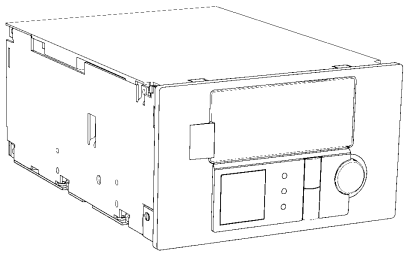
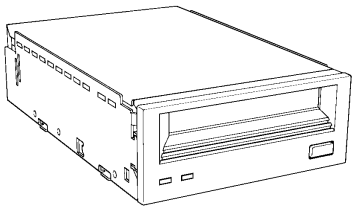
This document contains sections from the following manuals:

HP DDS Technical Manual

HP C1533A DDS-2 Drive (8 gigabyte)
HP C1534A DDS-1 Drive (2 gigabyte)
HP C1536A DDS-DC Drive (4 gigabyte)
HP C1537A & HP C1554A DDS-3 Drive (24 gigabyte)
HP C1539A & HP C1599A DDS-2 Drive (8 gigabyte)
HP C1553A DDS-2 Autoloader (48 gigabyte)
HP C1557A & HP C5648A DDS-3 Autoloader (144 gigabyte)

Volume 2: Integration Guide





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Hewlett-Packard Ltd.
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HP DDS Configuration Guide

HP C1533A DDS-2 Drive (8 gigabyte)
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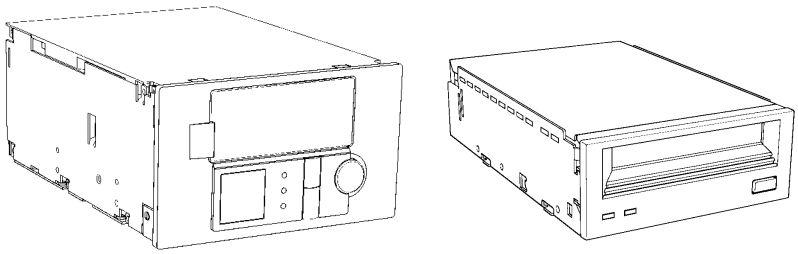

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Filton Road, Stoke Gifford
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Table of Contents

2

Configuration and Initialization

This chapter describes how to establish the current configuration of the drive, including the physical configuration, and how to reconfigure it.

The drive can return complete information about itself, and how it is configured. Unfortunately, much of this information is scattered across a couple of commands and across several Mode pages. The section "Determining Device Type and Configuration" on page 2-3 lists types of information that can be found about the drive, and where to find them.

Note For information on the Configuration switches and how to configure the drive to work with various popular workstations and software applications, see the *HP DDS Configuration Guide* (Volume 5 of the HP DDS Technical Manual).

Initializing and Configuring the Drive

A process of initialization is required when one of the following occurs:

- The drive is configured
- UNIT ATTENTION is received
- A device or medium remount is designated

Initialization consists of finding the current status and configuration of the drive, and then, if necessary, changing the configuration to what the host or user requires. The following procedure is recommended. See *The SCSI Interface*, Volume 3 of the HP DDS Technical Manual, for details of the commands.

1 INQUIRY Command. This gives the following information about the drive:

- Whether it is connected to the bus and powered up
- The device type, product ID and model number
- The manufacturer, firmware revision and date of build
- What SCSI options and specifications it supports

2 TEST UNIT READY Command. This determines the status of the drive by giving CHECK CONDITION status whenever the state of the drive changes. The nature of the status can then be found by sending a REQUEST SENSE command next and reviewing the returned REQUEST SENSE data.

3 REQUEST SENSE Command. This returns Sense data relating to the drive. See Chapter 8 for details.

4 Iterate Steps 2 and 3 to clear any multiple information situations such as:

- The drive has powered up and completed its self-test.
- The drive in the process of executing its self-test.
- A tape is loading.
- A tape is loaded and the drive is ready.
- A tape is unloading.

5 MODE SENSE Command. This returns the configuration of the drive, and the current values of the following configurable parameters:

- The type of tape drive (DDS, QIC, and so on)
- The block mode: fixed-length or variable-length
- The disconnect and reselect parameter configuration
- The device configuration
- The tape format
- The capacity of the current partition
- Whether the tape is write-protected
- Whether the drive is capable of data compression, and if it is enabled

6 MODE SELECT Command. This sets the drive to the following operational modes, required by the host, the application or the user:

- Set block mode
- Set the disconnect and reselect configuration
- Set the device configuration
- Set data compression on or off
- Format a new tape to two partitions, or reformat a tape

Chapter 4, "Factors Affecting Performance", gives information on optimizing modes for best performance.

Determining Device Type and Configuration

A host can determine the type of device and its operational mode by sending the MODE SENSE command. The information can then be extracted from one of the returned pages:

Page	Abbreviation	Code
Mode Parameter Header	*Header*	
Mode Block Descriptor	*Descriptor*	
Disconnect-Reconnect Mode Page	*Disc-Rec Page*	08h
Data Compression Characteristics Mode Page	*DC Char Page*	0Fh
Device Configuration Mode Page	*Dev Config Page*	10h
Medium Partitions Mode Page	*Partitions Page*	11h

The following tables list the information and where it is to be found.

Note For details of the MODE SENSE and MODE SELECT commands, see *The SCSI Interface*, Volume 3 of the DDS Technical Manual.

Finding the Device Type

Description	Value	Location	Byte	Bit
Drive and tape are DDS-1 compliant	13h	*Descriptor*	0	
Drive and tape are DDS-2 compliant	24h	*Descriptor*	0	
Drive and tape are DDS-3 compliant	25h	*Descriptor*	0	
Drive not capable of data compression	0	*DC Char Page*	2	6
Drive capable of data compression:	1	*DC Char Page*	2	6
■ with data compression enabled:	1		3	7
■ with data compression disabled:	0		3	7
Supports DCLZ data compression algorithm	20h	*DC Char Page*	4-7	

Finding the Operational Mode

Description		Value	Location	Byte	Bit
Drive is in Buffered Mode *(default)* ■ Immediate reporting is enabled ■ GOOD status is reported on all write commands after data has been transferred to the drive's data buffer		1	*Header*	2	4-6
Drive has had Buffering Disabled ■ Non-immediate reporting ■ GOOD status is not reported on write commands until all blocks and filemarks have been written successfully to the tape ■ Configured through MODE SELECT		0	*Header*	2	4-6
Variable Block Mode *(default)*		0	*Descriptor*	5-7	
Fixed Block Mode ■ Configured through MODE SELECT		>0	*Descriptor*	5-7	
Bus Inactivity Limit (*default*) ■ The maximum time (in 100 ms increments) for which the drive will assert the BSY signal without a REQ/ACK handshake ■ Configured through MODE SELECT	*HP C1534/36A:* *Other drives:*	38h (5.6s) 14h (2.0s)	*Disc-Rec Page*	4-5	
Maximum Burst size ■ The maximum amount of data the drive will transfer during a data phase before disconnecting, expressed in units of 512 bytes		80h (64 Kb)	*Disc-Rec Page*	10-11	
Read-After-Write is enabled (*default*) ■ The drive rewrites frames which have not been read correctly through RAW ■ You are recommended to keep RAW enabled		0	*Dev Config Page*	2	4
C3 ECC is enabled (*default*) ■ Drive always writes the C3 frame (frame 23), which allows up to any two frames in a group to be corrected ■ You are recommended to keep C3 ECC enabled		1	*Dev Config Page*	2	3
Write Delay Time (*default*) ■ The maximum time (in 100 ms units) that the drive will wait with a partially full buffer before writing to tape ■ Configured through MODE SELECT	*DDS-1/2 drives:* *DDS-3 drives:*	32h (5s) C8h (20s)	*Dev Config Page*	6-7	

Media Status

Description	Information Location	Byte	Bit	Value
Media Loaded	*TEST UNIT READY:* GOOD status returned			
No Media Present	*TEST UNIT READY:* CHECK CONDITION status returned. REQUEST SENSE data: Sense Key = NOT READY: ASC/ASCQ = Medium not present:	 2 12–13	 0–3	 2h 3A 00h
Media is Write-Protected	*Mode Parameter Header** *or* Write, CHECK CONDITION returned. REQUEST SENSE data: Sense Key = MEDIUM PROTECT: ASC/ASCQ = User selected write-protect:	2 2 12–13	7 0–3	1 7 27 00h
Media is single partition	*Partitions Page*	3		0
Media is formatted as two partitions	*Partitions Page* For a 2-Partition tape, the size of Partition 1 (in MB):	3 8–9		1 >0

* This information is also available by executing a WRITE command. When it fails, report the write failure ("tape write-protected") to the calling application.

Note For information on how to obtain further tape capacity information, see Chapter 3 "Use of Tapes".

Determining Revision Levels

The SCSI INQUIRY command returns standard Inquiry data as follows:

Description	Value	Drive	Byte	Bit
Drive is a sequential access device	1		0	0-4
Media is removable	1		1	7
Drive supports synchronous data negotiation	1		7	4
Drive manufacturer	"HP"		8-15	
Product ID (Note: the HP C1539A returns the same value as the HP C1533A)	"HP35470A" "C1534A" "HP35480A" "C1536A" "C1533A" "C1553A" "C1537A" "C1557A"	*DDS-1, non-DC* *DDS-1, non-DC* *DDS-1, DC* *DDS-1, DC* *DDS-2, DC* *DDS-2, DC, autoloader* *DDS-3, DC* *DDS-3, DC, autoloader*	16-31	

The firmware revision can be found from bytes 5–140 of the INQUIRY Vendor-Unique Firmware Revisions page (page C0h) as follows:

Bytes	Data	Example
5–29	`"Firmware Rev = xxxxxxxxxxxxxx"`	`"Firmware Rev = 1.86 "`
30–72	`"Build Date = ddd mmm dd yy. hh:mm GMT"`	`"Build date = Thu Oct 7 93. 15:58 GMT"`
73–140	`"Copyright 1990 by Hewlett Packard Company."`	`"Copyright 1990 by Hewlett Packard Company."`

The Servo revision can be found from bytes 5–24 of the INQUIRY Vendor-Unique Servo Revision page (page C1h):

Bytes	Data	Example
5–24	`"Servo Rev = RRR.VVV"`	`"Servo Rev = 4.1 "`

The revision level and build date of an autoloader's changer mechanism can be found from bytes 5–27 of the INQUIRY Vendor-Unique Changer Firmware Revisions page (page C2h):

Bytes	Data	Example
5–27	`"Firmware Rev = RRR.VVV"`	`"Firmware Rev = 3.1 "`
73–140	`"Build Date = ddd mmm dd yyyy. hh:mm GMT"`	`"Build Date = Fri Sep 29 1995. 10:28 GMT"`

For additional information, see *The SCSI Interface*, Volume 3 of the HP DDS Technical Manual.

2

Configuring and Verifying the Installation

This chapter outlines the basic procedure for configuring a drive, and tells you how to verify that the installation and configuration is correct.

- See Chapter 3 for information on configurations for specific systems.
- See Chapter 4 for an introduction to the Configuration switches themselves.
- See Chapter 5 for a summary table of all the available switch settings.

Configuring a Drive

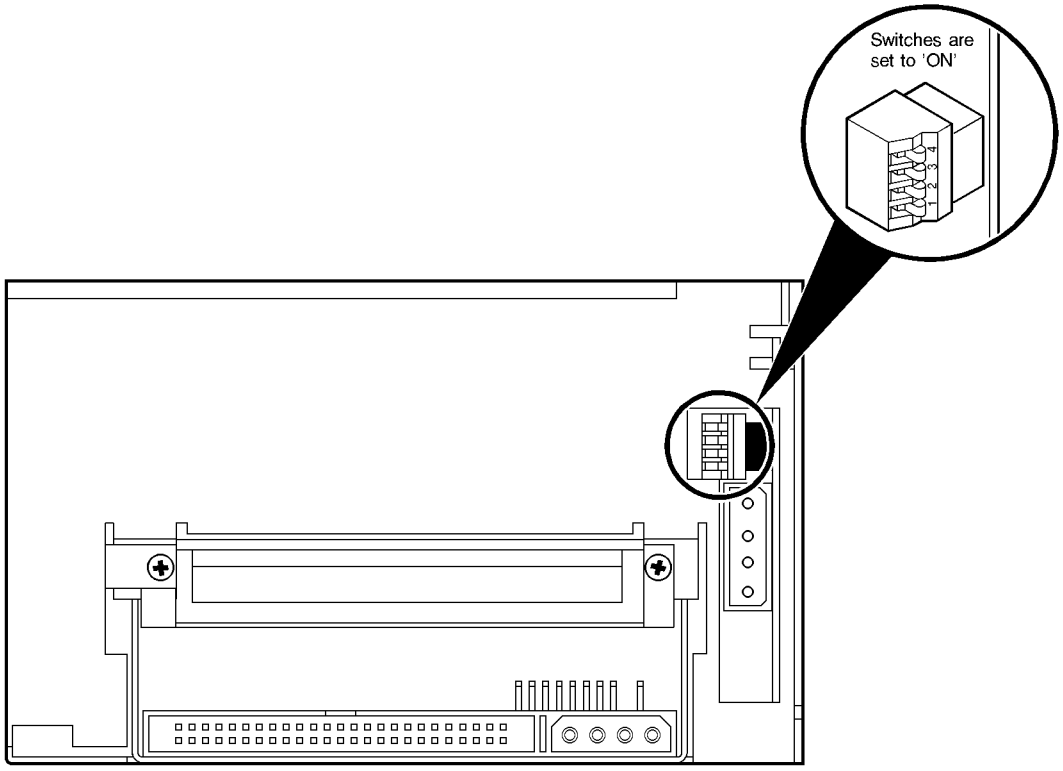
When the drive is powered on, it reads a set of configuration switches on the underside of the drive (see Chapter 4).

To change the configuration:

1. Switch the drive off.
2. Select the correct configuration for your system. See details of different operating systems in Chapter 3 for which switch to use.
3. Switch the drive on again.
4. Ensure that the appropriate drivers and application software are installed on the host computer.

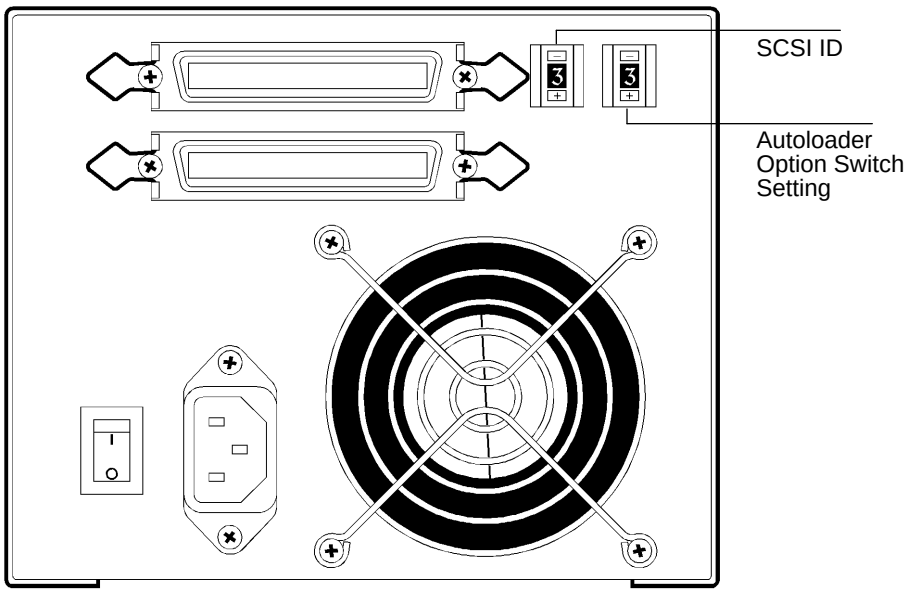
Configuring an Autoloader

Figure 2.1



Internal Autoloaders:
Option Switches

Figure 2.2



External Standalone Autoloaders: Option Switches

To configure an autoloader:

Note See Chapter 3 for details of the settings you need for different systems.

1 Switch the autoloader off.

2 Set the drive configuration on the switches on the underside.

3 Set the autoloader configuration as follows:

Internal built-in autoloaders: set the switches on the rear of the autoloader mechanism (see figure 2.1)
External standalone autoloaders: the value of the option switch settings is the number on the *right* when looking at the rear of the autoloader (see figure 2.2). To change the number, click on the little buttons marked '–' and '+' above and below the number with a ball-point pen or similar.

4 Switch the autoloader on again.

5 Ensure that the appropriate drivers and application software are installed on the host computer.

Verifying the Installation of the Drive (UNIX)

As part of the installation process, you will have installed the appropriate device driver for your UNIX system, and created device files to communicate with the tape drive.

This section describes how you can verify that the installation has been performed correctly.

In outline, the procedure is as follows:

1 Write test data to a tape.

2 Read the test data from the tape.

3 Compare the data read from the tape with the original data on disk.

To verify the installation:

1 Write an example file to tape, using '`tar`':

```
% cd /
% tar cvf <archive name> <file>
```

The options to `tar` have the following meanings:

`c`	Create a new archive on the device.
`v`	Operate in verbose mode.
`f`	Specify the archive name explicitly.

The arguments follow the `cvf` options in the command line. Their values depend on the operating system; suggested values are given in "System-Specific Arguments" below. The arguments are as follows:

`<archive name>`	The name of the archive name to be created. *Example:* `/dev/rmt/0m`
`<file>`	The name of the file to put into the archive, prefixed with '`./`'. *Example:* `./stand/vmunix`

Note Make sure you prefix the file name with a '`.`' when you back it up to tape. If you do not, the restore operation in step 2 will overwrite the original copy on disk.

2 Read the file back from tape:

```
% cd /tmp
% tar xvf <archive name>
```

The '`x`' option to `tar` here means "extract from the archive".
Use the same value for the `<archive name>` argument as in step 1.

3 Compare the original with this retrieved file:

```
% cmp <original file> /tmp/<retrieved file>
```

This step compares the retrieved file and the original file byte by byte. If they are the same, there should be no output, and this verifies that the installation is correct. The arguments are as follows:

`<original file>`	The name of the original file, prefixed with '`/`'. *Example:* `/stand/vmunix`
`<retrieved file>`	The name of the file retrieved from the archive. *Example:* `stand/vmunix`

Example:

Suppose you are verifying the installation of an HP DDS-format tape drive on an HP-UX 10.X system. The procedure would be as follows. See "System-Specific Arguments" below for the choice of `<archive name>` and `<file>` arguments:

1 Change directory to root:

```
% cd /
```

2 Back up `/stand/vmunix` to tape:

```
% tar cvf /dev/rmt/0m ./stand/vmunix
```

Note the prefix of '`.`' to the filename.

3 Change to the temporary directory:

```
% cd /tmp
```

4 Extract the file from the tape:

```
% tar xvf /dev/rmt/0m
```

5 Compare the original with the restored version:

```
% cmp /stand/vmunix /tmp/stand/vmunix
```

Note that the original filename is *not* prefixed with '**.**'.

System-Specific Arguments

The following table lists suggested values for the arguments `<archive name>` and `<file>` in the verification procedure described above. If any of the suggested files are symbolic links on your system, choose another file appropriate for your system.

System	File Name	Description	Archive Name	Notes
HP-UX 9.*x* and earlier	`hp-ux`	HP-UX kernel	`/dev/rmt/`*X*`m`	*X* is the SCSI ID of the drive
HP-UX 10.*x*	`stand/vmunix`	HP-UX kernel	`/dev/rmt/`*X*`m`	*X* is the SCSI ID of the drive
DEC OSF	`vmunix`	OSF kernel	`/dev/rmt/`*X*`m`	*X* is the SCSI ID of the drive
IBM AIX	`unix`	AIX kernel	`/dev/rmt`*X*`.1`	*X* is the device ID reported back as available when you ran '`smit -C tape`' to create the device files.
SUN Solaris 1	`bin/csh`	C shell	`/dev/rst0` `/dev/rst1`	If you installed with SCSI ID 4. If you installed with SCSI ID 5.
SUN Solaris 2	`bin/csh`	C shell	Determine the archive name as described below*.	
SCO	`unix`	SCO kernel	`/dev/rStp`*X*	Use the device file created during the running of '`mkdev tape`'.

*For SUN Solaris 2, determine the archive name by typing after the `%` prompt:

```
ls -l /dev/rmt/*m | grep "st@X"
```

where *X* is the SCSI ID. Identify the line for the tape drive. For example, if the drive was at SCSI ID 2, look for the line containing "`st@2,0`". This might be as follows (but on a single line):

```
lrwxrwxrwx 1 root root 63 Mar 1 00:00 /dev/rmt/0m
../../devices/sbus@1f,0/espdma@e,8400000/esp@e,8800000/st@2,0:m
```

Here you could use **`/dev/rmt/0m`** (shown in bold above) as the archive name.

3

This chapter provides notes for configuring drives with different systems, including switch settings and additional notes.

- See Chapter 2 for instructions on the general configuration procedure.
- See Chapter 4 for an introduction to configuration switches.
- See Chapter 5 for a complete listing of switch settings.

Configuring Drives with Specific Systems

Apple/Macintosh Applications

Configuration Switch Settings:

1	2	3 *	4	5	6	7	8
On	On	Off	On	On	On	On	On

*Switch 3 ON to disable MRS.

Autoloader Option Switch Settings:

1	2	3	4	Value
On	On	On	Off	7

DEC Workstations

Configuration Switch Settings:

1	2	3 *	4	5	6	7	8	Comments
On	On	Off	On	On	On	On	Off	DEC 3100/5000 Ultrix and VMS, Alpha AXP OSF/1

*Switch 3 ON to disable MRS

The SCSI command set used on DEC workstations differs from that of Sun significantly in the use of the SPACE command. Where Sun complies with the requirements of SCSI-2, DEC uses a SCSI-1 implementation of this command.

This has a major impact if a DEC user wants to boot from tape. By setting switch 6 to OFF, the drive automatically switches to the functionality required by DEC workstations (the standard INQUIRY data length is truncated by 3 bytes). This allows the user to plug-and-play on DEC workstations. No other changes are required.

If top performance is a requirement, the drive can be configured to operate in Immediate mode and with Infinite Flush by setting both switches 6 and 8 to OFF. This improves the drive's performance by reducing the time it takes to write filemarks, because all filemark commands will be treated as immediate commands. The drawback here is that if power fails, the host may not be able to work out where data is, because a filemark, supposed to be on tape, has now been lost in the buffer.

For DEC Alpha 3000/300 AXP OSF/1 v 1.2 and later

To allow the host to enable and disable compression, and for general improvements in host control, follow the procedure in step 3 below. Use steps 1 and 2 only if necessary:

1 *Perform this step only if necessary:*

In the file `/usr/sys/data/cam_data.c`, make the following addition to the `cam_devdesc_tab` structure.

For an HP C1534A:

String is 16 characters long ——

```
/*HP 35470A DDS DAT DRIVE*/
{"HP      HP35470A", 16, DEV_TZRDAT,
(ALL_DTYPE_SEQUENTIAL << DTYPE_SHFT) | SZ_RDAT_CLASS,
(struct pt_info *)ccmn_null_sizes, SZ_NO_BLK, (DEC_MAX_REC-1),
&tlz06_dens, NO_MODE_TAB, SZ_NO_FLAGS,
NO_OPT_CMDS, SZ_READY_DEF,
SZ_NO_QUE, DD_REQSNS_VAL| DD_INQ_VAL,
43,64
},
```

For an HP C1536A, replace the first two lines with the following:

```
/*HP 35480A DDS DAT DRIVE*/
{"HP      HP35480A", 16, DEV_TZRDAT,
```

For an HP C1533A or HP C1539A, replace the first two lines with the following:

String is 14 characters long —

```
/*HP C1533A DDS-2 DAT DRIVE*/
{"HP      C1533A", 14, DEV_TZRDAT,
```

For an HP C1537A, replace the first two lines with the following:

```
/*HP C1537A DDS-3 DAT DRIVE*/
{"HP      C1537A", 14, DEV_TZRDAT,
```

For an HP C1553A, replace the first three lines with the following:

```
/*HP C1553A DDS-2 DAT AUTOLOADER*/
{"HP      C1553A", 14, DEV_TZRDAT,
(ALL_DTYPE_SEQUENTIAL << DTYPE_SHFT) | SZ_RDAT_CLASS | SZ_LOADER,
```

For an HP C1557A, replace the first three lines with the following:

```
/*HP C1557A DDS-3 DAT AUTOLOADER*/
{"HP      C1557A", 14, DEV_TZRDAT,
(ALL_DTYPE_SEQUENTIAL << DTYPE_SHFT) | SZ_RDAT_CLASS | SZ_LOADER,
```

2 *Perform this step only if necessary:*

Rebuild the kernel using the `doconfig` script as described in your system manual. Then reboot the system.

3 Create the device special files required:

```
% cd/dev/rmt
% /dev/MAKEDEV tzX
```

where *X* is the SCSI ID of the device you are connecting.

The following files will be created, where *Y* is the instance of the drive in the system:

- `/dev/rmt/rmt`*Y*`h` rewind, compression enabled
- `/dev/rmt/rmt`*Y*`m` rewind, compression enabled
- `/dev/rmt/rmt`*Y*`l` rewind, compression disabled
- `/dev/rmt/rmt`*Y*`a` rewind, compression disabled
- `/dev/rmt/nrmt`*Y*`h` no rewind, compression enabled
- `/dev/rmt/nrmt`*Y*`m` no rewind, compression enabled
- `/dev/rmt/nrmt`*Y*`l` no rewind, compression disabled
- `/dev/rmt/nrmt`*Y*`a` no rewind, compression disabled

The final character in the filename indicates the density setting:

Code	Density	Compression	Code	Density	Compression
h	high	enabled	l	low	disabled
m	medium	enabled	a	triple	disabled

These density settings have no meaning with DDS drives other than to set compression on or off.

Autoloader Option Switch Settings:

1	2	3	4	Value
On	On	On	Off	7

HP Workstations

Configuration Switch Settings:

1	2	3 *	4	5	6	7	8	Comments
On	On	Off	On	On	On	On	On	HP 9000 Series 300, 400, 700, 800

* Switch 3 ON to disable MRS

If top performance is a requirement, configure the drive to operate in Immediate mode and with Infinite Flush by setting Switch 6 to OFF. This improves the drive's performance by reducing the time it takes to write filemarks, because all filemark commands will be treated as immediate commands. The drawback is that if power fails, the host may not be able to work out where data is, because a filemark that should be on tape has now been lost in the buffer.

Connectivity with Operating Systems

The table below shows the operating systems from which the drives will connect for different HP workstations:

System	HP C1533A/39A	HP C1534A/36A	HP C1537A[1]	HP C1553A	HP C1557A
700	HP-UX 9.01	HP-UX 8.07	HP-UX 9.07[2]	HP-UX 9.01	tbd
800 D, E Series	HP-UX 10.01	HP-UX 10.01	HP-UX 10.01	HP-UX 10.01	tbd
800 G. H. I Series	HP-UX 9.04	HP-UX 9.04	HP-UX 9.04	HP-UX 9.04	tbd
800 K Series	HP-UX 10.01	HP-UX 10.01	HP-UX 10.01	HP-UX 10.01	tbd
800 8*x*7	HP-UX 9.04[3]	HP-UX 9.04	HP-UX 9.04[3]	HP-UX 9.04[3]	tbd
800 890/T500	HP-UX 9.04	HP-UX 9.04	HP-UX 9.04	HP-UX 9.04	tbd

[1] The *intention* is that support will be as shown here for the HP C1537A. It is not currently been verified.

[2] Currently Series 700 support for the HP C1537A is only on models J2X0, C1X0 and 74X.

[3] These releases require a patch to support the drives fully.

Assuming the DDS unit is correctly installed, the Operating System kernel should already have the tape drivers configured. If you have any doubts, use the System Administration Manager (SAM) to check the kernel configuration.

Device Files and Major Numbers

Device files tell your host computer which system hardware path to use when communicating with a specific device, and what kind of device it is. The device files for HP DDS drives are located in the directory `/dev/rmt`.

A device file is made up of a Major Number and a Minor Number. Major Number recommendations are as follows:

Operating System	HP Workstation	Major Number
HP-UX 9.*x*	Series 700	**121**, **54***
	Series 800	**5**
HP-UX 10.*x*	Series 700	**205**
	Series 800	**212**

* Minor Number **54** will function satisfactorily from HP-UX 9.01 upwards, but is not recommended.

Each Major Number requires a different Minor Number format.

On a Series 700, use the following commands to create device files:

- '`mknod`' if you are using HP-UX 9.*x* or below
- '`mksf`' if you are using HP-UX 10.*x*

On a Series 800, you should not need to create device files manually—the system will reconfigure automatically when it is rebooted. If you do need to create device files manually because rebooting is not a feasible option, use '`mksf`' for all versions of HP-UX.

Details of the Minor Number format to use with '`mknod`', and the naming convention for device files with '`mksf`' are given starting on page 3-page 7.

Minor Number Parameters

The following device parameters can be set in the Minor Number formats described on page 3-page 7 and following.

Berkeley and AT&T Modes

Berkeley and AT&T modes differ in "*read only*" close behavior:

- In Berkeley mode, the tape position will remain unchanged by a device close operation.
- In AT&T mode, the device close will result in the tape being repositioned just after the next tape filemark (the start of the next file).

In most cases, Berkeley mode should be used.

Buffered and Unbuffered Modes

Write buffering (or immediate reporting) allows tape drives to indicate write completion as soon as data is received.This is generally necessary so that a tape drive can achieve streaming (continuous media motion).

- Device file Minor Numbers that set "*buffering*" cause write buffering to be enabled.
- Device file Minor Numbers that set "*no buffering*" cause write operations to be unbuffered (write completion is not indicated until the data has been written to tape). This mode is likely to reduce I/O performance and media capacity, and to cause the tape to make more passes over the tape head. This in turn reduces tape life. As a result of this, it is usually better to use device file Minor Numbers that set "*buffering*".

  Unbuffered mode is only available through device Major Number **205**.

Data Compression

Some tape drives can read and write data using multiple data formats. Typically, different formats use different data densities. The following table shows the specific meaning of data densities with respect to DDS tapes.

Data Density:	Medium	Very High
Data Compression:	Uncompressed	Compressed

Density

The density parameters in Minor Numbers were designed for use with reel-to-reel tape drives. In DDS-format drives, the density at which a tape is written is dictated by the cartridge type; for example, a DDS-1 tape will be written at DDS-1 density whatever DDS drive is writing it. The only option with the density parameter is to use it to turn data compression on or off, provided the drive supports it.

The DDS formats in which the drives will write and read different cartridges are as follows:

	DDS-1 60m	**DDS-1 90m**	**DDS-2 120m**	**DDS-3 125m**	**Compression**
HP C1533A/39A	DDS-1	DDS-1	DDS-2	ejected	supported
HP C1534A	DDS-1	DDS-1	ejected	ejected	not supported
HP C1536A	DDS-1	DDS-1	ejected	ejected	supported
HP C1537A	DDS-1	DDS-1	DDS-2	DDS-3	supported
HP C1553A	DDS-1	DDS-1	DDS-2	ejected	supported
HP C1557A	DDS-1	DDS-1	DDS-2	DDS-3	supported

Rewind and No Rewind Modes

- Normally the drive repositions the tape to BOT (Beginning of Tape) when the device file is closed. You can achieve this by using a device file Minor Number that sets "*rewind on close*".
- To prevent this repositioning to BOT, use a Minor Number that sets "*no rewind on close*". This behavior is useful when creating and reading tapes that contain multiple files.

Variable and Fixed Block Modes

- Data is written on tape media in data blocks. Device file Minor Numbers that set "*variable*" mode cause data-block sizes to be determined by write system calls (each write system call causes one data block to be written to the tape). Normally, variable-sized blocks are used.
- Device file Minor Numbers that set "*fixed*" mode cause data blocks of a consistent size to be written. Block size is determined by the tape device and the driver. Write system calls to a device file must be an integral number of blocks in length. Fixed-block-size mode can increase or decrease I/O performance and capacity (depending on the tape device and the specific fixed-block size).

  Fixed-block size is only available through Major Number **205**.

Partition 0 and Partition 1

Normally, tapes contain a single partition (Partition 0). HP DDS tape drives support the division of a single tape into two partitions (two separate logical volumes, Partition 1 and Partition 0). Tapes can be partitioned by using the `mediainit` command with "`-p`" option. Partition 1 is nearest to BOT (Beginning of Tape); Partition 0 is nearest to EOT (End of Tape).

If the last tape access was to Partition 0, the tape is not usually repositioned on an "open". However, device file Minor Numbers that set "*Partition 1*" cause the tape to reposition to the beginning of Partition 1 on an "open" when the tape contains multiple partitions and the last tape access was to Partition 0.

If the last tape access was to Partition 1, the tape is not repositioned on an "open".

Partitioning tapes and access to Partition 1 require the use of Major Number **54**.

Major Number **121**—Minor Number Format

For an HP Series 700 workstation that uses Major Number **121**, the Minor Number format is **0x*BBBTLD***

BBB Bus (Interface)

- `201` Core SCSI
- `207` Fast/Wide (F/W) SCSI
- `4S0` EISA SCSI (*S* = slot number)

T Target (SCSI ID)

- `0–6` The drive is normally configured as SCSI ID 3. If some other device on the bus has this ID, set both the drive and this parameter to another SCSI ID in the range 0–6 that is currently unused. Note that SCSI ID 7 is usually reserved for the host adapter.

L Logical Unit Number (LUN) and partition

- `0` LUN 0, Partition 0
- `1` LUN 0, Partition 1
- `8` LUN 1, Partition 0
- `9` LUN 1, Partition 1

D Device type-specific configuration parameters:

- `6` Berkeley, rewind on close, *uncompressed*
- `7` Berkeley, no rewind on close, *uncompressed*
- `E` Berkeley, rewind on close, *compressed*
- `F` Berkeley, no rewind on close, *compressed*

Example:

Suppose you want to create a device file on SCSI ID 3 with the following options:

- Major Number **121**, with data compression for DDS-DC format drives
- Connection onto the core SCSI bus
- No rewind on close option

Enter the following after the `%` prompt:

```
mknod /dev/rmt/3hcn c 121 0x20130F
```

Major Number **205** & Series 800 Major Number **212**—Minor Number Format

For HP Series 700 workstations that use Major Number 205 and for HP Series 800 workstations that use Major Number 212, the Minor Number format can use the additional configuration options available in HP-UX release 10.0 and above.

For HP-UX 10.0, use `mksf` (make special device file) to create the device files for the drive. The `mknod` command is not recommended because it selects configuration options by directly setting bits in the Minor Number. With release10.0 and above, there

are more configuration options than will fit in the device file's Minor Number, so this method is no longer possible.

In order to cope with the extra configuration options, the Minor Number contains a base set of options, while extended options are stored in a table of configuration properties. The Minor Number contains an index to this property table. This index is maintained by the tape driver and is not directly visible to the user.

Depending on the parameters passed to it, the `mksf` command sets the Minor Number and modifies the property table as necessary. If the device configuration requirements are limited to the base set of options, the default property table should be correct.

The base set of options is as follows:

- Hardware address (card instance, target and unit number)
- Density (from the set of pre-defined options listed in `mksf`)
- Compression (using the default compression algorithm)
- Rewind or no rewind
- Berkeley or AT&T mode

All other configuration options are extended options that result in use of the property table.

You *must* put tape device files using extended configuration options in the `/dev/rmt` directory. This is necessary for proper maintenance of the property table.

Note Use the `rmsf` command to clean up the unused device files, otherwise the property table may overflow and cause the `mksf` command to fail.

For conventions in naming device files, see "Device File Names—HP-UX 10.0" on page 3-page 9.

Major Number **5**—Minor Number Format

When the operating system boots on a Series 800, it automatically configures any new peripherals attached to it. You can use `mksf` to create these device files manually as described in the `man mksf` page.

Device File Names (pre-HP-UX 10.0): Major Numbers **5**, **54**, **121**

Ideally, device file names should correspond to device file Minor Numbers. However, as some commonly used tape applications have built-in default tape device names, you may need to ignore the default naming convention for device file names. The recommended formats are given below:

Device File Type	Standard Name
Character	`/dev/rmt/c`*`BBB`*`d`*`TLDN`*
Core character	`/dev/rmt/`*`TDPCN`*
Default `tar`	`/dev/rmt/0m`
Default `mt`	`/dev/rmt/0mn`

where:

BBB *Bus (SCSI Interface)*

`201` Core SCSI

T *Target (SCSI ID)*

`0–6` The drive is normally configured as SCSI ID 3. If some other device on the bus has this ID, set both the drive and this parameter to another SCSI ID in the range 0–6 that is currently unused. Note that SCSI ID 7 is usually reserved for the host adapter.

L *Logical Unit Number (LUN)*

D *Density*

`l`	low density
`m`	medium density
`h`	high density
`c`	very high density (compressed)

P *Partition (available for Minor Number **54** only)*

omitted	Partition 0
`p`	Partition 1

C *Close convention*

`b`	Berkeley style close
omitted	AT&T style close

N *Rewind mode*

`n`	no rewind on close
omitted	automatic rewind on close

Device File Names (HP-UX 10.0), Major Numbers **121**, **205**

Note The naming conventions defined in this section indicate the options used with each device, and it is recommended that you follow them. You can however create device files with names of your own choice.

There are two naming conventions in HP-UX 10.0 for device special files.

- The standard (and preferred) convention is used on systems that support long file names. It is recommended because it allows for all possible configuration options in the device name and is used by the `mksf` command.
  The name structure is as follows. The options are described below:
  `/dev/rmt/c#t#d#[o] [z] [e] [p] [s[#]] [w] <density> [c[#]] [n] [b]`
- An alternative convention is provided for systems limited to short file names. The device special file names are less descriptive, but guarantee unique device naming and are used by the `mksf` command where required.
  `/dev/rmt/c#t#d# [f#] [i#] [n] [b]`

For each tape device present, eight device files are automatically created for regular use when the system is initialized. (A ninth file can be created especially for use by system diagnostics.)

- Four of these device files, corresponding to the four permutations of the "`h`" and "`b`" options, use one of the naming conventions described above. When the standard naming convention is used, these four files contain the density specification "`BEST`". When the alternative convention is used, these four files contain the density specification "`f0`".
- The other four files, again corresponding to the permutations of "`h`" and "`b`", use the pre-HP-UX 10.0 device file-naming convention. The names include an arbitrary number to distinguish this tape device from others in the system, followed by the letter "`m`". They are created automatically when the system is

initialized.

Each of the files using the standard or alternative naming conventions is linked to the corresponding device file using the pre-HP-UX 10.0 naming convention. Thus, the device files which use the pre-HP-UX 10.0 naming convention typically provide the same functionality as the device files which contain the density specification "`BEST`" or "`f0`".

Options

The options in the naming conventions are common to all HP-UX 10.0 tape drivers. The `c#t#d#` notation in the device special file name derives from `ioscan` output and is described in the `man` pages for `ioscan` and `intro`. Options unique to `stape`, `tape1` and `tape2` are described in "Device-Specific Options" on page 3-page 11.

`c#` Instance number assigned by the operating system to the interface card

`t#` Target address on a remote bus (for example, SCSI or HP-IB address)

`d#` Device unit number at the target address (for example, SCSI LUN)

`w` Writes wait for physical completion of the operation before returning status. The default behavior (buffered mode or immediate reporting mode) requires the tape device to buffer the data and return immediately with successful status. (*This option is not recommended as it increases head wear and decreases performance dramatically.*)

`density` Density or format used in writing data to tape. This field can have the following values:

- BEST — Highest capacity density or format will be used, including data compression, if the device supports compression.
- NOMOD — Maintains the density used for data previously written to the tape. Behavior using this option depends on the type of device. This option is only supported on DDS and 8 mm drives.
- DDS — Selects one of the known DDS formats. It can be used to specify DDS 1, DDS1C, DDS 2 or DDS2C, as required.

For DDS drives, this parameter has no effect other than to turn compression on or off. The density is dictated by the DDS format of the tape cartridge. See page 3-page 6 for more information.

`C[#]` Write data in compressed mode on tape drives that support data compression. If a number is included, it specifies a compression algorithm specific to the device.
Note: Compression can be also controlled through the density field , provided the device supports it.

`n` No rewind on close. Unless this mode is requested, the tape is automatically rewound upon close.

`b` Specifies Berkeley-style tape behavior. When the `b` is absent, the tape drive follows AT&T-style behavior.

`f#` Used for short filename notation only. Specifies the format (or density) value encoded in the Minor Number. The meaning of the value depends on the type of tape drive. Use 0 for the highest density on DDS drives.

`i#` Used for short filename notation only. Specifies an internal Property Table index value maintained by the tape driver, containing an array of configuration options. The contents of this table are not directly accessible. Use the `lssf` command to determine which configuration options are invoked.

Device Special File Name—Example

For a device at card instance 1, target 2, LUN 0, with exhaustive mode enabled (see "Device-Specific Options" below), fixed block size of 512 bytes, DDS 1 density with compression, AT&T-style with no rewind on close, the standard device file special name would be:

```
/dev/rmt/c1t2d0es512DDS1Cn
```

For a system requiring short file names, the same device special file would be named:

```
/dev/rmt/c1t2d3i<#>n
```

where <#> is an index value selected by the tape driver.

Use the `lssf` command to determine which configuration options are actually used with any device file.

Device-Specific Options

For `stape` (Series 700 Major Number `205` only)

The following options (available only through the property table) can be used in creating device special files for tape drives which access the `stape` driver:

e Exhaustive mode is enabled. When exhaustive mode is enabled, the driver will, if necessary, attempt several different configuration options when opening a device. The first attempt follows the Minor Number configuration exactly. If that fails, the driver attempts other likely configuration values.

With exhaustive mode disabled (the default setting), the driver makes only one attempt to configure a device, using the configuration indicated in the Minor Number.

s[#] Specifies fixed-block mode. The optional number indicates the block size. If you omit the number, the driver selects a default block size appropriate to the device type.

For `tape1` and `tape2` (Series 800 Major Number `212` only)

The following options may be used in creating device special files for tape drives which access the `tape1` and `tape2` driver:

o Diagnostic messages to the console are suppressed.

z The tape driver will attempt to mimic the behavior of RTE systems; that is, the driver will not do any tape alteration or movement when the device is closed.

Autoloader Option Switch Settings:

1	2	3	4	Value	Comments
Off	On	On	Off	6	Series 800
On	On	On	Off	7	Series 700

IBM RS/6000 Workstations

Configuration Switch Settings:

1	2	3	4	5	6	7	8	Comments
On	On	Off	On	On	Off	Off	On	■ Immediate mode and Infinite Flush enabled ■ No disconnects during data phase enabled ■ If you want to use the AIX '`backup`' and '`restore`' utilities, the drive's default condition must be "fixed mode". Set switch 5 OFF in this case. ■ Switch 8 should be set to OFF to disable MRS.
On	On	On	Off	On	On	Off	Off	*HP C1537A/39A/57A and HP C1533A/53A (firmware revision 9503):* ■ Immediate mode and Infinite Flush enabled ■ No disconnects during data phase enabled ■ MRS disabled
On	On	Off	Off	On	On	Off	Off	*HP C1537A/39A/57A and HP C1533A/53A (firmware revision 9503):* ■ Immediate mode and Infinite Flush enabled ■ MRS disabled

For *AIX 3.2.5 or later*, these switch settings will allow HP DDS drives to be supported using the `smit` function's "`Other SCSI Device`" option. The default block size in this configuration is 512 bytes, and this will only allow interchange with other devices using a 512-byte block size.

Note Do *not* choose the `smit` option of "`4mm2gb`" as the Tape Device Type. This is reserved for Connor drives. If you use it with HP drives, you will get the error "Device to be configured does not match the physical device at the specified connection location".

To change to variable block mode, use the following procedure:

1. *If you are using a graphics terminal* running X-Windows, then at a Windows terminal, type: `smit tape`

   If you are using a non-graphics terminal, at the command line type:
   `% smit -C tape`
2. If no device has been configured at this address before, select "`add a tape drive`" to set up the address. From the pop-up window, select "`ost`" or "`Other SCSI tape drive`" as the tape drive you wish to change and choose connection addresses as appropriate.
3. Select from the window: "`change/show characteristics of a tape drive`"
4. From the pop-up window, select "`ost`" or "`Other SCSI tape drive`" as the tape drive you wish to change. Do *not* choose "`4mm2gb`".
5. Change the block size field to 0, and click on the "`DO`" button or press [Enter] to apply the change.

HP DDS-format drives will work with `tar`, `cpio`, `backup`, `restore` and `dd`. For systems other than the 43P, the drive is also boot-capable, provided a boot tape is generated using `mksysb`.

Device Filenames under AIX

Use device filenames as listed below for the combination of Rewind on Close, Retension on Open, and Compression that you want:

Filename	Rewind on Close	Retension on Open	Compression
/dev/rmt*n*	Yes	No	enabled
/dev/rmt*n*.1	No	No	enabled
/dev/rmt*n*.2	Yes	Yes	enabled
/dev/rmt*n*.3	No	Yes	enabled
/dev/rmt*n*.4	Yes	No	disabled
/dev/rmt*n*.5	No	No	disabled
/dev/rmt*n*.6	Yes	Yes	disabled
/dev/rmt*n*.7	No	Yes	disabled

The *n* in the filename is the instance number assigned to the drive by the operating system, where 0 is the first device, 1 is the second and so on.

Rewind on Close Normally, the drive repositions the tape to BOT (Beginning of Tape) when the device file is closed. Using the no rewind option is useful when creating and reading tapes that contain multiple files.

Retension on Open Retensioning consists of winding to EOT (End of Tape) and then rewinding to BOT, in order to reduce errors. If this option is selected, the tape is positioned at BOT as part of the open process.

Autoloader Option Switch Settings:

1	2	3	4	Value
On	On	On	Off	7

PC/PC-LAN Applications (not UNIX)

Configuration Switch Settings:

1	2	3 *	4	5	6	7	8
On	On	Off	On	On	On	On	On

*Switch 3 ON to disable MRS

For:

IBM OS/2, PC DOS

MicroSoft MS-DOS, Windows, Windows for Workgroups, OS/2, LAN Manager, Windows NT

Novell NetWare Lite, NetWare 2x- 3x, NetWare 4.x, DR-DOS

Autoloader Option Switch Settings:

1	2	3	4	Value
On	On	On	Off	7

PC-Based UNIX

Configuration Switch Settings:

1	2	3 *	4	5	6	7	8
On	On	Off	On	On	On	On	On

*Switch 3 OFF to enable MRS

For: **Novell** UnixWare
SCO Xenix, Unix System/V, Open Desktop, UnixWare

To install on an SCO system:

To install the relevant driver and device files on an SCO system, perform the following steps:

1. Run '`mkdev tape`' as root.
2. Select '`Configure SCSI tape drive`'.
3. Select '`Install tape drive`'.
4. Select the appropriate SCSI adapter.
5. Select the appropriate SCSI bus.
6. Select the Target ID to match that set on the back of the drive.
7. Select the LUN to be 0.
8. Enter 'y' to update the SCSI configuration.
9. Enter the following details:

Vendor identification string:	`HP`
SCSI version to which the drive conforms:	`2`
Response Data Format (SCSI-2):	`2`
DAT device:	`4`

   If another device is already configured, you can now make the drive the default device.
   If no other device is configured, the configure procedure will automatically make the drive the default device.
10. Enter '`q`' to leave unchanged the boot string that is displayed when the system is rebooted.
11. Enter '`q`' to return to the Main Menu.
12. Enter '`q`' to quit.
13. You are now prompted to rebuild the kernel and the kernel environment (which includes the device files). Perform both steps by answering 'y' when prompted, and select the new kernel to be booted by default.

    You can now use one of the following files, as appropriate, for backup operations:

    `/dev/nrStp`*X* if you require a no-rewind device
    `/dev/rStp`*X* if you require a rewind device

where *X* is the drive's SCSI ID.

For an autoloader, specify the control device `/dev/xStp`*X* through the '`-d`' option when using `mtx`.

Controlling Compression with SCO

Because SCO does not have any compression/no-compression device files, you must use '`tape setcomp`' to control the compression status of the drive as follows:

Command	Compression	Decompression
`tape -a 0 setcomp`	disabled	disabled
`tape -a 1 setcomp`	enabled	disabled
`tape -a 2 setcomp`	disabled	enabled
`tape -a 3 setcomp`	enabled	enabled

If you have multiple drives, you must specify the appropriate device files in the command. For example:

```
% tape -a 0 setcomp /dev/nrStp2
```

Use '`tape getcomp`' to tell you the current status of the drive.

Note Do *not* use the SCO '`mt`' utility. This is obsolete, and does not perform the same function as '`mt`' on other platforms. Use '`tape`' instead to achieve the same result.

Improving Performance Through Block Size on SCO

In order to improve performance, specify larger blocking factors for `cpio` and `tar`. Use the '`B`' option of `cpio` or use the '`b`' option of `tar` with an argument of 20. Alternatively, you can use the `tape` command as follows:

```
% tape -a 32768 setblk <device file>
```

This explicitly sets the block size used for the drive when you are using built-in applications such as `cpio` and `tar`.

The `<device file>` is either `/dev/nrStp`*X* or `/dev/rStp`*X* as described above.

Autoloader Option Switch Settings:

1	2	3	4	Value
On	On	On	Off	7

If you are using `mtx`, specify the control device `/dev/xStp#` through the '`-d`' option.

MIPS Systems

Configuration Switch Settings:

1	2	3	4	5	6	7	8
On	On	Off	On	On	On	Off	Off

Autoloader Option Switch Settings:

1	2	3	4	Value
On	On	On	Off	7

Silicon Graphics (SGI)

Configuration Switch Settings:

1	2	3	4	5	6	7	8*
On	On	Off	On	On	Off	Off	On

* Switch 8 OFF to disable MRS

With these switch settings, SCSI parity checking is turned off.

SGI DMA hardware requires that DMA starts on a 32-bit aligned address. HP DDS drives only limit disconnects to a 16-bit alignment. As a result, you must disable disconnect and keep transfers short to avoid tying up the bus:

- The switch setting above disables disconnect during a data transfer.
- If you want `tar` to default to short block transfers, change the `512*512` in your `tpsc` or `scsi` HP entry to `128*512` (128-kilobyte blocks) or, better still, `64*512` (64-kilobyte blocks).

1 Modify the following files in the operating system configuration:

- In IRIX 5.1 or earlier: `/usr/sysgen/master.d/tpsc`
- In IRIX 5.2: `/usr/sysgen/master.d/scsi`
- In IRIX 5.3: `/var/sysgen/master.d/scsi`

2 Make a copy of the following Archive/Python entry in the above file:

```
{DATTAPE, TPDAT,7,6,"ARCHIVE","Python",0,0,{0,0,0,0},
MTCAN_BSF|MTCAN_BSR|MTCAN_APPEND|MTCAN_SETMK|MTCAN_PART|
MTCAN_PREV|MTCAN_SYNC|MTCAN_SPEOD|MTCAN_CHKRDY|MTCAN_VAR|
MTCAN_SETSZ|MTCAN_SILI|MTCAN_AUDIO|MTCAN_SEEK|MTCAN_CMTYPEANY,
/*minimum delay to I/O is 4 minutes, because when a retry is
*performed, the drive retries a number of times, and then
*rewinds to BOT, repositions, and tries again.*/
40,4*60,4*60,5*60,512,512*512},
```

3 In the copy, remove `MTCAN_AUDIO` (shown in bold above), and then, for the HP C1534A, modify the entry as follows:

```
{DATTAPE, TPDAT,2,8,"HP","HP35470A",0,0,{0,0,0,0},
MTCAN_BSF|MTCAN_BSR|MTCAN_APPEND|MTCAN_SETMK|MTCAN_PART|
MTCAN_PREV|MTCAN_SYNC|MTCAN_SPEOD|MTCAN_CHKRDY|MTCAN_VAR|
MTCAN_SETSZ|MTCAN_SILI|MTCAN_SEEK|MTCAN_CHTYPEANY,
/*minimum delay to I/O is 4 minutes, because when a retry is
*performed, the drive retries a number of times, and then
*rewinds to BOT, repositions, and tries again. */
40,4*60,4*60,5*60,512,64*512},
```

For the HP C1536A, the start of this entry should be:

```
{DATTAPE, TPDAT,2,8,"HP","HP35480A",0,...
```

For the HP C1533A or HP C1539A, the start of this entry should be:

```
{DATTAPE, TPDAT,2,6,"HP","C1533A",0,...
```

For the HP C1537A, the start of this entry should be:

```
{DATTAPE, TPDAT,2,6,"HP","C1537A",0,...
```

For the HP C1553A, the start of this entry should be:

```
{DATTAPE, TPDAT,2,6,"HP","C1553A",0,...
```

For the HP C1557A, the start of this entry should be:

```
{DATTAPE, TPDAT,2,6,"HP","C1557A",0,...
```

4 Recompile the kernel using the `autoconfig` command, reboot, and then you are ready to start backing up files to the HP drive.

Autoloader Option Switch Settings:

1	2	3	4	Value
On	On	On	Off	7

Sun Workstations

Configuration Switch Settings:

1	2	3	4	5	6	7	8	Comments
On	On	On	On	On	Off	Off	On	■ Everything is Immediate mode (where relevant) ■ Write Delay = 0, equivalent to an infinite time-out ■ Switch 8 should be set to OFF to disable MRS
On	On	On	Off	On	On	Off	Off	*HP C1537A/39A/57A and HP C1533A/53A (firmware revision 9503):* ■ Immediate mode and Infinite Flush enabled ■ No disconnects during data phase enabled ■ Data compression control allowed via device files ■ MRS disabled
On	On	Off	Off	On	On	Off	Off	*HP C1537A/39A/57A and HP C1533A/53A (firmware revision 9503):* ■ Immediate mode and Infinite Flush enabled ■ Data compression control allowed via device files ■ MRS disabled

These settings allow drives to "plug-and-play" with Sun's workstation products which have internal SCSI support and are running Sun Operating System 4.1 and later, together with Solaris 2.3 and later. For Solaris 2.1 and 2.2 see below.

Note If you use vendor-supplied software which recommends a switch setting other than these, use the setting which they recommend.

If top performance is a requirement, configure the drive to operate in Immediate mode and with Infinite Flush by setting Switch 6 to OFF. This improves the drive's performance by reducing the time it takes to write filemarks, because all filemark commands will be treated as immediate commands. The drawback is that if power fails, the host may not be able to work out where data is, because a filemark that should be on tape has now been lost in the buffer.

For Sun OS 4.1.x (Solaris 1)

Sun Operating System 4.1.x requires that the SCSI address of tape devices is either 4 or 5. If the address is set to 4, the '`rst0`' or '`nrst0`' driver is used. If the address is 5, '`rst1`' or '`nrst1`' is used.

When using the `cpio` command, be sure to set the block size option (`B`) so that you use a block size of 5120. This will improve performance significantly.

Note Use the switch settings shown above. Drives should then work well with Sun Operating Systems 4.1x without you needing to modify the Device Definition files, and you are recommended to try this.

Only if necessary, modify the Device Definition files to optimize performance in plug-and-play applications as follows:

1 In the file `/user/sys/scsi/targets/stdef.h`, add the following line (shown in bold) after the entry that defines an Exabyte device:

```
#define ST_TYPE_EXABYTE 0x28 /* Exabyte */
#define ST_TYPE_HP1 0x29 /* HP */
```

Use the next unused number

2 In the file `/usr/sys/scsi/targets/st_conf.c`, after the paragraph:

```
/* Exabyte 8mm cartridge */
{
"Exabyte 8mm Helical Scan", 7, "EXABYTE", ST_TYPE_EXABYTE, 1024,
(ST_VARIABLE | ST_BSF | ST_BSR | ST_LONG_ERASE |
ST_AUTODEN_OVERRIDE), 5000, 5000, { 0x00, 0x00, 0x00, 0x00 }, { 0,
0, 0, 0 } }
```

add the following paragraph:

```
/* HP 4mm Helical Scan */
{ "<drive name> 4mm DAT", <n>, "<drive number>", ST_TYPE_HP1, 1024,
(ST_VARIABLE | ST_BSF | ST_BSR | ST_LONG_ERASE
|ST_AUTODEN_OVERRIDE), 8000, 8000, { 0x00, 0x00, 0x00, 0x00 }, { 0,
0, 0, 0 } }
```

where **<drive name>** is any descriptive name you like, and **<n>** (the string length) and **<drive number>** should be as in the following table:

Drive	n	Drive Number
HP C1533A	14	"HP C1533A"
HP C1534A	16	"HP HP35470A"
HP C1536A	16	"HP HP35480A"
HP C1537A	14	"HP C1537A"
HP C1539A	14	"HP C1533A"
HP C1553A	14	"HP C1553A"
HP C1557A	14	"HP C1557A"

6 spaces

3 Once you have made these modifications, recompile your kernel as follows (note the backticks):

```
% cd /usr/sys/‘arch -k‘/conf
```

If you already have a kernel configuration file (called `MYCONF`), configure the kernel with the following command:

```
% /usr/etc/config MYCONF
```

This will create a directory (`../MYCONF`) in which you can rebuild the kernel:

```
% cd ../MYCONF
% make
```

Note If the `make` reports any errors, do *not* use the kernel that is generated. Check that you have followed all the instructions correctly.

If the `make` runs successfully, move the existing kernel somewhere safe and install

the new one using the following commands:

```
% mv /vmunix /vmunix.old
% mv ./vmunix /vmunix
```

You are now ready to halt the system. (If other users are on the system, use `shutdown` instead.)

```
% sync;halt
```

Once the system is halted, power on the tape drive and reboot the system from the boot prompt. (On older workstations, the prompt is a > symbol.) If you have powered the system down completely, it may reboot automatically.

```
ok boot vmunix
```

For Solaris 2

Note Use the switch settings shown above. Drives should then work well with Solaris 2 without modifications to the kernel, and you are recommended to try this.

Only if necessary, make the following file modifications to enhance performance:

1 In the file `/kernel/drv/st.conf`, after these lines:

```
########
# Copyright (c) 1992, by Sun Microsystems, Inc.
#ident  "@(#)st.conf    1.6     93/05/03 SMI"
```

add the following (the spaces are significant in the strings):

```
tape-config-list =
    "HP      C1533A", "HP DDS 4mm DAT", "HP-data2",
    "HP      HP35480A", "HP DDS-DC 4mm DAT", "HP-data1",
    "HP      HP35470A", "HP DDS 4mm DAT", "HP-data1",
    "HP      C1537A", "HP DDS3 4mm DAT", "HP-data2",
    "HP      C1553A", "HP DDS2 4mm DATloader", "HP-data2",
    "HP      C1557A", "HP DDS3 4mm DATloader", "HP-data2";
HP-data1 = 1,0x34,1024,0x639,3,0x00,0x13,0x03,2;
HP-data2 = 1,0x34,1024,0xd639,4,0x00,0x13,0x24,0x3,3;

name="st" class="scsi"
     target=X lun=0;
name="st" class="scsi"
     target=X lun=1;
```

6 spaces

For variable block size mode, use 0 instead of 1024. This does not apply to Solaris 2.3. where you should *never* use 0.

Only add these lines for an autoloader

where *X* is the SCSI target address of the device you have attached.

Note that the HP C1539A identifies itself as an HP C1533A, so an extra line is not needed in the config-list for the drive.

"`HP-data2`" is intended to provide an 8 mm emulation mode, where the density figures ("`0x0,0x13,0x24,0x3`") in the SCSI MODE SELECT Mode Parameter Block Descriptor are used to switch compression on and off.

HP autoloaders with firmware revision 9503 or later only: To allow random access to tapes within the autoloader, you must add the "`lun=1`" entry for each autoloader.

You may also like to make the following addition to your standard configuration just above the `tape-config-list` entries:

```
tape-driver-buffering = 4;
```

This may improve the ability of your system to keep the drive streaming, depending on your form of backup.

2 If you are replacing an existing tape device on the same SCSI ID, remove the contents of the `/dev/rmt` directory as follows:

```
% cd /dev/rmt
% rm *
```

3 Do a reconfigure boot:

```
% cd /
% touch  /reconfigure
% sync;halt
```

4 When the system is down, reboot:

```
% boot -r
```

Make sure you include the `-r` switch, so that the device directory is reconfigured using the new data.

5 You should now be able to use the drive.

- Use `/dev/rmt/`*x*`cb` if you require a compression rewind device file, where *x* is the relevant device address.
- Use `/dev/rmt/`*x*`cbn` when you require a compression non-rewind device.

Autoloader Option Switch Settings:

1	2	3	4	Value
On	Off	On	Off	5

These switch settings cause the LUN 1 device of the autoloader (the changer mechanism) to report itself as a tape drive. This configuration allows random access to any tape within the autoloader using the "`mtx`" utility.

The necessary device files should exist. If you find you need to create them, follow the steps for Solaris 2 above. The correct device files in the `/dev/rmt` directory will look similar to the following:

- LUN 0 tape device file:

```
lrwxrwxrwx 1 root 50 Apr 25 16:45 0 -> ../../device/sbus@1,f8000000/
esp@0,800000/st@4,0:
```

- LUN 1 tape device file:

```
lrwxrwxrwx 1 root 50 Apr 25 16:45 1-> ../../device/sbus@1,f8000000/
esp@0,800000/st@4,1:
```

You can check them with the following command:

```
% ls -al | grep "st@X,1"|head -1
```

where *x* is the autoloader's SCSI ID.

4

Instructions for installing HP DDS drives can be found in the HP DDS User Manual (Volume 1 of the HP DDS Technical Manual). This chapter repeats elements of this information and provides additional notes on the Configuration switches and Autoloader Option switches.

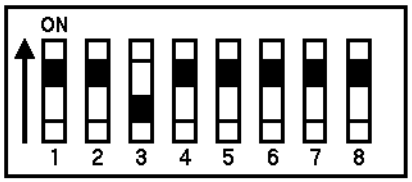
- *See Chapter 2 for instructions on the general configuration procedure.*
- *See Chapter 3 for information on configuration for specific systems.*
- *See Chapter 5 for a complete listing of switch settings.*

Introduction to Configuration Switches

Configuration Switches

When the drive is powered on, it reads a set of configuration switches on the underside of the unit, as shown in figure 4.1.

Figure 4.1



Configuration Switches
(shown in default positions)

To change the configuration, switch the drive off, select the correct configuration for your system, and switch the drive on again.

Note For the drive to operate correctly, appropriate drivers and application software must be loaded on the host computer.

Switches 1 and 2 control Data Compression. Switch 3 usually controls the Media Recognition System (MRS). Switches 4–8 control other functionality.

Switches 1–3 are described below. See Chapter 5 for a full list of settings for switches 3–8.

The following table shows typical Configuration Switch settings:

	1	2	3	4	5	6	7	8
Default SCO and PC UNIX, and most PC Applications	On	On	Off	On	On	On	On	On
Hewlett-Packard Workstations/Servers Series 700/800	On	On	Off	On	On	On	On	On
SUN Workstations/Servers	On	On	On	On	On	Off	Off	On
IBM RS6000 Workstations/Servers	On	On	Off	On	On	Off	Off	On
Silicon Graphics Workstations/Servers	On	On	Off	Off	On	Off	Off	On
DEC Workstations/Servers	On	On	Off	On	On	Off	On	Off

Data Compression—Switches 1 and 2

Note Switches 1 and 2 are disabled on the HP C1534A, because the drive does not support data compression.

Switches 1 and 2 are used to configure the way in which data compression is set for the drive. The following table shows the available options; whether data compression is enabled or disabled at power-on, and whether the host can subsequently control compression:

Switch 1	Switch 2	Data Compression at Power-On	Control of Compression
On	On	Enabled	Host control
On	Off	Enabled	No host control
Off	On	Disabled	Host control
Off	Off	Disabled	No host control

- If switch 1 is ON, data written to the tape will be compressed without the

knowledge of the host.

- If switch 2 is ON, the host can control Data Compression through the DC Characteristics Page of the SCSI MODE SELECT command.
- By default, the drives (excluding the HP C1534A) and autoloaders will decompress data when reading a compressed tape, regardless of the settings of switches 1 and 2. Decompression can be turned off through the DC Characteristics Page of the SCSI MODE SELECT command.

Media Recognition System (MRS)—Switch 3 or 8

Note MRS is described in the *User Manua*l, Volume 1 of the HP DDS Technical Manual (see the Introduction).

Switch 3 is usually used to configure the drive to respond to DDS Media Recognition System tapes:

Switch 3	Meaning
On	The Media Recognition System is disabled. All DDS tapes will be treated the same, whether they possess the Media Recognition stripes or not.
Off	The Media Recognition System is active. This is the default. Non-MRS tapes are treated as if they are write-protected.

Switch 8 is used with SUN and IBM RS6000 systems. Here switch 8 ON *enables* MRS, and OFF *disables* MRS.

See details of different operating systems in Chapter 3 for which switch to use, or consult the table of switch settings in Chapter 5.

Switches3 through 8

Switches 3 through 8 are used to specify connectivity and functionality according to host or customer requirements. The default setting is switch 3 *OFF*, and all the other switches *ON*.

Configuring an Autoloader

For autoloader mechanisms, the option switches are on the rear-panel of the autoloader (see figure 2.1 on page 2-2). They are used to set different configurations for the autoloader mechanism, and are read at power-on.

For external (standalone) autoloaders , the value of the option switch setting is shown on the rear panel (see figure 2.2 on page 2-3). It can be adjusted by clicking on the little buttons above and below the number with a ball-point pen or similar.

With the autoloader switched off, you can set the following configurations:

	Switches				
	1	2	3	4	Value
HP Series 700 *Default setting for the HP C1553A/57A*	On	On	On	Off	7h
HP Series 800 *Default setting for the HP Series 6400 Model 48AL*	Off	On	On	Off	6h
SUN Solaris 2.3, 2.4 & 2.5	On	Off	On	Off	5h

Switch 4 is not used; its position is not read by the firmware.