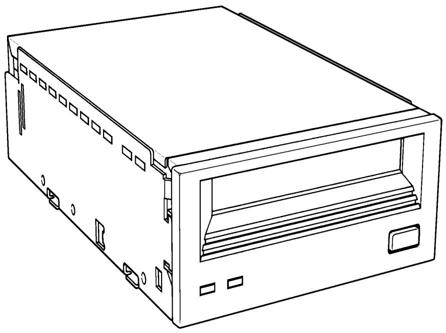
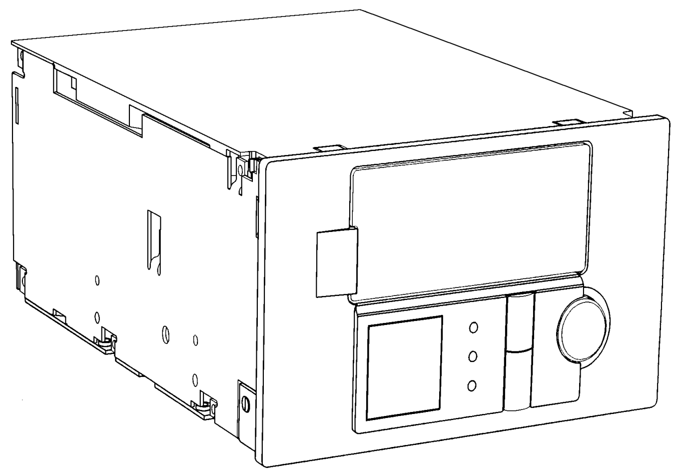
HEWLETT PACKARD

HP DDS Configuration Guide





HP 35470A	***2 GByte***
HP 35480A	***4 GByte***
HP C1533A	***8 GByte***
HP C1553A	***48 GByte Autoloader***

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Contents

Introduction

The Purpose of this Manual

To provides basic information on configuring drives and systems. The following products are covered:

- 35470A DDS-1 Drive, Capacity - 2 GBytes
- 35480A DDS-1 Drive, Capacity - 4 GBytes
- C1533A DDS-2 Drive, Capacity - 8 GBytes
- C1553A DDS-2 Autoloader, Capacity - 48 GBytes, 6 x 8 GBytes

Note Information on connecting to various Operating Systems is given in this volume. The information is given in good faith, but as the Operating Systems, and upgrades to them, are outwith Hewlett-Packard' s control, the information cannot be guaranteed to be correct. Y ou should also refer to your Operating System manual .

1- Drivers and Application Software

Drivers

A number of operating systems do not provide appropriate drivers for DDS drives - check your operating system manual. When no operating system drivers are available, connectivity can be achieved through application software packages. For those systems that do provide direct operating system support, application software packages are still recommended. Whereas operating system support is very basic, available application packages provide friendly user interfaces and make full use of DDS features.

UNIX Applications

For UNIX basic control, through standard backup utilities such as cpio and tar , is possible. Scripts can easily be put together to control DDS operation and additional utilities are available. Control remains basic and the range of available application software should be considered.

Application Software Availability

Most backup software companies provide packages for HP DDS products. Contact your software supplier for details. Alternatively details of a wide range of compatible software is available from HP - contact your HP supplier .

Software for the C1553A Autoloader

A number of software companies provide software specifically for the autoloader . This may be sold as an extension to the basic software package. The following table gives a list of available software:

Operating System	Software Vendor	Product	Supported from
Netware	Cheyenne	ARCserve 4.x	Changer Option 1.04
		ARCserve 5.x	Changer Option 2.0
	Legato	Networker	3.0
	Palindrome	Network Director	3.1
		Network Archivist	3.1
DOS	Palindrome	Backup Director	3.1
		Network Archivist	3.1
Solaris, AIX, SCO	Legato	Networker	4.0.2
HP-UX	Innovus	Networker	3.3.1
	Cheyenne	ARCserve/ Open	2.0
Windows NT	Arcada	backup Exec for NT AS	5.0
Macintosh	Dantz	Retrospect Remote	2.1

Arcada Software	USA	1-800-541-2220
	UK	44-628-777-277
Cheyenne	USA	1-516-484-5110
	UK	44-8178-11954
	France	33-1-396-33401
	Germany	49-896-802055
	Far East	81-3-3865-0191
Dantz	USA	1-510-253-3000
	France	33-93-69-59-90
	Far East	1 510 253 3000
Innovus	Canada	1-905-529-8117
Legato	USA	1-415-812-6000
	Holland	31-20-64-23985
	Far East	1-415-812-6000
Palindrome	USA	1-708 505 3300
	UK	44-753-810751
	Far East	1-708-505-3300

2 - Configuring Drive and System

Installation

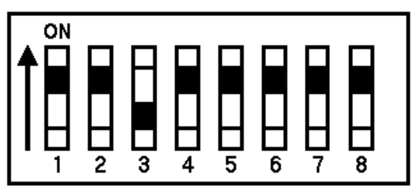
Instructions for installing HP DDS drives can be found in the DDS User manual. This chapter repeats elements of this information and provides additional notes as follows:

- Configuration Switches
- Autoloader Option Switches
- Notes on Specific Systems
- Further Information on Configuration Switches

Configuration Switches

There is a set of configuration switches on the underside of the unit, as shown in figure 2-1. These are read at power-on. With the unit switched off select the correct configuration for your system. The table below provides typical settings. More specific details can be found in the remainder of this chapter.

Figure 2-1



Configuration Switches,
(shown in default positions)

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

Configuration Switches

Typical Configuration Switch Settings, see below for further details:

	1	**2**	3	4	5	6	7	8
Default and Most PC Applications	On	On	Off	On	On	On	On	On
Hewlett-Packard Workstations Series 300/400/700/ 800	On	On	Off	On	On	On	On	On
SUN (1)	On	On	On	On	On	Off	Off	On
IBM RS/6000 (1)	On	On	Off	On	On	Off	Off	On
DEC	On	On	Off	On	On	Off	On	Off

Note 1: For Sun and IBM RS/6000 - to disable MRS, switch 8 should be in the OFF position.

Data Compression

(The HP 35470A does not support data compression - these switches are disabled in this unit.)

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:

Switch 1	Switch 2	Meaning
On	On	Compression enabled at power-on, with host control
On	Off	Compression enabled at power-on, no host control
Off	On	Compression disabled at power-on, the host is allowed to control compression
Off	Off	Compression disabled at power-on, no host control

Note that with switch 1 on, data written to the tape will be compressed without the knowledge of the host.

When switch 2 is on, the host can control Data Compression through the SCSI MODE SELECT commands, DC Characteristics Page.

By default, the HP 35480A, HP C1533A and HP C1553A will decompress data when reading a compressed tape, regardless of the settings of switches 1 and 2. Decompression can be turned of through the SCSI MODE SELECT commands, DC Characteristics Page.

Media Recognition System (MRS)

(MRS is discussed in Volume 1)

Switch 3 is ***normally*** 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-Media Recognition System tapes are treated as if they are write-protected.

There are a large number of exceptions to the use of switch 3 to control MRS. Refer to the section giving Further Information on Configuration Switch Settings later in this chapter.

Switches 4 to 8

Switches 4 to 8 are used to specify connectivity and functionality according to host or customer requirements. The default setting is all switches *on*.

Autoloader Modes of Operation - Stacker and Random

The autoloader can operate in two modes, Stacker or Random.

In *Stacker* (or sequential) mode, the autoloader does not depend on host implementation of SCSI medium changer commands. You can select which cartridge you want by using the “Select” and “Load” buttons on the front panel. When a cartridge is ejected from the drive following a host UNLOAD command, the autoloader will automatically load the next available cartridge from the magazine into the drive.

In *Random* (or changer) mode, the host views the autoloader as two devices:

- A changer mechanism to which SCSI Medium Changer commands can be sent.
- A tape drive to which SCSI Sequential Access commands can be sent.

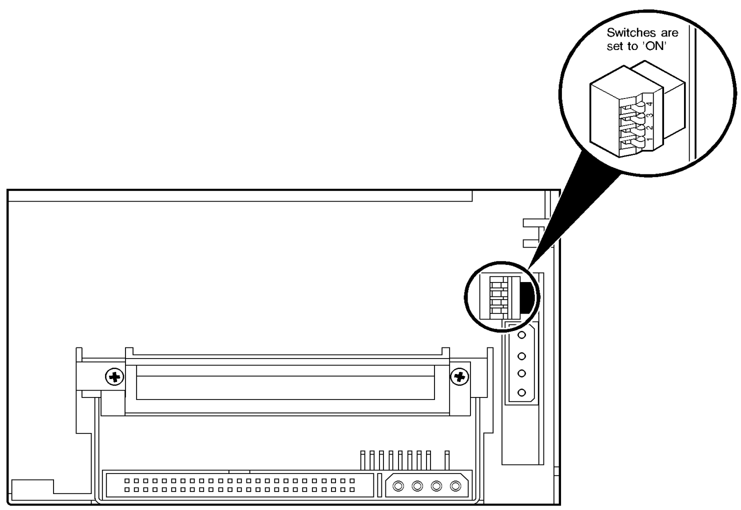
The controlling host computer therefore has full random access to any cartridge.

Autoloader Option Switches

The Autoloader option switches are on the rear-panel (see figure 2-2). The switches are read at power-on and set different configurations for the autoloader mechanism.

Figure 2-2

Autoloader Option Switches



With the autoloader switched off the following configurations can be set, (other settings are not used at this time):

Switches 4	3	2	1		Auto. Stack	Auto. Eject	Allow Resequencing	Lun 1 Magazine Ready	Lun 0 Drive Inquiry
off	**off**	**off**	**on**	**1h**	Enabled	Enabled			
off	**on**	**on**	**off**	**6h HP Series 800**			Enabled	Enabled	Enabled
off	**on**	**on**	**on**	**7h HP Series 700**			Enabled	Enabled	
on	**on**	**on**	**on**	**Fh Default**					

Lun 0 - drive Lun 1 - autoloader

Auto Stack: The autoloader will enter stacker mode after a magazine has been inserted. The first cartridge will automatically be loaded when a magazine is inserted

Auto Eject: When the autoloader is in Stacker mode it will eject the magazine following the unload of the last cartridge in the magazine.

Allow Resequencing: Load and Select buttons may be used, whilst the unit is in Stacker mode, to select an alternative cartridge to that presently loaded in the drive. When not enabled the Load and Select buttons are ignored in Stacker mode.

Lun 1 Magazine Ready: A SCSI T est Unit Ready command to LUN 1 will report good status whenever a magazine is present in the autoloader and magazine census data is available. This provides a method of detecting magazine presence. When not enabled a TUR command will receive a good status report whenever the unit has completed the power on self-tests.

Lun 0 Drive Inquiry: The Product ID sent in response to a SCSI Inquiry command to LUN 0 will be "C1533A", the DDS-2 drive. When not enabled the ID sent is "C1553A", the DDS-2 autoloader mechanism. The LUN 1 Inquiry Product ID will always be "C1553A".

Apple/Macintosh Applications

Configuration Switch Settings:

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

* Switch 3 Off to enable MRS

C1553A Autoloader

Option Switch Settings:

1	2	3	4	Comments
On	On	On	On	

Banyan Vines Networks

Configuration Switch Settings:

1	**2**	3	4	5	6	7	8*	Comments
On	On	Off	On	On	On	Off	On	Plug-and-play with Adaptec HBA

* Switch 8 On to enable MRS

C1553A Autoloader

Option Switch Settings:

1	**2**	3	4	Comments
On	On	On	On	

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
On	On	Off	On	On	Off	On	Off	Ignores non-immediate filemarks

* Switch 3 Off to enable MRS

The SCSI command set used on DEC workstations differs from that of SUN in one major area. This is the SPACE command. Where SUN complies to the requirements of SCSI-2, DEC chose to stay with a SCSI-1 implementation of this command. This slight difference is a major impact if a DEC user wants to boot from tape. By setting Switch 8 to OFF, the drive automatically switches to the functionality required by DEC workstations - the standard inquiry data length is truncated by 3 bytes. This will allow 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 “Performance” mode by setting Switches 8 and 6 to 0 (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 that was supposedly on tape, has now been lost in the buffer.

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

To allow the host to enable and disable compression and general improvements in host control make the following modifications:

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

```
/*HP C1533A DDS-2 DAT DRIVE/

or

/*HP 35470A DDS DAT DRIVE/

or

/*HP 35480A DDS DAT DRIVE/

or

/*HP C1553A DDS-2 DAT AUTOLOADER/

{“HP               xxxxxA” , 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
},
```

where `"HP                    xxxxxA"` is 35470A, 35480A, C1533A, C1553A and the string is 16 characters long.

2 Rebuild the kernel using the doconfig script as described in your system manual.

3 After rebooting the system 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:

/dev/rmt/rmt0h	(rewind with compression enabled)
/dev/rmt/rmt0m	(rewind with compression enabled)
/dev/rmt/rmt0l	(rewind compression disabled)
/dev/rmt/rmt0a	(rewind compression disabled)
/dev/rmt/nrmt0h	(no rewind with compression enabled)
/dev/rmt/nrmt0m	(no rewind compression enabled)
/dev/rmt/nrmt01	(no rewind compression disabled)
/dev/rmt/nrmt0a	(no rewind compression disabled)

C1553A Autoloader

Option Switch Settings:

1	2	3	4	Comments
On	On	On	On	

HP Workstations

Configuration Switch Settings:

1	**2**	3 *	4	5	6	7	8	Comments
On	On	Off	On	On	On	On	On	HP 9000/300, 400, 700, 800
On	On	Off	On	On	Off	On	On	Ignores non-immediate filemarks.

* Switch 3 Off to enable MRS

If top performance is a requirement, the drive can be configured to operate in "Performance" mode by setting Switche 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 here is that if power fails, the host may not be able to work out where data is, because a filemark that was supposedly on tape, has now been lost in the buffer .

Connectivity

The table below shows the operating system the drives will connect from:

System	HP 35470A	HP 35480A	HP C1533A	HP C1553A
700	HP-UX 8.07	HP-UX 8.07	HP-UX 9.01	HP-UX 9.01
800 8x0	HP-UX 8.06	HP-UX 9.0	HP-UX 9.04	HP-UX 9.04
800 8x7	HP-UX 8.02	HP-UX 9.0	HP-UX 9.04	HP-UX 9.04
800 890/T500	HP-UX 9.0	HP-UX 9.0		
800 8x6	HP-UX 9.04	HP-UX 9.04		

Assuming the DDS unit is correctly installed the Operating System kernal should already have the tape drivers configured. If you have any doubts, use 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 and Minor number . Major number recommendations are as follows:

- **121** is recommended as the preferred major number for Series 700. (**54** is not recommended but will function satisfactorily from HP-UX 9.01 upwards.)
- **5** is the recommended major number for Series 800.

Note Future releases of HP-UX (10.0 and above) may use different major numbers.

Each major number requires a different minor number format.

Series 700 Minor Number Format for Major Number **121**

The minor number format is **0x[BBB][T][L][D]**

[BBB] Bus (Interface)

- 201 = Core SCSI
- 207 = Fast/Wide (F/W) SCSI
- 4[S]0 = EISA SCSI ([S] = slot number)

[T] Target (SCSI ID)

- 7 = Invalid (reserved for the host system or initiator

[L] LUN To select Partition 1, add 8 to the LUN.

[D] Device type-specific configuration parameters:

- 6 = Medium density, Berkeley, rewind on close, **non-compressed**
- 7 = Medium density, Berkeley, no rewind on close, **non-compressed**
- E = Very high density,Berkeley, rewind on close, **compressed**
- F = Very high density, Berkeley, no rewind on close, **compressed**

The drive is normally configured as SCSI ID 3. Make sure that this does not conflict with other peripherals on the same SCSI bus.

As an 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:

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

Series 700 Minor Number Format for Major Number **54**

The minor number format is **0x[BBB][T][X][D]**.

[BBB] Bus (Interface)

201 = Core SCSI

[T] Target (SCSI ID)

7 is reserved for host system (initiator)

[X] Density and Partition

4	= Medium density, partition zero,	**non-compressed**
5	= Medium density, partition one,	**non-compressed**
C	= Very high density, partition zero,	**compressed**
D	= Very high density, partition one,	**compressed**

[Y] Block Size, Buffer Mode and Close Behavior

2	= Variable, buffering, Berkeley, rewind on close
3	= Variable, buffering, Berkeley, no rewind on close

Note Only SCSI tape devices with zero-valued logical unit numbers are accessible through major number 54.

As an example, suppose you want to create a device file for a non-DC drive with the following:

- Major number 54
- SCSI ID 3 on the core SCSI bus
- Automatic rewind on close

Enter the following:

```
mknod /dev/rmt/3m c 54 0x201302
```

Series 800 Minor Number Format for Major Number 5

When the operating system boots on a Series 800, it automatically configures any new peripherals attached to it.

Device File Configuration Parameters

Rewind and No Rewind Modes

Normally the tape media is repositioned to Beginning of Tape (BOT) when the device file is closed. Device file minor numbers identified by "rewind on close" cause this mode of operation. Device file minor numbers identified by "no rewind on close" do not cause tape media to be repositioned to BOT when the device file is closed. This mode of operation is useful when creating and reading multiple file tape media.

Berkeley and AT&T Modes

Berkeley and AT&T functional modes differ in "read only" close functionality. If Berkeley identifies a "read only" close on a device file minor number, the tape media position will remain unchanged by the device close operation. If AT&T identifies a "read only" close on a device file minor number, the tape media will be repositioned just after the next tape filemark (the start of the next file). Normally, Berkeley mode should be used.

Data Compression

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

Data Density	Medium	Very High
Data Compression	Non-Compressed	Compressed

Buffered and Unbuffered Modes

Write buffering (also known as immediate reporting) allows tape devices to indicate write completion as soon as data is received. Device file minor numbers identified by "buffering" cause write buffering to be enabled. Write buffering is generally necessary so that a tape device can achieve continuous media motion (streaming).

Device file minor numbers identified by "no buffering" cause write operations to be unbuffered (write completion is not indicated until data is committed to media). This mode is likely to reduce I/O performance and media capacity, and cause the tape to make more passes over the tape head. These additional tape passes reduce tape life. Device file minor numbers identified by "no buffering" should not normally be used. Unbuffered mode is only available through device major number **54**.

Variable and Fixed Block Modes

Data is written on tape media in data blocks. Device file minor numbers identified by "variable" cause data block sizes to be attermined by write system calls (each write system call causes one data block to be written to the tape media.) Device file minor numbers identified by "fixed"cause data blocks of a consistent size to be written. The specific data size is determined by the tape device and the driver. Write system calls to a device file in fixed block size mode must be an integral number of blocks in length. Normally, variable sized blocks are used. 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 **54**.

Partition Zero and Partition One

Normally, tape media contains a single partition (identified as partition zero). HP DDS tape devices support dividing a single tape medium into two partitions (two separate logical volumes). Media can be partitioned by using the `mediainit` command with "`-p`" option. The partition identified as partition one is located nearest to the beginning of the tape (BOT). The partition identified as partition zero is located nearest to the end of the tape (EOT).

If the last tape access was to partition zero, the tape media is unchanged on an "open". Device file minor numbers identified by "partition one" cause the tape media to reposition to the beginning of partition one on an "open" when the tape contains multiple partitions and the last tape access was to partition zero.

If the last tape access was to partition one, the tape media is unchanged on an "open".

Partitioning tape media and access to partition one requires the use of major number **54**.

Device File Names

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[T][L][D][N]
Core character	/dev/rmt/[T][D][P][C][N]
default tar	/dev/rmt/0m
default mt	/dev/rmt/0mn

where:

BBB: Bus (Interface)
201 = Core SCSI

T: Target (SCSI ID)
7 is reserved for the host system (initiator)

L: Logical unit number

D: Density

l	= low density
m	= medium density (non-compressed)
h	= high density
hc	= very high density (compressed)

P: Partition

ommitted	= partition 0
p	= partition 1

C: Close convention

a	= AT&T style close for S700
ommitted	= BSD style close for S700
b	= BSD style cose for S800
ommitted	= AT&T style close for S800

N: Rewind mode

n	= no rewind on close
(empty)	= automatic rewind on close

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Option Switch Settings:

1	**2**	3	4	Comments
Off	On	On	Off	Series 800
On	On	On	Off	Series 700

IBM RS6000 Workstations

Configuration Switch Settings:

1	2	3	4	5	6	7	8*	Comments
On	On	Off	On	On	Off	Off	On	Performance mode enabled and no-disconnects during data phase enabled.

* Switch 8 On to enable MRS

For **AIX 3.2 or later**, the switch settings shown will allow HP DDS drives to be supported using the SMIT functions "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. To change to variable block mode perform the following:

at the command line type: smit tape

select from the window: change / show characteristics of a tape drive

select the tape drive you wish to change form the select pop up window

change the block size field to 0

click on the "DO" button and apply the change.

For systems using **AIX 3.1.x or earlier**, special firmware is required allowing the drive to emulate a QIC device. Contact the re-seller you purchased your drive from for a RS6K QIC emulation upgrade cartridge.

HP DDS-format drives will work with '`tar`', '`cpio`', and '`dd`'. The drive is also boot capable, provided a boot tape is generated. For those customers who want to use the AIX 'backup' and 'restore' utilities, the drive's default condition must be "fixed mode". Switch 5 needs to be set to OFF in this case.

C1553A Autoloader

Option Switch Settings:

1	2	3	4	Comments
On	On	On	On	

PC/ PC-LAN Applications - Novell etc.

Configuration Switch Settings:

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

* Switch 3 Off to enable MRS

For:

IBM: OS/2

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

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

SCO: Xenix, Unix System/V, Open Desk Top

C1553A Autoloader

Option Switch Settings:

1	**2**	3	4	Comments
On	On	On	On	

MIPS Systems

Configuration Switch Settings:

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

C1553A Autoloader

Option Switch Settings:

1	**2**	3	4	Comments
On	On	On	On	

Silicon Graphics (SGI)

Configuration Switch Settings:

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

* Switch 8 On to enable MRS

With the above switch settings SCSI parity checking is turned off.

SGI DMA hardware requires that DMA start on a 32 bit aligned address. HP DDS drives only limit disconnects to a 16 bit alignment. It is necessary to disable disconnect and keep transfers short to avoid tying up the bus. The above switch setting disable disconnect during a data transfer . To have tar default to short block transfers change the 512*512 in your tpsc HP entry to 128*512 (128KB blocks) or better still 64*512 (64KB blocks).

Modify the following files in the operating system kernel:

- In IRIX 5.1 or earlier - /usr/sysgen/master.d/tpsc
- In IRIX 5.2 - /usr/sysgen/master.d/scsi

Copy the Archive / Python entry:

```
{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},
```

Make the modifications (shown in bold) to the copied version, and remove MTCAN_AUDIO shown in bold above. “HPxxxxxA” should be “HP35470A”, “HPC1533A”, etc. as appropriate:

```
{DATTAPE, TPDAT,2,8,"HP","HPxxxxxA",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_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*60,512,64*512},
```

Recompile your kernel and then you are ready to start backing up files to the HP drive.

C1553A Autoloader

Option Switch Settings:

1	**2**	3	4	Comments
On	On	On	On	

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 On to enable MRS

These settings will allow drives to “plug-and-play” with SUN’s workstation products which have internal SCSI support and are running SUN 4.1 O/S and later, and Solaris 2.3 and later. For Solaris 2.1 and 2.2 see below.

For SUN OS 4.1.x

SUN 4.1.x O/S requires that the SCSI address of tape devices be 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 or greater. This will improve performance significantly.

When using the “dump” command, set the tape size (-s) and density (-d) parameters to 15000 for 90m media and 20000 for 120m media. The defaults for the “dump” command are set up for QIC drives, and will result in storing only about 600 megabytes.

Optimizing Performance with SUN OS 4.1.x

Modify the Device Definition files to optimize performance in plug-and-play applications.

The following changes should be made to the files listed below;

1 In file `/user/sys/scsi/targets/stdef.h`
add after the entry defining an Exabyte device:

```
ST_TYPE_EXABYTE 0x28 /* Exabyte */
```

the following:

```
ST_TYPE_HP1 0x29 /* HP */
```

2 In file `/user/sys/scsi/targets/st_conf.c` add 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 } }
```

the paragraph:

```
* HP 4mm Helical Scan *
{ "HP-xxxxxA 4mm DAT", 2, "HP", ST_TYPE_HP1, 10240, (ST_VARIABLE |
ST_BSF | ST_BSR | ST_LONG_ERASE |ST_AUTODEN_OVERRIDE), 6000, 6000,
{ 0x00, 0x00, 0x00, 0x00 }, { 0, 0, 0, 0 } }
```

where `"HPxxxxxA"` should be `"HP35470A"`, `"HPC1533A"`, etc. as appropriate.

3 Recompile your kernel, and you are ready to start backing up files to the DDS drive.

For Solaris

Use the switch settings shown above.

For **Solaris 2.1 and 2.2**, a firmware upgrade cartridge is available to provide the emulation necessary for a plug and play connection using these switch settings. Contact the re-seller you purchased your drive from to get a copy of the Solaris emulation cartridge.

For **Solaris 2.3,** make the following file modifications to enhance performance:

1. In the file `/ kernel/drv/st.conf`
   Add after:

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

The following where `"HPxxxxxA"` should be `"HP35470A"`, `"HPC1533A"`, etc. as appropriate:

```
tape-config-list =
       "HP        HPxxxxxA", "HP DDS 4mm DAT", "HP-data";
HP-data = 1, 0x34, 0, 0x19, 4, 0x18, 0x18, 0x18 ,3 ;
```

2. Remove the `cd /dev/ rmt; rm *` file in `/dev/rmt`

3. Do a reconfigure boot:

```
cd /
touch  /reconfigure
halt
```

4. When the system is down reboot.

```
boot -r
```

You should now be able to use the drive. Use `/dev/rmt/Xcb` if you require a compression rewind device file and `/dev/rmt/Xcbn` when you require a compression non-rewind device. Where `X` is the relevant device address.

C1553A Autoloader

Option Switch Settings:

1	**2**	3	4	Comments
On	On	On	On	

Further Information on Configuration Switch Settings

This section gives a fuller explanation of the functionality associated with Switches 3 - 8. In the following table “1” corresponds to “on” and “0” to “off”. Functions are defined below .

Host	**Functions**									**Switches**					
	MRS on	*Perfor-mance*	*Caution on Hard Error*	*Default Fixed Mode*	*Parity off*	*No Data Phase Disc.*	*Truncate Request Sense*	*Forced Eject*	*Inquiry 35480*	**3**	**4**	**5**	**6**	**7**	**8**
HP			1					1		1	1	1	1	1	1
HP	1		1					1		0	1	1	1	1	1
HP			1				1	1		1	0	1	1	1	1
HP			1			1		1		1	0	0	1	1	1
HP	1		1			1		1		0	0	0	1	1	1
HP								1		1	1	0	1	1	1
HP	1							1		0	1	0	1	1	1
HP		1	1					1		1	1	1	0	1	1
HP	1	1	1					1		0	1	1	0	1	1
HP			1					1	1	1	0	0	0	1	1
HP			1							0	0	0	0	1	1
DEC			1					1		1	1	1	1	1	0
DEC	1		1					1		0	1	1	1	1	0
DEC		1	1					1		1	1	1	0	1	0
DEC	1	1	1					1		0	1	1	0	1	0
DEC		1	1			1		1		1	0	1	0	1	0
DEC	1	1	1			1		1		0	0	1	0	1	0
Other	1		1			1		1		0	1	1	1	0	1
Other	1		1	1				1		1	1	0	1	0	1
Other	1	1	1					1		1	1	1	0	0	1
Other	1	1	1			1		1		0	1	1	0	0	1
Other	1	1	1		1			1		1	0	1	0	0	1
Other	1	1	1		1	1		1		0	0	1	0	0	1
Other	1	1	1	1		1		1		0	1	0	0	0	1
Other	1	1	1	1	1	1		1		0	0	0	0	0	1
Other			1			1		1		0	1	1	1	0	0
Other			1					1		1	1	1	1	0	0
Other			1	1				1		1	1	0	1	0	0
Other		1	1				1	1		1	0	0	1	0	0
Other			1				1	1		0	0	0	1	0	0
Other		1	1					1		1	1	1	0	0	0
Other		1	1			1		1		0	1	1	0	0	0
Other		1	1		1			1		1	0	1	0	0	0
Other		1	1		1	1		1		0	0	1	0	0	0
Other		1	1	1		1		1		0	1	0	0	0	0
Other		1	1	1	1	1		1		0	0	0	0	0	0

Where “Host” in the above table indicates that the following features are enabled / disabled.

Host Variant	Async Sense	EW-EOM on Read Error	Write Zero FM	No EW EOM Residue	Attention after Load	Full Reset	Signed Residue	Trunc Inquiry	SDCA
HP	1	1	1	1	1				
DEC						1	1	1	1
Other		1							

Note In the HP modes, the SCSI command following a LOAD command will result in a CHECK CONDITION, with the drive reporting via the Sense Key that the media may have been changed.

In the DEC/Other modes, the CHECK CONDITION resulting from the LOAD operation is not issued

Special Function Definitions

In the following table, “True” corresponds to “1” in the preceding tables, and “False” to a blank entry.

Asynchronous Sense	True	The Mark bit may be set on asynchronous request sense.
	False	The Mark will never be set on asynchronous request sense.
Attention after Load	True	“Unit attention” and “not ready to ready transition” posted for command following a load, including those which just rewinds, or do nothing.
	False	“Unit attention” only posted for loading a new tape.
Caution on Hard Error	True	If a hard error occurs on a read or write, then the LED display will display a Caution Signal or Cleaning Needed signal indicating that the drive requires cleaning.
	False	No special LED displays are used to report hard errors.
Default Fixed mode	True	Defaults to fixed block mode with block size set to 1024 bytes.
	False	The default block size is 0 (variable block mode).
EW-EOM on Read Error	True	The EOM bit is set for read errors resulting from read commands meeting the EW-EOM mark.
	False	The EOM bit is only set if the tape is at PEOP/M.
Forced Eject	True	The Force Eject function is enabled
	False	The Force Eject functin is disabled
Full Reset	True	The drive performs a firm reset initialization in the event of a SCSI reset, or on receipt of a BUS DEVICE RESET message. See Chapter 10.
	False	The drive performs a soft reset initialization in the event of a SCSI reset, or on receipt of a BUS DEVICE RESET message, as defined in Chapter 10.

MRS on	True	The Media Recognition System capabilities of the drive are enabled, allowing the drive to write data to MRS media only, and read from any DDS-format 4 mm media. Non-MRS tapes are treated as if they are write-protected, and write commands will be rejected with a Sense Key of DATA PROTECT and additional sense of 3000h (incompatible medium).
	False	The drive is capable of reading and writing to any 4 mm media.
No Data Phase Disconnects	True	No disconnects in data phase. Save Data pointers may still be sent.
	False	Disconnects are not regulated, and may occur in the data phase.
No EW EOM Residue	True	If CHECK CONDITION is reported for EW EOM, the Sense data will not have the Valid bit set.
	False	The Valid bit will be set in the Sense data if CHECK CONDITION is reported for EW EOM.
Parity Off	True	No parity checking of SCSI data is performed.
	False	Parity is checked.
Performance	True	“Immediate” and “Infinite Flush” functions are selected (set to “True”). Immediate mode is carried out on all commands. “Switched buffer” = False is also enforced. The Immediate flags on commands are silently ignored and assumed to be set to “1”. Infinite Flush: The Write Delay is set to 0 (infinite buffer flush time-out). Write Delay timing in MODE SELECT is silently ignored.
	False	They are not selected (they are cleared to “False”). Immediate flags are used, and “switched buffer” is left as it is. Infinite Flush:The default Write Delay time is used. MODE SELECT may be used to re-specify the time-out.
SDCA	True	SDCA field in the device configuration mode page (10h) turns on DC if set to ‘1’, and turns DC off if set to ‘0’.
	False	SDCA field must be zero.
Signed Residue	True	The Residue is negative on a backspace.
	False	The Residue is absolute and positive, for all spacing.
Truncate INQUIRY	True	The standard INQUIRY page is truncated to 40h bytes.
	False	The INQUIRY page remains 43h bytes long.
Truncate Request Sense	True	The REQUEST SENSE page is truncated to 19 bytes.
	False	The page remains at 22 bytes long.
Write Zero FM	True	Allows write zero filemarks on a write-protected tape.
	False	Write Zero Filemarks is treated as any other write command with respect to write-protected tapes, and when there is no tape present.
Inquiry 35480 (does not apply to 35470A)	True	The product ID field in the returned Inquiry data will be “HP35480A” regardless of the identity of the drive itself.
	False	The drives product ID will correspond to its genuine HP model number, e.g. “C1533A”, etc.