse order.

Connecting the Cables to the Rewritable Optical Controller PCA

Connect the cables to the rewritable optical controller PCA as follows (see Figure 3-12):

1. Connect the BEND/flex cable adapter to the BEND/flex cable.
2. Connect the other end of the BEND/flex cable adapter to the SCSI connector on the rewritable optical controller PCA.
3. Connect the control cable to the control connector on the rewritable optical controller PCA.
4. Connect the data cable to the data connector on the rewritable optical controller PCA.
5. Connect one of the split ends of the dc power cable to the dc power connector on the rewritable optical controller PCA.
6. Connect the long end (with the 14-pin connector) of the dc power cable to any of the unused dc power connectors on the power supply (see Figure 3-13).

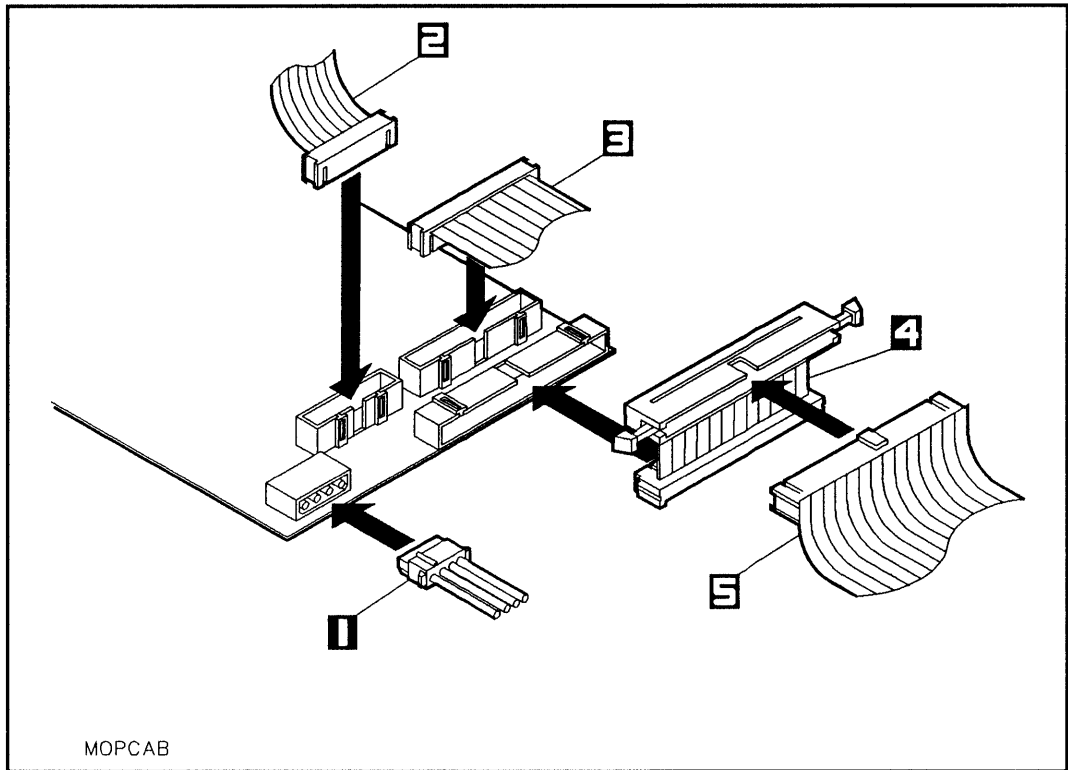


Figure 3-12. Connecting Cables to the Rewritable Optical Controller PCA

1-DC Power Cable

2-Data Cable

3-Control Cable

4-BEND/flex Cable Adapter

5-BEND/flex Cable

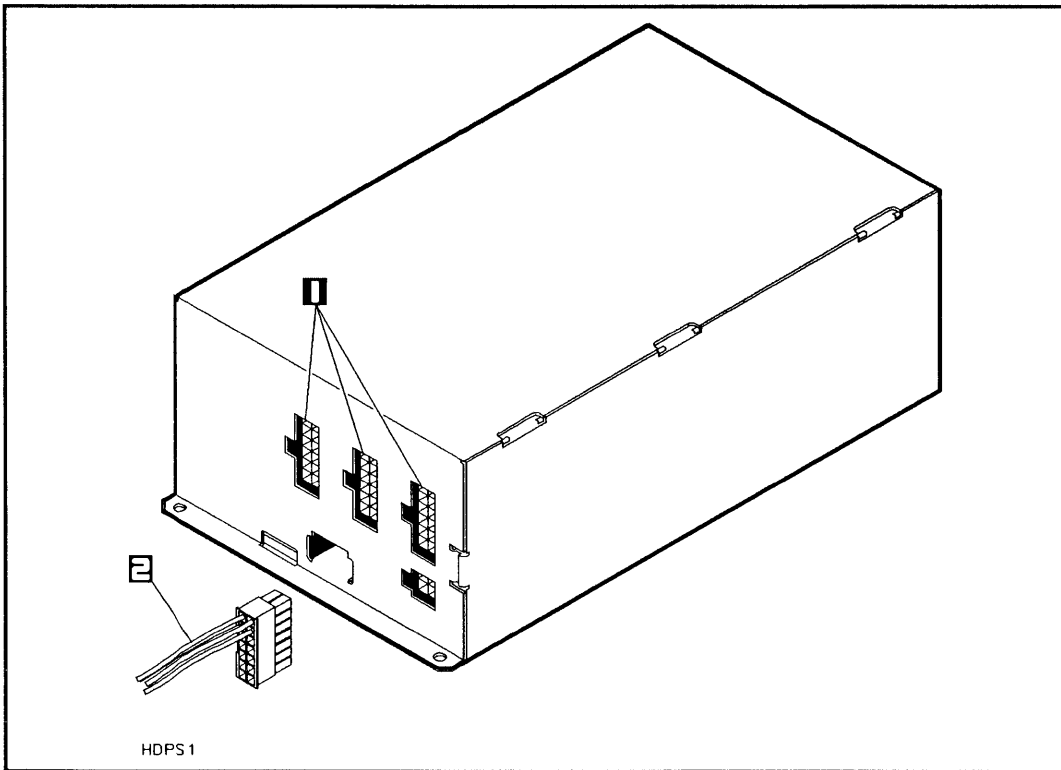


Figure 3-13. Connecting the DC Power Cable

1-DC Power Connectors

2-DC Power Cable

Installing the Rewritable Optical Disk Drive into Slot 1

Install the rewritable optical disk drive into the mass storage system chassis as follows (see Figure 3-14):

1. Lift the rewritable optical disk drive from the conductive sheet, gently push the cables connected to the rewritable optical controller PCA toward the center of the mass storage system chassis, and lower the mounting tabs into the mounting slots in the chassis rails.

Keep the cables which are connected to the rewritable optical controller PCA positioned in the center of the mass storage system chassis. The cables may be damaged if they are caught between the rewritable optical disk drive and the chassis rails.

2. Push down on the rewritable optical disk drive and slide it on the chassis rails toward the front of the mass storage system chassis until the mounting tabs lock into the mounting slots and the rewritable optical disk drive stops against the front of the chassis.
3. Tighten the T25 screw through the hole in the mass storage system chassis and into the rewritable optical disk drive securing tab.

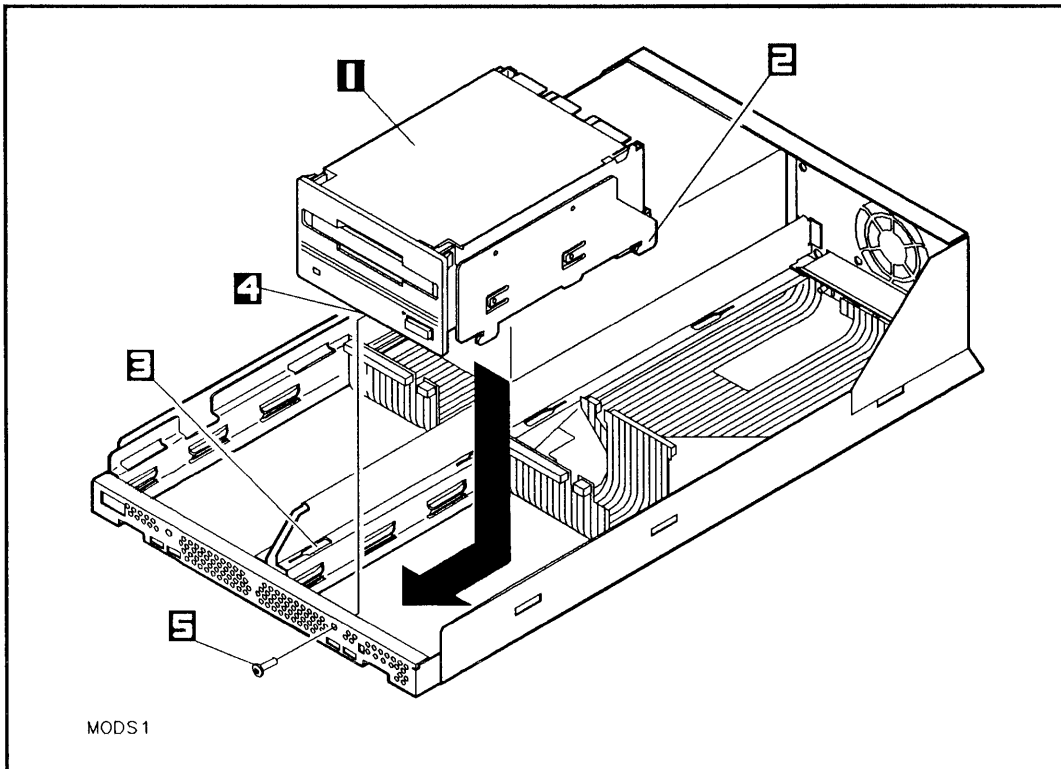


Figure 3-14. Installing the Rewritable Optical Disk Drive

- | | |
|-----------------------------------|------------------|
| 1 - Rewritable Optical Disk Drive | 4 - Securing Tab |
| 2 - Mounting Tab (1 of 4) | 5 - T25 Screw |
| 3 - Mounting Slots (1 of 4) | |

Connecting Cables to the Rewritable Optical Disk Drive

Connect the cables to the rewritable optical disk drive as follows (see Figure 3-15):

1. Connect the 34-pin control cable to the rewritable optical disk drive.
2. Connect the 20-pin data cable to the rewritable optical disk drive.
3. Connect the other split end side of the dual 4-pin power cable to the rewritable optical disk drive.

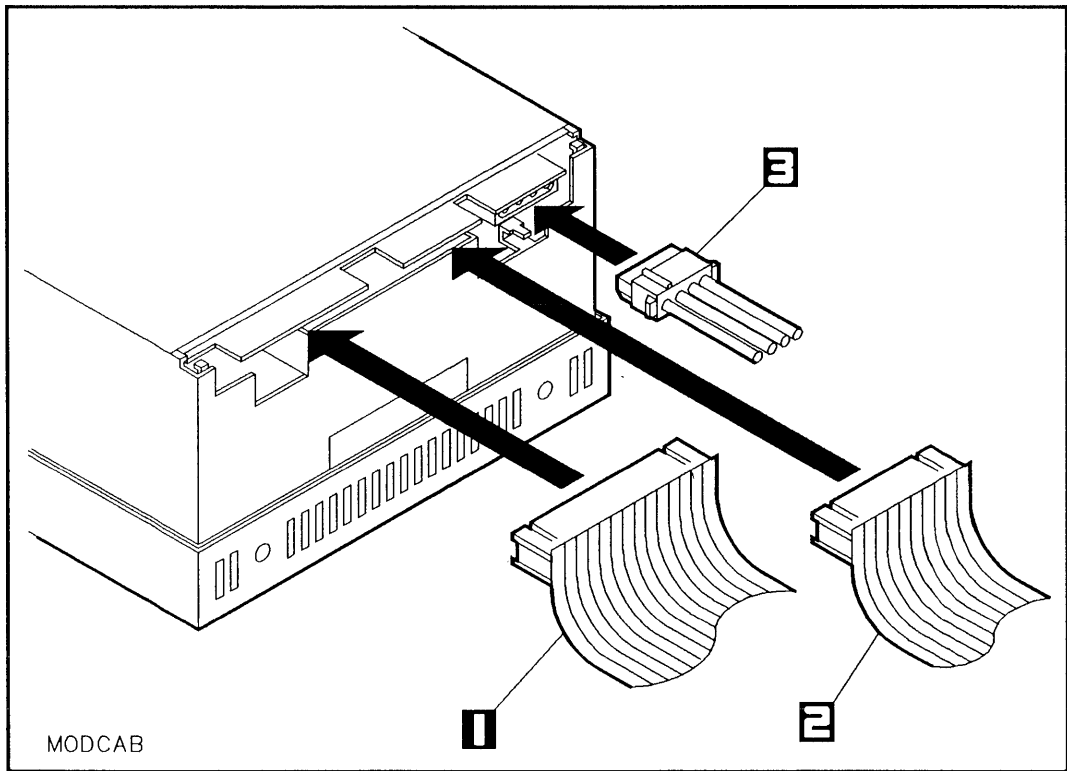


Figure 3-15. Connecting Cables to the Rewritable Optical Disk Drive

1-Control Cable

3-DC Power Cable

2-Data Cable

Reinstalling the Hard Disk Drive

To reinstall a hard disk drive that was removed from slot 1, refer to chapter 2.

Reinstalling the Front Panel and Top Cover

Reinstall the front panel and top cover as follows:

1. Slide the top cover down over the mass storage system chassis so that the rear of the top cover extends one-half inch beyond the rear of the mass storage system chassis, then slide the top cover forward into place.
2. Install and tighten the T15 top cover screws.
3. Insert the front panel mounting tabs into the slots in the top cover and swing the front panel down until the **LINE™** switch comes through the opening in the front panel.
4. Push the bottom edge of the front panel into the front of the chassis until the front panel locking tabs engage.
5. Remove the wrist strap from the disk drive chassis and your wrist.

Due to the self-contained design of your rewritable optical disk drive, regular maintenance of the drive is not required. However, the performance and reliability of your drive depend on the operating environment. Make sure your rewritable optical disk drive operates within the environmental restrictions listed in this chapter (refer to “Environmental Requirements”).

If your rewritable optical disk drive requires service, perform the following steps:

1. Contact your local Hewlett-Packard Sales and Support Office.
 2. Explain the problem you are having with the rewritable optical disk drive.
 3. State the serial number of the rewritable optical disk drive.
-

If you have any questions about the warranty on your rewritable optical disk drive, please contact your local Hewlett-Packard Sales and Support Office.

Following are the operating specifications and environmental requirements for the rewritable optical disk drive.

For a complete list of technical specifications for your mass storage system, refer to chapter 1.

Operating Specifications

The following information stipulates the specifications and characteristics of this product when installed and operated within the limits specified under “Environmental Requirements” in this chapter.

PERFORMANCE

Data transfer rate (asynchronous)

Reads (maximum sustained):	680 kilobytes per second
Writes (maximum sustained):	340 kilobytes per second
Burst:	1.2 megabytes per second

Seek time

Average:	95 ms
Full stroke:	185 ms

Average rotational delay: 12.5 ms

Disk performance index (1 kilobyte)

Average read:	8.9 I/Os per second
Average write:	7.3 I/Os per second

FUNCTIONAL

Average load time (from CARTRIDGE-IN detection to ready for access):	6.4 seconds
Average unload time (from EJECT command execution to cartridge ejection):	3.6 seconds
Average spin-up time (from start of spin-up to ready for access):	3.5 seconds
Rotational speed:	2400 rpm $\pm 0.05\%$
Number of read/write heads:	1 (one side only)

MEDIA

Diameter: 5.25 inches (130 mm)

Number of read/write surfaces: 2

Format type: Continuous Composite
C*C (ISO 10089 Standard
Type A)

Track density: 15,875 tracks per inch

Formatted capacity:

	Data Bytes Per	Sectors Per	Tracks Per
Sector	1,024		
Track	17,408	17	
Surface	326,417,408	318,767	18,751
Disk	652,834,816	637,534	37,502

Environmental Requirements

TEMPERATURE

Operating ¹ :	10°C to 40°C (50°F to 104°F)
Nonoperating ¹ :	-30°C to 60°C (-22°F to 140°F)

¹Operating and nonoperating temperature specifications are exceptions to the specifications listed in chapter 1.

HUMIDITY

Operating ² :	15% to 80% RH (noncondensing)
Nonoperating ² :	5% to 90% RH (noncondensing)

²Operating and nonoperating humidity specifications are exceptions to the specifications listed in chapter 1.

CD-ROM Drive

This chapter provides information about operating the CD-ROM drive (option 004) within your HP Series 6000 Models 330S and 660S Mass Storage Systems. This chapter also describes how to install a CD-ROM drive, which is included in the C2293A upgrade kit (refer to “Installing the CD-ROM Drive Upgrade Kit” in this chapter).

The CD-ROM drive is a random access read-only mass storage device that uses removable CD-ROM disks. The CD-ROM drive contains a semiconductor laser for reading data optically, and includes an embedded controller with a single-ended SCSI interface.

CD-ROM disks are identical to audio compact discs, except that they are used to store computer data. CD-ROM disks are 120mm (4.7 inches) in diameter and use one data surface with a data capacity of 599 megabytes. The single data surface contains pits and flat spots which are arranged in a continuous spiral track which is read at constant linear velocity.

A CD-ROM disk is mounted in a rigid plastic caddy, similar to a 3.5-inch magnetic flexible disk (see Figure 4-1). Data is retrieved from a CD-ROM disk through a window beneath a shutter in the caddy. When you insert a CD-ROM disk caddy into the disk port, the shutter opens automatically to expose the disk surface. When you eject a CD-ROM disk caddy from the disk port, the shutter closes over the window to protect the disk surface.

Do not open the shutter manually. Opening the shutter will expose the surface of the disk to dust, which over time will reduce the reliability of the read head in the CD-ROM drive.

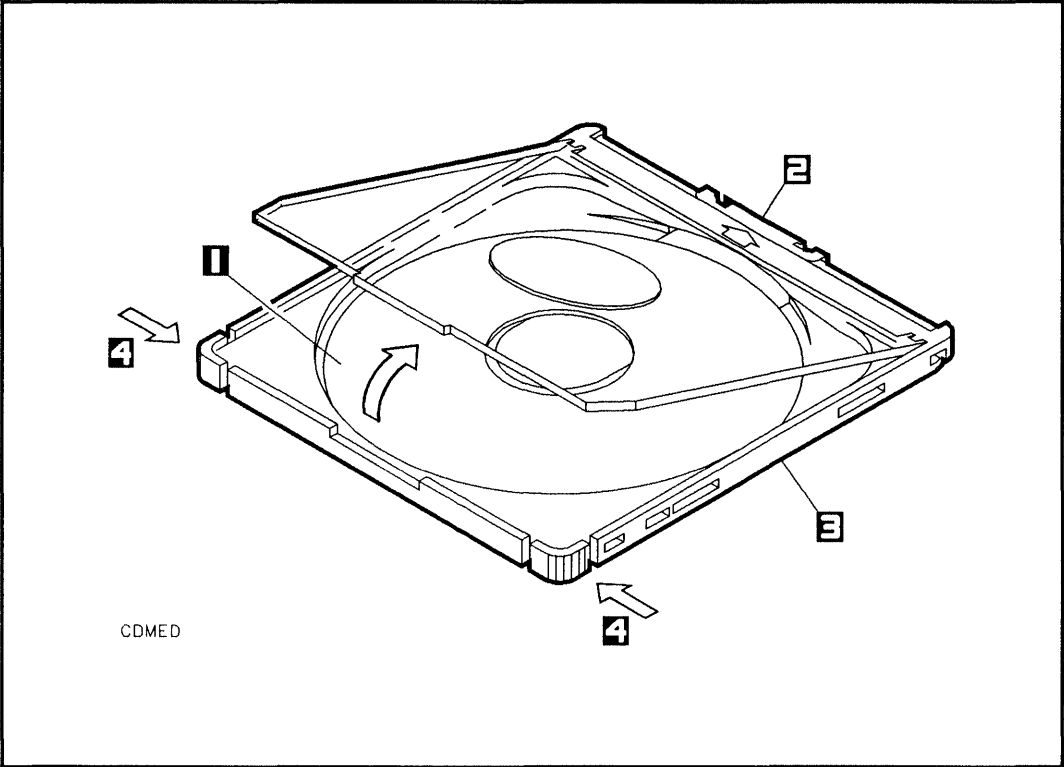


Figure 4-1. CD-ROM Disk and Caddy

1 - CD-ROM Media

3 - Disk Caddy

2 - Shutter

4 - Press tabs to open caddy

Caring for CD-ROM Disks

The following guidelines will help you prevent data loss and prolong the life of your CD-ROM disks and your CD-ROM drive:

Use CD-ROM disks in a clean environment to prevent dust particles from scratching disk surfaces.

Store CD-ROM disks in a cool, dry place to prevent moisture and heat damage.

Do not try to clean the surface of a CD-ROM disk. Some cleaning solvents may damage the disk.

Putting CD-ROM Disks into the Caddy

Install the CD-ROM disk into the disk caddy (Figure 4-1) as follows:

1. Press the tabs on the outside edges of the disk caddy inward and open the top cover of the disk caddy.
2. Place a CD-ROM disk onto the center of the tray in the disk caddy with the label side up.
3. Close the top of the caddy.

The following paragraphs describe how to operate your CD-ROM drive with a CD-ROM disk and your host computer.

Do not operate your CD-ROM drive if it has been exposed to extreme temperatures, such as being left in an automobile overnight in cold weather. Your CD-ROM drive must stabilize at room temperature for two hours before operation. Operating your CD-ROM drive when it is very cold or very hot could cause damage to your CD-ROM drive. Refer to the end of this chapter and also to chapter 1 for limits on temperature and humidity for your mass storage system.

Switching on Power

To switch on power to your CD-ROM drive, push in the

LINE switch on the mass storage system front panel.

To switch off power to your CD-ROM drive, push in the

LINE switch then release it until it is fully extended out.

(See Figure 1-2 in chapter 1 for the location of the **LINE** switch.)

Inserting a Disk

To insert a CD-ROM disk caddy into the disk port, grasp the edge of the disk caddy opposite the arrow and slide the disk caddy into the disk port until you hear an audible click (see Figure 4-2). The CD-ROM drive will automatically load the CD-ROM disk caddy into the disk port.

If power to the CD-ROM drive has been switched off, the disk load function will not be activated, and the CD-ROM disk caddy will not be loaded into the disk port until power is on.

If a CD-ROM disk caddy has been ejected but has not been removed from the disk port, the CD-ROM disk caddy must be pulled out more than 5mm from the disk port and reinserted again before the disk load function will be activated.

Ejecting a Disk

To eject a CD-ROM disk caddy, press the disk eject button (see Figure 4-3) continuously for at least three seconds, then pull the disk caddy straight out of the disk port.

If the eject button is pressed for less than three seconds, the eject function will not be activated.

Some application software may prohibit the ejection of a disk until the user exits the application program.

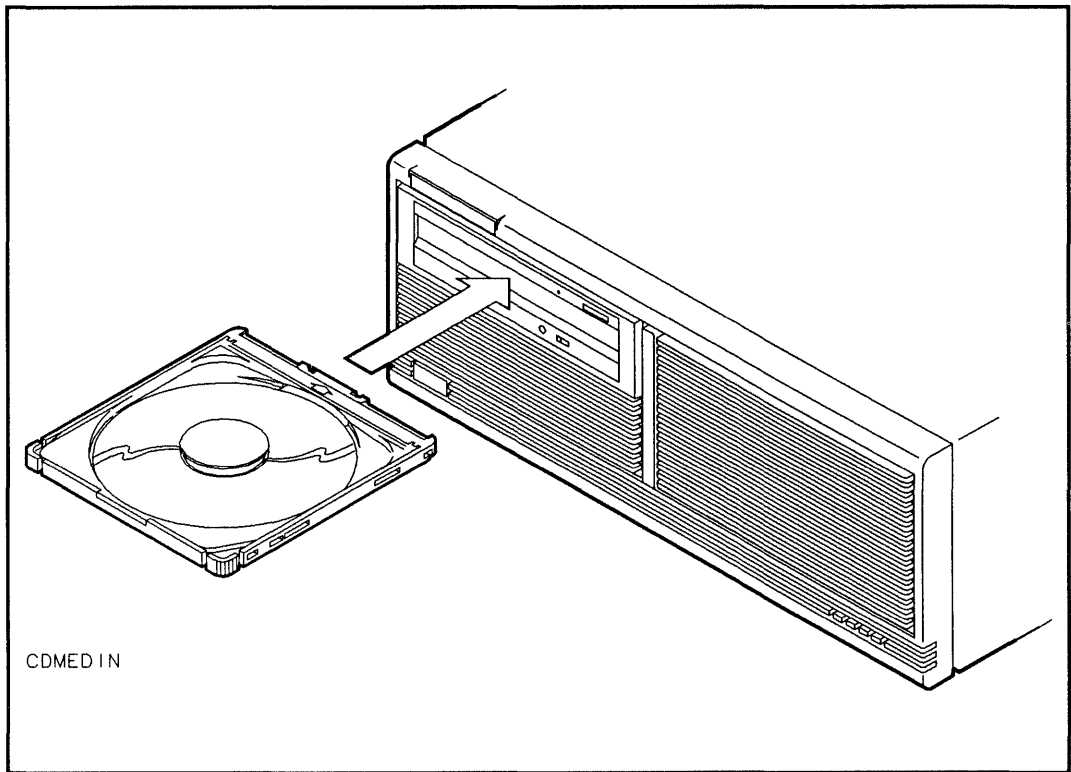


Figure 4-2. Inserting a CD-ROM Disk

Checking the Busy Light

When the CD-ROM drive power is switched on, the CD-ROM drive automatically performs a self-test. The CD-ROM busy light shows the status of the CD-ROM drive during the self-test and during activity with the host computer. The CD-ROM busy light is a small orange light-emitting diode (LED) located on the front panel of the CD-ROM drive (see Figure 4-3). If a CD-ROM disk caddy has been inserted into the disk port, the CD-ROM drive performs the following self-test when the power is switched on, and the CD-ROM busy light displays the following sequence:

The CD-ROM busy light also displays the following sequence anytime a CD-ROM disk caddy is inserted into the disk port when the power is on.

1. ON

The CD-ROM busy light goes on as the disk is loaded into the disk port.

2. FLASHING

The CD-ROM busy light flashes six times while a read test is performed on the disk.

3. OFF

The CD-ROM busy light goes off when the self-test completes.

If there is no CD-ROM disk caddy in the disk port when the power is switched on, the CD-ROM busy light will not go on.

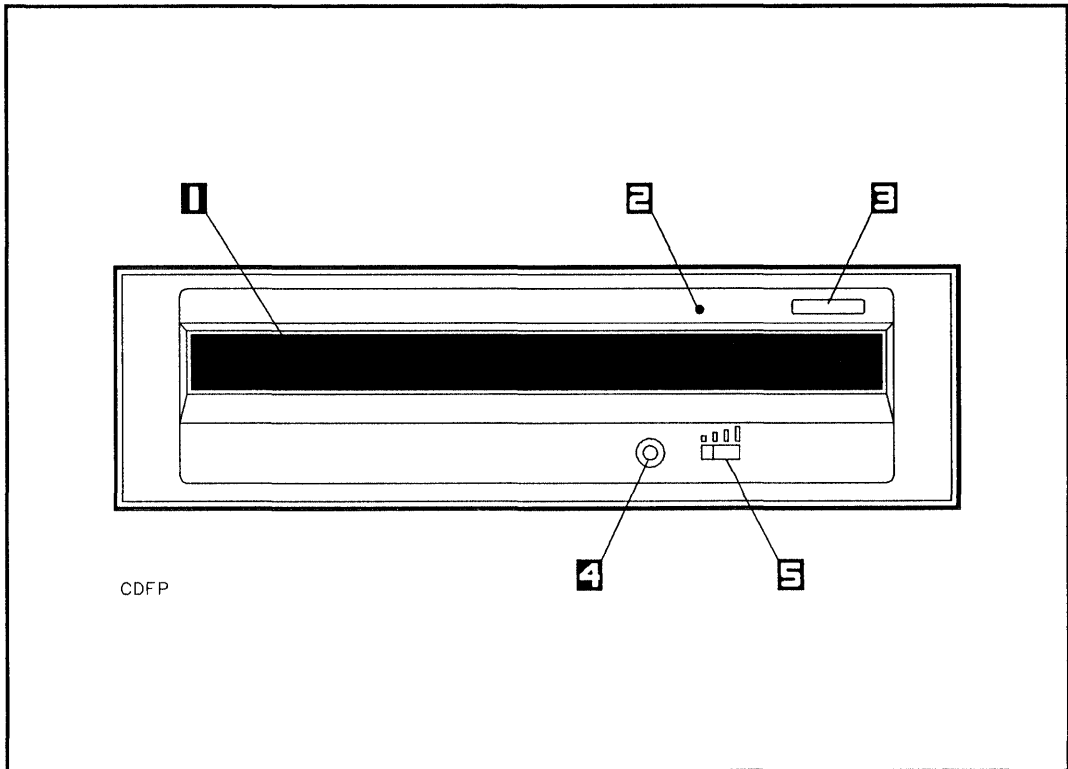


Figure 4-3. CD-ROM Drive Front Panel

1–Disk Port

2–CD-ROM Busy Light

3–Disk Eject Button

4–Audio Headphone Jack

5–Volume Switch

If either of the following fault conditions is detected, the CD-ROM busy light will stay ON after the self-test has completed:

The disk detecting function is disabled by a defective CD-ROM disk.

A disk insertion error is detected.

After the mass storage system power has been switched on and the self-test has completed, the CD-ROM busy light will flash at half second intervals during CD-ROM drive activity with the host computer, or if the TEST switch is set to 1 for continuous audio mode (refer to “Setting the TEST Switch” in this chapter). If the CD-ROM busy light is off, the CD-ROM drive is idle.

Table 4-1 shows the status of the CD-ROM busy light during normal operation and fault conditions:

If a fault condition is indicated by the CD-ROM busy light, contact your local Hewlett-Packard Sales and Support Office.

Table 4-1. CD-ROM Busy Light Status

Status	Explanations
ON	No disk detected (disk detection disabled by a defective CD-ROM disk) or disk insertion error detected or no disk in the disk caddy.
OFF	CD-ROM drive power failure or CD-ROM idle on SCSI bus.
FLASHING	Normal activity with the host or CD-ROM drive in continuous audio mode.

Reading a Disk

To read data from a CD-ROM disk with your host computer, refer to Volume I of your *HP-UX System Administrator Manual*, part number 98594-90060.

To play an audio compact disc (CD) in your CD-ROM drive, perform the following steps:

1. Place the CD-ROM Drive in continuous audio mode by setting the PRTY, ARBT, and TEST switches (refer to “Setting Switches to Continuous Audio Mode”).

You must cycle power off and back on again for the CD-ROM drive to recognize the new switch settings.

2. Connect a pair of miniature stereo headphones to the headphone jack (see Figure 4-3).
3. Place an audio CD in the CD-ROM disk caddy.
4. Insert the disk caddy into the disk port (refer to “Inserting CD-ROM Disks” in this chapter).
5. Move the volume switch (see Figure 4-3) from left to right to increase the volume level of the audio signal in three incremental steps.
6. Press the disk eject button momentarily to switch tracks (songs).
7. Press and hold the disk eject button for more than one second to eject the compact disc.

Setting Switches to Continuous Audio Mode

The PRTY, ARBT, and TEST switches (see Figure 4-5) are used to activate the continuous audio mode in your CD-ROM drive. To activate continuous audio mode, set the switches to the positions shown in the following table:

PRTY	ARBT	TEST	FUNCTION
0	0	1	Continuous audio mode.

When the CD-ROM drive is in continuous audio mode, press the eject button for 0.1 to 1 second to switch to the next track. If you press the eject button for longer than 1 second, the compact disc will be ejected.

The following paragraphs describe how to install a CD-ROM drive into your mass storage system. Two CD-ROM drives can be added to your mass storage system as upgrade kits. The C2293A upgrade kit includes one CD-ROM drive.

This installation procedure is written for personal computer dealers, technicians, and others who are familiar with setting up mass storage devices. If you are not experienced with such tasks, please find an experienced person to help you or contact your local Hewlett-Packard Sales and Support Office.

CD-ROM drives can only be installed into slot 3.

After installing CD-ROM drives into your mass storage system, your mass storage system must be carefully reassembled to ensure compliance with RFI emission requirements and to provide adequate protection against electrical shock and fire hazards.

Laser Safety

Use of controls, adjustments, or performing procedures other than those specified in this manual may result in hazardous invisible laser radiation exposure. None of the mechanisms within the mass storage system contain customer or field-replaceable parts.

The CD-ROM drive becomes a Class 3B laser mechanism when disassembled. If the CD-ROM disk drive is disassembled, exposure to the invisible laser beam and hazardous invisible laser radiation could result in blindness. Do NOT disassemble the CD-ROM drive for any reason.

Handling Precautions

If you do not protect the CD-ROM drive against electrostatic discharge, you may damage the CD-ROM drive and void your warranty.

A static charge of 39,000 volts can be generated on a carpeted floor. Such a voltage exceeds the limits of the CD-ROM drive and can cause unsuccessful operation of the product.

To ensure continuously successful operation of the CD-ROM drive in a carpeted office environment, Hewlett-Packard recommends the use of anti-static mats and carpets with this product. Refer to the *Hewlett-Packard Computer Users Catalog*, part number 5953-2450D, for a complete listing of static control equipment, including anti-static mats and carpets.

Handle the CD-ROM drive with care. The CD-ROM drive is susceptible to mechanical shock and vibration until it is secured into the mass storage system chassis.

The mass storage system contains a BEND/flex* cable that is used to distribute signals to the drives in the mass storage system. When handling the BEND/flex cable, *do not* crease, twist, or stress the cable or its connectors. Also, make sure that the BEND/flex cable is at room temperature when connecting or disconnecting any of its cables. The BEND/flex cable tears easily when it is twisted. When connecting a BEND/flex connector to another connector, push directly from the back of the BEND/flex connector and carefully push it onto the other connector.

* *BEND/flex is a product of Rogers Corporation.*

Unpacking the Upgrade Kit

The first step to installing a CD-ROM drive into your mass storage system is to unpack and identify the contents of the C2293A upgrade kit. Figure 4-4 shows the contents of the C2293A upgrade kit.

TORX* hardware is used in the upgrade kit. This hardware requires the use of special drivers. In this manual, any reference to this type of hardware will be accompanied by the required driver size (for example, "T25").

**TORX is a product of the Camcar Division of Textron, Inc.*

If you are installing a second (or two) CD-ROM drives, you will have an extra mounting bracket and an extra SCSI cable adapter. Neither of these parts will be needed.

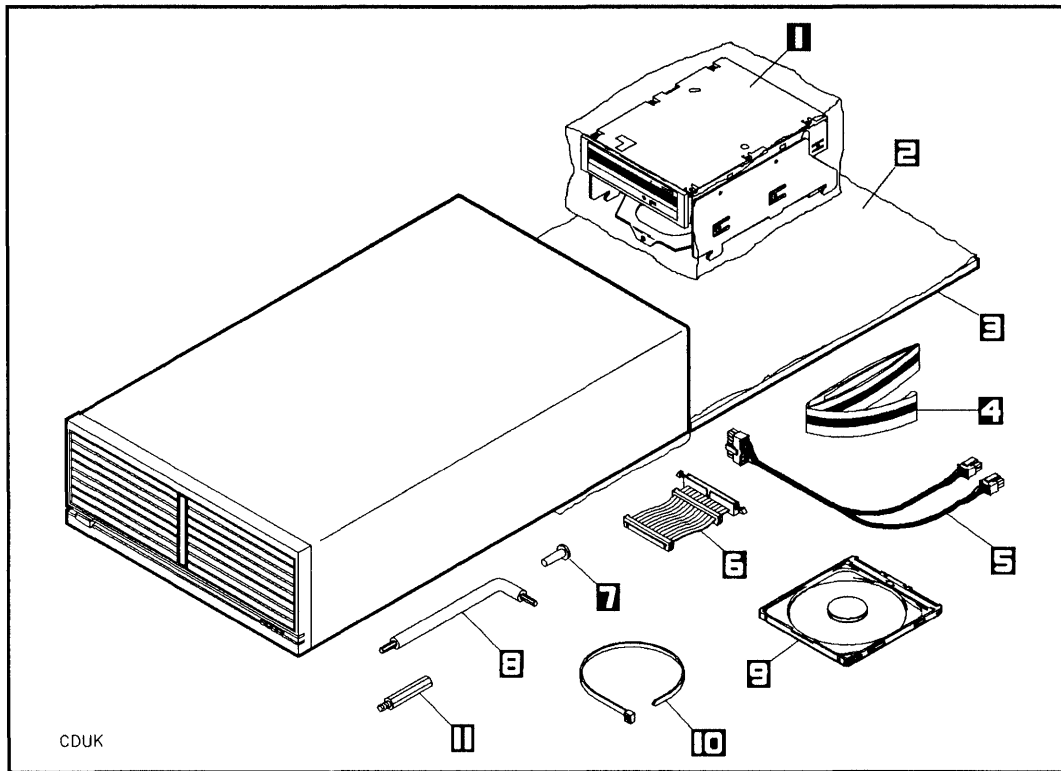


Figure 4-4. CD-ROM Drive Upgrade Kit Contents

- | | |
|--|--------------------------------|
| 1-CD-ROM Drive, 600-Mbyte
(1150-1832) | 7-T25, 10 mm Screw (0515-0386) |
| 2-Conductive Sheet (07961-80021) | 8-TORX Tools |
| 3-Foam Pad (07961-80022) | 9-Disk Caddy (C2293-80001) |
| 4-Wrist Ground Strap (9300-1408) | 10-Cable Tie (1400-0249) |
| 5-DC Dual Power Cable
(C2212-60054) | 11-Hex Standoff (C2212-20001) |
| 6-BEND/flex Cable Adapter
(C2212-60048) | |

Learning About Upgrade Kit Parts

The following paragraphs describe the characteristics and functions of the parts in the C2293A upgrade kit.

CD-ROM Drive

See “Product Description” in this chapter.

Mounting Bracket

The mounting bracket holds the CD-ROM drive inside the mass storage system chassis.

DC Dual Power Cable

The dc dual power cable is a 4-pin split cable that can provide dc power to two CD-ROM drives.

BEND/flex Cable Adapter

The BEND/flex cable adapter is a 50-pin cable with two connectors that adapt the Small Computer System Interface (SCSI) connectors on two CD-ROM drives to the SCSI connector on the BEND/flex cable. The BEND/flex cable SCSI connector enables CD-ROM drives to communicate with the host computer (initiator) over an industry-standard single-ended SCSI bus.

T25 Screw

The T25 screw secures the CD-ROM drive to the mass storage system chassis.

Cable Tie

The cable tie is for wrapping the power cables in place once the new SCSI device is installed.

Conductive Sheet

The conductive sheet is an anti-static sheet that is placed under the CD-ROM drive to prevent electrostatic damage.

Foam Pad

The foam pad is placed under the conductive sheet to prevent mechanical shock and vibration damage to the CD-ROM drive before it is mounted into the mass storage system chassis.

Wrist Ground Strap

The wrist ground strap is used to ensure that the CD-ROM drive, the conductive sheet, the mass storage system chassis, and your hand are all at the same electrical potential.

TORX Tools

The TORX tools are used to drive TORX screws.

Hex Standoff

The hex standoff is use when a hard disk drive is installed (or moved) into slot 2.

CD-ROM Disk Caddy

The disk caddy is for holding the CD-ROM disk, and is inserted into the CD-ROM drive.

Preparing to Install a CD-ROM Drive

Before installing a CD-ROM drive, make sure you have access to all sides of the mass storage system, and that the mass storage system is near an ac power outlet.

1. Shut down the host computer.
2. Turn off power to both the host computer and the mass storage system.
3. Disconnect the SCSI cables from the mass storage system rear panel.
4. Set the **LINE** switch on the mass storage system front panel to the out position.
5. Set the **LINE** switch to the 0 (out) position and connect the power cord from the mass storage system rear panel to an ac power outlet.
6. Wrap one end of the wrist ground strap around your wrist and apply the copper end to a flat, unpainted area of the mass storage system chassis. The mass storage system chassis, the conductive sheet, and your hand are now at the same electrical potential.
7. Place the rear of the mass storage system chassis on the conductive sheet as shown in Figure 4-4.

Keep the wrist strap on until you have performed all the steps in the installation procedure.

8. Slide the foam pad beneath the loose end of the conductive sheet, while making sure the mass storage system chassis maintains contact with the conductive sheet.
9. Place the anti-static bag containing the CD-ROM drive on the conductive sheet. Open the bag, remove the CD-ROM drive, and place it on the conductive sheet.
10. Set the SCSI-ID, PRTY, ARBT, and TEST switches on the rear panel of the CD-ROM drive (refer to the following paragraphs).
11. Disconnect the ac power cord from the mass storage system rear panel.

Ensure that the LINE switch on the mass storage system front panel is in the 0 (out) position, and that the power cord is disconnected from the mass storage system rear panel. Electrical shock may result if the power cord is connected and the LINE switch is in the 1 (in) position while the top cover is off.

Setting the SCSI Address Switches

The address switches on the back of your mass storage system are for hard disk drives only.

Make sure your CD-ROM drive is set to a unique SCSI address relative to the other devices on the SCSI bus. The mass storage system will not function properly if two devices in the mass storage system have the same SCSI address.

The SCSI-ID switches (see Figure 4-5) enable you to select a unique SCSI address for the CD-ROM drive. The SCSI-ID switches are set to address 0 at the factory, so all of the switches should be in the down (0) position when you take the CD-ROM drive out of the anti-static bag.

To set the SCSI-ID switches to a different address before installing the CD-ROM drive, perform the following steps:

1. Verify that the PRTY and ARBT switches are set to 1, and the TEST switch is set to 0.
2. Set the SCSI switches 1, 2, and 3 to 0 or 1 for the desired address (refer to Table 4-2 and Figure 4-5).

To set the SCSI-ID switches to a different setting after the CD-ROM drive has already been installed, perform the following steps:

1. Set the mass storage system **LINE** switch to the 0 (out) position.
2. Disconnect the power cord from the mass storage system rear panel.

3. Remove the front panel and top cover (refer to “Removing the Front Panel and Top Cover” in this chapter).
4. Verify that the PRTY and ARBT switches are set to 1, and the TEST switch is set to 0.
5. Set the SCSI switches 1, 2, and 3 to 0 or 1 for the desired address (refer to Table 4-2 and Figure 4-5).
6. Install the front panel and top cover.
7. Connect the power cord to the mass storage system rear panel.
8. Set the mass storage system **LINE** switch to the 1 (in) position.

**Table 4-2.
CD-ROM Drive SCSI-ID Switch Settings**

SCSI Address	SCSI-ID 1 Switch 1	SCSI-ID 2 Switch 2	SCSI-ID 4 Switch 3
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

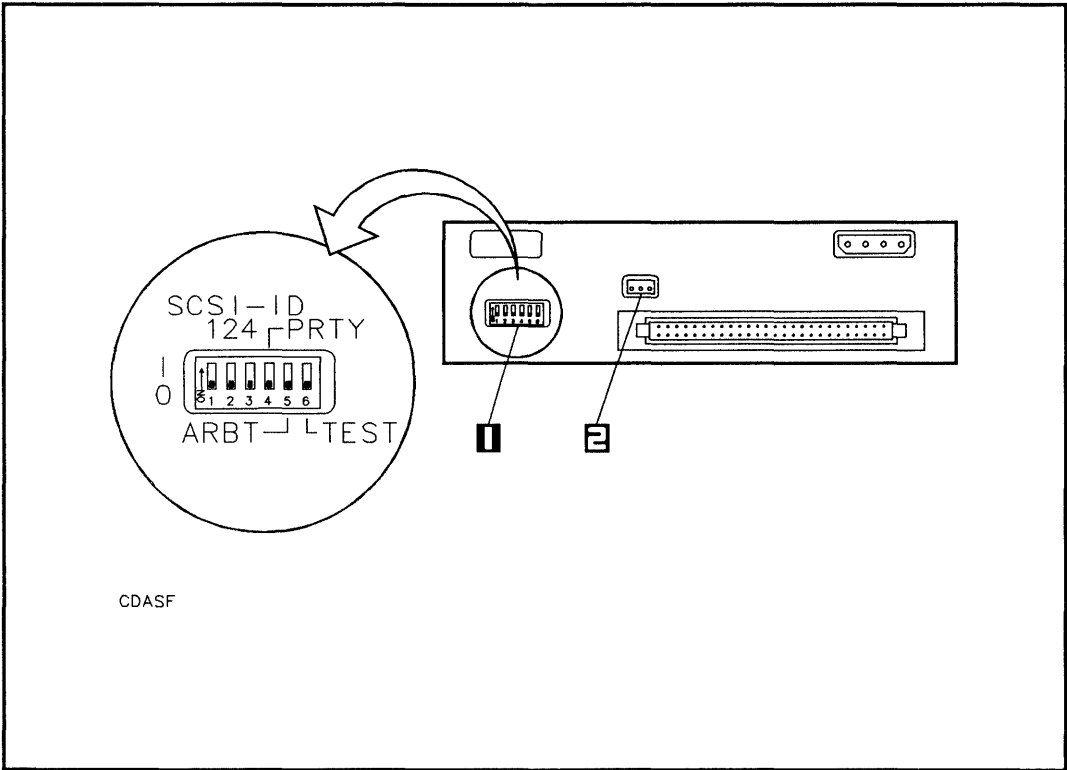


Figure 4-5. CD-ROM Drive Rear Panel Switches

1-SCSI/Options Switch

2-Audio Output Jack (not used)

Setting the PRTY Switch

The PRTY switch (see Figure 4-5) must be set to 1 for your CD-ROM drive to operate properly in your mass storage system. The following table shows the function of the PRTY switch for both switch positions:

PRTY	Function
0	No parity check executed.
1	Parity check executed.

Setting the ARBT Switch

The ARBT switch (see Figure 4-5) must be set to 1 for your CD-ROM drive to operate properly in your mass storage system. The following table shows the function of the ARBT switch for both switch positions:

ARBT	Function
0	Non-arbitration system.
1	Arbitration system.

Setting the TEST Switch

The TEST switch (see Figure 4-5) is used to activate the continuous audio mode in your CD-ROM drive. When the continuous audio mode is activated, you can play an audio CD in your CD-ROM drive (refer to “Playing Audio Compact Discs” in this chapter). If you do *not* want to activate the continuous audio mode, set the TEST switch to 0.

The following table shows the function of the TEST switch with the PRTY and ARBT switches for both switch positions:

You must cycle power off and back on again for the CD-ROM drive to recognize the new switch settings.

PRTY	ARBT	TEST	Function
1	1	0	Normal operating mode.
0	0	1	Continuous audio mode.

Removing the Front Panel and Top Cover

Remove the front panel and top cover as follows (see Figure 4-6):

1. Slide the front of the mass storage system chassis beyond the edge of the table top until the front panel locking tabs are exposed. The tabs are located on the underside of the chassis.
2. Press up on the front panel locking tabs until the front panel releases from the mass storage system chassis.
3. Pull the bottom of the front panel forward, rotate the front panel up, and lift the front panel mounting tabs out of slots in the front edge of the top cover.
4. Remove the two T15 top cover screws.
5. Slide the rear of the top cover one-half inch beyond the rear of the mass storage system chassis, then lift the front of the top cover up and off of the mass storage system chassis.

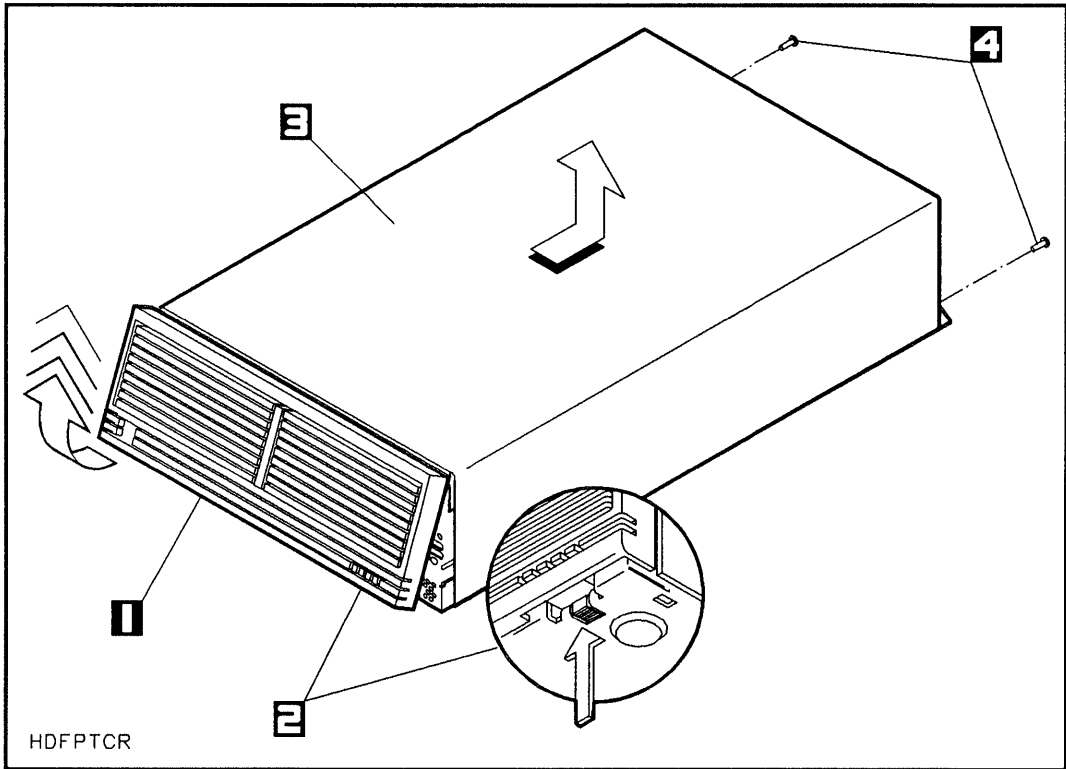


Figure 4-6. Removing the Front Panel and Top Cover

1 - Front Panel

3 - Top Cover

2 - Front Panel Locking Tabs

4 - T15 Top Cover Screws

Removing a Front Panel Bezel

If you are installing only one CD-ROM drive, and if your mass storage system does not already contain a CD-ROM drive, remove only the upper bezel in the slot 3 position (left side) of the front panel (see Figure 4-7).

If your mass storage system already contains a CD-ROM drive and you are installing a second CD-ROM drive, remove the lower bezel in the slot 3 position (left side) of the front panel.

If you are installing two CD-ROM drives, remove the upper and lower bezels from the slot 3 position (left side) of the front panel.

Remove a front panel bezel as follows:

1. Position your thumbs in front of the bezel on the right-hand and left-hand edges of the bezel.
2. Gently push the bezel out with your thumbs.

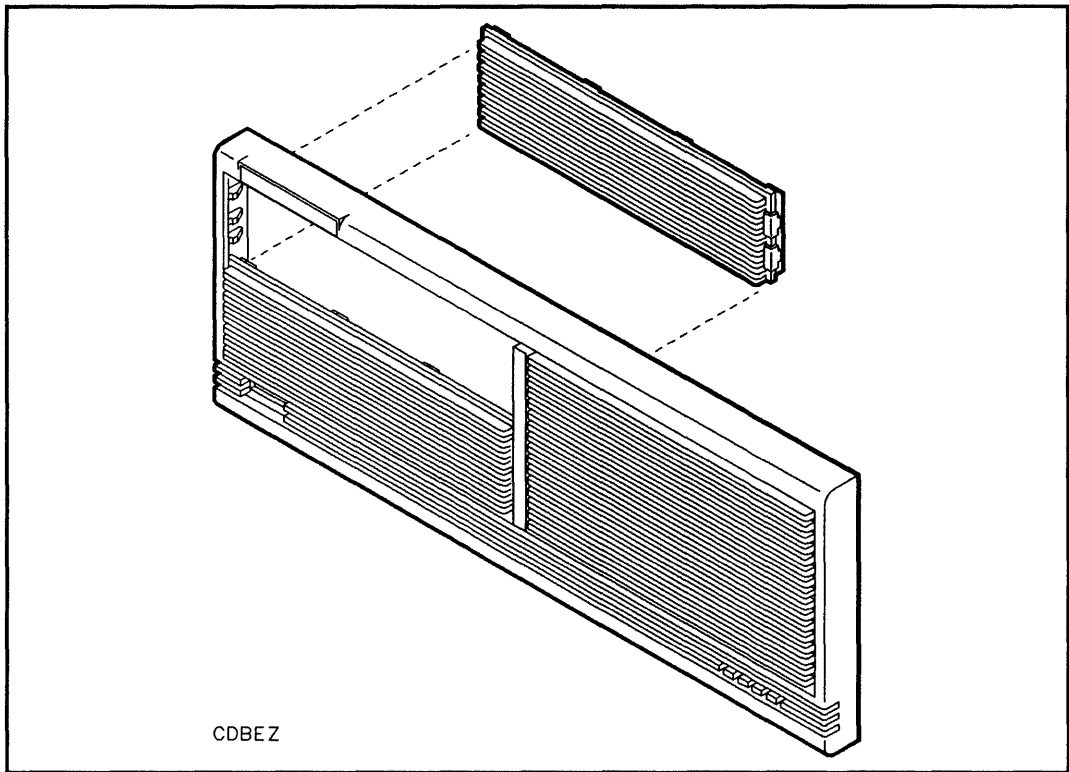


Figure 4-7. Removing a Front Panel Bezel

Removing the RFI Bracket from Slot 3

The mass storage system chassis is shipped with a radio frequency interference (RFI) bracket in slot 3 (unless slot 3 contains a factory-installed optional SCSI device). The RFI bracket ensures the compliance of your mass storage system with RFI emission requirements whenever there is no device in slot 3. If a CD-ROM drive has not yet been installed into slot 3, you must first remove the RFI bracket as follows (see Figure 4-8):

1. Remove the T25 screw from the front of the mass storage system chassis and the RFI bracket.
2. Use a flat-bladed screwdriver to pry the RFI bracket away from the mass storage system chassis.
3. Slide the RFI bracket on the chassis rails toward the center of the mass storage system chassis and lift the RFI bracket out of the chassis.

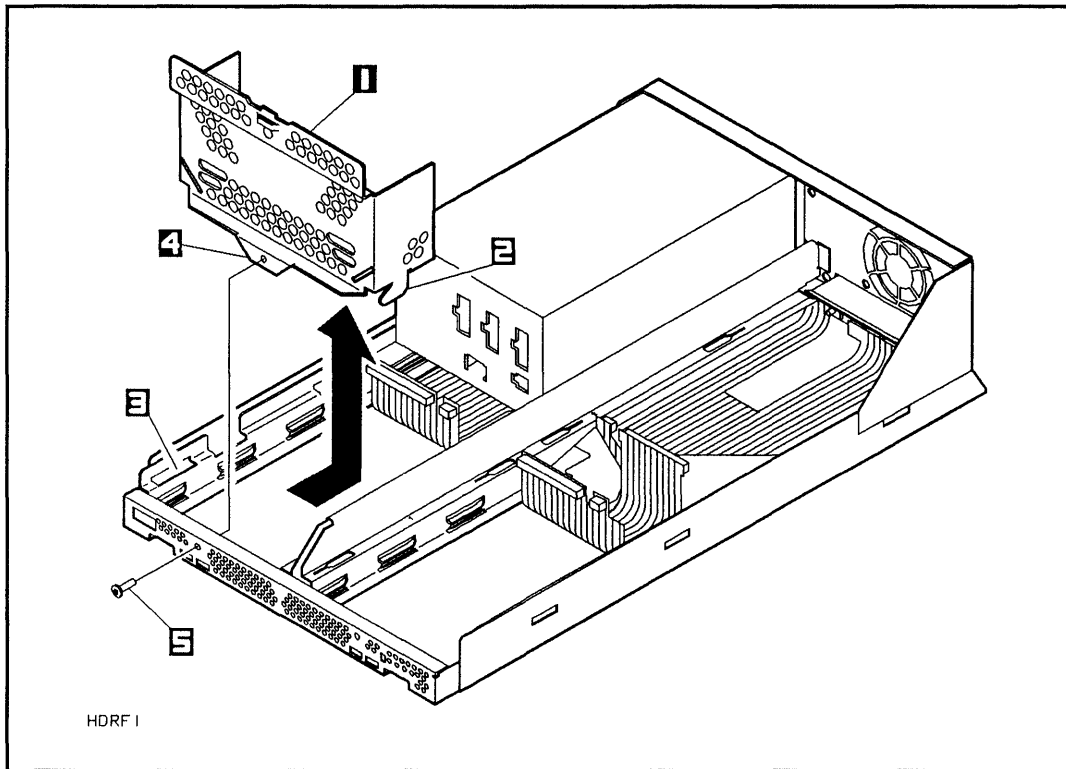


Figure 4-8. Removing the RFI Bracket

1 - RFI Bracket

4 - Securing Tab

2 - Mounting Tab (1 of 2)

5 - T25 Screw

3 - Mounting Slot

Installing a CD-ROM Drive into the Mounting Bracket

Perform the following steps only if you are adding a second CD-ROM drive beneath an existing CD-ROM drive in slot 3:

1. Remove the dc dual power cable from the DC SUPPLY connector on the rear of the CD-ROM drive.
2. Disconnect the BEND/flex SCSI adapter connector from the CD-ROM drive SCSI connector by pressing both cable ejectors outwards until the cable is removed.
3. Remove the T25 screw from the chassis front panel, and remove the CD-ROM drive from slot 3 with the CD-ROM bracket attached.
4. Place both of the CD-ROM drives on the conductive sheet.
5. Remove the T10 bracket screws from the new CD-ROM drive and bracket you received in the new upgrade kit.
6. Remove the new CD-ROM drive from the mounting bracket.
7. Install the new CD-ROM drive into the lower level of the mounting bracket you removed from slot 3.
8. Secure the CD-ROM drive in the mounting bracket with the T10 bracket screws (see Figure 4-9).

If you are installing two CD-ROM drives at the same time (from two upgrade kits), perform the following steps:

1. Place both of the CD-ROM drives on the conductive sheet.
2. Remove the T10 bracket screws from the CD-ROM drive and the mounting bracket you received in one of the upgrade kits.
3. Remove the CD-ROM drive from the mounting bracket and install it into the lower level of the mounting bracket you received in the other upgrade kit.
4. Secure the CD-ROM drive in the mounting bracket with the T10 bracket screws (see Figure 4-9).

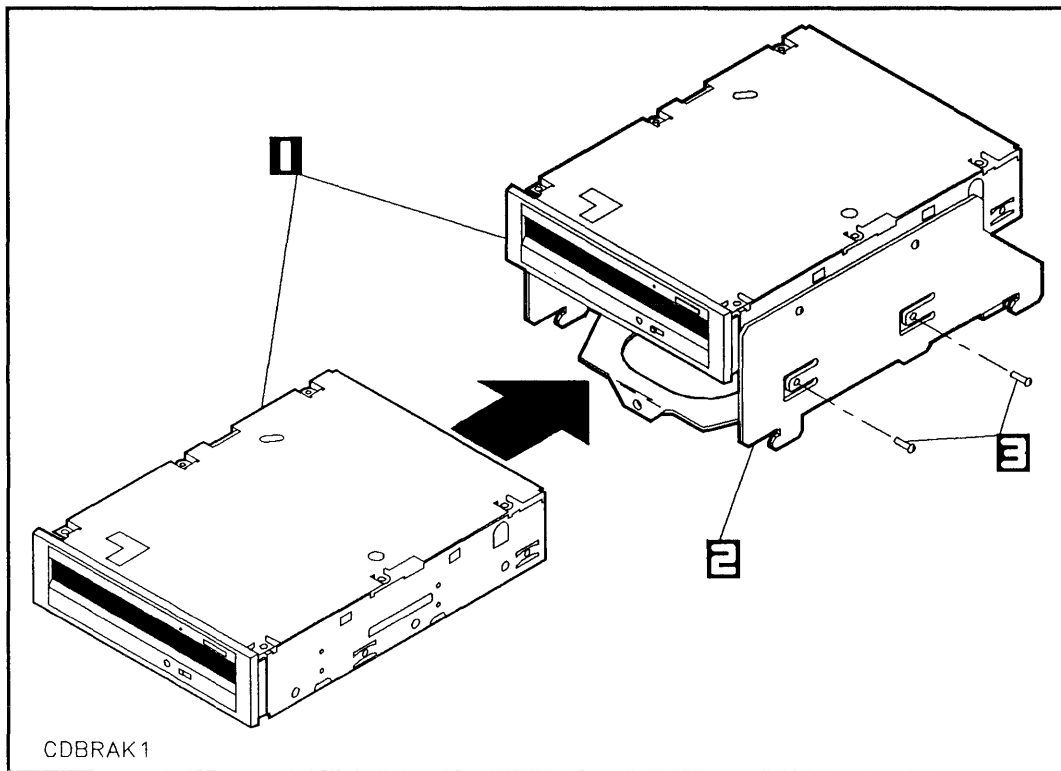


Figure 4-9. Installing a CD-ROM Drive into a Mounting Bracket

1-CD-ROM Drives

3-T10 Screws

2-Mounting Bracket

Installing a CD-ROM Drive into Slot 3

Install a CD-ROM drive into the mass storage system chassis as follows:

1. Hold the BEND/flex cable out of the way with one hand, and lift the CD-ROM drive or drives in the mounting bracket from the conductive sheet and lower the bracket mounting tabs into the mounting slots in the chassis rails (see Figure 4-10 and Figure 4-11).
2. Push down on the mounting bracket and slide it on the chassis rails toward the front of the mass storage system chassis until the mounting tabs lock into the mounting slots and the mounting bracket stops against the front of the chassis.
3. Tighten the T25 screw through the hole in the mass storage system chassis and into the securing tab (see Figure 4-11).

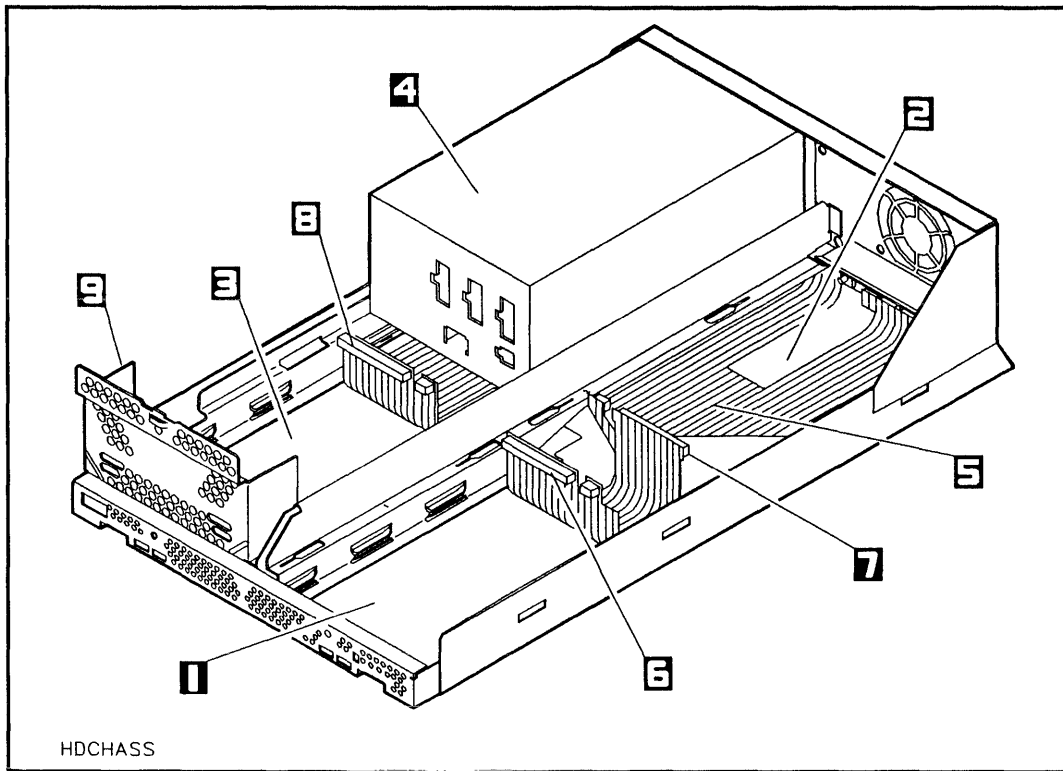


Figure 4-10. Mass Storage System Chassis

1 - Slot 1

2 - Slot 2

3 - Slot 3

4 - Power Supply

5 - BEND/flex Cable

6 - Slot 1 BEND/flex Connector

7 - Slot 2 BEND/flex Connector

8 - Slot 3 BEND/flex Connector

9 - RFI Bracket

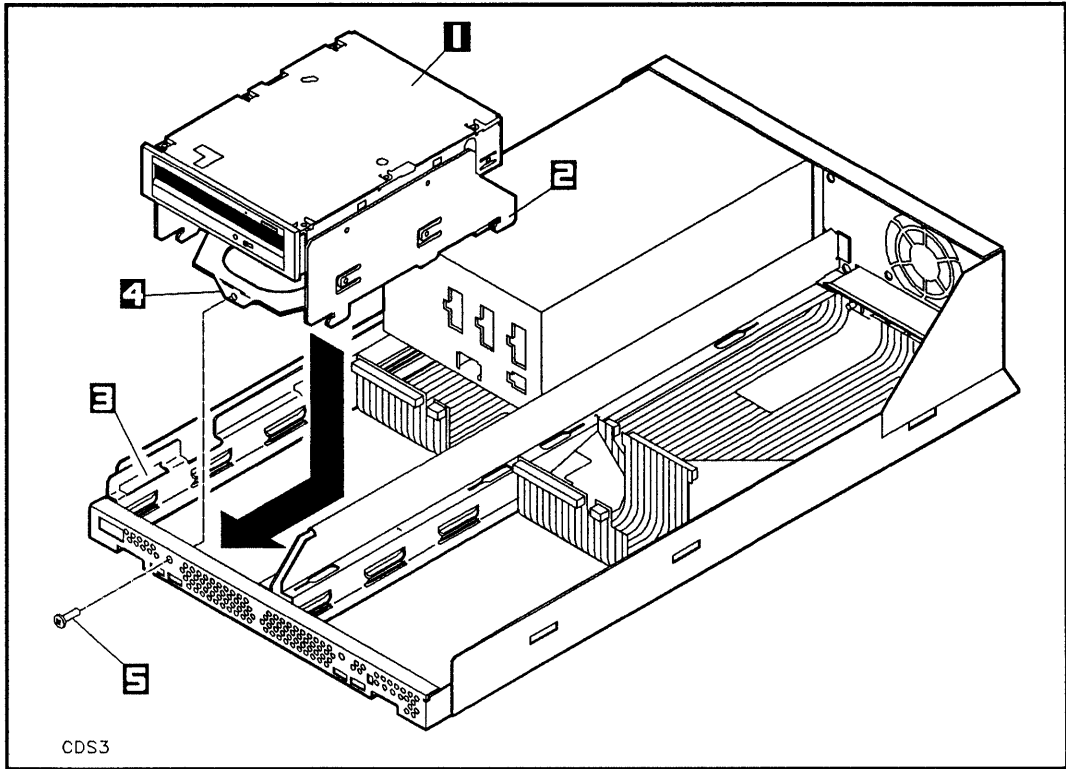


Figure 4-11. Installing a CD-ROM Drive

1 - CD-ROM Drive

4 - Securing Tab

2 - Mounting Tab (1 of 4)

5 - T25 Screw

3 - Mounting Slot (1 of 4)

Connecting Cables to a CD-ROM Drive

Connect the cables to your CD-ROM drive as follows:

1. Connect the BEND/flex cable adapter to the BEND/flex cable.
2. If you are installing only one CD-ROM drive, connect only one of the split ends of the dc dual power cable to the DC SUPPLY connector on the rear panel of the CD-ROM drive (see Figure 4-12), and connect the long end of the dc dual power cable to any of the unused dc power connectors on the power supply (see Figure 4-13).

If you are installing two CD-ROM drives, connect both of the split ends of the dc dual power cable to the DC SUPPLY connectors on the rear panels of the CD-ROM drives (see Figure 4-12), and connect the long end (with the 14-pin connector) of the dc dual power cable to the slot 3 power connector on the power supply (see Figure 4-13).

3. If you are installing only one CD-ROM drive, attach only the upper SCSI connector of the BEND/flex cable adapter to the SCSI connector on the rear of the CD-ROM drive (see Figure 4-12).

If you are installing two CD-ROM drives, attach the upper SCSI connector of the BEND/flex cable adapter to the upper CD-ROM drive, and attach the lower SCSI connector of the BEND/flex cable adapter to the lower CD-ROM drive.

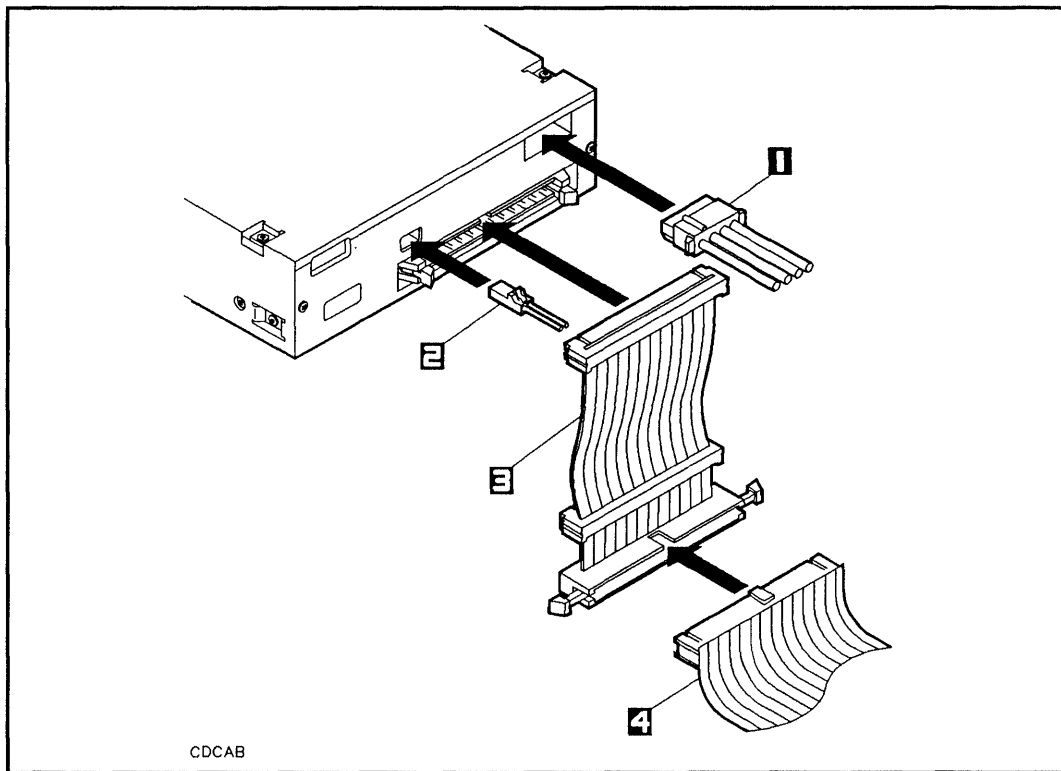


Figure 4-12. Connecting Cables to a CD-ROM Drive

1-DC Dual Power Cable

2-Audio Cable

3-BEND/flex Cable Adapter

4-BEND/flex Cable

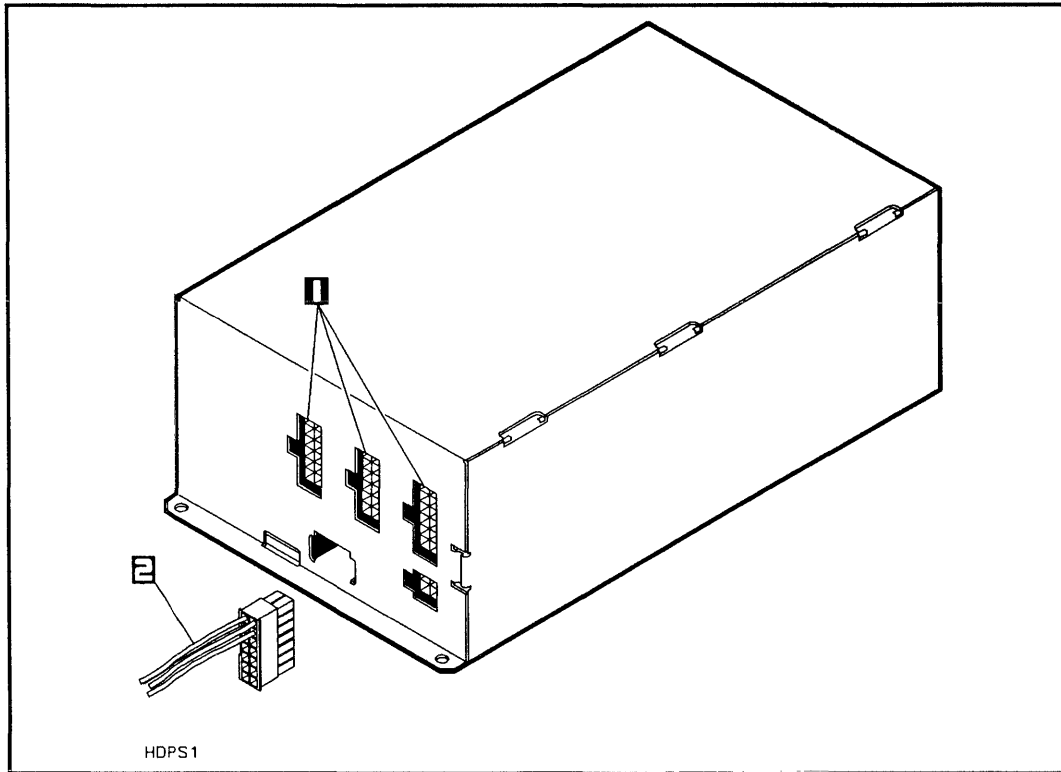


Figure 4-13. Connecting the DC Power Cable

1 - DC Power Connectors

2 - DC Power Cable

Reinstalling the Front Panel and Top Cover

Reinstall the front panel and top cover as follows:

1. Slide the top cover down over the mass storage system chassis so that the rear of the top cover extends one-half inch beyond the rear of the mass storage system chassis, then slide the top cover forward into place.
2. Install and tighten the T15 top cover screws.
3. Insert the front panel mounting tabs into the slots in the top cover and swing the front panel down until the **LINE** switch comes through the opening in the front panel.
4. Push the bottom edge of the front panel into the front of the chassis until the front panel locking tabs engage.
5. Remove the wrist strap from the mass storage system chassis and your wrist.

Due to the self-contained design of your CD-ROM drive, regular maintenance of the drive is not required. However, the performance and reliability of your drive depend on the operating environment. Make sure your CD-ROM drive operates within the environmental restrictions listed in this chapter (refer to “Environmental Requirements”).

If your CD-ROM drive requires service, perform the following steps:

1. Contact your local Hewlett-Packard Sales and Support Office.
 2. Explain the problem you are having with the CD-ROM drive.
 3. State the serial number of your CD-ROM drive.
-

If you have any questions about the warranty on your CD-ROM drive, please contact your local Hewlett-Packard Sales and Support Office.

Following are the CD-ROM drive operating specifications and environmental requirements.

For a complete list of technical specifications for your mass storage system, refer to chapter 1.

Operating Specifications

The following information stipulates the specifications and characteristics of this product when installed and operated within the limits specified under “Environmental Requirements” in this chapter.

PERFORMANCE

Data transfer rate (asynchronous)

Average:	153.6 kilobits per second
Maximum:	1400 kilobits per second

Access time (including latency)

Track-to-track:	1 ms
Average random:	400 ms
Maximum:	700 ms

FUNCTIONAL

Load time:	6 seconds
Unload time:	3 seconds
Motor spin-up time:	1 second
Rotational speed ¹ :	530 to 200 rpm

¹*Decreases from inner diameter (ID) to outer diameter (OD) to maintain constant linear velocity.*

MEDIA

Diameter:	4.7 inches (120mm)
Number of read surfaces:	1
Format type:	<i>Yellow Book</i>
Data capacity Mode 1:	599 Mbytes
Data capacity Mode 2:	683 Mbytes
User data per block Mode 1:	2,048 bytes
User data per block Mode 2:	2,336 bytes
Blocks per disk:	292,500

Environmental Requirements

TEMPERATURE

Operating ¹ :	5°C to 45°C (41°F to 113°F)
Nonoperating ¹ :	-10°C to 65°C (14°F to 149°F)

¹*Operating and nonoperating temperature specifications are exceptions to the specifications listed in chapter 1.*

ALTITUDE

Nonoperating ² :	minimum -305 m (-1000 ft)
	maximum 12 500 m (41,600 ft)

²*Nonoperating altitude specification is an exception to the specifications listed in chapter 1.*

Digital Audio Tape Drive

This chapter provides information about operating the Digital Audio Tape (DAT) Drive (option 003) within your HP Series 6000 Models 330S and 660S Mass Storage Systems. This chapter also describes how to install the Digital Audio Tape Drive, which is included in the C2292A upgrade kit (refer to “Installing the DAT Drive Upgrade Kit” in this chapter).

The Digital Audio Tape (DAT) drive is a sequential access streaming tape device that stores data on removable DAT cassettes in Digital Data Storage (DDS) format. The DAT drive includes an embedded controller with a single-ended SCSI interface. The DAT drive uses helical-scan technology on a standard 1.3 gigabyte DAT cassette.

The Digital Audio Tape (DAT) cassettes used by the DAT drive (see Figure 5-1) are the same cassettes used by DAT players in the audio industry, except they are recorded in Digital Data Storage (DDS) format using helical-scan technology. The DAT cassettes have a total data capacity of 1.3 gigabytes.

Write-protecting a DAT Cassette

The write-protect tab on the DAT cassette allows you to protect valuable programs and data from being over-written (see Figure 5-1).

To write-protect a DAT cassette, place the tip of a pen on the right side of the write-protect tab and slide the write-protect tab to the left-hand side of the plastic case (see Figure 5-1).

When the write-protect tab is in the write-protect (left-hand) position, an empty round hole will be exposed on the right-hand side of the write-protect tab.

Write-enabling a DAT Cassette

To write-enable a DAT cassette, slide the write-protect tab to the right-hand side of the write-protect tab (see Figure 5-1). Data and programs can now be over-written.

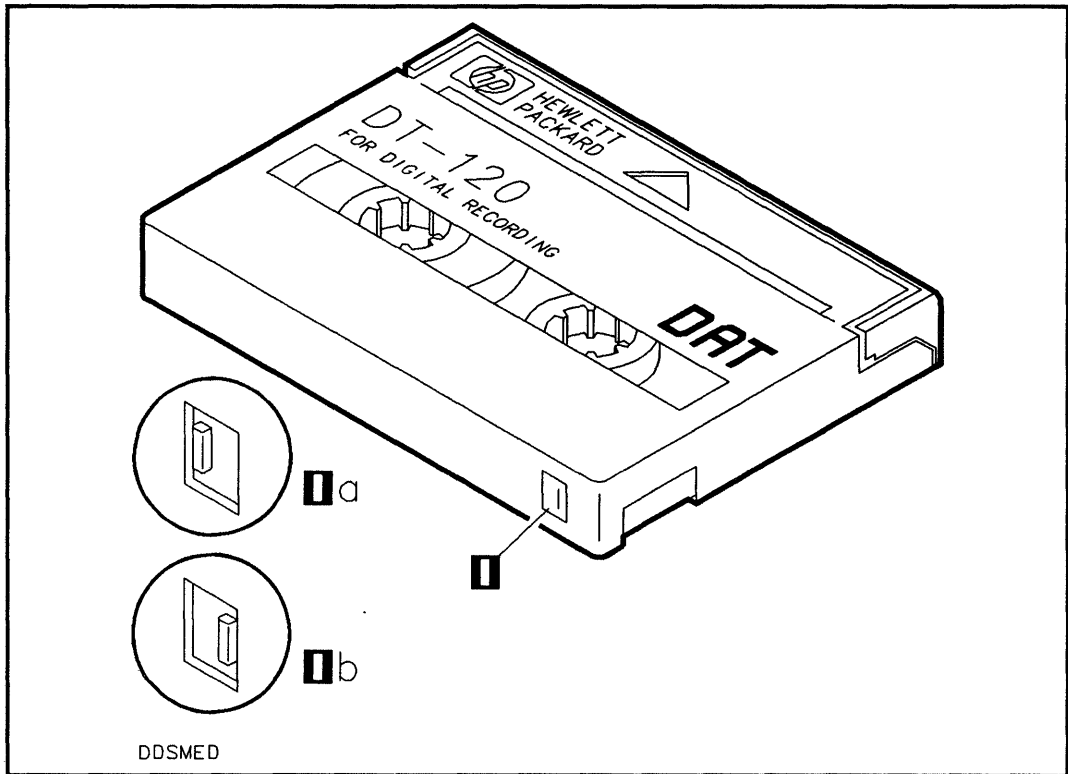


Figure 5-1. DAT Cassette

- 1 - Write-protect Tab
- 1a - Write-protect position
- 1b - Write-enable position

Caring for DAT Cassettes

The following guidelines will help you to maintain data integrity and prolong the life of your DAT cassettes and your DAT drive:

Keep DAT cassettes away from appliances with magnetic fields, such as telephones or appliances with small motors or transformers.

Do not leave DAT cassettes in excessively dry or humid environments (see DAT Cassette Temperature Limits).

Do not leave DAT cassettes in direct sunlight.

Do not touch the tape or try to clean the tape path or tape guides.

Do not apply more than one label to a DAT cassette; extra labels can cause cassettes to jam in the DAT drive.

Store DAT cassettes in their plastic cases in a clean environment when not in use.

Do not use cassettes beyond their useful life (see Media Warning and Tape Wear).

DAT Cassette Temperature Limits

If you expose DAT cassettes to temperatures outside the operating limits, the temperature of the cassettes must be stabilized before they are used. To stabilize the temperature of a DAT cassette, leave the cassette in the operating temperature for a length of time equal to the time the cassette was outside the limits, up to a maximum of eight hours (refer to “Environmental Requirements” at the end of this chapter).

Media Warning and Tape Wear

The read/write head in your DAT drive should be cleaned with a cleaning cassette after every 10 hours of use to maximize data integrity and prolong the life of the read/write head in your DAT drive.

The DAT drive monitors tape wear. The DAT cassette and drive busy lights flash a media warning when the tape is nearing the end of its useful life, or when the tape heads are dirty (refer to MEDIA WARNING in Table 5-3). Perform the following sequence when the busy lights indicate a media warning:

1. Clean the tape heads with the cleaning cassette (follow the instructions on the cleaning cassette case).
2. Repeat the operation that was being performed when the media warning occurred.
3. If the media warning is not repeated, the tape heads were dirty and normal use of the DAT cassette can be resumed. If the media warning is repeated, perform the following steps:
 - a. Copy the data from the DAT cassette onto a hard disk drive.

- b. Copy the data from the hard disk drive to a new DAT cassette.
- c. Discard the old DAT cassette.

Ordering DAT Cassettes

Table 5-1 lists DAT products you can order from Hewlett-Packard.

Table 5-1. Ordering DAT Media

Part Number	Quantity	Description
92283A	5	Box of five 1.3-gigabyte DAT cassettes with protective cases and labels.
92283K	1	Cleaning Cassette

Do not operate your DAT drive if it has been exposed to extreme temperatures, such as being left in an automobile overnight in cold weather. Your DAT drive must stabilize at room temperature for two hours before operation. Operating your DAT drive when it is very cold or very hot could cause damage to your DAT drive. Refer to the end of this chapter and also to chapter 1 for limits on temperature and humidity for your mass storage system.

The following paragraphs describe how to operate your DAT drive.

Switching on Power

To switch on power to your DAT drive, push in the **LINE** switch on the mass storage system front panel. To switch off power to your DAT drive, push in the **LINE** switch then release it until it is fully extended out. (See Figure 1-2 in chapter 1 for the location of the **LINE** switch.)

Inserting a DAT Cassette

To insert a DAT cassette, slide the cassette into the DAT drive with the label facing up (see Figure 5-2).

When a DAT cassette is inserted into the cassette port, the DAT drive automatically loads it into the drive mechanism, threads the tape, and performs a load sequence that lasts about 25 seconds. The load sequence tests the tape and the read/write circuitry in the DAT drive. Refer to Table 5-2 for the status of DAT cassette and DAT drive busy lights during the cassette load operation.

Ejecting a DAT Cassette

To eject a DAT cassette, press the cassette eject button on the front panel of the DAT drive (see Figure 5-3).

When the eject button is pressed, the DAT drive starts an eject sequence that lasts about 15 seconds. The eject sequence winds the tape to the beginning, unthreads the tape, and ejects the DAT cassette. After the DAT cassette has been ejected, pull the DAT cassette straight out of the cassette port. Refer to Table 5-2 for the status of DAT cassette and DAT drive busy lights during the cassette eject operation.

Some application software may prohibit the ejection of a DAT cassette until the user exits the application program.

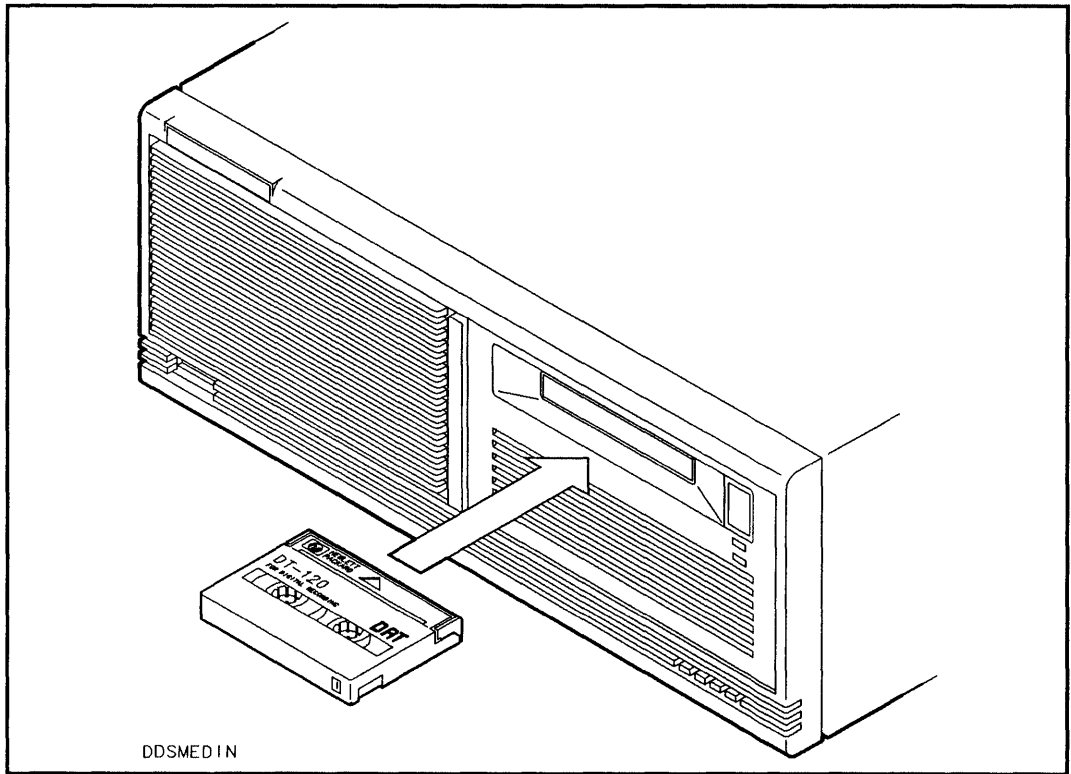


Figure 5-2. Inserting a DAT Cassette

Checking the Busy Lights

When the DAT drive power is switched on, the DAT drive automatically performs a self-test. The cassette busy light indicates the status of the DAT cassette during the self-test and during activity with the host computer. The drive busy light indicates the status of the DAT drive during the self-test and during activity with the host computer. Both busy lights are light-emitting diodes (LEDs) located on the front panel of the DAT drive, and can display either green or yellow colors (see Figure 5-3).

Table 5-2 shows the status of the DAT cassette and DAT drive busy lights during normal operation of the DAT drive, and Table 5-3 shows the status of the DAT cassette and DAT drive busy lights during fault conditions.

If the DAT drive fails the self-test, contact your local Hewlett-Packard Sales and Support Office.

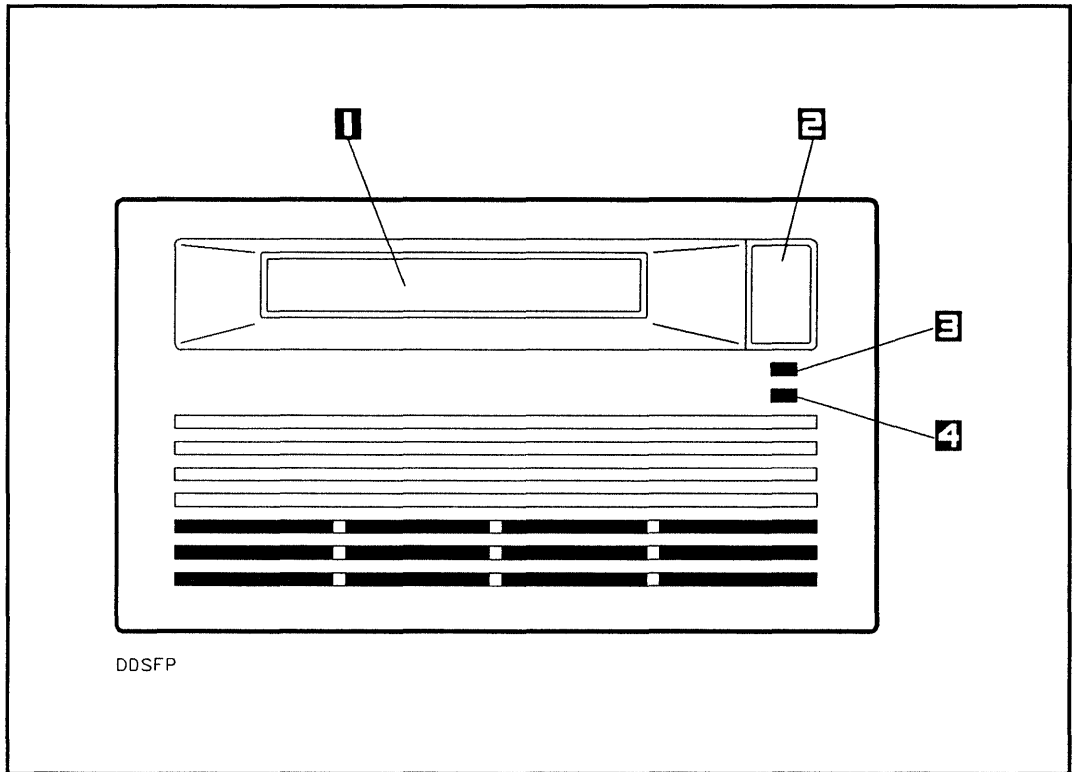


Figure 5-3. DAT Drive Front Panel

1 - Cassette Port

2 - Cassette Eject Button

3 - Cassette Busy Light

4 - Drive Busy Light

**Table 5-2.
DAT Busy Light Status In Normal Operation**

Cassette (Upper) Busy Light	Drive (Lower) Busy Light	Explanation
OFF	OFF	No cassette loaded or power not switched on.
OFF	GREEN (FLASHING RANDOMLY)	No cassette loaded and activity with host.
GREEN (FLASHING)	GREEN (FLASHING)	Loading or unloading a write-enabled cassette.
GREEN	OFF	Write-enabled cassette loaded and drive off-line.
GREEN	GREEN (FLASHING)	Write-enabled cassette loaded and activity with host.
GREEN	GREEN	Write-enabled cassette loaded and drive on-line.
YELLOW	OFF	Write-protected cassette loaded and drive off-line.
YELLOW	YELLOW (FLASHING)	Write-protected cassette loaded and activity with host.
YELLOW	GREEN	Write-protected cassette loaded and drive on-line.

**Table 5-3.
DAT Busy Light Status During Fault Conditions**

Cassette (Upper) Busy Light	Drive (Lower) Busy Light	Explanation
OFF	OFF	Power failure.
GREEN ON 4.5 s / OFF 0.5 s	GREEN or YELLOW	MEDIA WARNING (use Cleaning Cassette or replace tape)
YELLOW	YELLOW	High humidity.
1 YELLOW FLASH	YELLOW	Drive failed.
2 YELLOW FLASHES	YELLOW	Buffer PCA failed.
3 YELLOW FLASHES	YELLOW	Controller PCA failed.

Initializing DAT Media

A DAT cassette does not need to be initialized with a command from the host computer. A DAT cassette is initialized as data is stored on the media.

Writing and Reading Data

After the DAT cassette has been loaded, data can be written to and read from the DAT cassette. (Refer to Volume I of the *HP-UX System Administrator Manual*, part number 98594-90060).)

The following paragraphs describe how to install a DAT (DAT) drive into your mass storage system. A DAT drive can be added to your mass storage system as an upgrade kit. The C2292A upgrade kit includes one DAT drive. Figure 5-4 shows the contents of the C2292A upgrade kit.

A DAT drive can only be installed into slot 1 or slot 3.

This installation procedure is written for personal computer dealers, technicians, and others who are familiar with setting up mass storage devices. If you are not experienced with such tasks, please find an experienced person to help you or contact your local Hewlett-Packard Sales and Support Office.

After a DAT drive is installed into the mass storage system, the mass storage system must be carefully reassembled to ensure compliance with RFI emission requirements and to provide adequate protection against electrical shock and fire hazards.

Handling Precautions

If you do not protect your DAT drive against electrostatic discharge, you may damage your DAT drive and void your warranty.

A static charge of 39,000 volts can be generated on a carpeted floor. Such a voltage exceeds the limits of the DAT drive and can cause unsuccessful operation of the product.

To ensure continuously successful operation of the DAT drive in a carpeted office environment, Hewlett-Packard recommends the use of anti-static mats and anti-static carpets with this product. Refer the *Hewlett-Packard Computer Users Catalog*, part number 5953-2450D, for a complete listing of static control equipment, including anti-static mats and carpets.

Handle the DAT drive with care. The DAT drive is susceptible to mechanical shock and vibration until it is secured into the mass storage system chassis. Never set the DAT drive upside-down or it may be damaged.

The mass storage system contains a BEND/flex* cable that is used to distribute signals to the drives in the mass storage system. When handling the BEND/flex cable, *do not* crease, twist, or stress the cable or its connectors. Also, make sure that the BEND/flex cable is at room temperature when connecting or disconnecting any of its cables. The BEND/flex cable tears easily when it is twisted. When connecting a BEND/flex connector to another connector, push directly from the back of the BEND/flex connector and carefully push it onto the other connector.

* *BEND/flex* is a product of Rogers Corporation.

Unpacking the Upgrade Kit

The first step when installing a DAT drive into your mass storage system is to unpack and identify the contents of the C2292A upgrade kit. Figure 5-4 shows the contents of the C2292A upgrade kit.

TORX* hardware is used in the upgrade kit. This hardware requires the use of special drivers. In this manual, any reference to this type of hardware will be accompanied by the required driver size (for example, "T25").

**TORX is a product of the Camcar Division of Textron, Inc.*

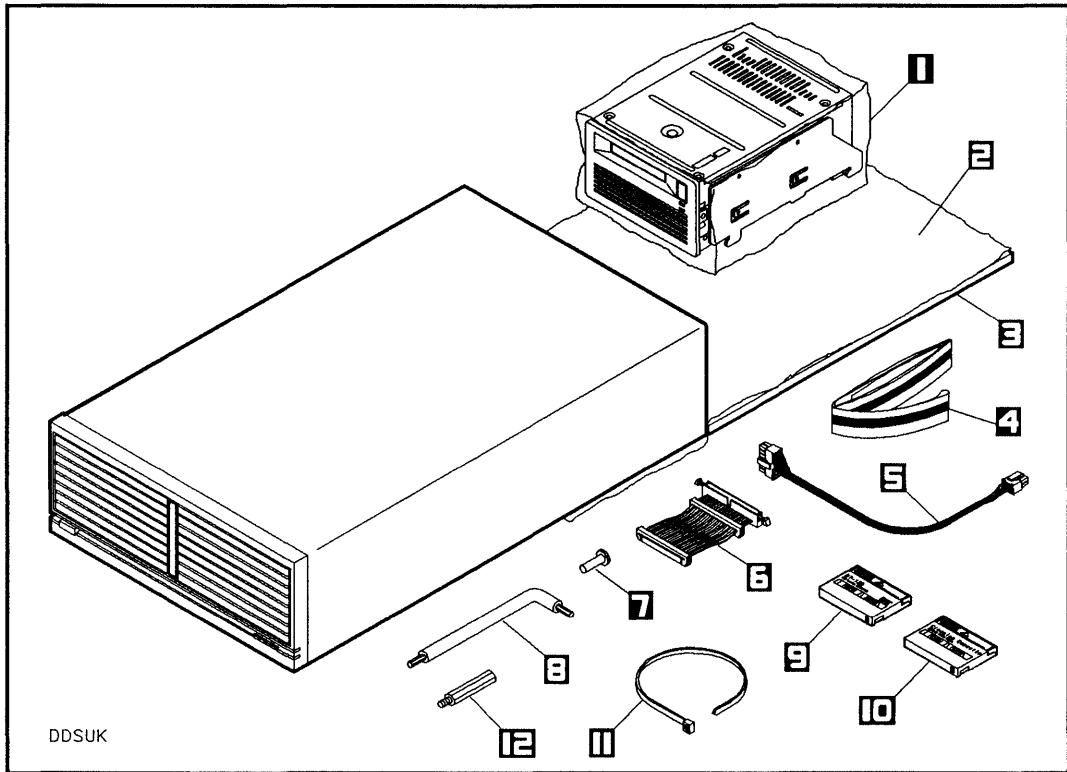


Figure 5-4. DAT Drive Upgrade Kit Contents

- | | |
|---|--|
| 1-DAT Drive, 1.3-gigabyte (C1502A) | 7-Screw, T25, 10 mm (0515-0386) |
| 2-Conductive Sheet (07961-80021) | 8-TORX Tools |
| 3-Foam Pad (07961-80022) | 9-DAT Cassette, 1.3-gigabyte (9164-0334) |
| 4-Wrist Ground Strap (9300-1408) | 10-Cleaning Cassette (92283K) |
| 5-DC Power Cable (C2201-60122) | 11-Cable Tie (1400-0249) |
| 6-BEND/flex Cable Adapter (C2212-60048) | 12-Hex Standoff (C2212-20001) |

Learning About Upgrade Kit Parts

The following paragraphs describe the characteristics and functions of the parts in the C2292A upgrade kit.

DAT Drive

See “Product Description” in this chapter.

Mounting Bracket

The mounting bracket is a bracket that holds the DAT drive and is mounted inside the mass storage system chassis.

DC Power Cable

The dc power cable is a 4-pin cable that passes dc power from the mass storage system power supply to the DAT drive.

T25 Screw

The T25 screw secures the DAT drive to the mass storage system chassis.

Cable Tie

The cable tie is for wrapping the power cables in place once the new SCSI device is installed.

Conductive Sheet

The conductive sheet is an anti-static sheet that is placed under the DAT drive to prevent electrostatic damage.

Foam Pad

The foam pad is placed under the conductive sheet to prevent mechanical shock and vibration damage to the DAT drive before it is mounted into the mass storage system chassis.

Wrist Ground Strap

The wrist ground strap is used to ensure that the DAT drive, the conductive sheet, the mass storage system chassis, and your hand are all at the same electrical potential.

TORX Tools

The TORX tools are used to drive TORX screws.

Hex Standoff

The hex standoff is use when a hard disk drive is installed (or moved) into slot 2.

BEND/flex Cable Adapter

The BEND/flex cable adapter is a 50-pin cable with two connectors that adapt the Small Computer System Interface (SCSI) connectors on the DAT drive to the SCSI connector on the BEND/flex cable. The BEND/flex cable SCSI connector enables DAT drives to communicate with the host computer (initiator) over an industry-standard single-ended SCSI bus.

Address Jumpers

The address jumpers are used to connect address pin sets together. This sets the SCSI address of your DAT drive. The DAT drive is shipped with four address jumpers installed across one pin (not set).

DAT Cassette

See "Product Media" in this chapter.

Cleaning Cassette

The cleaning cassette is used to clean the tape head within the DAT drive periodically.

Preparing to Install a DAT Drive

Before installing a DAT drive, make sure you have access to all sides of the mass storage system, and that the mass storage system is near an ac power outlet.

1. Shut down the host computer.
2. Turn off power to both the host computer and the mass storage system.
3. Disconnect the SCSI cables from the mass storage system rear panel.
4. Set the **LINE** switch on the mass storage system front panel to the 0 (out) position.
5. Connect the power cord from the mass storage system rear panel to an ac power outlet.
6. Place the rear of the mass storage system chassis on the conductive sheet as shown in Figure 5-4.
7. Wrap one end of the wrist ground strap around your wrist and apply the copper end to a flat, unpainted area of the mass storage system chassis. The mass storage system chassis, the conductive sheet, and your hand are now at the same electrical potential.

Keep the wrist strap on until you have performed all the steps in the installation procedure.

8. Slide the foam pad beneath the loose end of the conductive sheet, while making sure the mass storage system chassis maintains contact with the conductive sheet.

9. Place the bag containing the DAT drive on the conductive sheet. Cut open the bag, remove the DAT drive, and place the DAT drive on the conductive sheet.
10. Set the address jumpers on the DAT drive to the desired address (refer to “Setting the Address Jumpers”).
11. Disconnect the ac power cord from the mass storage system rear panel.

Ensure that the **LINE** switch on the mass storage system front panel is in the 0 (out) position, and that the power cord is disconnected from the mass storage system rear panel. Electrical shock may result if the power cord is connected and the **LINE** switch is in the 1 (in) position while the top cover is off.

Setting the Address Jumpers

The address switches on the back of your mass storage system are for hard disk drives only.

The address pin sets on the rear panel of the DAT drive enable you to select a unique SCSI address for the drive (see Figure 5-5). The numbers 0, 1, and 2 above the pin sets correspond to SCSI address bits 0, 1, and 2. When a jumper is placed on a pin set, the corresponding address bit is set to 1. When no jumper is in place on a pin set, the corresponding address bit is set to 0. Your DAT drive is shipped from the factory with four jumpers installed on one of the address pin sets (not set), so the SCSI address is set to 0.

Make sure your DAT drive is set to a unique SCSI address relative to the other devices on the SCSI bus. The mass storage system will not function properly if two devices in the mass storage system have the same SCSI address. Refer to chapter 1 for information on checking address switch settings for the hard disk drives.

To set your DAT drive to a different address before installing the DAT drive into the mass storage system, install jumpers across address pin sets to set address bits to 1, or leave jumpers off address pin sets to set address bits to 0. Table 5-4 shows the SCSI address for the corresponding bit settings.

To set the address to a different setting after your DAT drive has been installed into your mass storage system chassis, perform the following steps:

1. Set the mass storage system **LINE⁻** switch to the 0 (out) position.
2. Disconnect the power cord from the mass storage system rear panel.
3. Remove the front panel and top cover (refer to “Removing the Front Panel and Top Cover” in this chapter).
4. Install jumpers across address pin sets to set address bits to 1, or leave jumpers off address pin sets to set address bits to 0.

5. Install the front panel and top cover (refer to “Reinstalling the Front Panel and Top Cover” in this chapter).
6. Connect the power cord to the mass storage system rear panel.
7. Set the mass storage system **LINE** switch to the 1 (in) position.

Table 5-4. DAT Drive Address Pin Settings

SCSI Address	Bit 2	Bit 1	Bit 0
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

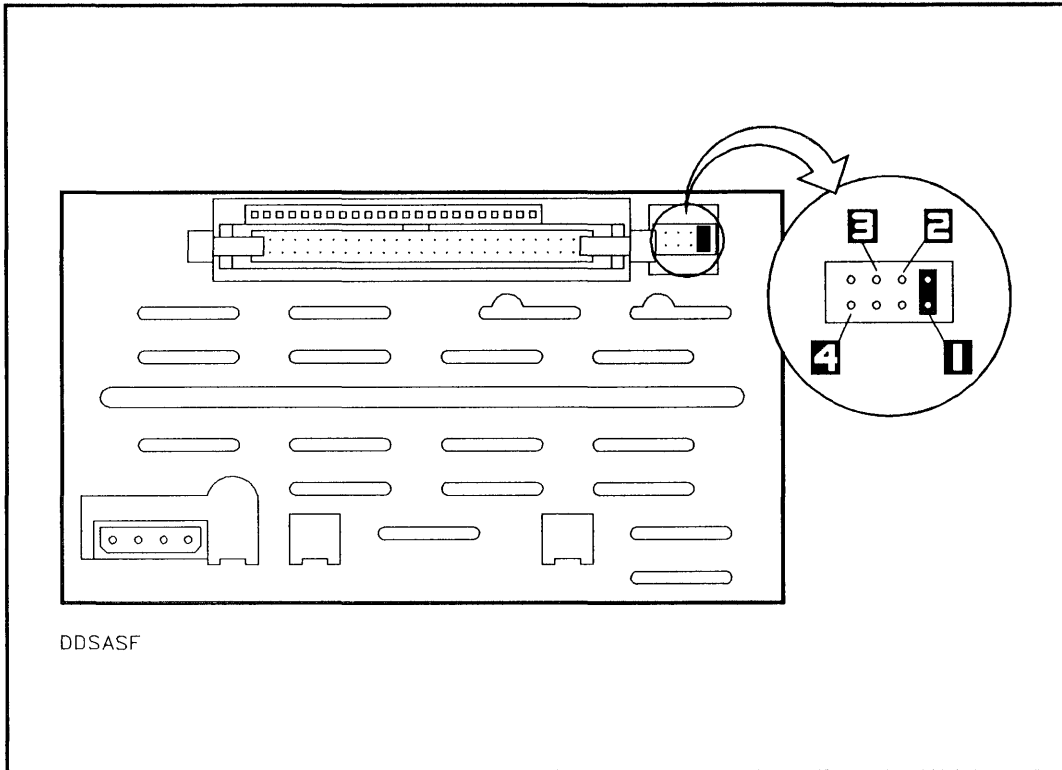


Figure 5-5. DAT Drive Address Pins

1-SCSI Address Bit 0

3-SCSI Address Bit 2

2-SCSI Address Bit 1

4-Termination Power (not used)

Removing the Front Panel and Top Cover

Remove the front panel and top cover as follows (see Figure 5-6):

1. Slide the front of the mass storage system chassis beyond the edge of the table top until the front panel locking tabs are exposed. The tabs are located on the underside of the chassis.
2. Press up on the front panel locking tabs until the front panel releases from the mass storage system chassis.
3. Pull the bottom of the front panel forward, rotate the front panel up, and lift the front panel mounting tabs out of slots in the front edge of the top cover.
4. Remove the two T15 top cover screws.
5. Slide the rear of the top cover one-half inch beyond the rear of the mass storage system chassis, then lift the front of the top cover up and off the mass storage system chassis.

Removing the Front Panel Bezels

Remove a front panel bezels as follows:

1. Position your thumbs in front of the bezel on the right-hand and left-hand edges of the bezel (see Figure 5-7).
2. Gently push the bezel out with your thumbs.

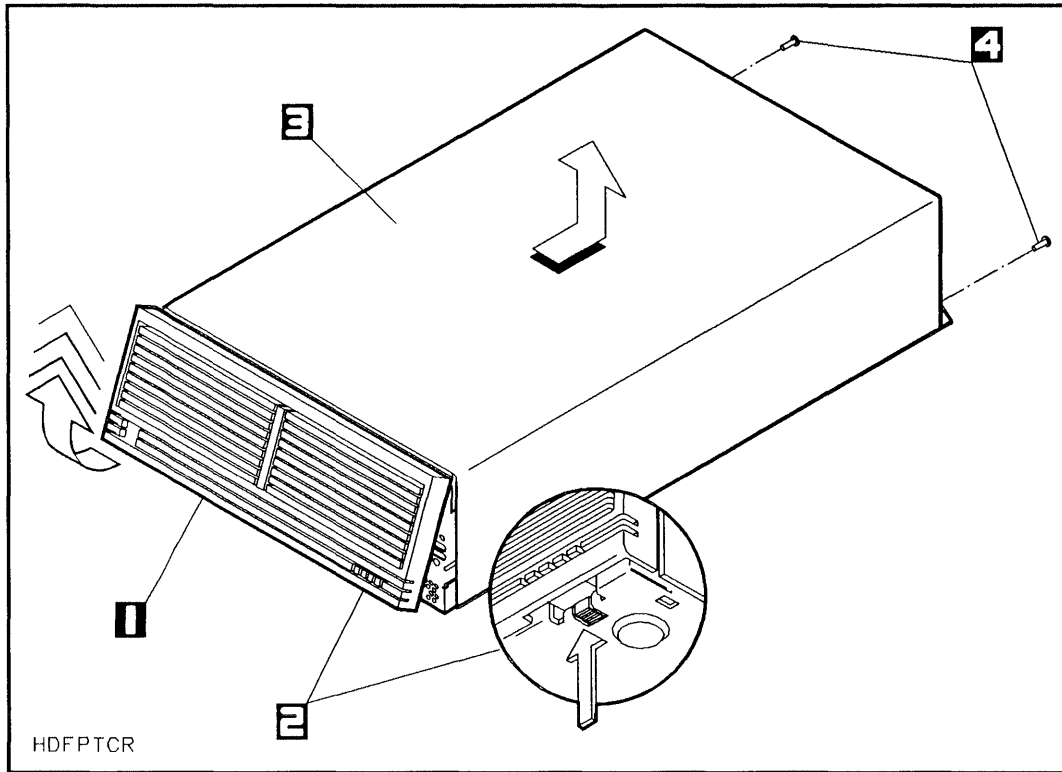


Figure 5-6. Front Panel and Top Cover Installation and Removal

1–Front Panel

3–Top Cover

2–Front Panel Locking Tabs

4–T15 Top Cover Screws

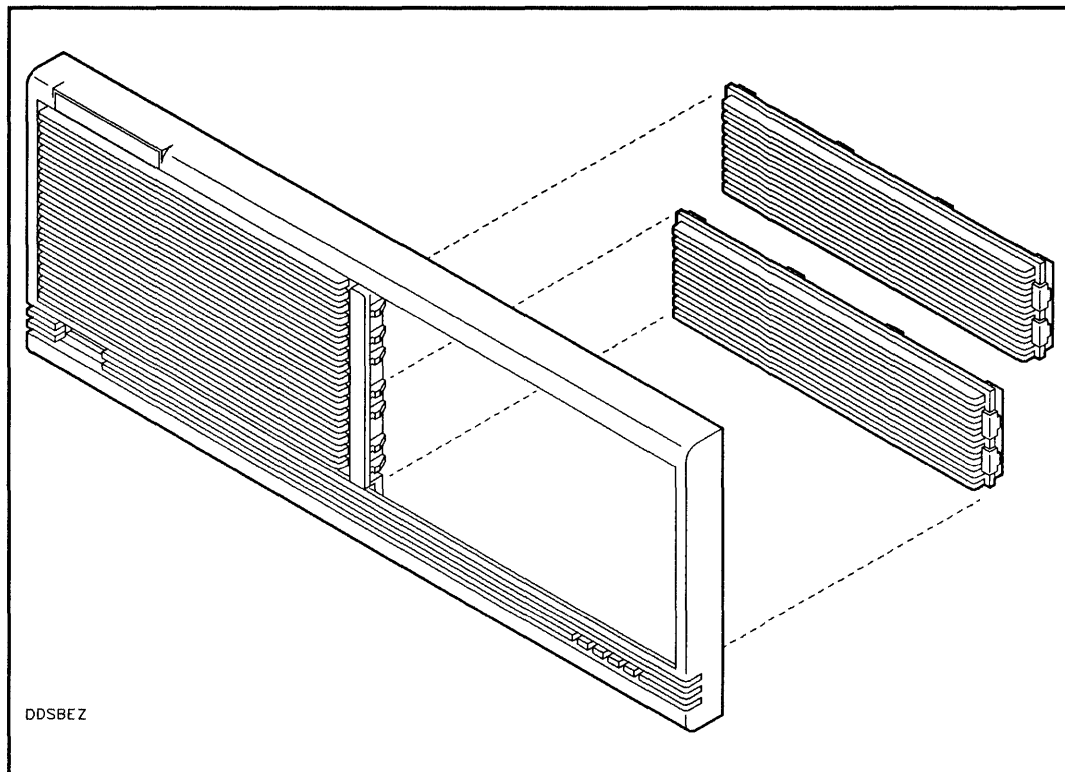


Figure 5-7. Removing the Front Panel Bezels

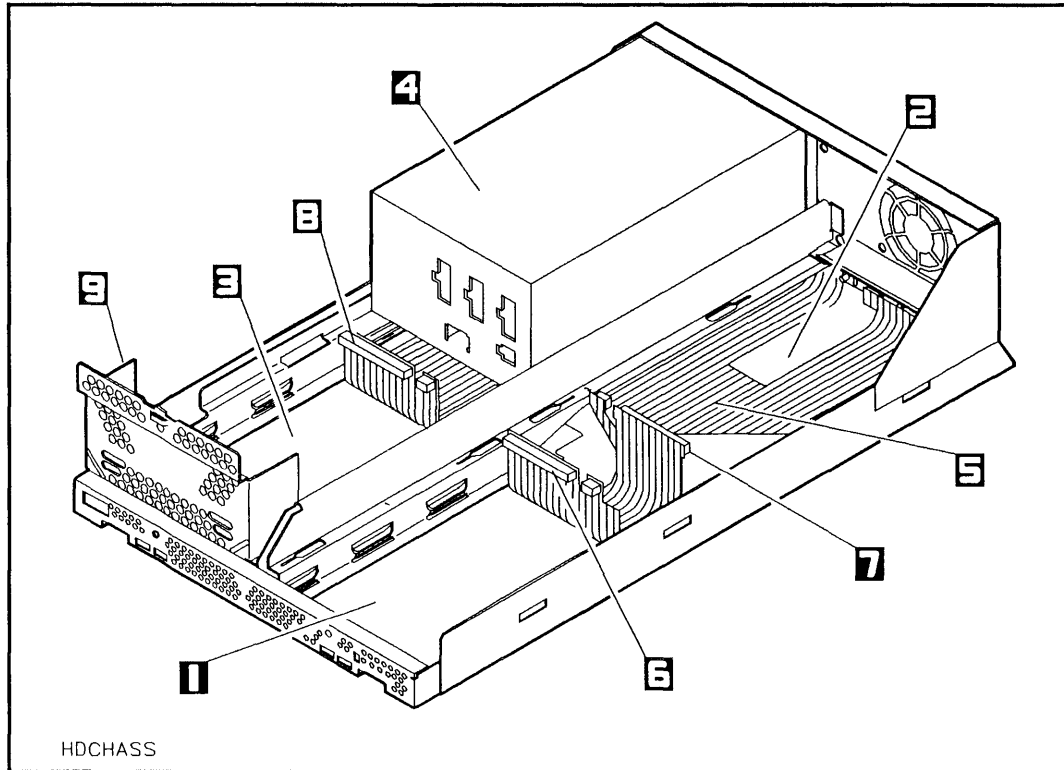


Figure 5-8. Mass Storage System Chassis

- | | |
|-------------------|------------------------------|
| 1-Slot 1 | 6-Slot 1 BEND/flex Connector |
| 2-Slot 2 | 7-Slot 2 BEND/flex Connector |
| 3-Slot 3 | 8-Slot 3 BEND/flex Connector |
| 4-Power Supply | 9-RFI Bracket |
| 5-BEND/flex Cable | |

Removing the Hard Disk Drive from Slot 1 or Slot 3

The DAT drive can be installed into slot 1 or slot 3. If your mass storage system was shipped with a hard disk drive in slot 1, you must first move the hard disk drive (refer to chapter 2).

Removing the RFI Bracket from Slot 3

If you are not installing the DAT drive into slot 3, proceed to the next section.

The mass storage system chassis is shipped with a radio frequency interference (RFI) bracket in slot 3. The RFI bracket ensures the compliance of your mass storage system with RFI emission requirements whenever there is no device in slot 3. If you are installing a SCSI device into slot 3, you must first remove the RFI bracket as follows (see Figure 5-9):

1. Remove the T25 screw from the front of the mass storage system chassis.
2. Use a flat-bladed screwdriver to pry the RFI bracket away from the mass storage system chassis.
3. Slide the RFI bracket on the chassis rails toward the center of the mass storage system chassis until the mounting tabs stop against the ends of the mounting slots.
4. Lift the RFI bracket out of the chassis.

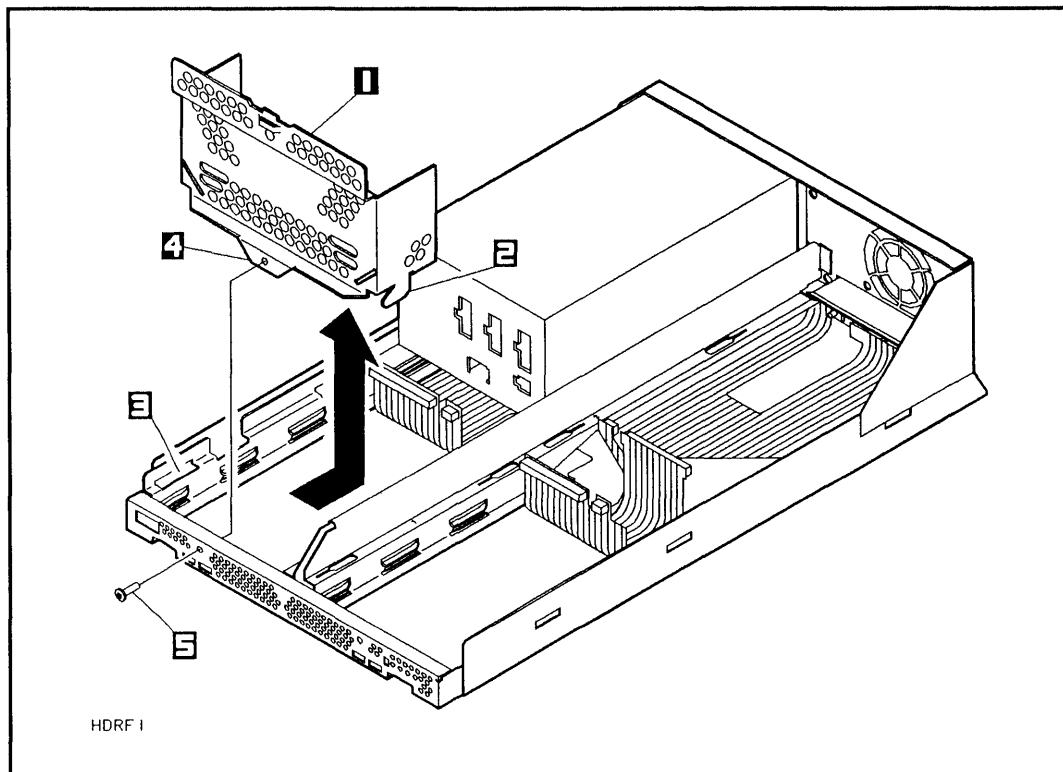


Figure 5-9. Removing the RFI Bracket

1-RFI Bracket

2-Mounting Tab (1 of 2)

3-Mounting Slot

4-Securing Tab

5-T25 Screw

Installing the DAT Drive

Install the DAT drive into the mass storage system as follows (see Figure 5-10 or Figure 5-11:

1. Lift the DAT drive from the conductive sheet, push the BEND/flex cable toward the center of the mass storage system chassis, and lower the mounting tabs into the mounting slots in the chassis rails.
2. Push down on the DAT drive and slide it on the chassis rails toward the front of the mass storage system chassis until the mounting tabs lock into the mounting slots and the DAT drive stops against the front of the chassis.
3. Tighten the T25 screw into the DAT drive securing tab.

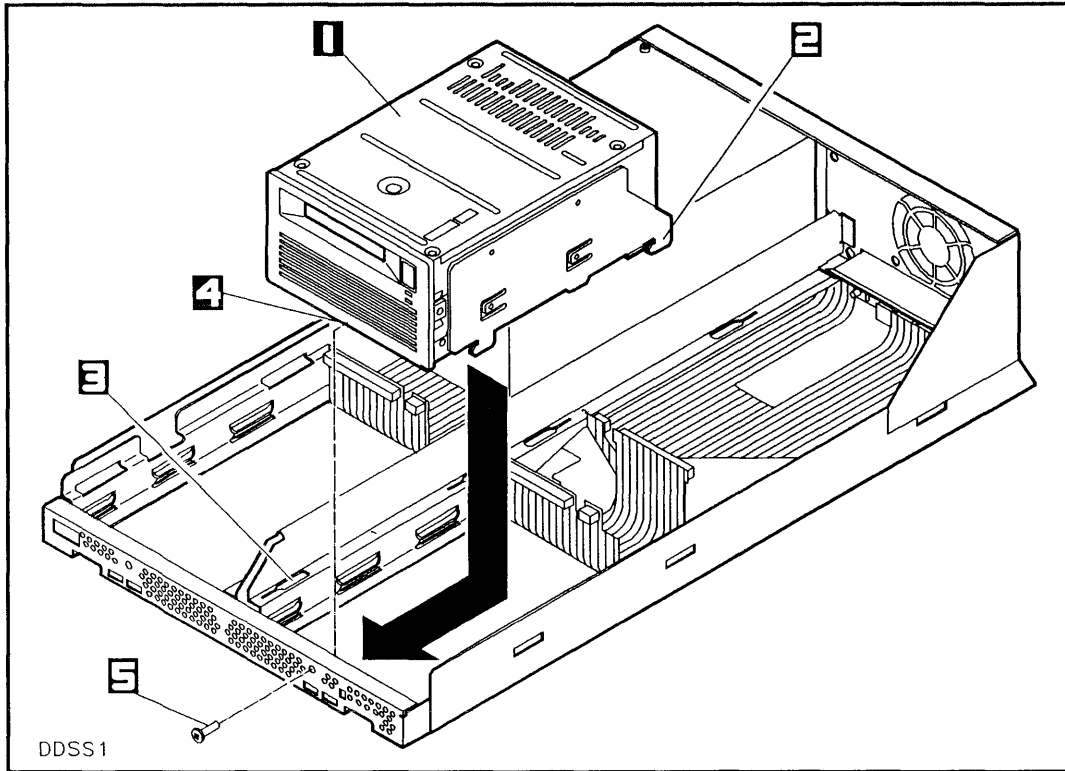


Figure 5-10. Installing the DAT Drive into Slot 1

1-DAT Drive

4-Securing Tab

2-Mounting Tab (1 of 4)

5-T25 Screw

3-Mounting Slot (1 of 4)

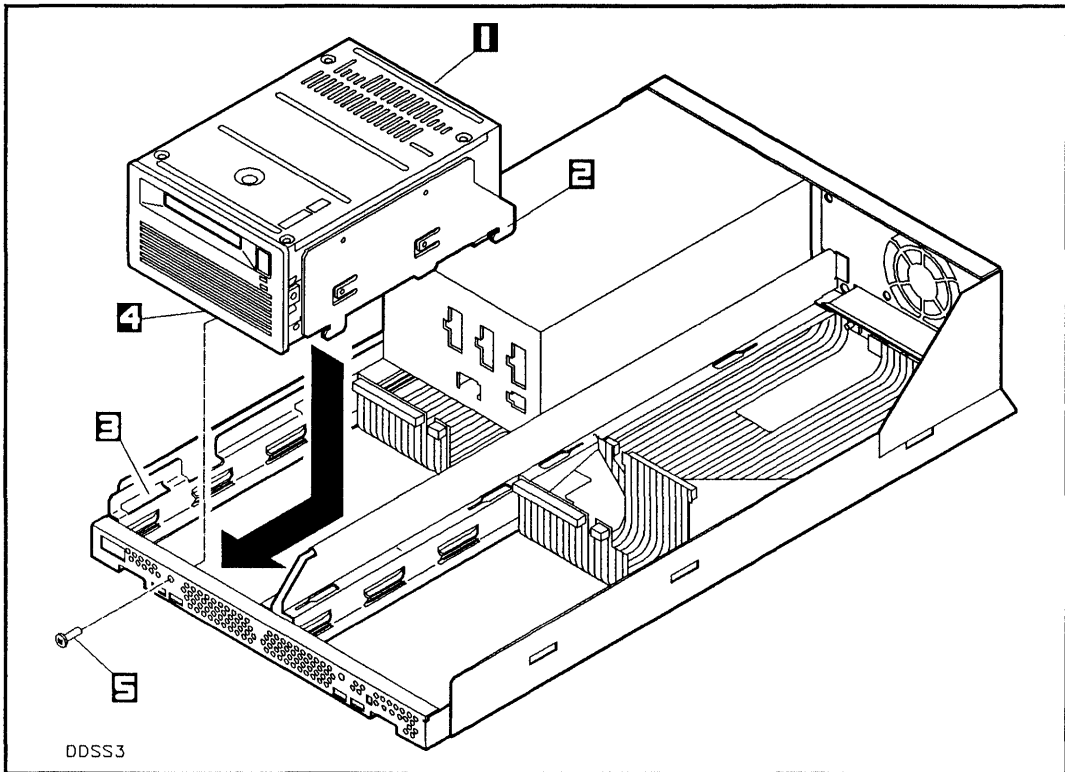


Figure 5-11. Installing the DAT Drive into Slot 3

1-DAT Drive

2-Mounting Tab (1 of 4)

3-Mounting Slot (1 of 4)

4-Securing Tab

5-T25 Screw

Connecting the Cables

Connect the cables to the DAT drive as follows (see Figure 5-12 and Figure 5-13):

1. Connect one end of the power cable to any of the unused dc power connectors on the power supply (see Figure 5-13), route the power cable to the DAT drive, and connect the other end of the power cable to the dc power connector on the DAT drive.
2. Connect the BEND/flex cable adapter to the BEND/flex cable.
3. Connect the other end of the BEND/flex cable adapter to the SCSI connector on the DAT drive (see Figure 5-12). The cable adapter may have to be folded slightly as shown to fit properly.

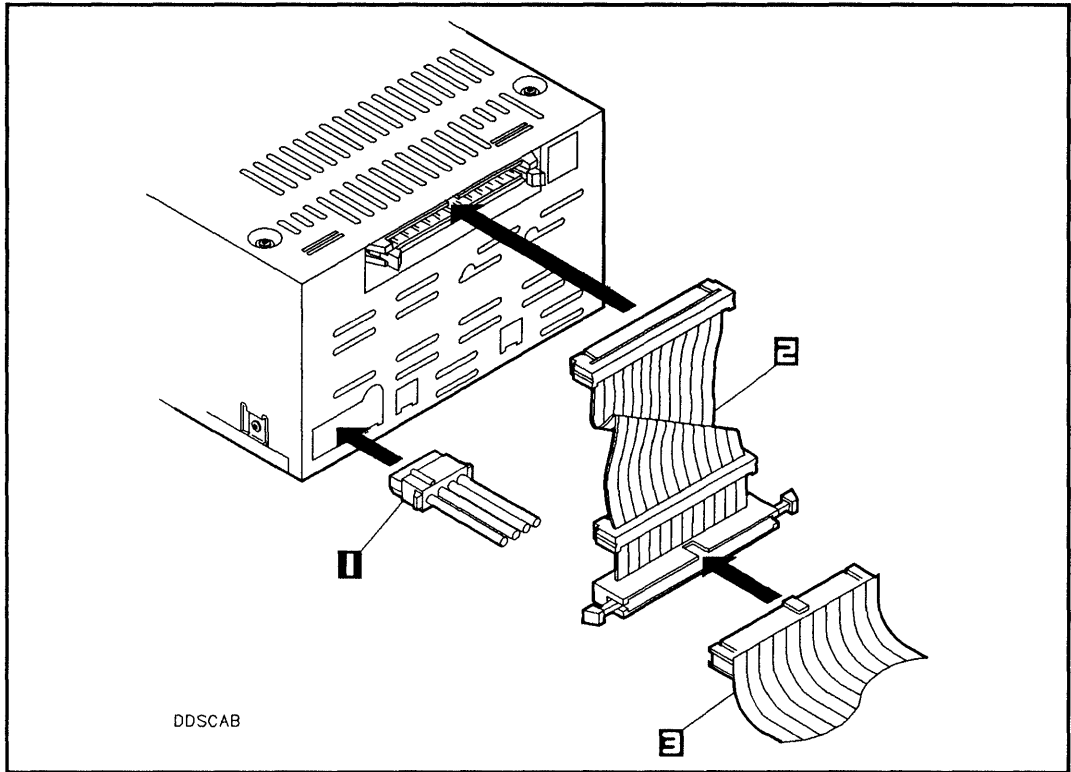


Figure 5-12. Connecting Cables to the DAT Drive

1-DC Power Cable

3-BEND/flex Cable

2-BEND/flex Cable Adapter

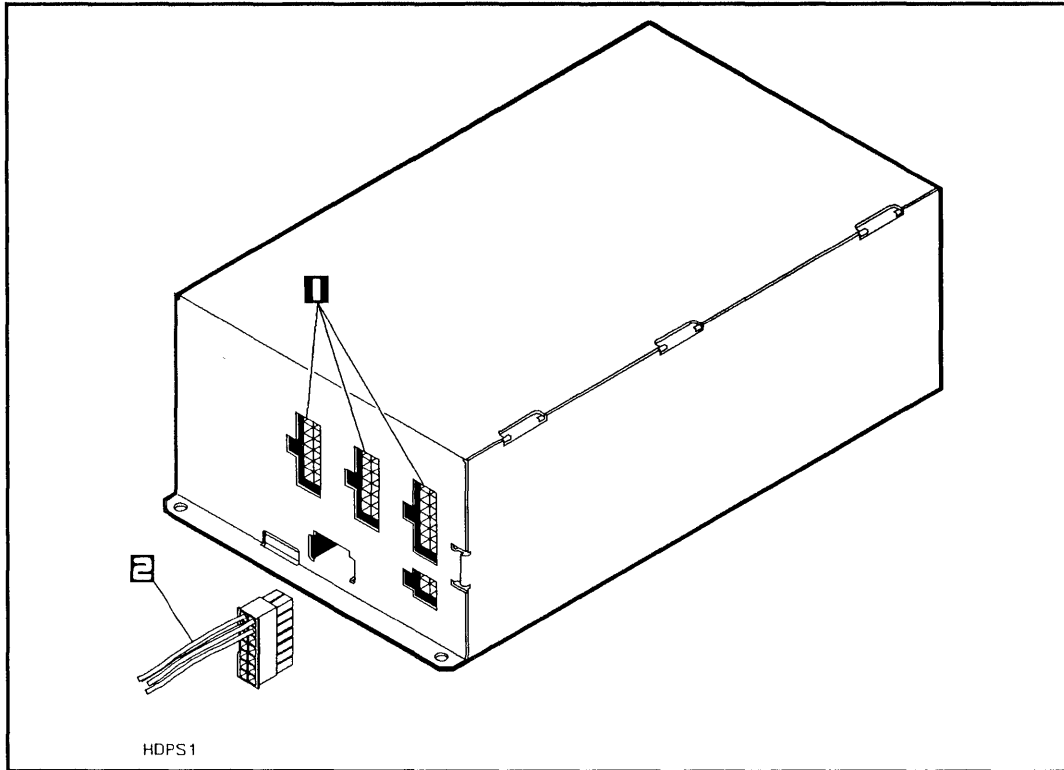


Figure 5-13. Connecting the DC Power Cable

1-DC Power Connectors

2-DC Power Cable

Reinstalling the Front Panel and Top Cover

Reinstall the front panel and top cover as follows:

1. Slide the top cover down over the mass storage system chassis so that the rear of the top cover extends one-half inch beyond the rear of the mass storage system chassis, then slide the top cover forward into place.
2. Install and tighten the T15 top cover screws.
3. Insert the front panel mounting tabs into the slots in the top cover and swing the front panel down until the **LINE** switch comes through the opening in the front panel.
4. Push the bottom edge of the front panel into the front of the chassis until the front panel locking tabs engage.
5. Remove the wrist strap from the mass storage system chassis and your wrist.

This section describes how to remove a DAT drive from your mass storage system. If a DAT drive has been installed into slot 1 and you are adding a rewritable optical drive to your mass storage system, the DAT drive must be removed from slot 1.

This removal procedure is written for personal computer dealers, technicians, and others who are familiar with setting up mass storage devices. If you are not experienced with such tasks, please find an experienced person to help you or contact your local HP Sales and Support Office for service.

After a DAT drive is removed from the mass storage system, the mass storage system must be carefully reassembled to ensure compliance with RFI emission requirements and to provide adequate protection against electrical shock and fire hazards.

Handling Precautions

Electrostatic discharge can damage the DAT drive and associated electronics. The installation procedure must be performed in areas with carpeting treated for ESD protection or in areas with conductive flooring. If you do not protect the DAT drive against electrostatic discharge, you may damage the DAT drive and void your warranty.

Handle the DAT drive with care. The DAT drive is susceptible to mechanical shock, vibration, and electrostatic discharge until it is secured into the mass storage system chassis. Never set the DAT drive upside-down or the DAT drive may be damaged.

Preparing to Remove a DAT Drive

1. Shut down the host computer.
2. Turn off power to both the host computer and the mass storage system.
3. Disconnect the SCSI cables from the mass storage system rear panel.
4. Set the **LINE~** switch to the 0 (out) position and connect the power cord from the mass storage system rear panel to an ac power outlet.
5. Wrap one end of the ground strap around your wrist and apply the copper end to a flat, unpainted area of the mass storage system chassis.

Keep the wrist strap on until you have performed all the steps in the removal procedure.

6. Disconnect the ac power cord from the mass storage system rear panel.

Ensure that the **LINE~ switch on the mass storage system front panel is in the 0 (out) position, and that the power cord is disconnected from the mass storage system rear panel. Electrical shock may result if the power cord is connected and the **LINE~** switch is in the 1 (in) position while the top cover is off.**

7. Remove the front panel and top cover from the mass storage system (refer to “Removing the Front Panel and Top Cover” in this chapter).

Disconnecting the Cables

Disconnect the cables from the DAT drive as follows:

1. Disconnect the dc power cable from the dc power connector on the DAT drive.
2. Disconnect the dc power cable from the slot 1 power connector on the power supply (see Figure 5-13), then cut the power cable tie wrap.
3. Disconnect the BEND/flex SCSI connector from the DAT drive SCSI connector by pressing both cable ejectors outwards until the cable is removed.
4. Disconnect the cable adapter from the BEND/flex SCSI connector by pressing both cable ejectors outwards until the cable is removed.

Removing the DAT Drive

Remove the DAT drive from your mass storage system chassis as follows:

1. Remove the T25 screw from the front of the mass storage system chassis (see Figure 5-10).
2. Use a flat-bladed screw driver to pry the front of the DAT drive away from the mass storage system chassis.
3. Slide the DAT drive on the chassis rails toward the center of the mass storage system chassis until the mounting tabs stop against the ends of the mounting slots.
4. Push the BEND/flex cable connectors toward the center of the chassis and lift the DAT drive out of the mass storage system chassis and onto the conductive sheet.

If you are relocating your DAT drive within your mass storage system, proceed now to the “Installing the DAT Drive” in this chapter.

5. If the DAT drive is not being relocated into another slot, place the DAT drive into a conductive bag.
6. Install the front panel and top cover on the mass storage system chassis (refer to “Installing the Front Panel and Top Cover” in this chapter).
7. Remove the wrist strap from the mass storage system chassis and your wrist.

The only maintenance the DAT drive requires is cleaning of the read/write heads.

The performance and reliability of the DAT drive depend upon its operating environment. Make sure the DAT drive operates within the environmental restrictions listed in this chapter (refer to “Environmental Requirements”).

Cleaning Cassette

During normal use of the DAT drive, the read/write heads pick up residue from the DAT cassette. The heads should be cleaned at the following times:

After every 10 hours of use or more frequently if required.

If the media warning is displayed by the busy lights (see Table 5-3).

You should clean the heads with the cleaning cassette that is provided with your DAT drive. To clean the heads, follow the instructions on the cleaning cassette case.

If the DAT drive requires service, perform the following steps:

1. Contact your local Hewlett-Packard Sales and Support Office.
2. Explain the problem you are having with the DAT drive.
3. State the serial number of the DAT drive.

If you have any questions about the warranty on your drive, please contact your local Hewlett-Packard Sales and Support Office.

Following are the operating specifications and environmental requirements for the DAT drive.

For a complete list of technical specifications for your mass storage system, refer to chapter 1.

Operating Specifications

The following information stipulates the specifications and characteristics of this product when installed and operated within the limits specified under “Environmental Requirements” in this chapter.

PERFORMANCE

Data transfer rate (asynchronous)

Maximum sustained:	183 kilobytes per second
Maximum burst:	1.5 megabytes per second

Access time

Average random:	20 seconds ¹
-----------------	-------------------------

¹*Available on selected HP systems by the end of 1990.*

FUNCTIONAL

Load time:	25 seconds (from cassette inserted until ready to perform first command)
Unload time:	10 seconds (wind tape to BOT, unthread, and eject cassette)

MEDIA

Type:	60 meter (120-minute) DAT
Format:	helical-scan digital audio tape
Data capacity:	1.3 gigabytes
Record size:	512 bytes

Environmental Requirements

DAT cassettes should only be used at temperatures between 5°C (40°F) and 45°C (113°F). Also, do not transfer data to or from the DAT cassette if the temperature is changing more than 10°C per hour. However, DAT cassettes can be stored at temperatures down to -40°C (-40°F).

TEMPERATURE

Operating ¹ :	5°C to 40°C (41°F to 104°F)
--------------------------	-----------------------------

¹Temperature specifications are exceptions to the specifications listed in chapter 1. Do not transfer data to and from the DAT cassette if the temperature is changing more than 10°C per hour.

ALTITUDE

Operating ¹ :	minimum 0 m (0 ft) maximum 4 600 m (15,000 ft)
Nonoperating ¹ :	minimum 0 m (0 ft) maximum 15 240 m (50,000 ft)

¹*Operating and nonoperating altitude specification is an exception to the specifications listed in chapter 1.*

HUMIDITY

Operating ² :	20% to 80% RH (noncondensing)
Nonoperating ² :	5% to 95% RH (noncondensing)
Maximum wetbulb temperature ² :	26°C (79°F)

²*Humidity specifications are exceptions to specifications listed in chapter 1.*

Glossary

An address is a unique number determined by a switch setting on the SCSI bus. Each device on the bus must be set to its own number, so the host computer can identify which device is currently active or addressed.

Each device connected to the Small Computer System Interface (SCSI) bus must have its own unique address. The address switches on the rear panel of the mass storage system are connected to the installed hard disk drives. The SCSI address settings for devices other than hard disk drives are either switches or jumpers that are located on the device itself.

An automatic ranging power supply senses the voltage of the power in your area and automatically adjusts its internal circuits for that voltage, producing the proper internal working voltages regardless of external voltage applied. An automatic ranging power supply therefore does not require an external voltage selector switch or need an external fuse.

For recovering data in an emergency situation, important information on a hard disk drive is copied to another disk or tape medium. This copy is called a backup copy.

BEND/flex cable is a brand name of flexible cabling used within your mass storage system. BEND/flex is a product of Rogers Corporation.

This is an abbreviation in common use for binary digit.

This is an abbreviation for Beginning Of Media. A digital audio tape is said to be at the BOM when it has unthreaded and can be ejected, exactly the same way a video cassette is removed.

This is an abbreviation for Beginning Of Tape. Once a digital audio tape has been loaded and threaded and is ready to use, it is at BOT.

Compact Disc-Read Only Memory is the same as consumer (audio) Compact Disc technology, and is used to store large amounts of read-only computer data. (The spelling of Compact Disc with a "c" for *disc* is an accepted industry standard for audio media. In this manual, however, the more familiar term CD-ROM *disk* is used, unless referring explicitly to the playing of audio Compact Discs.)

A controller PCA (Printed Circuit Assembly) connects the SCSI bus cable and the power supply cable to a disk drive (or other SCSI device), and performs the SCSI commands as directed by the host computer system.

The temperature at which a magnetic material becomes easier to magnetize is its Curie point. Rewritable optical drives take advantage of this phenomenon: the laser quickly heats a spot on the Magneto-Optical (MO) disk

to 150°C (its Curie point), allowing the drive's magnet to change the magnetic polarity of a bit.

This is an abbreviation for Direct Access Secondary Storage. This is an area of mass storage between magnetic hard disk primary storage and off-line magnetic tape storage. DASS is provided by the rewritable optical disk drive, and allows convenient access to a vast library of archived text, graphics, image, voice, and data files.

DAT is an abbreviation for Digital Audio Tape. DAT is identical to the media that is used in the audio industry. A single cassette holds up to 1.3 Gigabytes of digital information written in DDS format.

Digital Data Storage Format is a standard data formatting scheme for tape, originally developed by Hewlett-Packard and Sony Corporation. DDS format is used by the Digital Audio Tape or DAT.

The identification and correction of data errors that occur in the reading and writing processes is called error detection and error correction. Redundant stored information is used to identify errors. Error Detection Codes along with Error Correction Codes are used to reconstruct the data if an error is detected.

A hard disk drive contains a nonremovable (hard) disk mechanism and its associated electronics necessary to perform reading and writing of data onto the disk. The hard disk drives referred to in this manual all have embedded SCSI controller PCAs attached to them, and are installed as a unit.

Three lights are visible in the lower right-hand corner of the mass storage system front panel . These Light Emitting Diodes or LEDs are connected to the hard disk drives in the slots corresponding to the number 1, 2, or 3. The lights show hard disk drive self-test status and activity. Lights for empty slots (or slots that contain devices other than hard disk drives) will remain off, since they are not connected. If a device other than a hard disk drive is installed, it will have its own indicator light or lights on its own front panel.

This is an abbreviation for Input/Output. A device that has removable media, such as a tape or removable disk, allows you to put files or information into your computer or take information out. This function of adding and removing data is called Input/Output, or simply I/O.

A laser beam is a very narrow beam of intense, single-wavelength (coherent) light used in the process of reading and writing data on optical disk media. The laser used to write on a rewritable optical disk drive is set at a higher power than the laser used to read the same data.

To load means to insert a removable disk or tape medium into a disk or tape drive.

Refer to Rewritable Optical Disk Drive.

In this manual, mass storage system refers to the entire box, including the power supply, all internal SCSI devices, and associated cables and parts.

When a host computer cannot access a particular storage device, that device is said to be off-line. This could be because a disk or tape has not been loaded.

When a host computer has the ability to access a particular storage device, that device is said to be on-line.

The power supply converts alternating current into the necessary direct current at the appropriate voltages needed by each internal device and its associated electronics and controller PCA.

Primary storage typically refers to fixed hard disk drives, which are used for fast, random-access applications. The primary storage devices are used as on-line system disks.

Rewritable optical disk drives provide a removable disk medium that offers high storage density like CD-ROM memory, and can be erased and written to repeatedly like standard magnetic disk media. To write, spots on a magnetic layer on the disk are heated with a laser beam and magnetically polarized by the drive's magnet in one of two directions. These two directions represent either digital 0s or 1s. To read the data, a detector sees the rotation of the beam reflected back from the magnetic layer.

This is an abbreviation for Small Computer System Interface. SCSI is an established industry standard interface that specifies the mechanical, electrical, and

functional requirements for a small computer system bus.

Secondary storage devices are typically tape drives, used to back up and archive data stored on the system disks (see Primary Storage). Secondary storage is also used to log transactions, interchange data, and distribute software. Secondary storage devices always use removable media.

Every time the mass storage system is powered on, each internal device performs a self-test. Various internal pre-programmed tests are attempted, and their status is returned via front panel indicators as to whether the self-test passed or failed. The self-test is only performed when the mass storage system is powered on.

The mass storage system contains four slots, which are available spaces for internal components to be mounted. The power supply always takes up one slot, so there are three remaining slots for peripherals such as hard disk drives.

The back panel of your mass storage system has two SCSI connectors, which form a loop through the mass storage system, connecting to each internal SCSI device. If the mass storage system is the last (or only) device on the SCSI bus, it must have its unused (second) SCSI connector plugged with a SCSI bus terminator.

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Telephone: (52/5) 596 79 33

Hewlett-Packard Ltd.
Miller House
The Ring, Bracknell
Berkshire RG12 1XN, England
Telephone: (44/344) 424-898

