# HP Ultrium Tape Drives

## UNIX Configuration Guide

**Edition 1, February 2001**

**Hewlett-Packard Ltd.**
Computer Peripherals Bristol
Filton Road, Stoke Gifford
Bristol BS12 6QZ, U.K.

## Notice

The information contained in this document is subject to change without notice.

**Hewlett-Packard makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.** Hewlett-Packard shall not be liable for errors contained herein or direct, indirect, special, incidental or consequential damages in connection with the furnishing, performance, or use of this document.



## Printing History

| Version | Date | Changed Pages |
|---|---|---|
| Edition 1 | Feb 2001 | All |

# Contents

# 1

# Introduction

# The Purpose of this Manual

This manual provides basic information on configuring the drives with various operating systems.

Please see the top-level release notes that accompany the drive for expected functionality and features.

As the drive is an early release with firmware that we expect to mature, we have provided a number of tools in both source and binary form. These tools can be used to demonstrate the drive's capabilities and debug its connectivity to platforms.

Details are provided for the following platforms, both for SCSI pass-through capability and native SCSI tape driver capability:

- Digital UNIX (Chapter 3)
- HP UNIX systems (HP-UX) (Chapter 4)
- IBM RS/6000 workstations (Chapter 5)
- PC-based UNIX, SCO and Linux (Chapter 6)
- Silicon Graphics Systems (IRIX) (Chapter 7)
- Sun Systems, Solaris 2 (SunOS 5.x) (Chapter 8)

For platforms not mentioned here, please contact HP because there may be new connectivity details available that arrived after the release notes were published.

See Chapter 2 for details of how to verify the installation.

# 2

# Verifying the Installation

# 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 Test the SCSI connection to the tape drive by doing a rewind operation:

a If there is a tape cartridge already in the drive, remove it.

b Insert a tape cartridge.

c Rewind the tape using the command line:

```
% mt -t <archive name> rewind
```

or for SCO UNIX:

```
% tape -a /dev/rStpX rewind
```

If you do not see the Tape light flash as the tape rewinds, the hardware installation may be faulty. Check the troubleshooting section of the User's Guide for help in identifying the problem.

4 Write a sample file to tape, using '**tar**':

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

The options to **tar** have the following meanings:

| | |
|---|---|
| **c** | Create a new archive (backup file) 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" on page 2-9. The arguments are as follows:

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

**Note** Make sure you prefix the file name with '**.**' when you back it up to tape. If you do not, the restore operation in step 3 will overwrite the original copy on disk.

5 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 2.

6 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 |
|---|---|---|---|---|
| DEC OSF | **vmunix** | OSF kernel | **/dev/rmt/*Y*m** | ***Y*** is the instance of the drive |
| HP-UX 10.*x* | **stand/vmunix** | HP-UX kernel | **/dev/rmt/*Y*m** | ***Y*** is the instance of the drive |
| IBM AIX | **unix** | AIX kernel | **/dev/rmt*Y*.1** | ***Y*** is the device ID reported back as available when you ran '**smit -C tape**' to create the device files. |
| SCO | **unix** | SCO kernel | **/dev/rStp*Y*** | Use the device file created during the running of '**mkdev tape**', where ***Y*** is the instance of the tape drive. |

| System | File Name | Description | Archive Name | Notes |
|---|---|---|---|---|
| Silicon Graphics IRIX | **unix** | IRIX kernel | **/dev/rmt/tps*C*d*X*** | ***C*** is the SCSI card<br>***X*** is the SCSI ID of the drive |
| SUN Solaris 2 (SunOS 5.*x*) | **bin/csh** | C shell | Determine the archive name as described below*. | |
| Linux | **bin/sh** | Bourne shell | **/dev/stp** | |

*For SUN Solaris 2, determine the archive name by typing:

```
% 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 underlined above) as the archive name.

# 3

# Digital UNIX

# For Digital UNIX 4.*x*

1 Add the following entry to your **/dev/ddr.dbase** file:

```
SCSIDEVICE
Type = tape
Name = "HP      Ultrium"
```
*(6 spaces between "HP" and "Ultrium")*

2 Set the following parameters in the file:

```
PARAMETERS:
MaxTransferSize = 0xffffff
ReadyTimeSeconds = 0x2d
InquiryLength = 0x20
DENSITY:
DensityNumber = 0
OneFileMarkOnClose = yes
DensityCode = 0x00
Blocking = 0
CompressionCode = 0x0
Buffered = 0x1
DENSITY:
DensityNumber = 1
OneFileMarkOnClose = yes
DensityCode = 0x00
Blocking = 0
CompressionCode = 0x1
Buffered = 0x1
```

3 Rebuild the kernel by running **/sbin/ddr_config**, then reboot the system with the tape drive attached. The device files for the Ultrium drive will be generated in **/dev/rmt** when you reboot.

4 The names of the device files can be interpreted as follows:

```
[n]rmtX D
```

where:

| Code | Meaning |
|---|---|
| **n** | No rewind |
| **X** | Instance number assigned to the drive by the operating system (0 is the first, 1 is the second, and so on) |
| **h** | Compression on (high density) |
| **l** | Compression off (low density) |

For example, **/dev/rmt/nrmt0h** is a device file for the first device, which is a high-density, no-rewind device.

# What Next?

Once the device files have been created, you should confirm that your new tape drive is working properly. Chapter 2, "Verifying the Installation" provides instructions on backing up and restoring a sample file to test your installation.

# 4

# HP-UX Systems

# SCSI Pass-Through Driver

**Note** This information is only needed when writing certain software applications.

The drive connects using the **sctl** driver on appropriate architectures. The drive has not been tested on the **spt** driver.

### *To configure the SCSI pass-through driver:*

See the man page for scsi_ctl and then execute a command of the following form:

```
mknod /dev/scsi/0.3 c 203 0xiiTL0o
```

where:

- **ii** The controlling card instance
- **T** The SCSI target ID
- **L** The SCSI logical unit number, which should be zero
- **o** The SCSI options value, which should be zero. See the man page for **scsi_ctl** for other values this can take.

You should verify the major number (**203** as shown above) by examining the output of the **lsdev** command and looking for the characteristic major number of the **sctl** or **spt** driver.

You can use the HP-UX pass-through driver with both of the trace download tools (trace directory), the firmware download utility and the **ppict** utility to demonstrate tape read, write and motion.

# HP Series 700 Workstations, HP-UX 10.*x*

## Determining the SCSI ID

Before you configure your system to support your new HP Ultrium drive, you need to determine what SCSI ID to use. The SCSI ID must be unique for each device attached to the SCSI bus. To list the existing devices, use the following command:

```
% /sbin/ioscan -f
```

The output of this should look similar to the following example:

```
Class     I  H/W Path    Driver       S/W State H/W Type   Description
=============================================================-------------------------====
bc        0              root         CLAIMED   BUS NEXUS
graphics  0  1           graph3       CLAIMED   INTERFACE  Graphics
ba        0  2>          bus adapter  CLAIMED   BUS NEXUS  Core I/O Adapter
ext_bus   0  2/0/1       c700         CLAIMED   INTERFACE  Bulit-in SCSI
target    0  2/0/1.2     tgt          CLAIMED   DEVICE
tape      0  2/0/1.2.0   stape        CLAIMED   DEVICE     HP HP35480A
target    1  2/0/1.3     tgt          CLAIMED   DEVICE
tape      1  2/0/1.3.0   stape        CLAIMED   DEVICE     HP HP35470A
target    2  2/0/1.4     tgt          CLAIMED   DEVICE
disk      0  2/0/1.4.0   sdisk        CLAIMED   DEVICE     TOSHIBA CD-ROM XM-34
target    3  2/0/1.6     tgt          CLAIMED   DEVICE
disk      1  2/0/1.6.0   sdisk        CLAIMED   DEVICE     HP C2490A
```

```
lan        0  2/0/2       lan2         CLAIMED   INTERFACE  Built-in LAN
 :         :    :           :             :         :            :
```

In this example, the existing SCSI bus currently has two HP DAT drives (SCSI IDs 2 and 3), a CD-ROM (SCSI ID 4), and a hard disk (SCSI ID 6). You could therefore assign SCSI ID 5 to the new HP Ultrium drive.

After you have installed the new tape drive, you can check that it has been attached successfully. From a shell window (**hpterm/xterm**), execute **ioscan** to display the list of attached devices.

For an HP Ultrium drive, execute the following:

```
% /sbin/ioscan -f | grep "Ultrium"
```

The new lines should look similar to the following, where the **4** in the **I** field represents the instance of the SCSI tape driver, not the SCSI ID:

```
tape       4  2/0/1.5.0  stape        CLAIMED   DEVICE     HP       Ultrium
```

## Creating the Device Files

Once you have verified the tape drive connection, you will need to create the appropriate device files for the drive. Normally, you would have rebooted your system after attaching the tape drive, and this process runs **insf**. However, if you have not rebooted your system since attaching the drive, you should run **insf** as follows before running **mksf** to create the device files:

```
% /sbin/insf -C tape
```

Create the device files for the devices using the **mksf** command as follows:

```
% /sbin/mksf -d stape -I <instance> [-n] [-u] /dev/rmt/X<name>
```

where:

| Argument | Description |
|---|---|
| **-d stape** | Specifies the SCSI tape driver |
| **-I <instance>** | Specifies the tape drive's hardware address via the instance of the SCSI tape driver. The first instance is 0, the second 1, and so on. |
| **[-n]** | Specifies no rewind; absence of this parameter indicates rewind mode |
| **[-u]** | Specifies Berkeley mode; absence of this parameter indicates AT&T mode. Berkeley and AT&T modes differ in their read-only close behavior:<br>■ In Berkeley mode, the tape position will remain unchanged by a device close operation.<br>■ In AT&T mode, a device close operation will cause the tape to be repositioned just after the next tape filemark (the start of the next file).<br>In most cases, Berkeley mode should be used. |

| Argument | Description |
|---|---|
| **/dev/rmt/X<name>** | Specifies the path of the device file, where:<br>**X** Specifies the tape device identifier. Use the next available identifier. You can examine the contents of /dev/rmt using the ls command to determine which identifiers have already been used.<br>**<name>** Specifies the short name (in HP-UX 9.x-style) of the device file:<br>**mnb** No rewind, compression disabled, Berkeley-mode device<br>**hnb** No rewind, compression disabled, Berkeley-mode device<br>**mnb** No rewind, compression disabled, Berkeley-mode device<br>**hnb** No rewind, compression enabled, Berkeley-mode device |

See the man page (**man 1m mksf**) for other options of the **mksf** command. The **stape** section covers the SCSI tape driver options. The man page **man 7 mt** describes the long filenames used in HP-UX 10.x.

*Example:*

To create a device file with the following characteristics:

- A hardware address specified by instance 5 (**-I 5**)
- No rewind (**-n**)
- Berkeley mode tape positioning on close (**-u**)
- A filename of **4mnb**, where **4** is the tape device identifier (**/dev/rmt/4mnb**)

You would execute the following:

```
% /sbin/mksf -d stape -I 4 -n -u /dev/rmt/4mnb
```

You can check that the appropriate device file was created using the lssf command as follows:

```
% /sbin/lssf /dev/rmt/4mnb
```

This should produce the following output to show that the device file now exists:

```
stape card instance 0 SCSI target 6 SCSI LUN 0 berkeley no rewind
BEST density at address 2/0/1.6.0 /dev/rmt/4mnb
```

To create a device file for Ultrium in uncompressed mode, you should use a command such as:

```
mksf -H -a -b U_18
```

and for compressed mode (default):

```
mksf -H -a -b U_18C
```

The hardware path can be found from previous ioscan output.

# What Next?

Once the device files have been created, you should confirm that your new tape drive is working properly. Chapter 2, “Verifying the Installation” provides instructions on backing up and restoring a sample file to test your installation.

# 5

# IBM RS/6000 Workstations

# Determining the SCSI ID

Before you configure your system to support you Ultrium drive, you need to determine which SCSI ID to use. IDs must be unique for each devide attached to the SCSI bus. To list the existing devices, use the following command:

```
% lsdev -C |grep SCSI
```

This will produce output that looks similar to:

```
scsi0 Available 00-00-0S Standard SCSI I/O Controller
hdisk0 Available 00-00-0S-0 1.0 GB SCSI Disk Drive
rmt1 Defined 00-00-0S-2,0 Other SCSI Tape Drive
```

The SCSI ID is in the series **00-00-0S-*X*,0**, where ***X*** is the SCSI ID. Review the list of existing SCSI IDs and choose an available ID to assign to the new tape drive.

# Configuring the Device Files

To install an HP Ultrium drive on an IBM workstation you will need to create the appropriate device files for the drive.

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 Ultrium 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 **mkszfile** and **mksysb**.

Once the device files have been created, you should confirm that your new tape drive is working properly. Chapter 2, "Verifying the Installation" provides instructions on backing up and restoring a sample file to test your installation.

## 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. DDS drives do not require retensioning, so you should not use device fields that send retensioning commands.

**Compression** Compression can be disabled or enabled.

# 6

# PC-Based UNIX, SCO and Linux

No pass-through examples are provided for this platform, although the tape driver is capable of performing that function.

# Determining the SCSI ID (Linux)

Look at the output of **dmesg** to find out what SCSI channel number is used for each connection.

To find out the SCSI IDs in use on each channel, type:

```
run cat /proc/scsi/scsi
```

This will produce output similar to the following for each device:

```
Attached Devices
Host: SCSI0 Channel: 00 Id:00 Lun:00
Vendor: HP Model ------------
Type: Direct-Access ANSI SCSI Revision 02
```

Look at the ID information to establish which IDs are in use.

# Configuring for an SCO System

To install the relevant driver and device files on an SCOOpenServer 5.X 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 the SCSI ID 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** |
| Generic device: | **1** |

   This procedure will automatically make the drive the default device, even if another device is already configured.

   You may want to edit **/etc/conf/pack.c/stp/space.c** to change the filemark handling on close. By default, it writes only one filemark for a write filemark **ioctl()**. See the comments in the **space.c** file.

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 instance number as assigned to the drive by the operating system (0 is the first device, 1 is the second, and so on).

## 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**' 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 **tar** with an argument of 20 or use the '**B**' option of **cpio**. For example:

```
% tar cvbf 20 /dev/rStpY ./*
```

or

```
% find / -print | cpio -ocB > /dev/rStpY
```

or, if you have a version of SCO UNIX earlier than 5.*x*:

```
% find / -print | cpio -ocB > /dev/rStpY
```

In each case, ***Y*** is the instance number as assigned to the drive by the operating system (0 is the first device, 1 is the second, and so on).

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***Y* or **/dev/rStp***Y* as described above.

# Configuring on Linux Systems

No changes are needed to support Ultrium on Linux platforms, however you should ensure that you have the relevant drivers loaded.

To see the device drivers loaded currently, execute an lsmod command, this will give output like:

```
Module          Size     Used by
sgm             4376     1
ide-scsi        7200     0
lockd           30792    1
sunrpc          53316    1
st              24656    0
ncr53c8xx       52096    1
aic7xxx         136184   2
```

The lines of interest here are:

| | |
|---|---|
| **st** | This is the tape driver. Its presence in the output of the **lsmod** command shows that the tape driver is loaded. |
| **ncr53c8xx** | This is a SCSI chipset driver for the LSI Logic family of HBAs (amongst others). |
| **aix7xxx** | This is a SCSI chipset driver for the Adaptec 7*xxx* chipset family (such as Adaptec 2940UW). |

In order to communicate with a tape device, the operating system needs to have drivers for the tape and the underlying transport mechanism (the host bus adaptor) loaded. Ensure that both are available as either loadable modules (for example, usable with **insmod** and visible with **lsmod**) or are statically built into your kernel.

In order to determine if the drive has been detected by the tape driver at module load time, execute:

```
dmesg | grep "st"
```

This should find a number of lines. One should look like:

```
Detected SCSI tape st0 at scsi1, channel 0, id 5, lun 0
```

To load the tape driver module if it is not loaded as above, execute:

```
insmod st
```

to load it. This should happen naturally if your system is rebooted after attaching the drive.

In order to enable large transfers under Linux (>64 KB per write), edit the file **/usr/src/linux/drivers/scsi/st_options.h** and change the definition of **ST_BUFFER_BLOCKS**.

If you want requests to space to end of data to be faster, you should also enable **ST_FAST_MTEOM** in the same file. After changing this file, rebuild the modules and install the new binary. At the very least, this requires:

```
make modules
make modules_install
```

from the **/usr/src/linux** directory. See your kernel documentation.

# What Next?

Once the device files have been created, you should confirm that your new tape drive is working properly. Chapter 2, “Verifying the Installation” provides instructions on backing up and restoring a sample file to test your installation.

# 7

# Silicon Graphics Systems (IRIX)

# Determining the SCSI ID

Before you configure your system to support the HP Ultrium drive, you need to determine which SCSI ID to use. IDs must be unique for each device on attached to the SCSI bus. To list the existing devices, use the following command:

```
% hinv -v | grep SCSI
```

This will produce output similar to the following:

```
Integral SCSI controller 0: Version WD33C93B, revision D
Disk drive: unit 1 in SCSI controller 0
```

In this, '**unit X**' indicates the SCSI ID. Review the list of existing SCSI IDs and choose an available ID to assign to the new tape drive.

# Configuring the Device Files

SGI DMA hardware requires that DMA starts on a 32-bit aligned address. You should also keep block transfers short to avoid tying up the bus:

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 Select the name of the kernel configuration file for your version of IRIX from the list below and open it with a text editor:

```
/var/sysgen/master.d/scsi
```

2 Find the following entry in the kernel configuration file and copy it to a new location in the file where you can edit it as appropriate for your tape drive:

*For IRIX 6.2:*

```
{DATTAPE, TPDAT,2,7,"HP","Ultrium",0,0,{0},
MTCAN_BSF|MTCAN_BSR|MTCAN_APPEND|MTCAN_PREV|MTCAN_SYNC|
MTCAN_SPEOD|MTCAN_CHKRDY|MTCAN_VAR|MTCAN_SETSZ|MTCAN_SILI|
MTCAN_SEEK|MTCAN_CMTYPEANY|MTCAN_COMPRESS,
/*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, 5*60, 20*60, 20*60, 512, 64*512, 0, (u_char*)0 },
```

*For IRIX 6.4/6.5:*

```
{ DATTAPE, TPDAT, 2, 7, "HP", "Ultrium", 0, 0, {0},
MTCAN_BSF|MTCAN_BSR|MTCAN_APPEND|MTCAN_COMPRESS|
MTCAN_PREV|MTCAN_SYNC|MTCAN_SPEOD|MTCAN_CHKRDY|MTCAN_VAR|
MTCAN_SETSZ|MTCAN_SILI|MTCAN_SEEK|MTCAN_CHTYPEANY,
/* minimum delay on 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, 5*60, 20*60, 20*60, 3*3600, 512, 512*512,
tpsc_default_dens_count, tpsc_default_hwg_dens_names,
tpsc_default_alias_dens_names,
{0}, 0, 0, 0,
0, (u_char *)0 },
```

For an explanation of the functions of the **MTCAN** values and constants, see "MTCAN and Constants Values" on page 7-27.

3 Recompile the kernel by running **autoconfig** and then reboot the system. When you reboot, the device files for the Ultrium drive will be created automatically.

The following device files will be created in **/dev/rmt**:

| | | | |
|---|---|---|---|
| **tps0d3** | **tps0d3cnrv** | **tps0d3nrns** | **tps0d3s** |
| **tps0d3c** | **tps0d3cns** | **tps0d3nrnsv** | **tps0d3sv** |
| **tps0d3cnr** | **tps0d3cnsv** | **tps0d3nrs** | **tps0d3v** |
| **tps0d3cnrns** | **tps0d3cs** | **tps0d3nrsv** | **tps0d3stat** |
| **tps0d3cnrnsv** | **tps0d3csv** | **tps0d3nrv** | |
| **tps0d3cnrs** | **tps0d3cv** | **tps0d3ns** | |
| **tps0d3cnrsv** | **tps0d3nr** | **tps0d3nsv** | |

These device file names can be interpreted as follows:

| Device Name | Function |
|---|---|
| **c** | Compression |
| **nr** | No rewind on close |
| **v** | Device supports variable block sizes |
| **ns** | Device does not byte-swap |
| **s** | Device does byte-swap |
| **stat** | Allows the device to be used when one of the other device files specifying the same physical device is already opened |

For example, the device file **tps0d3** indicates a device on controller card 0 at SCSI ID 3, and the device file **tps0d3nrv** indicates a device on controller card 0 at SCSI ID 3 that does not rewind on close and supports variable block sizes.

Once the device files have been created, you should confirm that your new tape drive is working properly. Chapter 2, "Verifying the Installation" provides instructions on backing up and restoring a sample file to test your installation.

## MTCAN and Constants Values

The **MTCAN** values have the following functions:

| MTCAN value | Capability Enabled |
|---|---|
| **APPEND** | Append to existing tape data |
| **BSF** | Backspace file |
| **BSR** | Backspace record |
| **CHKRDY** | Determine if a tape cartridge is present |
| **CHTYPEANY** | Change density and/or fixed to variable at points other than beginning of tape |
| **COMPRESS** | Compression |
| **PREV** | Prevent media removal |
| **SEEK** | Seek to a particular block |
| **SETSZ** | Fixed block size can be set |
| **SILI** | Suppress illegal length indicators |
| **SPEOD** | Space to EOD (end of data) |
| **SYNC** | Synchronous mode SCSI |
| **VAR** | Variable block sizes |

The constants have the following functions:

| Constant | Description |
|---|---|
| `40` | Transfer time-out in “inverse ticks” |
| `5*60` | Minimum time-out in seconds for any command |
| `20*60` | Space command time-out in seconds |
| `20*60` | Time-out in seconds for long operations (such as rewinds) |
| `512` | Default block size in bytes for fixed block size mode |
| `64*512` *or* `512*512` | Recommended blocking factor in bytes for the upper limit of read/write commands |

# 8

# Sun Systems, Solaris 2 (SunOS 5.*x*)

# Determining the SCSI ID

Before you configure your system to support the HP Ultrium drive, you need to determine which SCSI ID to use. IDs must be unique for each device on attached to the SCSI bus.

1 Check for existing SCSI controllers using the following command:

```
% modinfo | grep "SCSI Host"
```

This will produce output similar to the following:

```
18 501a4000 c3b8 61 1 esp (ESP SCSI Host Bus Adapter Drive)
21 501c8000 9e70 6 1 fas (FAS SCSI Host Bus Adapter Drive)
```

This indicates that there are two SCSI controllers on the system, an ESP-based adapter and a FAS-based adapter. For the adapter to which the new tape drive is attached, you will need to determine what SCSI IDs are already used.

2 Determine the SCSI IDs of the existing devices attached to the SCSI controller:

*For all adapters:*

```
% dmesg | egrep ".*xxx.*target" | sort | uniq
```

where **xxx** = the type of adapter (**esp**, **glm**, **fas** or **isp**), as appropriate.

For example, for an ESP-based adapter:

```
% dmesg | egrep ".*esp.*target" | sort | uniq
```

This produces a list similar to:

```
sd0 at esp0: target 0 lun 0 sd6 at esp0: target 6 lun 0
```

This indicates that SCSI IDs 0 and 6 are used for existing devices. SCSI ID 7 is generally used for the adapter itself. In this situation, you would use a SCSI ID from 1 to 5 for the new tape drive.

# SCSI Pass-Through Driver

**Note** This information is only needed when writing certain software applications.

Sun Solaris does not have a good pass-through driver available for general SCSI peripherals unless attached through an existing target driver.

We have included a driver that we have found to be useful during in-house testing. Please see the copyright notice enclosed within the **SCHILYscg.tar.Z** archive.

## *To install the SCSI pass-through driver:*

1 Extract the binary into a directory with some space free:

```
zcat SCILYscg.tar.Z | tar xvf -
```

2 Install the package:

```
pkgadd -d
```

3 Select **SCHILYscg** to install.

Once the driver is installed, you will find a variety of pass-through device files under **/dev**, named **scg*N*** (where ***N*** is the SCSI bus number). You will require a

reconfigure boot to make this driver work, and if you are running Solaris 7, you will have to boot in 32 boot mode via the following from the boot prom:

```
ok boot disk kernel/unix -r
```

As an aid to find the device file to use with the SCG devices, see the **inqscq** binary and source. Note that the first argument to the program specifies the SCSI bus and the second (**-t**) is the SCSI target ID of the device.

**Ppict**, the firmware download utility and the trace log retrieval programs can all be used with this driver.

To compile any of the sources that use the **scg** driver, you must use the following command line:

```
cc inqscg.c -DSVR4 -I. -o inqscg
```

where

| | |
|---|---|
| **inqscg.c** | An example source file |
| **inqscg** | An example source file |

# Configuring the Device Files

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 (there are 6 significant spaces between HP and Ultrium in line 2):

```
tape-config-list =
      "HP      Ultrium", "HP      Ultrium", "ULTRIUM",
ULTRIUM = 1,0x36,0,0xd639,4,0x00,0x00,0x00,0x40,3;

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

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

See "HP-Data Values" on page 8-32 below for the values of the parameters in these lines.

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.

Once the device files have been created, you should confirm that your new tape drive is working properly. Chapter 2, "Verifying the Installation" provides instructions on backing up and restoring a sample file to test your installation.

# HP-Data Values

The values for **Ultrium** and **name**, which provide normal LTO mode, have the following meanings:

The syntax for **ULTRIUM** is:

```
ULTRIUM = <version>, <type>, <bsize>, <options>,
  <no. of densities>, <density 0>, <density 1>, <density 2>,
  <density 3>, <default density>
```

where:

| Parameter | Value | Meaning |
|---|---|---|
| **<version>** | **1** | Indicates that this is the first version. |
| **<type>** | **0x36** | The value for an Ultrium drive in **/usr/include/sys/mtio.h**. This indicates a type of **MT_ISOTHER**, in other words not any of the default types such as **DAT** or **DLT**. |
| **<bsize>** | **0** | Indicates variable block size. |
| **<options>** | **0xd639** | This value is derived from constants provided in **/usr/include/sys/scsi/targets/stdef.h**. The value determines which operations the driver can perform with the attached device by using a unique value for each feature and then adding them together to form **0x639**. The features are as follows:<br>**0x001** Device supports variable length records.<br>**0x008** Device can backspace over files (as in the '**mt bsf**' option).<br>**0x010** Device supports backspace record (as in '**mt bsr**').<br>**0x020** Device requires a long time-out period for erase functions.<br>**0x0200** Device knows when end of data has been reached.<br>**0x0400** Device driver is unloadable.<br>**0x1000** Time-outs five times longer than normal.<br>**0x4000** Driver buffers write requests and pre-acknowledges success to application.<br>**0x8000** Variable record size not limited to 64 KB.<br>So **0xd639** indicates variable record length, **bsf** and **bsr** enabled, long timeouts for erase, EOD recognition, Unloadable device driver, 5 x longer timeouts, buffer writes and pre-acknowledge sucess, variable records not limited to 64 KB. |
| **<no. of densities>** | **4** | There are four densities following in the parameter list. |
| **<density *n*>** | **0x00** | Creates a device file with compression disabled. |
| **<density 3>** | **0x40** | The density code for data compression enabled by default. |
| **<default density>** | **3** | Density 3 (**0x40**) is the default for Ultrium drives. |

Values for the parameters for **name** are as follows::

| Parameter | Value | Meaning |
|---|---|---|
| **target** | ***X*** | ***X*** specifies the SCSI ID (target) of the device. |
| **lun** | **0** | Specifies the LUN for the device. |

# Glossary

**AT&T mode** Berkeley and AT&T functional modes differ in “read-only” close functionality. In AT&T mode, a device close operation will cause the tape to be repositioned just after next filemark on the tape (the start of the next file).

**Berkeley mode** Berkeley and AT&T functional modes differ in “read-only” close functionality. In Berkeley mode the tape position will remain unchanged by a device close operation.

**BOT** Beginning Of Tape. The first point on the tape that can be accessed by the drive.

**buffered mode** A mode of data transfer in write operations that facilitates tape streaming. It is selected by setting the Buffered Mode Field to 1 in the SCSI MODE SELECT Parameter List header.

**compression** A procedure in which data is transformed by the removal of redundant information in order to reduce the number of bits required to represent the data. This is basically done by representing strings of bytes with codewords.

In Ultrium drives, the data is compressed using the LTO-DC compression format which is based on ALDC (licensed from Stac/IBM) with two enhancements. One limits the increase in size of data that cannot be compressed that ALDC produces. The other is the use of embedded codewords.

**data transfer phase** On a SCSI bus, devices put in requests to be able to transfer information. Once a device is granted its request, it and the target to which it wants to send information can transfer the data using one of three protocols (assuming both devices support them): asynchronous, synchronous, and wide.

In *asynchronous* transfers, the target controls the flow of data. The initiator can only send data when the target has acknowledged receipt of the previous packet. All SCSI devices must support asynchronous transfer.

In *synchronous* data transfer, the initiator and target work in synchronization, allowing transmission of a packet of data to start before acknowledgment of the previous transmission.

In *wide* (16-bit) data transfer, two bytes are transferred at the same time instead of a single byte.

HP Ultrium drives support asynchronous, synchronous and narrow (8-bit) wide transfers.

**filemark** A mark written by the host to the tape that can be searched for, often using the drive’s fast-search capability. It does not necessarily separate files. It is up to the host to assign a meaning to the mark.

**group** A fixed capacity set of tracks written to or read from tape, defined in the DDS format.

**immediate mode** A mode of responding to SCSI commands where the drive or other peripheral does not wait until the command has finished before returning status information back to the host. For writing filemarks, Immediate mode can significantly improve the performance of systems that do not set the Immediate bit when sending a SCSI WRITE FILEMARKS command. On the other hand, data is not flushed to tape in response to a filemark command.

**infinite flush** By default, the buffer in the drive is flushed every 5 seconds. Infinite flush avoids frequent starting and stopping of the mechanism when using a very slow application. It also avoids losing capacity through the flushing of partly written groups. On the other hand, infinite flush means that data can remain in the buffer for very long periods of time, and could be lost in the event of a power failure.

**LUN** Logical Unit Number. A unique number by which a device is identified on the SCSI bus. A tape drive has a fixed LUN of 0. In an autoloader, the changer mechanism is LUN1.

**SCSI** Small Computer System Interface—a standard command specification and command set that enables computers and peripherals to communicate with each other. HP's Ultrium drives adhere to the SCSI-3 specification and support all features required by that standard.

***Single-Ended and Low Voltage Differential SCSI***

These terms define how the signals are transmitted along the cable.

With *single-ended (SE) SCSI*, each signal travels over a single wire and each signal's value is determined by comparing the signal to a paired ground wire. Signal quality tends to decrease over longer cable lengths or at increased signal speed.

With *low voltage differential (LVD)* signaling, signals travel along two wires and the difference in voltage between the wire pairs determines the signal value. This enables faster data rates and longer cabling with less susceptibility to noise than SE signaling and reduced power consumption.

***Narrow and Wide, Fast, Ultra and Ultra2 SCSI***

*Narrow* SCSI devices can transfer data one byte at-a-time (and are sometimes called “8-bit SCSI” devices). They can conform to either the SCSI-2 or SCSI-3 protocols. They have a 50-pin connection to the SCSI bus.

*Wide* SCSI devices can transfer two bytes of data simultaneously (“16-bit SCSI”). They usually have a single, 68-pin connection to the SCSI bus. (This physical arrangement is part of the SCSI-3 specification.) They may support either SCSI-2 or SCSI-3 protocols. Wide and narrow devices can simultaneously be connected to the same bus without problem, provided certain rules are followed.

*Fast* SCSI can transfer data at up to 10 MB/sec, using a cable of up to 6 meters total length.>/dd>

*Ultra* SCSI can transfer data at up to 20 MB/sec, but the cable length cannot exceed 3 meters (it is also known as “Fast20”).

*Ultra2* SCSI can transfer data at up to 40 MB/sec, using a cable of up to 25 meters total length for a single device, or up to 12 meters for two or more devices (it is also known as “Fast40”).

Ultra SCSI supports both SE and LVD interfaces. Ultra2 SCSI supports LVD interfaces only. In normal situations, slower devices can coexist with faster devices, and narrow devices can be used on the same SCSI bus as wide devices using a suitable adapter.

HP's Ultrium drives are Ultra2, wide SCSI-3 compatible devices. They can be used with both LVD and SE host bus adapters.

**sequential access** Sequential access devices store data sequentially in the order in which it is received. Tape devices are the most common sequential access devices. Devices such as disk drives are direct access devices, where data is stored in blocks, not necessarily sequentially. Direct access allows for speed of retrieval, but is significantly more costly.

# Index

## U



## V



## W