

Symantec NetBackup™ Device Configuration Guide

UNIX, Windows, Linux

Release 7.6 Draft

Symantec NetBackup™ Device Configuration Guide

The software described in this book is furnished under a license agreement and may be used only in accordance with the terms of the agreement.

Documentation version:

PN:

Legal Notice

Copyright © 2013 Symantec Corporation. All rights reserved.

Symantec, the Symantec Logo, the Checkmark logo, Veritas, and NetBackup are trademarks or registered trademarks of Symantec Corporation or its affiliates in the U.S. and other countries. Other names may be trademarks of their respective owners.

This Symantec product may contain third party software for which Symantec is required to provide attribution to the third party ("Third Party Programs"). Some of the Third Party Programs are available under open source or free software licenses. The License Agreement accompanying the Software does not alter any rights or obligations you may have under those open source or free software licenses. Please see the Third Party Legal Notice Appendix to this Documentation or TPIP ReadMe File accompanying this Symantec product for more information on the Third Party Programs.

The product described in this document is distributed under licenses restricting its use, copying, distribution, and decompilation/reverse engineering. No part of this document may be reproduced in any form by any means without prior written authorization of Symantec Corporation and its licensors, if any.

THE DOCUMENTATION IS PROVIDED "AS IS" AND ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, ARE DISCLAIMED, EXCEPT TO THE EXTENT THAT SUCH DISCLAIMERS ARE HELD TO BE LEGALLY INVALID. SYMANTEC CORPORATION SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, PERFORMANCE, OR USE OF THIS DOCUMENTATION. THE INFORMATION CONTAINED IN THIS DOCUMENTATION IS SUBJECT TO CHANGE WITHOUT NOTICE.

The Licensed Software and Documentation are deemed to be commercial computer software as defined in FAR 12.212 and subject to restricted rights as defined in FAR Section 52.227-19 "Commercial Computer Software - Restricted Rights" and DFARS 227.7202, "Rights in Commercial Computer Software or Commercial Computer Software Documentation", as applicable, and any successor regulations. Any use, modification, reproduction release, performance, display or disclosure of the Licensed Software and Documentation by the U.S. Government shall be solely in accordance with the terms of this Agreement.

Symantec Corporation
350 Ellis Street
Mountain View, CA 94043

<http://www.symantec.com>

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

DRAFT

Technical Support

Symantec Technical Support maintains support centers globally. Technical Support's primary role is to respond to specific queries about product features and functionality. The Technical Support group also creates content for our online Knowledge Base. The Technical Support group works collaboratively with the other functional areas within Symantec to answer your questions in a timely fashion. For example, the Technical Support group works with Product Engineering and Symantec Security Response to provide alerting services and virus definition updates.

Symantec's support offerings include the following:

- A range of support options that give you the flexibility to select the right amount of service for any size organization
- Telephone and/or Web-based support that provides rapid response and up-to-the-minute information
- Upgrade assurance that delivers software upgrades
- Global support purchased on a regional business hours or 24 hours a day, 7 days a week basis
- Premium service offerings that include Account Management Services

For information about Symantec's support offerings, you can visit our website at the following URL:

www.symantec.com/business/support/

All support services will be delivered in accordance with your support agreement and the then-current enterprise technical support policy.

Contacting Technical Support

Customers with a current support agreement may access Technical Support information at the following URL:

www.symantec.com/business/support/

Before contacting Technical Support, make sure you have satisfied the system requirements that are listed in your product documentation. Also, you should be at the computer on which the problem occurred, in case it is necessary to replicate the problem.

When you contact Technical Support, please have the following information available:

- Product release level

- Hardware information
- Available memory, disk space, and NIC information
- Operating system
- Version and patch level
- Network topology
- Router, gateway, and IP address information
- Problem description:
 - Error messages and log files
 - Troubleshooting that was performed before contacting Symantec
 - Recent software configuration changes and network changes

Licensing and registration

If your Symantec product requires registration or a license key, access our technical support Web page at the following URL:

www.symantec.com/business/support/

Customer service

Customer service information is available at the following URL:

www.symantec.com/business/support/

Customer Service is available to assist with non-technical questions, such as the following types of issues:

- Questions regarding product licensing or serialization
- Product registration updates, such as address or name changes
- General product information (features, language availability, local dealers)
- Latest information about product updates and upgrades
- Information about upgrade assurance and support contracts
- Information about the Symantec Buying Programs
- Advice about Symantec's technical support options
- Nontechnical presales questions
- Issues that are related to CD-ROMs, DVDs, or manuals

Support agreement resources

If you want to contact Symantec regarding an existing support agreement, please contact the support agreement administration team for your region as follows:

Asia-Pacific and Japan	customercare_apac@symantec.com
Europe, Middle-East, and Africa	semea@symantec.com
North America and Latin America	supportsolutions@symantec.com

DRAFT

Contents

Technical Support	4
Chapter 1 Introducing device configuration	13
Using this guide	13
General device configuration sequence	14
Configuration cautions	14
About the NetBackup compatibility lists	15
Section 1 Operating systems	17
Chapter 2 AIX	19
Before you begin configuring NetBackup on AIX	19
RS/6000 AIX adapter number conventions	20
About AIX persistent naming support	21
About configuring robotic control device files in AIX	21
About configuring tape drive device files in AIX	21
About choosing a tape driver	22
About non-QIC tape drives	22
About extended-file marks for drives	23
About fast-tape positioning (locate-block) on AIX	23
About no rewind device files	24
Creating no rewind device files for tape drives	24
Using multiple tape densities	27
About SPC-2 SCSI reserve on AIX	28
Disabling SPC-2 SCSI reserve in AIX	28
About Sony AIT drives	29
AIX command summary	30
Chapter 3 HP-UX	31
Before you begin configuring NetBackup on HP-UX	31
About robotic control on HP-UX	32
About HP-UX device addressing schemes	32
HP-UX tape drive device file requirements for NetBackup	33
About device drivers and files for persistent DSFs	34

About device drivers for persistent DSFs	34
About persistent DSFs for robotic control	35
About persistent DSFs for tape drive access	35
About persistent DSF pass-through paths	35
About configuring persistent DSFs	36
Creating HP-UX persistent DSFs	36
Upgrading NetBackup to use HP-UX persistent DSFs	37
Creating persistent DSF pass-through paths	37
About HP-UX legacy device drivers and files	38
About device drivers for legacy device files	38
About legacy robotic control device files	38
About legacy tape drive device files	39
About legacy pass-through paths for tape drives	40
Creating device files for SAN clients on HP-UX	40
About configuring legacy device files	41
Creating legacy SCSI and FCP robotic controls on HP-UX	41
About creating legacy tape drive device files	48
Creating tape drive pass-through device files	48
About SPC-2 SCSI reserve on HP-UX	52
Disabling SPC-2 SCSI reserve in HP-UX	52
About disabling the HP-UX EMS Tape Device Monitor for a SAN	52
HP-UX command summary	53

Chapter 4

Linux	55
Before you begin on Linux	55
About the required Linux SCSI drivers	56
st driver support for additional tape devices	57
About st buffer size and performance	58
About the st driver debug mode	58
Verifying the Linux drivers	58
About configuring robot and drive control for the Linux 2.6 kernel	58
About the Linux 2.6 kernel robotic control device files	59
About the Linux 2.6 kernel tape drive device files	59
Verifying the device configuration	59
About SAN clients on Linux	60
About SCSI persistent bindings	61
About Emulex HBAs	61
Utilities to test SCSI devices	62
Linux command summary	62

Chapter 5	Solaris	63
	Before you begin on Solaris	63
	About the NetBackup sg driver	64
	Determining if the NetBackup sg driver is installed	65
	Special configuration for the Sun StorEdge Network Foundation HBA driver	66
	About binding Fibre Channel HBA drivers	66
	Configuring Solaris 10 x86 for multiple drive paths	67
	Installing/reinstalling the sg and the st drivers	67
	st.conf file example	69
	sg.conf file example	70
	sg.links file example	71
	Preventing Solaris driver unloading	72
	About Solaris robotic controls	73
	About SCSI and FCP robotic controls on Solaris	73
	About Solaris tape drive device files	74
	About Berkeley-style close	75
	About no rewind device files on Solaris	76
	About fast-tape positioning (locate-block) on Solaris	76
	About SPC-2 SCSI reserve on Solaris	76
	Disabling SPC-2 SCSI reserve on Solaris	77
	About nonstandard tape drives	77
	Configuring SAN clients to recognize FT media servers	77
	Adding the FT device entry to the st.conf file	78
	Modifying the st.conf file so that Solaris discovers devices on two LUNS	78
	Uninstalling the sg driver	79
	Solaris command summary	79
Chapter 6	Windows	81
	Before you begin configuring NetBackup on Windows	81
	About tape device drivers on Windows	82
	Attaching devices to a Windows system	82
Section 2	Robotic storage devices	83
Chapter 7	Robot overview	85
	About NetBackup robot types	85
	Robot attributes	86
	ACS robots	86
	TL4 robots	87

TL8 robots	88
TLD robots	89
TLH robots	90
TLM robots	91
Table-driven robotics	92
Robotic test utilities	92
Robotic processes	93
Processes by robot type	93
Robotic process example	95

Chapter 8 ADIC Automated Media Library (AML) 97

About ADIC Automated Media Library	97
Sample TLM configuration	98
Media requests for a TLM robot	99
Configuring TLM robotic control	100
Configuring TLM drives on the host	100
Installing ADIC client software on UNIX	101
Installing ADIC client software on Windows	101
Configuring the DAS or Scalar DLC client name	102
Allocating TLM drives on a DAS server	103
Allocating TLM drives on a Scalar DLC server	104
Configuring TLM drives in NetBackup	104
Determining drive designations	105
Configuring shared TLM drives	106
Configuring the ADIC DAS server	106
Configuring the ADIC Scalar DLC server	107
Configuring the shared drives in NetBackup	108
Providing common access to volumes	109
Adding tapes to a TLM robot	109
Removing tapes from a TLM robot	110
Robot inventory operations on TLM robots	111

Chapter 9 IBM Automated Tape Library (AML) 113

About IBM Automated Tape Library	113
Sample TLH configurations	114
UNIX system example configurations	114
Windows system example configurations	117
Media requests for a TLH robot	120
About configuring robotic control	121
Robotic control on an AIX system	121
Robotic control on a UNIX system	123
Robotic control on a Windows system	126

	About configuring TLH drives	128
	About cleaning drives	129
	Adding tapes to TLH robots	129
	Removing tapes from TLH robots	130
	Robot inventory operations on TLH robots	131
	Robot inventory filtering on TLH robots	132
Chapter 10	Sun StorageTek ACSLS robots	133
	About StorageTek ACSLS robots	133
	Sample ACSLS configurations	134
	Media requests for an ACS robot	138
	About configuring ACS drives	138
	Configuring shared ACS drives	140
	Adding tapes to ACS robots	142
	About removing tapes from ACS robots	142
	Removing tapes using the ACSLS utility	143
	Removing tapes using NetBackup	143
	Robot inventory operations on ACS robots	143
	Configuring a robot inventory filtering on ACS robots	145
	NetBackup robotic control, communication, and logging	146
	NetBackup robotic control, communication, and logging for	
	Windows systems	146
	NetBackup robotic control, communication, and logging for UNIX	
	systems	146
	ACS robotic test utility	151
	acstest on Windows systems	152
	acstest on UNIX systems	152
	Changing your ACS robotic configuration	152
	ACS configurations supported	153
	Multiple ACS robots with one ACS library software host	153
	Multiple ACS robots and ACS library software hosts	154
	Sun StorageTek ACSLS firewall configuration	155
Chapter 11	Device configuration examples	157
	A robot on a server example	157
	Stand-alone drives on a server example	160
	A robot and multiple servers example	163
	Configuration on the Windows server eel	165
	Configuration on the Windows server shark	165
	Configuration on the UNIX server whale	166
	An ACS robot on a Windows server example	167
	An ACS robot on a UNIX server example	170

A TLH robot on a UNIX server example 173

A TLM robot on a UNIX server example 175

Index 179

DRAFT

Introducing device configuration

This chapter includes the following topics:

- [Using this guide](#)
- [General device configuration sequence](#)
- [About the NetBackup compatibility lists](#)

Using this guide

Use this guide to help set up and configure the operating systems of the hosts you use for NetBackup servers. Also use this guide for help with storage devices. This guide provides guidance about NetBackup requirements; it does not replace the vendor documentation.

This guide is organized as follows:

- Information about operating systems.
- Information about robotic storage devices.

Portions of this guide apply only to a specific NetBackup server type (for example, NetBackup Enterprise Server). Such topics are identified.

Read the "Before you start" sections (if applicable) of the chapters in this guide. These sections provide any important platform-specific instructions or may contain specific instructions or limitations for server types.

Symantec tested the configuration file options in this guide; other configuration settings may also work.

To minimize configuration errors, you can copy and paste configuration details from a text file of the operating system chapters of this configuration guide. The

format of this text file is similar to the printed version of the guide. Be sure to review the differences as explained at the beginning of the text file.

The `NetBackup_DeviceConfig_Guide.txt` file is installed with NetBackup server software in the following paths:

- `/usr/opensv/volmgr` (UNIX)
- `install_path\Veritas\Volmgr` (Windows)

The NetBackup Hardware Compatibility List contains information about supported devices.

See [“About the NetBackup compatibility lists”](#) on page 15.

General device configuration sequence

Use the following general sequence when you **configure** devices:

- Physically connect the storage devices to the media server. Perform any hardware configuration steps that the device vendor or the operating system vendor specifies.
- Create any required system device files for the drives and robotic control. Device files are created automatically on Windows and on some UNIX platforms. Explicit configuration of device files is required on some UNIX servers to make full use of NetBackup features.
For SCSI controlled libraries, NetBackup issues SCSI commands to the robotic devices. SCSI commands allow NetBackup to discover and configure devices automatically. You may have to configure the server operating system to allow device discovery.
- Add the storage devices to NetBackup and configure them.
For instructions, see the *NetBackup Administrator's Guide, Volume I* or the **NetBackup Administration Console** help.
You can configure devices in NetBackup from the master server or the media server to which the devices are attached (the device host). For more information, see "To administer devices on other servers" in the *NetBackup Administrator's Guide, Volume I* or the **NetBackup Administration Console** help.

Configuration cautions

Observe the following cautions:

- In multiple-initiator (multiple host bus adapter) environments, NetBackup uses SCSI reservation to avoid tape drive usage conflicts and possible data loss

problems. SCSI reservation operates at the SCSI target level; the hardware that bridges Fibre Channel to SCSI must work correctly.

By default, NetBackup uses SPC-2 SCSI reserve and release. Alternatively, you can use SCSI persistent reserve or disable SCSI reservation entirely.

For information about the NetBackup use of SCSI reservation, see the following:

- "Enable SCSI reserve" in the *NetBackup Administrator's Guide, Volume I*.
- "How NetBackup reserves drives" in the *NetBackup Administrator's Guide, Volume II*.
- Symantec does not recommend or support the use of single-ended to differential SCSI converters on NetBackup controlled devices. You may encounter problems if you use these converters.

About the NetBackup compatibility lists

Symantec provides compatibility lists for the operating systems, peripherals, and software with which NetBackup works.

See the NetBackup compatibility lists on the NetBackup landing page on the Symantec Support Web site:

<http://entsupport.symantec.com>

DRAFT

Operating systems

- [Chapter 2. AIX](#)
- [Chapter 3. HP-UX](#)
- [Chapter 4. Linux](#)
- [Chapter 5. Solaris](#)
- [Chapter 6. Windows](#)

DRAFT

DRAFT

AIX

This chapter includes the following topics:

- [Before you begin configuring NetBackup on AIX](#)
- [RS/6000 AIX adapter number conventions](#)
- [About AIX persistent naming support](#)
- [About configuring robotic control device files in AIX](#)
- [About configuring tape drive device files in AIX](#)
- [About Sony AIT drives](#)
- [AIX command summary](#)

Before you begin configuring NetBackup on AIX

Observe the following points when you configure the operating system:

- Verify that NetBackup supports your server platform and devices. Download the NetBackup hardware and operating system compatibility lists. See “[About the NetBackup compatibility lists](#)” on page 15.
- Install and configure the IBM AIX Enhanced Device Driver (Atape device driver).
- Attach all peripherals and reboot the system before you configure the devices in NetBackup. When the computer is rebooted, AIX creates the device files for the attached peripherals.
- For many configuration steps, you can use the `smit` System Management Interface Tool. For more information, see the `smit(1)` man page.
- To verify that the devices are configured correctly, use `smit` and `/usr/sbin/lssdev` command.

For the tape drives that you want to share among NetBackup hosts, ensure that the operating system detects the devices on the SAN before you configure the NetBackup Shared Storage Option.

- To obtain error and debug information about devices and robotic software daemons, the `syslogd` daemon must be active. See the AIX `syslogd(1)` man page for more information.

After you configure the hardware, add the robots and the drives to NetBackup.

RS/6000 AIX adapter number conventions

The location code for an adapter consists of two pairs of digits with the format AA-BB, as follows:

- AA identifies the location code of the drawer that contains the adapter card, as follows:
 - If AA is 00, the adapter card is located in the CPU drawer or system unit, depending on the type of system.
 - If AA is not 00, the card is located in an I/O expansion drawer, as follows:
 - The first digit identifies the I/O bus; 0 corresponds to the standard I/O bus and 1 corresponds to the optional I/O bus.
 - The second digit identifies the slot on the I/O bus.
- BB identifies the I/O bus and the slot that contains the card, as follows:
 - The first digit of BB identifies the I/O bus that contains the adapter card, as follows:
 - If the card is in the CPU drawer or system unit, 0 represents the standard I/O bus and 1 represents the optional I/O bus. If the card is in an I/O expansion drawer, this digit is 0.
 - The second digit identifies the slot number on the I/O bus (or slot number in the I/O expansion drawer) that contains the card.

The following are examples of adapter numbers:

- 00-00 identifies the Standard I/O Planar.
- 00-05 indicates an adapter card that is in slot 5 of the standard I/O board. The board is in either the CPU drawer or the system unit, depending on the type of system.
- 00-12 indicates an adapter card that is in slot 2 of the optional I/O bus in the CPU drawer.

- 18-05 indicates an adapter card that is located in slot 5 of an I/O expansion drawer. The drawer is connected to the asynchronous expansion adapter that is located in slot 8 of the optional I/O bus in the CPU drawer.

About AIX persistent naming support

NetBackup requires that you enable persistent naming support for the AIX device files. Doing so ensures that the device targets and LUNs do not change after a system restart.

To enable persistent naming support, use the AIX SMIT utility or the `chdev` command to change the logical names of the devices. Change the logical names after the initial device configuration in AIX. For more information, see the IBM documentation.

About configuring robotic control device files in AIX

For IBM robotic libraries, Symantec supports the IBM AIX Enhanced Device Driver (Atape device driver) for use with NetBackup. NetBackup discovers the device files when you configure devices.

For information about the driver and how to configure device files, see the IBM documentation.

For robotic libraries other than IBM, Symantec recommends that you use an operating system other than AIX as the robotic control host.

About configuring tape drive device files in AIX

The following topics provide information about configuring tape drive device files on AIX systems.

Table 2-1 AIX tape drive device file topics

Subject	Topic
About choosing a tape driver	See “About choosing a tape driver” on page 22.
About non-QIC tape drives	See “About non-QIC tape drives” on page 22.
About extended-file marks for drives	See “About extended-file marks for drives” on page 23.

Table 2-1 AIX tape drive device file topics (*continued*)

Subject	Topic
About fast-tape positioning (locate-block) on AIX	See “About fast-tape positioning (locate-block) on AIX” on page 23.
Creating no rewind device files for tape drives	See “About no rewind device files” on page 24. See “Creating no rewind device files for tape drives” on page 24. See “Example of creating a no rewind device file” on page 26.
About multiple tape densities	See “Using multiple tape densities” on page 27.
About SPC-2 SCSI reserve on AIX	See “About SPC-2 SCSI reserve on AIX” on page 28. See “Disabling SPC-2 SCSI reserve in AIX” on page 28.

About choosing a tape driver

If you use IBM tape drives, Symantec recommends that you install the IBM AIX Atape driver. For information about the driver, see the IBM documentation.

If you use other tape drives, Symantec recommends that you use the IBM AIX ost (other SCSI tape) driver. For information about the driver, see the IBM documentation.

For information about the drivers and how to configure device files, see the IBM documentation.

About non-QIC tape drives

Variable length block and fixed length block refer to how the operating system reads from and writes to a tape. Variable-mode devices allow more flexibility to read previously written tapes. Many tape devices can be accessed in either mode. NetBackup assumes variable length for non-quarter inch cartridge (QIC) drives.

For more information, see the `chdev(1)` and `smit(1)` man pages and the system management guide. The `smit` application is the most convenient way to change from fixed to variable-length-block devices manually.

Warning: For NetBackup, you must configure non-QIC tape drives as variable-length-block devices. Otherwise NetBackup can write data but may not be able to read it correctly. During a read, you may see a not in tar format error.

When you add a non-QIC tape drive to NetBackup, NetBackup issues the `chdev` command to configure the drive as a variable length block device. For reference, the following is the command that NetBackup uses to configure a drive for variable mode:

```
/usr/sbin/chdev -l Dev -a block_size=0
```

Dev represents the logical identifier for the drive (for example: `rmt0` or `rmt1`).

Therefore, you do not have to configure the drive manually for variable mode.

About extended-file marks for drives

If a tape drive supports extended file marks, you must configure it to use them (for example, 8-mm drives). Otherwise, NetBackup may not be able to use those drives.

For information, see the AIX `chdev(1)` and `smit(1)` man pages.

When you add a tape drive to NetBackup, NetBackup issues the `chdev` command to configure the drive to use extended file marks. For reference, the following is the command that NetBackup uses:

```
/usr/sbin/chdev -l Dev -a extfm=yes
```

Replace *Dev* with the logical identifier for the drive (such as `rmt0` or `rmt1`)

Therefore, you do not have to configure the drive manually for extended file marks.

About fast-tape positioning (locate-block) on AIX

Applies to AIT, DLT, Exabyte, and half-inch cartridge tape drives.

To position a tape to a specific block, NetBackup supports the SCSI `locate-block` command.

NetBackup uses the `locate-block` command by default.

Symantec recommends that you do not disable locate-block positioning. If you need to disable it, execute the following command:

```
touch /usr/opensv/volmgr/database/NO_LOCATEBLOCK
```

With locate-block positioning disabled, NetBackup uses the forward-space-file/record method.

About no rewind device files

By default, NetBackup uses no rewind device files. These SCSI device files are in the `/dev` directory and have the following format:

```
/dev/rmtID.1
```

ID is the logical identifier assigned to the device by the system. The `.1` extension specifies the no rewind, no retension on open device file.

Normally, AIX creates tape drive device files automatically at boot time. Alternatively, you can run the AIX `cfgmgr` command, which should create the device files. If they do not exist, you must create them for the tape drives.

See [“Creating no rewind device files for tape drives”](#) on page 24.

Creating no rewind device files for tape drives

Use the following procedure to check for and create a no rewind device file.

To check for and create a no rewind device file

- 1 Display the I/O controllers in the system by using the following command:

```
/usr/sbin/lssdev -C | grep I/O
```

The following sample output shows that SCSI controller 1 (00-01) has been assigned the logical identifier `scsi0`.

```
scsi0    Available 00-01      SCSI I/O Controller
```

- 2 Display the SCSI and Fibre Channel devices in the system by using the following command. For SCSI devices, use `scsi` for the *type*; for Fibre Channel Protocol devices, use `fcp` for the *type*.

```
/usr/sbin/lssdev -C -s type
```

The following example shows two disk drives and a tape drive:

```
hdisk0   Available 00-01-00-0,0 400 MB SCSI Disk Drive
hdisk1   Available 00-01-00-1,0 400 MB SCSI Disk Drive
rmt0     Available 00-01-00-3,0 Other SCSI Tape Drive
```

If the device files for the tape drives exist, they appear in the output as `rmt0`, `rmt1`, and so on. The previous example output shows `rmt0`.

- 3 If a device file does not exist for the wanted tape drive, create it by using the following command:

```
/usr/sbin/mkdev -c tape -s scsi -t ost -p controller -w id,lun
```

The following are the arguments for the command:

- *controller* is the logical identifier of the drive's SCSI adapter, such as *scsi0*, *fscsi0*, or *vscsi1*.
- *scsi_id* is the SCSI ID of the drive connection.
- *lun* is the logical unit number of the drive connection.

For example, the following command creates a device file for a non-IBM 8-mm drive connected to controller *scsi0* at SCSI address 5,0:

```
mkdev -c tape -s scsi -t ost -p scsi0 -w 5,0
```

- 4 To verify, display the SCSI device files by using the *lsdev* command, as follows:

```
/usr/sbin/lsdev -C -s scsi
hdisk0 Available 00-01-00-0,0 400 MB SCSI Disk Drive
hdisk1 Available 00-01-00-1,0 400 MB SCSI Disk Drive
rmt0 Available 00-01-00-3,0 Other SCSI Tape Drive
rmt1 Available 00-01-00-5,0 Other SCSI Tape Drive
```

The output shows that the *rmt1* device file was created.

- 5 If the device files do not exist on an FCP controller, use the following command to create them:

```
/usr/sbin/cfgmgr -l device
```

device is the controller number from step 1.

- 6 Ensure that the device is configured for variable-mode and extended file marks. Use the *chdev* command, as follows (*dev* is the logical identifier for the drive (for example, *rmt1*)).

```
/usr/sbin/chdev -l dev -a block_size=0
/usr/sbin/chdev -l dev -a extfm=yes
```

- 7 To configure the drive manually in NetBackup, enter the following device file pathname:

```
/dev/rmt1.1
```

Example of creating a no rewind device file

This topic provides an example of how to create a no rewind device file on AIX for NetBackup. Assume the device files for the wanted SCSI 8-mm tape drive (controller 1, SCSI ID 5) do not exist.

To create a no rewind device file for SCSI ID 5

- 1 Determine the logical identifier for the SCSI controller as follows:

```
/usr/sbin/lsdev -C -c adapter | grep SCSI
```

The following output shows that `scsi0` is the logical name for SCSI controller 1:

```
scsi0    Available 00-01      SCSI I/O Controller
```

- 2 Determine if the device files exist for any device at SCSI ID 5.

```
/usr/sbin/lsdev -C -s scsi
```

The following output shows that some device files exist for tape and disk. However, a device files does not exist for the 8-mm tape drive at controller 1 (`scsi0`) and SCSI ID 5 (5,0):

```
hdisk0    Available 00-01-00-0,0 400 MB SCSI Disk Drive
hdisk1    Available 00-01-00-1,0 400 MB SCSI Disk Drive
rmt0      Available 00-01-00-3,0 Other SCSI Tape Drive
```

- 3 Create the device file by using the following command:

```
mkdev -c tape -t ost -s scsi -p scsi0 -w 5,0
```

- 4 Display the device files by issuing the following command:

```
/usr/sbin/lsdev -C -s scsi
hdisk0    Available 00-01-00-0,0 400 MB SCSI Disk Drive
hdisk1    Available 00-01-00-1,0 400 MB SCSI Disk Drive
rmt0      Available 00-01-00-3,0 Other SCSI Tape Drive
rmt1      Available 00-01-00-5,0 Other SCSI Tape Drive
```

- 5 To ensure that the tape device is configured for variable-mode and extended file marks, use the following commands:

```
chdev -l rmt1 -a block_size=0
chdev -l rmt1 -a extfm=yes
```

- 6 To configure the drive manually in NetBackup, enter the following device file pathname:

```
/dev/rmt1.1
```

Using multiple tape densities

After you create the device files for your tape drives, you can configure densities on the drives that support multiple densities. Exabyte 8500C is an example of a tape drive for which you can use different densities.

AIX supports two configuration settings for density, although not all tape drives support multiple densities. The default density for both density setting 1 and density setting 2 is 0, which means maximum density.

The following procedure is an example of using the `chdev` command to modify the density settings. Alternatively, you can use the System Manager Interface Tool (SMIT).

To modify the density settings

- ◆ The following commands modify both of the tape drive device files:

```
chdev -l tapedev -a density_set_1=density
chdev -l tapedev -a density_set_2=density
```

The following describe the arguments to the command options:

- *tapedev* is the logical identifier for the drive, such as `rmt0` or `rmt1`.
- *density* is a decimal number from 0 to 255 that represents the wanted density. Zero (0) selects the default density for the tape drive, which is usually the drive's high density setting. Permitted values and their meanings vary with different types of tape drives.

To use density setting 1, use the following no rewind on close device file when you configure the device in NetBackup:

```
/dev/rmt*.1
```

To use density setting 2, use the following no rewind on close device file when you configure the device in NetBackup:

/dev/rmt*.5

About SPC-2 SCSI reserve on AIX

By default, NetBackup uses SPC-2 SCSI reserve and release for tape drive reservations in shared drive environments. The NetBackup Shared Storage Option provides shared drive functionality in NetBackup.

Alternatively, you can use SCSI persistent reserve for shared tape drive reservations in NetBackup, as follows:

- For the tape drives that support SPC-3 Compatible Reservation Handling (CRH), you can use SCSI persistent reserve by enabling it in NetBackup. No special configuration in AIX is required.
- For the tape drives that do not support CRH, you must disable SPC-2 SCSI reserve in AIX for those drives. After you disable SPC-2 SCSI reserve, you can use persistent reserve by enabling it in NetBackup. If the drive does not support CRH and you do not disable SPC-2 SCSI reserve, access attempts to the drive fail.

See [“Disabling SPC-2 SCSI reserve in AIX”](#) on page 28.

Warning: If the tape driver does not let you disable SPC-2 SCSI reserve, do not use SCSI persistent reserve with the drives that do not support CRH. The `sctape` driver is an example of a tape driver that lets you disable SPC-2 SCSI reserve.

For more information about NetBackup and SCSI reservations, see the following:

- The description of the **Enable SCSI Reserve Media** host property in the *NetBackup Administrator's Guide, Volume I*.
- The "How NetBackup reserves drives" topic in the *NetBackup Administrator's Guide, Volume II*.

Disabling SPC-2 SCSI reserve in AIX

To disable SPC-2 SCSI reserve, use the AIX `chdev` command to change the reserve attribute for the device file for the tape drive.

For information about the `chdev` command, see the AIX `chdev` man page.

To disable SPC-2 SCSI reserve in AIX

- ◆ Invoked the following command:

```
chdev -l name -a res_support=no
```

Replace *name* with the name of the device file, such as `rmt0`.

About Sony AIT drives

Sony S-AIT drives have DIP switches (SWA and SWB) located on the bottom of the drive.

For the NetBackup Shared Storage Option, you must set the SWA-1 (**No Reply Unit Attention After Process Login**) switch correctly. Its factory setting depends on the serial number of the drive.

If the drive has an early serial number, switch SWA-1 may be OFF. If so, change the switch to ON.

Drives with newer serial numbers have SWA-1 set to ON as the default.

These newer serial numbers are as follows:

- SDZ-130 :01442007 and later
- SDZ-130/L :01200696 and later

Also, for the drives that have a date of May 17, 2004 and later, the DIP switch is set to ON.

The following table shows the dip switch settings for the newer serial number drives.

Table 2-2 DIP switch positions for AIT drives

Switch	Setting (1 = ON and 0 = OFF)
SWA-1	1
SWA-2	0
SWA-3	0
SWA-4	0
SWA-5	0
SWA-6	0
SWA-7	1

Table 2-2 DIP switch positions for AIT drives (continued)

Switch	Setting (1 = ON and 0 = OFF)
SWA-8	0

AIX command summary

The following is a summary of commands that may be useful when you configure devices. For examples of their usage, see the procedures in this chapter.

- `/usr/sbin/lsdev -C | grep I/O`
Displays the adapters that are physically available on your server.
- `/usr/sbin/lsdev -C -s filetype`
Displays the device files that have been created, where *filetype* defines the type of file displayed: `scsi` displays SCSI files and `fc` displays Fibre Channel files.
- `mkdev -c tape -s scsi -t ost -p controller -w id,lun`
Creates the device files for tapes.
controller is the logical identifier of the drive SCSI adapter (such as `scsi0` or `scsi1`). *id* is the SCSI ID of the robotic connection. *lun* is the logical unit number of the robotic connection.
- `/usr/sbin/chdev -l dev -a block_size=0`
Configures the drive with logical identifier specified by *dev* (for example: `rmt0`) to variable mode.
- `/usr/sbin/chdev -l dev -a extfm=yes`
Configures the drive with logical identifier specified by *dev* (for example: `rmt0`) for extended file marks.
- `/etc/lstat -l dev -E -H`
Displays the device information, where *dev* is the name of the device (for example, `rmt1`).
- `/usr/sbin/cfgmgr -l device`
Creates the device files on a Fibre Channel Protocol controller, where *device* is the controller number (for example, `fscsi0`).
- `/usr/bin/odmget -q "name=rmtX" CuAt`
Displays the device attributes for the device (*rmtX*). This command can be used to determine SCSI target and LUN pairs when you configure Fibre Channel devices.
Where *rmtX* is the name of the tape device (for example: `rmt0` or `rmt1`).

HP-UX

This chapter includes the following topics:

- [Before you begin configuring NetBackup on HP-UX](#)
- [About robotic control on HP-UX](#)
- [About HP-UX device addressing schemes](#)
- [HP-UX tape drive device file requirements for NetBackup](#)
- [About device drivers and files for persistent DSFs](#)
- [About configuring persistent DSFs](#)
- [About HP-UX legacy device drivers and files](#)
- [Creating device files for SAN clients on HP-UX](#)
- [About configuring legacy device files](#)
- [About SPC-2 SCSI reserve on HP-UX](#)
- [Disabling SPC-2 SCSI reserve in HP-UX](#)
- [About disabling the HP-UX EMS Tape Device Monitor for a SAN](#)
- [HP-UX command summary](#)

Before you begin configuring NetBackup on HP-UX

Observe the following points when you configure the operating system:

- Verify that NetBackup supports your server platform and devices. Download the NetBackup hardware and operating system compatibility lists. See [“About the NetBackup compatibility lists”](#) on page 15.

- For SCSI controlled libraries, NetBackup issues SCSI commands to the robotic devices. For NetBackup to function correctly, the properly named device files must exist.
- To verify that the devices are configured correctly, use the HP-UX `sam` utility and the `ioscan -f` command.
For the tape drives that you want to share among NetBackup hosts, ensure that the operating system detects the devices on the SAN before configure the NetBackup Shared Storage Option.
- Some HP SCSI adapters do not support SCSI pass through; therefore, devices on such adapters are not discovered automatically.

After you configure the hardware, add the robots and the drives to NetBackup.

About robotic control on HP-UX

Several options exist for robotic control, as follows:

- **SCSI or Fibre Channel Protocol control.**
SCSI control includes Fibre Channel Protocol (FCP), which is SCSI over Fibre Channel. A robotic device in a library moves the media between storage slots and the drives in the library.
See [“About HP-UX device addressing schemes”](#) on page 32.
- **API control over a LAN.**
See the "ADIC Automated Media Library (AML)" topic.
See the "IBM Automated Tape Library (ATL)" topic.
See the "Sun StorageTek ACSLS robots" topic.
If you use API control, you still must configure tape drive device file access in HP-UX.

About HP-UX device addressing schemes

NetBackup supports the following two HP-UX device addressing schemes for mass storage devices:

- **Agile addressing**, which was introduced in HP-UX 11i v3. Agile addressing uses persistent device special files (DSFs) for devices.
NetBackup device discovery finds persistent DSFs only. Therefore, Symantec recommends that you use persistent DSFs.
See [“About device drivers and files for persistent DSFs”](#) on page 34.
See [“About configuring persistent DSFs”](#) on page 36.
- **The legacy naming model.**

Legacy device files are supported in HP-UX 11i v3 and earlier.

If you use the legacy model, you must configure devices manually in NetBackup. You cannot use NetBackup device discovery and automatic configuration.

See [“About HP-UX legacy device drivers and files”](#) on page 38.

See [“About configuring legacy device files”](#) on page 41.

When HP-UX 11i v3 is installed, both legacy and persistent DSFs are created on the system. Both types of DSFs can coexist and may be used simultaneously to access mass storage devices.

NetBackup requires specific device file capabilities for tape drives.

See [“HP-UX tape drive device file requirements for NetBackup”](#) on page 33.

You may be required to perform other HP-UX configuration.

See [“About SPC-2 SCSI reserve on HP-UX”](#) on page 52.

See [“Creating device files for SAN clients on HP-UX”](#) on page 40.

See [“About disabling the HP-UX EMS Tape Device Monitor for a SAN”](#) on page 52.

See [“Disabling SPC-2 SCSI reserve in HP-UX”](#) on page 52.

HP-UX tape drive device file requirements for NetBackup

The following table describes the requirements for tape drive device files.

Table 3-1 Tape drive device file requirements

Requirement	Description
Berkeley-style close	<p>NetBackup requires Berkeley-style close for tape drive device files. The letter b in the file name indicates Berkeley-style close device files.</p> <p>In Berkeley-style close, the tape position remains unchanged by a device close operation. (Conversely, in AT&T-style close, the drive advances the tape to just after the next end-of-file (EOF) marker.) To establish the correct position for the next tape operation, applications must assume the tape's position after a close. NetBackup assumes Berkeley-style close on HP-UX systems.</p>

Table 3-1 Tape drive device file requirements (*continued*)

Requirement	Description
Fast-tape positioning (locate-block)	<p>HP-UX supports locate-block for most drive types for Fast Wide GSC SCSI adapters. For a list of drive types that NetBackup supports, see the Symantec support Web site.</p> <p>NetBackup uses the locate-block command by default if a pass-through path is configured.</p> <p>To disable locate-block positioning, execute the following command:</p> <pre>touch /usr/opensv/volmgr/database/NO_LOCATEBLOCK</pre> <p>When locate-block positioning is disabled, NetBackup uses the forward-space-file/record method.</p>
No rewind on close	NetBackup requires no rewind on close for tape devices. The letter n in the file name indicates no rewind device files.

About device drivers and files for persistent DSFs

NetBackup supports persistent device special files (DSFs) for robotic tape libraries and tape drives. Persistent DSFs are a component of a new storage stack addressing model HP calls agile addressing. The device World Wide Identifier (WWID) identifies a device; a device path does not identify a device. The device file name of the logical unit is independent of the paths that lead to the LUN.

When HP-UX 11i v3 is installed, both persistent DSFs and legacy device files are created on the system.

You can use persistent DSFs on some HP-UX servers and legacy device files on others. However, if you use legacy device files, you must configure devices manually in NetBackup.

Note: NetBackup device discovery finds persistent DSFs only. Therefore, Symantec recommends that you use persistent DSFs.

See “[About legacy pass-through paths for tape drives](#)” on page 40.

See “[About legacy tape drive device files](#)” on page 39.

About device drivers for persistent DSFs

The following are the device drivers required to use persistent DSFs:

- The eschgr driver for robotic control.

- The estape driver for tape drives.
- For IBM tape drives, the atdd driver. NetBackup requires a minimum atdd driver level. See the NetBackup Hardware Compatibility List for IBM atdd driver levels that are supported and atdd configuration information.
<http://www.symantec.com/docs/TECH76495>
Also see the NetBackup Operating System Compatibility List for the minimum OS patch level that is required to run on HP-UX:
<http://www.symantec.com/docs/TECH76648>

About persistent DSFs for robotic control

The following is the persistent DSF name format for robotic control:

```
/dev/rchgr/autoch#
```

The # represents the instance number. For example, if HP-UX discovers two robotic devices (auto-changers) and assigns them instance numbers 0 and 1 respectively, HP-UX automatically creates the following device files:

```
/dev/rchgr/autoch0
```

```
/dev/rchgr/autoch1
```

About persistent DSFs for tape drive access

The following is the persistent DSF name format for tape drive read and write access:

```
/dev/rtape/tape#_BESTnb
```

The following describe the DSF name format:

- The # represents the instance number.
- BEST indicates the highest density.
- n indicates no rewind on close.
- b indicates Berkeley-style close.

About persistent DSF pass-through paths

Although NetBackup requires the `/dev/rtape` DSFs to configure tape drives, NetBackup uses pass-through device files for drive access.

NetBackup creates pass-through paths for all valid `/dev/rtape` paths. NetBackup creates the paths during device discovery or when you run the `/usr/opensv/volmgr/bin/scan` command. The following is the file name format:

```
/dev/pt/pt_tape#
```

The # represents the instance number that matches the number in the `/dev/rtape/tape#_BESTnb` device file or that is retrieved from the `ioscan` output.

Although NetBackup uses the pass-through device files during tape drive operations, you specify the `/dev/rtape` device files if you configure the drives manually in NetBackup. NetBackup then uses the appropriate pass-through device files.

See [“Creating persistent DSF pass-through paths”](#) on page 37.

About configuring persistent DSFs

Configure persistent DSFs for the following:

- Robotic control.
See [“Creating HP-UX persistent DSFs”](#) on page 36.
See [“Upgrading NetBackup to use HP-UX persistent DSFs”](#) on page 37.
- Tape drive read and write access.
See [“Creating HP-UX persistent DSFs”](#) on page 36.
See [“Creating persistent DSF pass-through paths”](#) on page 37.

Creating HP-UX persistent DSFs

By default, new installations of HP-UX 11i v3 and later create both persistent DSFs and legacy device files for the `eschgr` and `estape` drivers. However, you can reinstall or create the persistent DSFs.

First connect the devices to the system. Then, create persistent DSFs on every server on which you want to use the new persistent DSFs.

To create the persistent DSFs automatically

- ◆ Depending on the driver, enter the following command as root:

For the `eschgr` autochanger driver, enter `insf -d eschgr`.

For the `estape` tape driver, enter `insf -d estape`.

For the IBM `atdd` tape driver, enter `insf -d atdd`.

To refresh the device path for all devices that use a driver, adding the `-e` option to the command line.

For more information about using the HP-UX `insf` command, see the man page.

Upgrading NetBackup to use HP-UX persistent DSFs

Use the following procedure to configure an existing NetBackup environment to use persistent DSFs after you upgrade a media server to HP-UX 11i v3.

The following procedure also removes the legacy paths from the NetBackup device configuration. To save the legacy paths, you can use the NetBackup `tpconfig` utility to disable the old paths but retain them in the device configuration.

If you run the NetBackup **Device Configuration Wizard** before you perform this change, NetBackup adds the new DSF paths to the device configuration. However, the legacy paths remain configured as alternate paths.

To change a NetBackup media server to use the new DSFs

- 1 Add the following entry to the `/usr/opensv/volmgr/vm.conf` file (the syntax must be as specified in all capital letters):

```
AUTO_PATH_CORRECTION=YES
```

The `AUTO_PATH_CORRECTION` entry directs NetBackup to scan for device paths when the `ltid` device daemon starts.

- 2 After adding the entry to the `vm.conf` file and with no current jobs running on the media server, run the following command:

```
/usr/opensv/volmgr/bin/stopltd
```

- 3 Wait a few minutes for the service to stop, then restart `ltid` by running the following command:

```
/usr/opensv/volmgr/bin/ltid
```

Upon start-up, `ltid` scans for device paths, adds the new DSFs, and then purges the legacy DSFs from your NetBackup configuration for the media server.

After `ltid` starts, only the new persistent DSF paths should be configured in NetBackup.

- 4 After the services are started and device paths updated, you can (but do not have to) remove the `AUTO_PATH_CORRECTION=YES` entry from the `vm.conf` file.

Creating persistent DSF pass-through paths

NetBackup creates pass-through paths for all valid `/dev/rtape` paths. NetBackup creates the paths during device discovery or when you run the

```
/usr/opensv/volmgr/bin/scan
```

command. However, you can create them manually. The following example shows how to create a pass-through device file for a persistent DSF.

To create a pass-through path for a tape drive

- ◆ Enter the following command (# is the instance number of the device from the `ioscan` output):

```
mksf -P -C tape -I #
```

For more information about using the HP-UX `mksf` command, see the man page.

About HP-UX legacy device drivers and files

Legacy device files are the old style device files that are not part of the HP-UX agile addressing scheme.

NetBackup does not discover legacy device files. If you use legacy device files, you must configure devices manually in NetBackup.

Note: NetBackup device discovery finds persistent DSFs only. Therefore, Symantec recommends that you use persistent DSFs.

See “[About device drivers and files for persistent DSFs](#)” on page 34.

About device drivers for legacy device files

The following are the drivers supported:

- The `sctl` driver for robotic control.
- The `stape` driver for tape drives.
- For IBM tape drives, the `atdd` driver. NetBackup requires a minimum `atdd` driver level. See the NetBackup Hardware Compatibility List for IBM `atdd` driver levels that are supported and `atdd` configuration information.

<http://www.symantec.com/docs/TECH76495>

NetBackup also supports the use of the IBM `atdd` tape driver on HP-UX 11i v3.

Also see the NetBackup Operating System Compatibility List for the minimum OS patch level that is required to run on HP-UX:

<http://www.symantec.com/docs/TECH76648>

About legacy robotic control device files

For SCSI robotic control, NetBackup can use the `/dev/sctl` device files. The device file names have the following format:

```
/dev/sctl/cCARDtTARGETtLUN c Major 0xIITL00
```

Where:

- *CARD* is the card instance number of the adapter.
- *TARGET* is the SCSI ID of the robotic control.
- *LUN* is the SCSI logical unit number (LUN) of the robot.
- *Major* is the character major number (from the `lsdev` command).
- *II* are two hexadecimal digits that represent the card instance number.
- *T* is a hexadecimal digit that represents the SCSI ID of robotic control.
- *L* is a hexadecimal digit that represents the SCSI LUN of the robotic control.

A library may have more than one robotic device. Each robotic device requires a device file.

See [“Creating legacy SCSI and FCP robotic controls on HP-UX”](#) on page 41.

About legacy tape drive device files

NetBackup requires the `/dev/rmt` device files to configure tape drives.

The device file names have the following format:

```
/dev/rmt/c#t#d#BESTnb
```

The following describe the device file names:

- *c#* is the card instance number.
- *t#* is the SCSI ID.
- *d#* is the device LUN.
- *BEST* indicates the highest density format and data compression the device supports.
- *n* indicates no rewind on close.
- *b* indicates Berkeley-style close.

The following are examples of tape drive device files:

```
/dev/rmt/c7t0d0BESTnb
/dev/rmt/c7t1d0BESTnb
/dev/rmt/c7t4d0BESTnb
/dev/rmt/c7t5d0BESTnb
```

See [“About creating legacy tape drive device files”](#) on page 48.

About legacy pass-through paths for tape drives

Although NetBackup requires the `/dev/rmt` device files to configure tape drives, NetBackup uses pass-through device files for drive access.

On media servers, NetBackup automatically creates pass-through device files if the appropriate `/dev/rmt` tape drive device files exist. NetBackup creates the pass-through device files in the `/dev/sctl` directory.

NetBackup does not modify or delete any existing pass-through paths.

NetBackup does not detect the type of adapter cards that are installed in the system. Therefore, NetBackup creates pass-through paths for tape drives connected to the adapter cards that do not support pass through. These pass-through paths do not cause problems.

Although NetBackup uses the pass-through device files during tape drive operations, you specify the `/dev/rmt` device files when you configure the drives in NetBackup. NetBackup then uses the appropriate pass-through device files.

Usually, you do not have to create pass-through paths for drives. However, instructions to do so are provided for reference.

NetBackup SAN clients require legacy pass-through device files.

See [“Creating device files for SAN clients on HP-UX”](#) on page 40.

Note: Pass-through paths are not supported on HP-PB adapters such as HP28696A - Wide SCSI or HP 28655A - SE SCSI.

See [“Creating tape drive pass-through device files”](#) on page 48.

See [“About device drivers and files for persistent DSFs”](#) on page 34.

Creating device files for SAN clients on HP-UX

NetBackup SAN clients use tape drivers and SCSI pass-through methods for Fibre Transport traffic to NetBackup FT media servers. On HP-UX systems, NetBackup SAN clients require the `sctl` driver and pass-through tape drive device files.

The following table describes the tasks that create the device files. Before you create the device files, the NetBackup FT media server must be active and the SAN must be zoned correctly as described in the *NetBackup SAN Client and Fibre Transport Guide*.

Table 3-2 SAN Client device file tasks

Step	Action	Description
Step 1	If the <code>scctl</code> driver is not the default pass-through driver on your system, install and configure the <code>scctl</code> driver.	See the HP-UX <code>scsi_ctl(7)</code> man page.
Step 2	Create the pass-through paths required.	See “About legacy pass-through paths for tape drives” on page 40. See “Creating tape drive pass-through device files” on page 48.

The media server FT devices appear as `ARCHIVE Python` tape devices during SCSI inquiry from the SAN client. However, they are not tape devices and do not appear as tape devices in NetBackup device discovery.

About configuring legacy device files

You can use legacy device files for the following:

- Robotic control using SCSI or Fibre Channel Protocol control.
SCSI control includes Fibre Channel Protocol (FCP), which is SCSI over Fibre Channel. A robotic device in a library moves the media between storage slots and the drives in the library.
See [“Creating legacy SCSI and FCP robotic controls on HP-UX”](#) on page 41.
- Tape drive read and write access.
See [“About creating legacy tape drive device files”](#) on page 48.
See [“Creating tape drive pass-through device files”](#) on page 48.
- SAN client pass-through paths for Fibre Transport traffic to NetBackup media servers.
See [“Creating device files for SAN clients on HP-UX”](#) on page 40.

Creating legacy SCSI and FCP robotic controls on HP-UX

You must create the robotic control device files for the `scctl` driver manually; they are not created automatically when the system boots.

Before you create the device files, you must do the following:

- Install and configure the `scctl` driver. For more information, see the HP-UX `scsi_ctl(7)` man page.

The `sctl` driver may be the default pass-through driver on your system. If so, you do not have to configure the kernel to use the `sctl` pass-through driver.

- Install and configure the `schgr` device driver. For more information, see the HP-UX `autochanger(7)` man page.
- Attach the devices.

Examples of how to create the device files are available.

See [“Example of how to create a sctl device file for SCSI \(PA-RISC\)”](#) on page 43.

See [“Example of how to create a sctl device file for FCP \(PA-RISC\)”](#) on page 44.

See [“Example of how to create sctl device files for FCP \(Itanium\)”](#) on page 46.

To create `sctl` device files

- 1 Invoke the `ioscan -f` command to obtain SCSI bus and robotic control information.
- 2 Examine the output for the card instance number and the SCSI ID and LUN of the robotic device, as follows:
 - The instance number of the card is in the `I` column of the output.
 - The `H/W Path` column of the `changer` output (`schgr`) includes the SCSI ID and LUN. Use the card's `H/W Path` value to filter the changer's `H/W Path` entry; the SCSI ID and the LUN remain.

- 3 Determine the character major number of the `sctl` driver by using the following command:

```
lsdev -d sctl
```

Examine the output for an entry that shows `sctl` in the Driver column.

- 4 Use the following commands to create the device file for the SCSI robotic control:

```
mkdir /dev/sctl
cd /dev/sctl
/usr/sbin/mknod cCARDtTARGETtLUN c Major 0xIITL00
```

Where:

- `CARD` is the card instance number of the adapter.
- `TARGET` is the SCSI ID of the robotic control.
- `LUN` is the SCSI logical unit number (LUN) of the robot.
- `Major` is the character major number (from the `lsdev` command).

- *II* are two hexadecimal digits that represent the card instance number.
- *T* is a hexadecimal digit that represents the SCSI ID of robotic control.
- *L* is a hexadecimal digit that represents the SCSI LUN of the robotic control.

Example of how to create a sctl device file for SCSI (PA-RISC)

In this example, the following robots exist:

- An ADIC Scalar 100 library is on a SCSI bus with an instance number of 7, SCSI ID 2, and LUN 0.
- The robotic control for an IBM ULT3583-TL library is on the same SCSI bus at SCSI ID 3 and LUN 0.

To create SCSI robotic device files for HP-UX PA-RISC

- 1 Invoke the `ioscan -f` command, as follows:

```
ioscan -f
Class      I  H/W Path      Driver  S/W State H/W Type  Description
=====
ext_bus    7  0/7/0/1       c720    CLAIMED   INTERFACE SCSI C896 Fast Wide LVD
target    10  0/7/0/1.0     tgt     CLAIMED   DEVICE
tape      65  0/7/0/1.0.0   stape   CLAIMED   DEVICE  QUANTUM SuperDLT1
target    11  0/7/0/1.1     tgt     CLAIMED   DEVICE
tape      66  0/7/0/1.1.0   stape   CLAIMED   DEVICE  QUANTUM SuperDLT1
target    12  0/7/0/1.2     tgt     CLAIMED   DEVICE
autoch    14  0/7/0/1.2.0   schgr   CLAIMED   DEVICE  ADIC Scalar 100
target    13  0/7/0/1.3     tgt     CLAIMED   DEVICE
autoch    19  0/7/0/1.3.0   schgr   CLAIMED   DEVICE  IBM ULT3583-TL
target    14  0/7/0/1.4     tgt     CLAIMED   DEVICE
tape     21  0/7/0/1.4.0   atdd    CLAIMED   DEVICE  IBM ULT3580-TD1
target    15  0/7/0/1.5     tgt     CLAIMED   DEVICE
tape     19  0/7/0/1.5.0   atdd    CLAIMED   DEVICE  IBM ULT3580-TD1
```

- 2 Examine the output for the card instance number and the SCSI ID and LUN of the robotic device, as follows:

The card H/W Path is 0/7/0/1; the card instance number (I column) is 7. Apply the H/W Path value as a mask. The ADIC robotic device (`schgr`) is at SCSI ID 2, LUN 0 on this bus. The IBM robotic device (`schgr`) is at SCSI ID 3, LUN 0 on this bus.

- 3 Determine the character major number of the `sctl` driver by using the following command:

```
lsdev -d sctl
Character      Block      Driver      Class
203           -1         sctl        ctl
```

The output from this command shows that the character major number for the `sctl` driver is 203.

- 4 The commands to create the device files follow. For the ADIC robot, the card instance number is 7, the target is 2, and the LUN is 0. For the IBM robot, the card instance number is 7, the SCSI ID is 3, and the LUN is 0.

```
cd /dev/sctl
/usr/sbin/mknod c7t2l0 c 203 0x072000
/usr/sbin/mknod c7t3l0 c 203 0x073000
```

If you add the robots to NetBackup manually, you specify the following for ADIC robotic control and IBM robotic control respectively:

```
/dev/sctl/c7t2l0
/dev/sctl/c7t3l0
```

Example of how to create a `sctl` device file for FCP (PA-RISC)

The following example shows how create a `sctl` device file for an HP VLS9000 robot. NetBackup uses the device file for robotic control.

To create an FCP robotic device file for HP-UX PA-RISC

- 1 Invoke the `ioscan -f` command. The following output example is edited for readability:

```
ioscan -f
Class   I   H/W Path                Driver  S/W State  H/W Type  Description
=====
fc      0   0/2/0/0                  td      CLAIMED    INTERFACE HP Tachyon XL2 Fibre
                                Channel Mass Storage
                                Adapter
fc      4   0/2/0/0.10              fcp     CLAIMED    INTERFACE FCP Domain
ext_bus 6   0/2/0/0.10.11.255.0     fcpdev  CLAIMED    INTERFACE FCP Device Interface
target  5   0/2/0/0.10.11.255.0.0   tgt     CLAIMED    DEVICE
autoch  2   0/2/0/0.10.11.255.0.0.0 schgr   CLAIMED    DEVICE    HP      VLS
tape    5   0/2/0/0.10.11.255.0.0.1 stape   CLAIMED    DEVICE    HP      Ultrium 4-SCSI
tape    6   0/2/0/0.10.11.255.0.0.2 stape   CLAIMED    DEVICE    HP      Ultrium 4-SCSI
tape    7   0/2/0/0.10.11.255.0.0.3 stape   CLAIMED    DEVICE    HP      Ultrium 4-SCSI
```

- 2 Examine the output for the card instance number and the SCSI ID and LUN of the robotic device. In this example, the interface card instance number (the `I` column) is 6. If you use the card's `H/W Path` value as a mask (`0/2/0/0.10.11.255.0`), you see the following:
 - An HP VLS9000 robot is at SCSI ID 0, LUN 0.
 - Three Ultrium 4-SCSI drives are at SCSI ID 0 and LUN 1, LUN 2, and LUN 3.

- 3 Determine the character major number of the `sctl` driver by using the `lsdev` command, as follows:

```
lsdev -d sctl
Character      Block      Driver      Class
203           -1         sctl        ctl
```

The output from this command shows that the character major number for the `sctl` driver is 203.

- 4 The commands to create the device file for the HP VLS9000 robotic control are as follows. The card instance number is 6, the target is 0, and the LUN is 0.

```
cd /dev/sctl
/usr/sbin/mknod c6t0l0 c 203 0x060000
```

If you add the robot to NetBackup manually, specify the following pathname for robotic control:

```
/dev/sctl/c6t0l0
```

Example of how to create `sctl` device files for FCP (Itanium)

With Fibre Channel, the hardware paths are longer than with SCSI.

In this example, the following devices are attached to the host.

- An HP EML E-Series robot with four HP drives (two LTO2 and two LTO3 drives). A separate path exists for each drive pair. The robotic control is through card instance 12 (0/4/1/1.2.12.255.0).
- An HP VLS 6000 robot with six drives. The robot is partitioned into two virtual libraries, three Quantum SDLT320 drives in one library and three HP LTO3 drives in the other library. Separate robotic control exists for each library.

To create FCP robotic device files for HP-UX Itanium

- 1 Invoke the `ioscan -f` command. The following is a command output excerpt that shows the Fibre Channel devices on a host:

```
ext_bus  4  0/4/1/1.2.10.255.0      fcd_vbus CLAIMED INTERFACE FCP Device Interface
target   7  0/4/1/1.2.10.255.0.0        tgt      CLAIMED DEVICE
tape     18 0/4/1/1.2.10.255.0.0.0      stape    CLAIMED DEVICE      HP Ultrium 3-SCSI
tape     20 0/4/1/1.2.10.255.0.0.1      stape    CLAIMED DEVICE      HP Ultrium 3-SCSI
ext_bus  13 0/4/1/1.2.11.255.0          fcd_vbus CLAIMED INTERFACE FCP Device Interface
target   8  0/4/1/1.2.11.255.0.0        tgt      CLAIMED DEVICE
autoch   4  0/4/1/1.2.11.255.0.0.0      schgr    CLAIMED DEVICE      HP VLS
tape     22 0/4/1/1.2.11.255.0.0.1      stape    CLAIMED DEVICE      QUANTUM SDLT320
tape     23 0/4/1/1.2.11.255.0.0.2      stape    CLAIMED DEVICE      QUANTUM SDLT320
tape     24 0/4/1/1.2.11.255.0.0.3      stape    CLAIMED DEVICE      QUANTUM SDLT320
autoch   5  0/4/1/1.2.11.255.0.0.4      schgr    CLAIMED DEVICE      HP VLS
tape     25 0/4/1/1.2.11.255.0.0.5      stape    CLAIMED DEVICE      HP Ultrium 3-SCSI
tape     26 0/4/1/1.2.11.255.0.0.6      stape    CLAIMED DEVICE      HP Ultrium 3-SCSI
tape     27 0/4/1/1.2.11.255.0.0.7      stape    CLAIMED DEVICE      HP Ultrium 3-SCSI
ext_bus  12 0/4/1/1.2.12.255.0          fcd_vbus CLAIMED INTERFACE FCP Device Interface
target   6  0/4/1/1.2.12.255.0.0        tgt      CLAIMED DEVICE
autoch   1  0/4/1/1.2.12.255.0.0.0      schgr    CLAIMED DEVICE      HP EML E-Series
tape     19 0/4/1/1.2.12.255.0.0.1      stape    CLAIMED DEVICE      HP Ultrium 2-SCSI
tape     21 0/4/1/1.2.12.255.0.0.2      stape    CLAIMED DEVICE      HP Ultrium 2-SCSI
```

- 2 Examine the output for the card instance number and the SCSI ID and LUN of the robotic device.

In this example, the following devices are attached to this host:

- The robotic control for the HP EML E-Series robot is through card instance 12 (0/4/1/1.2.12.255.0). Two of the drives are accessed through the same path, and the other two are accessed through card instance 4 (0/4/1/1.2.10.255.0).
- The robotic controls for the HP VLS 6000 robot partitions are through card instance 13. Robotic control for one partition is at SCSI ID 0 and LUN 0. Robotic control for the other partition is at SCSI ID 0 and LUN 4.

- 3 Determine the character major number of the `sctl` driver by using the following command:

```
lsdev -d sctl
Character      Block      Driver      Class
203            -1         sctl        ctl
```

The output from this command shows that the character major number for the `sctl` driver is 203.

- 4 The commands to create the devices file for the robotic controls are as follows:

```
cd /dev/sctl
/usr/sbin/mknod c12t010 c 203 0x0c0000
/usr/sbin/mknod c13t010 c 203 0x0d0000
/usr/sbin/mknod c13t014 c 203 0x0d0400
```

If you add the robots to NetBackup manually, you specify the following pathnames for robotic control. The first device file is for the HP EML E-Series robot. The second and third device files are for the VLS 6000 robot (two robotic devices).

```
/dev/sctl/c12t010
/dev/sctl/c13t010
/dev/sctl/c13t014
```

About creating legacy tape drive device files

By default, HP-UX creates tape drive device files when the system is booted. However, the tape driver must be installed and configured, and the devices must be attached and operational.

Alternatively, you can create tape drive device files manually. To do so, use either the HP-UX System Administration Manager (SAM) utility or the `insf(1M)` command. For information, see the HP-UX documentation.

Creating tape drive pass-through device files

On media servers, NetBackup creates pass-through paths for tape drives automatically. However, you can create them manually.

Use one of the following two procedures:

- Create pass-through tape drive device files
See [“To create pass-through tape drive device files”](#) on page 49.
- Create SAN client pass-through device files

See “To create SAN client pass-through device files” on page 51.

To create pass-through tape drive device files

- 1 Determine the devices that are attached to the SCSI bus by using the HP-UX `ioscan -f` command, as follows:

```
ioscan -f
Class      I  H/W Path      Driver S/W State  H/W Type  Description
=====
ext_bus    7  0/7/0/        c720   CLAIMED    INTERFACE  SCSI C896 Fast Wide LVD
target    10  0/7/0/1.0      tgt    CLAIMED    DEVICE      QUANTUM SuperDLT1
tape      65  0/7/0/1.0.0    stape  CLAIMED    DEVICE      QUANTUM SuperDLT1
target    11  0/7/0/1.1      tgt    CLAIMED    DEVICE      QUANTUM SuperDLT1
tape      66  0/7/0/1.1.0    stape  CLAIMED    DEVICE      QUANTUM SuperDLT1
target    12  0/7/0/1.2      tgt    CLAIMED    DEVICE      ADIC Scalar 100
autoch    14  0/7/0/1.2.0    schgr  CLAIMED    DEVICE      IBM ULT3583-TL
target    13  0/7/0/1.3      tgt    CLAIMED    DEVICE      IBM ULT3580-TD1
autoch    19  0/7/0/1.3.0    schgr  CLAIMED    DEVICE      IBM ULT3580-TD1
target    14  0/7/0/1.4      tgt    CLAIMED    DEVICE      IBM ULT3580-TD1
tape      21  0/7/0/1.4.0    atdd   CLAIMED    DEVICE      IBM ULT3580-TD1
target    15  0/7/0/1.5      tgt    CLAIMED    DEVICE      IBM ULT3580-TD1
tape      19  0/7/0/1.5.0    atdd   CLAIMED    DEVICE      IBM ULT3580-TD1
```

This example output shows the following:

- The robotic control for an ADIC Scalar 100 library is on a SCSI bus with an instance number of 7. The SCSI ID is 2, and the LUN is 0. The robotic control for an IBM ULT3583-TL library is on the same SCSI bus at SCSI ID 3 and LUN 0.
- The ADIC library contains two Quantum Super DLT drives. One has a SCSI ID of 0 and a LUN of 0. The other has a SCSI ID of 1 and a LUN of 0.
- The IBM library contains two IBM Ultrium LTO drives. One has a SCSI ID of 4 and a LUN of 0. The other has a SCSI ID of 5 and a LUN of 0. Use the IBM `atdd` driver when you configure IBM tape drives on HP-UX. Configure `atdd` and BEST device paths according to the IBM driver documentation. Do not configure `atdd` for robotic control of IBM robots.

For the latest recommended `atdd` driver version from IBM, check the Symantec support Web site.

2 Create the pass-through device files for the tape drives, as follows:

```
cd /dev/sctl  
/usr/sbin/mknod c7t010 c 203 0x070000  
/usr/sbin/mknod c7t110 c 203 0x071000  
/usr/sbin/mknod c7t410 c 203 0x074000  
/usr/sbin/mknod c7t510 c 203 0x075000
```

When you use the HP-UX `mknod` command for tape drives, the target is the SCSI ID of the tape drive. It is not the SCSI ID of the robotic control.

The previous commands create the following pass-through device files.

```
/dev/sctl/c7t010  
/dev/sctl/c7t110  
/dev/sctl/c7t410  
/dev/sctl/c7t510
```

Although the pass-through device files for tape drives are used during NetBackup operation, they are not used during NetBackup configuration. During NetBackup tape drive configuration, use the following device files to configure the tape drives.

```
/dev/rmt/c7t0d0BESTnb  
/dev/rmt/c7t1d0BESTnb  
/dev/rmt/c7t4d0BESTnb  
/dev/rmt/c7t5d0BESTnb
```

To create SAN client pass-through device files

- 1 Determine the devices that are attached to the SCSI bus by using the HP-UX `ioscan -f` command, as follows:

```
ioscan -f
```

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
ext_bus	9	0/3/1/0.1.22.255.0	fcd_vbus	CLAIMED	INTERFACE	FCP Device Interface
target	4	0/3/1/0.1.22.255.0.0	tgt	CLAIMED	DEVICE	
tape	6	0/3/1/0.1.22.255.0.0.0	stape	CLAIMED	DEVICE	ARCHIVE Python
tape	7	0/3/1/0.1.22.255.0.0.1	stape	CLAIMED	DEVICE	ARCHIVE Python

This example output shows that the instance number of the Fibre Channel HBA is 9. It also shows that the target mode drivers on the Fibre Transport media server appear as ARCHIVE Python devices. One has a SCSI ID of 0 and a LUN of 0; the other has a SCSI ID of 0 and a LUN of 1.

- 2 Determine the character major number of the sctl driver by using the following command:

```
lsdev -d sctl
```

Character	Block	Driver	Class
203	-1	sctl	ctl

The output from this command shows that the character major number for the sctl driver is 203.

- 3 Create the pass-through device files, as follows:

```
cd /dev/sctl
/usr/sbin/mknod c9t010 c 203 0x090000
/usr/sbin/mknod c9t011 c 203 0x090100
```

The following describes the device file name:

- c9 defines the instance number of the interface card.
- t0 defines the SCSI ID (the target).
- 11 defines the LUN (the first character is the letter “l”).

- 4 Verify that the device files were created, as follows:

```
# ls -l /dev/sctl
```

total 0										
crw-r--r--	1	root		sys	203	0x090000	Nov	1	13:19	c9t010
crw-r--r--	1	root		sys	203	0x090100	Nov	1	13:19	c9t011

About SPC-2 SCSI reserve on HP-UX

By default, NetBackup uses SPC-2 SCSI reserve and release for tape drive reservations in shared drive environments. However, you must disable SPC-2 SCSI reserve and release in HP-UX. If you do not, conflicts occur between the operating system and NetBackup. The NetBackup Shared Storage Option provides shared drive functionality in NetBackup.

Symantec recommends that you use the SAM utility to disable SPC-2 SCSI reserve and release.

As an alternative to SCSI reserve and release, you can use SCSI persistent reserve in NetBackup for shared tape drive reservations. If you use SCSI persistent reserve, you still must disable SPC-2 SCSI reserve and release in HP-UX.

For more information about NetBackup and SCSI reservations, see the following:

- The description of the **Enable SCSI Reserve Media** host property in the *NetBackup Administrator's Guide, Volume I*.
- The "How NetBackup reserves drives" topic in the *NetBackup Administrator's Guide, Volume II*.

Disabling SPC-2 SCSI reserve in HP-UX

Use the following procedure to disable SPC-2 SCSI reserve in HP-UX.

To disable SPC-2 SCSI reserve in HP-UX

- 1 Set the `st_ats_enabled` kernel parameter to 0 (zero).
- 2 Reboot the system.

About disabling the HP-UX EMS Tape Device Monitor for a SAN

This topic is a NetBackup Enterprise Server topic.

You should configure the Tape Device Monitor (`dm_stape`) so it does not run on HP-UX hosts in a SAN configuration. The Tape Device Monitor is a component of the Event Monitoring System (EMS). The EMS service periodically polls the tape devices to monitor their conditions. When a server polls the devices while another server uses a tape device, backup operations may time out and fail.

You can avoid the situation as follows:

- To disable EMS completely, run the HP-UX Hardware Monitoring Request Manager and select **(K) kill (disable) Monitoring**.

Invoke the Hardware Monitoring Request Manager by using the `/etc/opt/resmon/lbin/monconfig` command.

- To configure EMS so it does not log any events or poll devices, set the `POLL_INTERVAL` value to 0 (zero). The `POLL_INTERVAL` parameter is in the following HP-UX configuration file:
`/var/stm/config/tools/monitor/dm_stape.cfg`
EMS runs but does not send any SCSI commands.

HP-UX command summary

The following is a summary of commands that may be useful when you configure and verify devices. For usage examples, see the procedures in this chapter.

- `ioscan -C class -f`
Shows the information about the physical interfaces. Numeric information is displayed in decimal.
class is the type of interface, as follows:
 - `tape` specifies tape drives.
 - `ext_bus` specifies SCSI controllers.
- `mknod /dev/spt/cCARDtTARGETlLUN c Major 0xIITL00`
Creates the device files for SCSI robotic or tape drive controls.
The following describe the device file names:
 - *CARD* is the card instance number of the adapter.
 - *TARGET* is the SCSI ID of the robotic control.
 - *LUN* is the SCSI logical unit number (LUN) of the robot.
 - *Major* is the character major number (from the `lsdev` command).
 - *II* are two hexadecimal digits that represent the card instance number.
 - *T* is a hexadecimal digit that represents the SCSI ID of robotic control.
 - *L* is a hexadecimal digit that represents the SCSI LUN of the robotic control.
- `lsdev -d driver`
Displays the information about the SCSI robotic control drivers.
- `mksf -C tape -H hw-path -b BEST -u -n`
Creates the device files for tape drives. The *hw-path* is the hardware path of the tape drive, as specified by the `ioscan` command.

DRAFT

Linux

This chapter includes the following topics:

- [Before you begin on Linux](#)
- [About the required Linux SCSI drivers](#)
- [Verifying the Linux drivers](#)
- [About configuring robot and drive control for the Linux 2.6 kernel](#)
- [Verifying the device configuration](#)
- [About SAN clients on Linux](#)
- [About SCSI persistent bindings](#)
- [About Emulex HBAs](#)
- [Utilities to test SCSI devices](#)
- [Linux command summary](#)

Before you begin on Linux

Observe the following important points when you configure the operating system:

- Verify that NetBackup supports your server platform and devices. The Symantec support Web site contains server platform compatibility information. For the compatibility information, see the Compatibility List for NetBackup Server or NetBackup Enterprise Server. The following is the URL:
<http://entsupport.symantec.com>
- For SCSI controlled libraries, NetBackup issues SCSI commands to the robotic devices. For NetBackup to function correctly, the properly named device files must exist. Information about how to configure device files is available.

See [“About configuring robot and drive control for the Linux 2.6 kernel”](#) on page 58.

- Verify that a SCSI low-level driver is installed for each HBA in your system, as follows:
 - Follow the HBA vendor's installation guide to install or load the driver in the kernel.
 - Configure the kernel for SCSI tape support and SCSI generic support.
 - Probe all LUNs on each SCSI device and enable the SCSI low-level driver for the HBA.
 - Enable multi-LUN support for the kernel according to the Linux documentation.

For more information, refer to your HBA vendor documentation.

- Multipath configurations (multiple paths to robots and drives) are supported only with the following configurations:
 - Native path (`/dev/nstx`, `/dev/sgx`)
 - The `sysfs` file system that is mounted on `/sys`

After you configure the hardware, add the robots and the drives to NetBackup.

About the required Linux SCSI drivers

To use SCSI tape drives and robotic libraries, the following drivers must be configured in the kernel or loaded as modules:

- Linux SCSI generic (`sg`) driver. This driver allows pass-through commands to SCSI tape drives and control of robotic devices.

If you **do not** use a pass-through driver, performance suffers. NetBackup and its processes use the pass-through driver as follows:

- To scan drives
- For SCSI reservations
- For SCSI locate-block operations
- For SAN error recovery
- For Quantum SDLT performance optimization
- To collect robot and drive information
- To collect Tape Alert information from tape drives
- For WORM tape support

- For future features and enhancements
- SCSI tape (st) driver. This driver allows the use of SCSI tape drives.
- Standard SCSI driver.
- SCSI-adapter driver.

The standard Enterprise Linux releases have the `sg` and the `st` modules available for loading. The modules are loaded as needed. Also, you can load these modules if they are not in the kernel. Use the following commands:

```
/sbin/modprobe st
/sbin/modprobe sg
```

st driver support for additional tape devices

The `st` tape driver supports up to 32 tape devices in its default configuration. This configuration provides eight minor device numbers.

Because NetBackup uses only one minor number, you can modify the driver to support up to the following:

- 64 tape devices (with four minor device numbers)
- 128 tape devices (with two minor device numbers)

The following table shows the `ST_NBR_MODE_BITS` parameter values.

Modify the `ST_NBR_MODE_BITS` parameter in the `st.h` file; use a value from the table. The `st.h` file resides in the `/drivers/scsi` directory. The path to the `/drivers/scsi` directory depends on the Linux version and build. In the following two example paths, the first is on a RedHat Linux system and the second is on a SUSE Linux system:

```
/usr/src/redhat/BUILD/kernel-2.6.18/linux-2.6.18.x86_64/drivers/scsi
/usr/src/linux-2.6.16.60-0.21/drivers/scsi
```

Table 4-1 `st.h` `ST_NBR_MODE_BITS` values

Number of tape drives to support	Use this value for <code>ST_NBR_MODE_BITS</code>
64	1
128	0

About st buffer size and performance

Internal `st` tape driver buffers have a default size of 32K. You may improve performance if you set those buffers to match the default block size that the NetBackup `bptm` process uses. The default block size for `bptm` is 64K.

Modify the `ST_BUFFER_BLOCKS` parameter in the `st_options.h` file; set the value to 64.

Depending on the available system memory, you also may need to reduce the number of buffers to allow. To do so, modify the `ST_MAX_BUFFERS` parameter in the `st_options.h` file. The default value is 4.

To incorporate these source changes into your system, follow the operating system guidelines.

About the st driver debug mode

You can enable debug mode for the `st` tape driver. Debug mode echoes each command and its result to the system log. For details, see the [Linux documentation](#).

Verifying the Linux drivers

NetBackup requires specific Linux drivers.

See [“About the required Linux SCSI drivers”](#) on page 56.

You can use the `/sbin/lsmmod` command to verify that the `st` and the `sg` drivers are loaded in the kernel.

To verify that the drivers are installed and loaded in the kernel

- ◆ Invoke the `lsmmod` command as follows:

```
lsmmod
Module      Size      Used by
sg          14844         0
st          24556         0
```

About configuring robot and drive control for the Linux 2.6 kernel

NetBackup supports SCSI control and API control of robotic devices. SCSI control includes Fibre Channel Protocol (FCP), which is SCSI over Fibre Channel.

You must configure the control method, as follows:

- SCSI or Fibre Channel Protocol control.
NetBackup uses device files to configure control for SCSI tape devices, including robotic devices. (A robotic device in a library moves the media between storage slots and the drives in the library.)
See [“About the Linux 2.6 kernel robotic control device files”](#) on page 59.
See [“About the Linux 2.6 kernel tape drive device files”](#) on page 59.
- API control over a LAN.
See the "ADIC Automated Media Library (AML)" topic of this guide.
See the "IBM Automated Tape Library (ATL)" topic of this guide.
See the "Sun StorageTek ACSLS robots" topic of this guide.

About the Linux 2.6 kernel robotic control device files

For robotic devices, NetBackup uses the `/dev/sgx` device files, where *x* is a decimal number from 0 to 255. Linux should create the device files automatically. If the device files do not exist, see the Linux documentation for information about how to create them.

If you use device discovery, NetBackup looks for `/dev/sgx` robotic control device files. NetBackup discovers the robotic control device files (and hence the devices) automatically. Alternatively, if you add a robot manually in NetBackup, you must enter the pathname to the device file for that robotic device.

About the Linux 2.6 kernel tape drive device files

For tape drive device files, NetBackup uses the `/dev/nstx` files (*n* indicates the no rewind device file). The Linux driver should create the device files automatically. If the device files do not exist, see the Linux documentation for information about how to create them.

If you use device discovery in NetBackup, NetBackup looks for `/dev/nstx` device files. NetBackup discovers the device files (and hence the devices) automatically. Alternatively, if you add a drive manually in NetBackup, you must enter the pathname to the device file for that drive.

The NetBackup `avrd` daemon establishes a default tape driver operating mode. If you change the default mode, NetBackup may not read and write tapes correctly, which results in data loss.

Verifying the device configuration

The `/proc/scsi/scsi` file shows all of the devices that the SCSI driver detects.

If the operating system detects the SCSI devices, NetBackup can discover them.

To verify that the operating system can see the devices

- ◆ Run the following command from a terminal window:

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

The output that is displayed should be similar to the following:

```
Attached devices:
Host: scsi0 Channel: 00 Id: 01 Lun: 00
Vendor: HP          Model: C7200-8000      Rev: 1040
Type:   Medium Changer          ANSI SCSI revision: 03
Host: scsi0 Channel: 00 Id: 02 Lun: 00
Vendor: QUANTUM      Model: DLT8000        Rev: 010F
Type:   Sequential-Access       ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 03 Lun: 00
Vendor: QUANTUM      Model: DLT8000        Rev: 010F
Type:   Sequential-Access       ANSI SCSI revision: 02
```

About SAN clients on Linux

NetBackup SAN clients on Linux hosts require the SCSI Generic (sg) driver and pass-through tape drive device files for traffic to NetBackup FT media servers. The media server FT devices appear as `ARCHIVE Python` tape devices during SCSI inquiry from the SAN client. (However, they are not tape devices and do not appear as tape devices in NetBackup device discovery.)

You should verify that you have the correct driver and device files.

See [“Verifying the Linux drivers”](#) on page 58.

Also, by default Linux does not add generic SCSI device files greater than LUN 0. Therefore, you may have to modify the `/etc/rc.local` file to scan LUN 1 and higher.

The following is an example of code you can include in the `/etc/rc.local` file to add LUN 1, targets 0-7 on Controllers 0-2. Note that the last line is the `MAKEDEV` command, which makes the required device files. The code you include in your `/etc/rc.local` file depends on how your hardware environment.

```
# Add the troublesome device on LUN 1 for the FT server
echo "scsi add-single-device 0 0 0 1" > /proc/scsi/scsi
echo "scsi add-single-device 0 0 1 1" > /proc/scsi/scsi
echo "scsi add-single-device 0 0 2 1" > /proc/scsi/scsi
echo "scsi add-single-device 0 0 3 1" > /proc/scsi/scsi
MAKEDEV sg
```

```

echo "scsi add-single-device 0 0 4 1" > /proc/scsi/scsi
echo "scsi add-single-device 0 0 5 1" > /proc/scsi/scsi
echo "scsi add-single-device 0 0 6 1" > /proc/scsi/scsi
echo "scsi add-single-device 0 0 7 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 0 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 1 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 2 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 3 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 4 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 5 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 6 1" > /proc/scsi/scsi
echo "scsi add-single-device 1 0 7 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 0 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 1 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 2 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 3 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 4 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 5 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 6 1" > /proc/scsi/scsi
echo "scsi add-single-device 2 0 7 1" > /proc/scsi/scsi
/dev/MAKEDEV sg

```

About SCSI persistent bindings

Use persistent bindings to lock the mappings between the SCSI targets that are reported to Linux and the specific devices. World Wide Port Name (WWPN) binding is often used. If you cannot use binding with the HBA in your configuration, add an `ENABLE_AUTO_PATH_CORRECTION` entry in the `/usr/openv/volmgr/vm.conf` file on all Linux media servers.

About Emulex HBAs

If NetBackup cannot mount tapes when an Emulex Fibre Channel HBA is installed, you may have to modify the `lpfc.conf.c` file.

Set `lpfc_check_cond_err` to a value of zero. NetBackup is unable to mount tapes if this variable is set to one.

If you use a `/usr/openv/volmgr/AVRD_DEBUG` touch file on a system with an Emulex HBA driver, the system log may contain entries similar to the following:

```

Unknown drive error on DRIVENAME (device N, PATH) sense[0] = 0x70,
sense[1] = 0x0, sensekey = 0x5

```

You can ignore these messages.

Utilities to test SCSI devices

You can manipulate tape devices with the operating system `mt` command. For more information, see the `mt(1)` man page.

You can use the NetBackup `robtest` utility to test robots. The `robtest` utility resides in `/usr/opensv/volmgr/bin`.

A set of SCSI utilities are available from the Linux SCSI Generic (`sg`) driver home page.

Linux command summary

The following is a summary of commands that were used in this topic:

- `/sbin/lsmmod`
Lists the modules that are loaded.
- `/sbin/modprobe`
Installs loadable kernel modules.
- `/usr/sbin/reboot`
Stops and restarts the system.
- `/bin/mknod /dev/sgx c 21 N`
Creates SCSI generic device files; *x* is a decimal number from 0 to 255.

Solaris

This chapter includes the following topics:

- [Before you begin on Solaris](#)
- [About the NetBackup sg driver](#)
- [Determining if the NetBackup sg driver is installed](#)
- [Special configuration for the Sun StorEdge Network Foundation HBA driver](#)
- [About binding Fibre Channel HBA drivers](#)
- [Configuring Solaris 10 x86 for multiple drive paths](#)
- [Installing/reinstalling the sg and the st drivers](#)
- [Preventing Solaris driver unloading](#)
- [About Solaris robotic controls](#)
- [About Solaris tape drive device files](#)
- [Configuring SAN clients to recognize FT media servers](#)
- [Uninstalling the sg driver](#)
- [Solaris command summary](#)

Before you begin on Solaris

Observe the following points when you configure the operating system:

- Verify that NetBackup supports your server platform and devices. Download the NetBackup hardware and operating system compatibility lists. See “[About the NetBackup compatibility lists](#)” on page 15.

- For SCSI controlled libraries, NetBackup issues SCSI commands to the robotic devices.

For NetBackup to function correctly, the properly named device files must exist, as follows:

- NetBackup installs its own pass-through driver, the SCSI generic `sg` driver. You must configure this driver properly to create device files for any device NetBackup uses.
- The Solaris tape and disk driver interfaces also create a device file for each tape drive device. These device files must exist for all read or write I/O capability.

See [“About Solaris robotic controls”](#) on page 73.

- Verify that the Solaris `st` driver is installed.
- Verify that the devices are configured correctly. To do so, use the Solaris `mt` command and the NetBackup `/usr/openv/volmgr/bin/sgscan` utility. For the tape drives that you want to share among NetBackup hosts, ensure that the operating system detects the devices on the SAN before configure the NetBackup Shared Storage Option.
- When you configure devices, you should attach all peripherals and reboot the system with the reconfigure option (`boot -r` or `reboot -- -r`).
- If you remove or replace adapter cards, remove all device files that are associated with that adapter card.
- If you use the Automated Cartridge System (ACS) robotic software, you must ensure that the SunOS/BSD Source Compatibility Package is installed. The package is required so that the ACS software can use the shared libraries in `/usr/ucblib`.
- Sun systems with parallel SCSI host bus adapters do not support 16-byte SCSI commands on any devices that are attached to these HBAs. Therefore, those HBAs do not support WORM media. To override this limitation, create a touch file as follows:

```
touch /usr/openv/volmgr/database/SIXTEEN_BYTE_CDB
```

After you configure the hardware, add the robots and the drives to NetBackup.

About the NetBackup sg driver

NetBackup provides its own SCSI pass-through driver to communicate with SCSI-controlled robotic peripherals. This driver is called the SCSI (generic SCSI pass-through driver), also referred to as the `sg` driver.

For full feature support, NetBackup requires the sg driver and SCSI pass-through device paths.

Install the NetBackup sg driver on each Solaris NetBackup media server that hosts tape devices. Each time you add or remove a device, you should reinstall the sg driver again.

If you do not use a pass-through driver, performance suffers.

NetBackup uses the pass-through driver for the following:

- By `avrd` and robotic processes to scan drives.
- By NetBackup to position tapes by using the locate-block method.
- By NetBackup for SAN error recovery.
- By NetBackup for Quantum SDLT performance optimization.
- By NetBackup for SCSI reservations.
- By NetBackup device configuration to collect robot and drive information.
- To collect Tape Alert information from tape devices allowing support of functions such as tape drive cleaning.
- For WORM tape support.
- Future NetBackup features and enhancements

Note: Because NetBackup uses its own pass-through driver, NetBackup does not support the Solaris `sgen` SCSI pass-through driver.

See [“Installing/reinstalling the sg and the st drivers”](#) on page 67.

Determining if the NetBackup sg driver is installed

Use the following procedure to determine if the sg driver is installed and loaded.

More information about the driver is available.

See [“About the NetBackup sg driver”](#) on page 64.

To determine if the sg driver is installed and loaded

- ◆ Invoke the following command:

```
/usr/sbin/modinfo | grep sg
```

If the driver is loaded, output includes a line similar to the following:

```
141 fc580000 2d8c 116 1 sg (SCSA Generic Revision: 3.5e)
```

Special configuration for the Sun StorEdge Network Foundation HBA driver

When you configure the sg driver, it binds the StorEdge Network Foundation host bus adapter World Wide Port Names for use by the sg driver.

See [“Installing/reinstalling the sg and the st drivers”](#) on page 67.

The configuration process uses the Solaris `luxadm` command to probe for HBAs that are installed in the system. Ensure that the `luxadm` command is installed and in the shell path.

To determine if a host contains a StorEdge Network Foundation HBA, you can run the following command:

```
/usr/opensv/volmgr/bin/sgscan
```

If the script detects a StorEdge Network Foundation HBA, it produces output similar to the following example:

```
#WARNING: detected StorEdge Network Foundation connected devices not
           in sg configuration file:
#
#   Device World Wide Port Name 21000090a50001c8
#
#   See /usr/opensv/volmgr/NetBackup_DeviceConfig_Guide.txt topic
#   "Special configuration for Sun StorEdge Network Foundation
#   HBA/Driver" for information on how to use sg.build and
#   sg.install to configure these devices
```

Each time you add or remove a device, you should configure the sg and the st drivers again.

About binding Fibre Channel HBA drivers

For Fibre Channel HBAs other than Sun StorEdge Network Foundation, you must bind the devices to specific target IDs on the NetBackup host. When you bind devices to targets, the target ID does not change after a system reboot or a Fibre Channel configuration change.

In some instances, Symantec products are configured to use a specific target ID. If you change the ID, the products fail until you configure the ID correctly.

How you bind devices to targets is vendor and product specific. For information about how to modify the HBA configuration files to bind devices to targets, see the documentation for the HBA.

The binding may be based on the following:

- Fibre Channel World Wide Port Name (WWPN)
- World Wide Node Name (WWNN)
- The destination target ID and LUN

After you bind the devices to target IDs, continue with the Solaris configuration in the same manner as for parallel SCSI installations.

See [“Installing/reinstalling the sg and the st drivers”](#) on page 67.

Each time you add or remove a device, you must update the bindings and then configure the sg and the st drivers again.

Configuring Solaris 10 x86 for multiple drive paths

To use multiple paths to the same tape drive, NetBackup requires that Solaris Multiplexed I/O (MPxIO) be disabled. MPxIO is enabled by default on Solaris 10 x86 systems.

Use the following procedure to disable MPxIO.

To disable MPxIO

- 1 Use a text editor to open the following file:

```
/kernel/drv/fp.conf
```
- 2 Change the `mpxio-disable` value from **no** to **yes**. After the change, the line in the file should appear as follows:

```
mpxio-disable="yes"
```
- 3 Save the changes and exit from the text editor.

Installing/reinstalling the sg and the st drivers

You must install the NetBackup sg driver and the Sun st driver on each Solaris NetBackup media server that hosts tape devices.

Each time you add or remove a device, you should install and configure the sg and the st drivers again.

Before you configure the sg and the st drivers, ensure that all devices are turned on and connected to the HBA.

See [“About the NetBackup sg driver”](#) on page 64.

To install and configure the sg and the st drivers

- 1 Invoke the following two commands to run the NetBackup `sg.build` script:

```
cd /usr/opensv/volmgr/bin/driver
/usr/opensv/volmgr/bin/sg.build all -mt target -ml lun
```

The following describes the options:

- The `all` option creates the following files and populates them with the appropriate entries:
 - `/usr/opensv/volmgr/bin/driver/st.conf`
See “[st.conf file example](#)” on page 69.
 - `/usr/opensv/volmgr/bin/driver/sg.conf`
See “[sg.conf file example](#)” on page 70.
 - `/usr/opensv/volmgr/bin/driver/sg.links`
See “[sg.links file example](#)” on page 71.
- The `-mt target` option and argument specify the maximum target ID that is in use on the SCSI bus (or bound to an FCP HBA). The maximum value is 126. By default, the SCSI initiator target ID of the adapter is 7, so the script does not create entries for target ID 7.
- The `-ml lun` option and argument specify the maximum number of LUNs that are in use on the SCSI bus (or by an FCP HBA). The maximum value is 255.

- 2 Replace the following seven entries in the `/kernel/drv/st.conf` file with all of the entries from the `/usr/opensv/volmgr/bin/driver/st.conf` file:

```
name="st" class="scsi" target=0 lun=0;
name="st" class="scsi" target=1 lun=0;
name="st" class="scsi" target=2 lun=0;
name="st" class="scsi" target=3 lun=0;
name="st" class="scsi" target=4 lun=0;
name="st" class="scsi" target=5 lun=0;
name="st" class="scsi" target=6 lun=0;
```

You should make a backup copy of the `/kernel/drv/st.conf` file before you modify it.

- 3 Reboot the system with the reconfigure option (`boot -r` or `reboot -- -r`).

During the boot process, the system probes all targets in the `st.conf` file for devices. It should create device files for all devices it discovers.

- 4 Verify that the system created the device nodes for all the tape devices by using the following command:

```
ls -l /dev/rmt/*cbn
```

- 5 Install the new sg driver configuration by invoking the following two commands:

```
/usr/bin/rm -f /kernel/drv/sg.conf  
/usr/openv/volmgr/bin/driver/sg.install
```

The NetBackup sg.install script does the following:

- Installs and loads the sg driver.
 - Copies the `/usr/openv/volmgr/bin/driver/sg.conf` file to `/kernel/drv/sg.conf`.
 - Creates the `/dev/sg` directory and nodes.
 - Appends the `/usr/openv/volmgr/bin/driver/sg.links` file to the `/etc/devlink.tab` file.
- 6 Verify that the sg driver finds all of the robots and tape drives.

st.conf file example

The following `/usr/openv/volmgr/bin/driver/st.conf` file example shows targets 0-15 and LUNs 0-7.

```
name="st" class="scsi" target=0 lun=0;  
name="st" class="scsi" target=0 lun=1;  
name="st" class="scsi" target=0 lun=2;  
name="st" class="scsi" target=0 lun=3;  
name="st" class="scsi" target=0 lun=4;  
name="st" class="scsi" target=0 lun=5;  
name="st" class="scsi" target=0 lun=6;  
name="st" class="scsi" target=0 lun=7;  
name="st" class="scsi" target=1 lun=0;  
name="st" class="scsi" target=1 lun=1;  
name="st" class="scsi" target=1 lun=2;  
.  
<entries omitted for brevity>  
.  
name="st" class="scsi" target=15 lun=5;  
name="st" class="scsi" target=15 lun=6;  
name="st" class="scsi" target=15 lun=7;
```

sg.conf file example

The following `/usr/openv/volmgr/bin/driver/sg.conf` file example shows targets 0-15 and LUNs 0-8. It also includes target entries for three StorEdge Network Foundation HBA ports.

The `sg.build -mt` option does not affect FCP targets, but the `-ml` option does. The Solaris `luxadm` command detected three ports (identified by their World Wide Names). Therefore, the `sg.build` script created entries for LUNs 0 through 7 for those three ports.

```
name="sg" class="scsi" target=0 lun=0;
name="sg" class="scsi" target=0 lun=1;
name="sg" class="scsi" target=0 lun=2;
name="sg" class="scsi" target=0 lun=3;
name="sg" class="scsi" target=0 lun=4;
name="sg" class="scsi" target=0 lun=5;
name="sg" class="scsi" target=0 lun=6;
name="sg" class="scsi" target=0 lun=7;
name="sg" class="scsi" target=1 lun=0;
name="sg" class="scsi" target=1 lun=1;
name="sg" class="scsi" target=1 lun=2;
...
<entries omitted for brevity>
...
name="sg" class="scsi" target=15 lun=5;
name="sg" class="scsi" target=15 lun=6;
name="sg" class="scsi" target=15 lun=7;
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53c3";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53c3";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53c6";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53c6";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53c9";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53c9";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53cc";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53cc";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53b9";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53b9";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53c3";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53c3";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53c6";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53c6";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53c9";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53c9";
```

```
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53cc";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53cc";
name="sg" parent="fp" target=0 lun=0 fc-port-wwn="500104f0008d53b9";
name="sg" parent="fp" target=0 lun=1 fc-port-wwn="500104f0008d53b9"
```

sg.links file example

The following `/usr/openv/volmgr/bin/driver/sg.links` file example shows targets 0-15 and LUNs 0-7. It also includes entries for three StorEdge Network Foundation HBA ports.

The `sg.build -mt` option does not affect FCP targets, but the `-ml` option does. The Solaris `luxadm` command detected three ports (identified by their World Wide Names). Therefore, the `sg.build` script created entries for LUNs 0 through 7 for those three ports.

The field separator between the `addr=x,y;` field and the `sg/` field is a tab. The `addr=` field uses hexadecimal notation, and the `sg/` field uses decimal values.

```
# begin SCSI Generic devlinks file - creates nodes in /dev/sg
type=ddi_pseudo;name=sg;addr=0,0;          sg/c\N0t010
type=ddi_pseudo;name=sg;addr=0,1;          sg/c\N0t011
type=ddi_pseudo;name=sg;addr=0,2;          sg/c\N0t012
type=ddi_pseudo;name=sg;addr=0,3;          sg/c\N0t013
type=ddi_pseudo;name=sg;addr=0,4;          sg/c\N0t014
type=ddi_pseudo;name=sg;addr=0,5;          sg/c\N0t015
type=ddi_pseudo;name=sg;addr=0,6;          sg/c\N0t016
type=ddi_pseudo;name=sg;addr=0,7;          sg/c\N0t017
type=ddi_pseudo;name=sg;addr=1,0;          sg/c\N0t110
type=ddi_pseudo;name=sg;addr=1,1;          sg/c\N0t111
...
<entries omitted for brevity>
...
type=ddi_pseudo;name=sg;addr=f,5;          sg/c\N0t1515
type=ddi_pseudo;name=sg;addr=f,6;          sg/c\N0t1516
type=ddi_pseudo;name=sg;addr=f,7;          sg/c\N0t1517
type=ddi_pseudo;name=sg;addr=w500104f0008d53c3,0;    sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53c3,1;    sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53c6,0;    sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53c6,1;    sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53c9,0;    sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53c9,1;    sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53cc,0;    sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53cc,1;    sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53b9,0;    sg/c\N0t\A110
```

```

type=ddi_pseudo;name=sg;addr=w500104f0008d53b9,1;      sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53c3,0;      sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53c3,1;      sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53c6,0;      sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53c6,1;      sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53c9,0;      sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53c9,1;      sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53cc,0;      sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53cc,1;      sg/c\N0t\A111
type=ddi_pseudo;name=sg;addr=w500104f0008d53b9,0;      sg/c\N0t\A110
type=ddi_pseudo;name=sg;addr=w500104f0008d53b9,1;      sg/c\N0t\A111
# end SCSA devlinks

```

Preventing Solaris driver unloading

When system memory is limited, Solaris unloads unused drivers from memory and reloads drivers as needed. Tape drivers are often unloaded because they are used less often than disk drivers.

The drivers NetBackup uses are the st driver (from Sun), the sg driver (from Symantec), and Fibre Channel drivers. Problems may occur depending on when the driver loads and unloads. These problems can range from a SCSI bus not able to detect a device to system panics.

Symantec recommends that you prevent Solaris from unloading the drivers from memory.

The following procedures describe how to prevent Solaris from unloading the drivers from memory.

To prevent Solaris from unloading the drivers from memory

- ◆ Add the following `forceload` statements to the `/etc/system` file:

```

forceload: drv/st
forceload: drv/sg

```

To prevent Solaris from unloading the Fibre Channel drivers from memory

- ◆ Add an appropriate `forceload` statement to the `/etc/system` file.

Which driver you force to load depends on your Fibre Channel adapter. The following is an example for a Sun Fibre Channel driver (SunFC FCP v20100509-1.143):

```

forceload: drv/fcp

```

About Solaris robotic controls

NetBackup supports SCSI control and API control of robotic devices. A robotic device in a library moves the media between the storage slots and the drives in the library.

Robotic control varies, as follows:

- SCSI or Fibre Channel Protocol control.
See [“About SCSI and FCP robotic controls on Solaris”](#) on page 73.
- API control over a LAN.
See the "ADIC Automated Media Library (AML)" topic in this guide.
See the "IBM Automated Tape Library (ATL)" topic in this guide.
See the "Sun StorageTek ACSLS robots" topic in [this guide](#).

About SCSI and FCP robotic controls on Solaris

When you configure the NetBackup `sg` driver, a NetBackup script creates the device files for the attached robotic devices.

See [“About the NetBackup `sg` driver”](#) on page 64.

If you use device discovery in NetBackup, NetBackup discovers the robotic control device files in the `/dev/sg` directory (and hence the devices) automatically. If you add a robot manually in NetBackup, you must enter the pathname to the device file.

To display the device files that the `sg` driver can use, use the NetBackup `sgscan` command with the `all` parameter. The word "Changer" in the `sgscan` output identifies robotic control device files.

Examples are available.

See [“Examples of SCSI and FCP robotic control device files”](#) on page 73.

Examples of SCSI and FCP robotic control device files

The following is an example of `sgscan all` output from a host, to which the examples refer:

```
# /usr/opensv/volmgr/bin/sgscan all
/dev/sg/c0t6l0: Cdrum: "TOSHIBA XM-5401TASUN4XCD"
/dev/sg/c1tw500104f0008d53b9l0: Changer: "STK      SL500"
/dev/sg/c1tw500104f0008d53c3l0: Tape (/dev/rmt/0): "HP      Ultrium 3-SCSI"
/dev/sg/c1tw500104f0008d53c6l0: Tape (/dev/rmt/1): "HP      Ultrium 3-SCSI"
/dev/sg/c1tw500104f0008d53c9l0: Tape (/dev/rmt/2): "IBM     ULTRIUM-TD3"
/dev/sg/c1tw500104f0008d53cc10: Tape (/dev/rmt/3): "IBM     ULTRIUM-TD3"
```

```
/dev/sg/c2t110: Changer: "STK      SL500"
/dev/sg/c2t210: Tape (/dev/rmt/22): "HP      Ultrium 3-SCSI"
/dev/sg/c2t310: Tape (/dev/rmt/10): "HP      Ultrium 3-SCSI"
/dev/sg/c2ta10: Tape (/dev/rmt/18): "IBM      ULTRIUM-TD3"
/dev/sg/c2tb10: Tape (/dev/rmt/19): "IBM      ULTRIUM-TD3"
/dev/sg/c3t010: Disk (/dev/rdisk/c1t0d0): "FUJITSU MAV2073RCSUN72G"
/dev/sg/c3t310: Disk (/dev/rdisk/c1t3d0): "FUJITSU MAV2073RCSUN72G"
```

You can filter the `sgscan` output for device types by using other `sgscan` options. The following is the `sgscan` usage statement:

```
sgscan [all|basic|changer|disk|tape] [conf] [-v]
```

StorEdge Network Foundation HBA example

The robotic control for a Sun StorEdge Network Foundation HBA attached library is LUN 0 of World Wide Node Name (WWNN) 500104f0008d53b9. Therefore, the following is the device file pathname:

```
/dev/sg/c1tw500104f0008d53b910
```

STK SL500 example

For the SCSI robotic control for an STK SL500 is SCSI ID 1 of adapter 2, the following is the device file pathname:

```
/dev/sg/c2t110
```

About Solaris tape drive device files

NetBackup uses the tape drive device files that support compression, no rewind on close, and Berkeley style close.

When you configure the Solaris `st` driver, Solaris creates the device files for the attached tape devices

See [“Installing/reinstalling the `sg` and the `st` drivers”](#) on page 67.

The device files are in the `/dev/rmt` directory, and they have the following format:

```
/dev/rmt/IDcbn
```

The following describe the device file names:

- `ID` is the logical drive number as shown by the NetBackup `sgscan` command.
- `c` indicates compression.
- `b` indicates Berkeley-style close.

- `n` indicates no rewind on close.

If you use device discovery in NetBackup, NetBackup discovers the device files and hence the devices. If you add a tape drive to a NetBackup configuration manually, you must specify the pathname to the device file. NetBackup requires compression, no rewind on close, and Berkeley-style close device files.

To display the tape device files that are configured on your system, use the `sgscan` command with the `tape` parameter, as follows:

```
# /usr/opensv/volmgr/bin/sgscan tape
/dev/sg/cltw500104f0008d53c3l0: Tape (/dev/rmt/0): "HP      Ultrium 3-SCSI"
/dev/sg/cltw500104f0008d53c6l0: Tape (/dev/rmt/1): "HP      Ultrium 3-SCSI"
/dev/sg/cltw500104f0008d53c9l0: Tape (/dev/rmt/2): "IBM      ULTRIUM-TD3"
/dev/sg/cltw500104f0008d53cc10: Tape (/dev/rmt/3): "IBM      ULTRIUM-TD3"
/dev/sg/c2t2l0: Tape (/dev/rmt/22): "HP      Ultrium 3-SCSI"
/dev/sg/c2t3l0: Tape (/dev/rmt/10): "HP      Ultrium 3-SCSI"
/dev/sg/c2tal0: Tape (/dev/rmt/18): "IBM      ULTRIUM-TD3"
/dev/sg/c2tbl0: Tape (/dev/rmt/19): "IBM      ULTRIUM-TD3"
```

The following are examples of no-rewind, compression, Berkeley-style close device files from the preceding `sgscan` example output:

- For the Ultrium3 SCSI drive at LUN 0 of World Wide Node Name (WWNN) 500104f0008d53c3, the device file pathname is:

```
/dev/rmt/0cbn
```

- For the HP Ultrium3 SCSI drive at SCSI ID 2 of adapter 2, the device file pathname is:

```
/dev/rmt/22cbn
```

You can show all device types by using the `all` option. The output can help you associate tape devices with other SCSI devices that may be configured on the same adapter. The following is the `sgscan` usage statement:

```
sgscan [all|basic|changer|disk|tape] [conf] [-v]
```

About Berkeley-style close

NetBackup requires Berkeley-style close for tape drive device files. The letter `b` in the file name indicates Berkeley-style close device files.

In Berkeley-style close, the tape position remains unchanged by a device close operation. (Conversely, in AT&T-style close, the drive advances the tape to just after the next end-of-file (EOF) marker.) To establish the correct position for the next tape operation, applications must assume the tape's position after a close. NetBackup assumes Berkeley-style close on Solaris systems.

About no rewind device files on Solaris

NetBackup requires no rewind on close device files for tape drives.

With no rewind on close, the tape is not rewound after a close operation. It remains in position for the next write operation.

The letter `n` in the device file names in the `/dev/rmt` directory specifies no rewind on close.

About fast-tape positioning (locate-block) on Solaris

Applies to AIT, DLT, Exabyte, DTF, and half-inch tape drives.

To position a tape to a specific block, NetBackup supports the SCSI `locate-block` command. It requires the NetBackup `sg` driver.

NetBackup uses the `locate-block` command by default.

Symantec recommends that you do not **disable** `locate-block` positioning. If you need to disable it, execute the following command:

```
touch /usr/opensv/volmgr/database/NO_LOCATEBLOCK
```

If `locate-block` positioning is **disabled**, NetBackup uses the `forward-space-file/record` method.

About SPC-2 SCSI reserve on Solaris

By default, NetBackup **uses** SPC-2 SCSI reserve and release for tape drive **reservations** in **shared** drive **environments**. The NetBackup Shared Storage Option **provides** **shared** drive **functionality** in NetBackup.

Alternatively, you can use SCSI persistent reserve for shared tape drive **reservations** in NetBackup, as follows:

- For the tape drives that support SPC-3 Compatible Reservation Handling (CRH), you can use SCSI persistent reserve by enabling it in NetBackup. No special configuration in Solaris is required.
- For the tape drives that do not support CRH, you must disable SPC-2 SCSI reserve in Solaris for those drives. After you disable SPC-2 SCSI reserve, you can use persistent reserve by enabling it in NetBackup. If the drive does not support CRH and you do not disable SPC-2 SCSI reserve, access attempts to the drive fail.

See [“Disabling SPC-2 SCSI reserve on Solaris”](#) on page 77.

For more information about NetBackup and SCSI reservations, see the following:

- The description of the **Enable SCSI Reserve Media** host property in the *NetBackup Administrator's Guide, Volume I*.
- The "How NetBackup reserves drives" topic in the *NetBackup Administrator's Guide, Volume II*.

Disabling SPC-2 SCSI reserve on Solaris

Use the following procedure to disable SPC-2 SCSI reserve.

More information about reservations is available.

See ["About SPC-2 SCSI reserve on Solaris"](#) on page 76.

To disable SPC-2 SCSI reserve

- ◆ Modify the Solaris `st.conf` file on the NetBackup media server. In the `tape-config-list` section of the `st.conf` file, set the `ST_NO_RESERVE_RELEASE` configuration value (0x20000) in the appropriate `data-property-name` entry.

For example, the following entry disables SCSI reserve and release for all tape drives that use the `DLT7k-data` configuration values:

```
DLT7k-data = 1,0x38,0,0x20000,4,0x82,0x83,0x84,0x85,2;
```

For more information about the `st.conf` file, see the Solaris `st(7D)` man page.

About nonstandard tape drives

Solaris includes the device drivers that support most standard devices.

To receive the most current support for devices, you should install the latest Solaris patch for the `st` driver.

However, if you have a device that Solaris does not support, the device manufacturer should provide the software to install and administer the device properly. In addition, the device vendor should contact Sun Microsystems to add support for the device to Solaris.

For more information about what you need for unsupported devices, contact the device vendor. Also see the Solaris devices and file systems documentation.

Configuring SAN clients to recognize FT media servers

NetBackup SAN clients use tape drivers and SCSI pass-through methods for Fibre Transport traffic to NetBackup FT media servers. The media server FT devices appear as `ARCHIVE Python` tape devices during SCSI inquiry on the SAN client.

However, they are not tape devices and do not appear as tape devices in NetBackup device discovery.

Symantec owns the `ARCHIVE` brand name and `Python` product name. Therefore, `st.conf` file changes to `ARCHIVE Python` do not affect an existing tape drive product.

[Table 5-1](#) is an overview of procedures to configure the Solaris operating system so that it recognizes the NetBackup FT devices on the NetBackup media servers.

Table 5-1 Configuring SAN clients to recognize FT media servers

Step	Task	Procedure
1	Add the Fibre Transport device entry to the <code>st.conf</code> file	See “Adding the FT device entry to the st.conf file” on page 78.
2	Modify the <code>st.conf</code> file so that Solaris discovers devices on two LUNS	See “Modifying the st.conf file so that Solaris discovers devices on two LUNS” on page 78.

Adding the FT device entry to the st.conf file

The following procedure describes how to add the FT device entry to the `st.conf` file.

To add the FT device entry to the st.conf file

- 1 In the `/kernel/drv/st.conf` file, find the `tape-config-list=` section or create it if it does not exist.
- 2 Examine the `tape-config-list=` section for a line that begins with `ARCHIVE Python` and contains `ARCH_04106`. If such a line exists, ensure that it begins with a comment character (`#`).
- 3 Add the following line to the `tape-config-list=` section:

```
"ARCHIVE Python", "FT Pipe", "ARCH_04106";
```
- 4 Find the line that begins with `ARCH_04106`, copy it, and paste it after the `tape-config-list=` line. Delete the comment character (`#`) from the beginning of the line. The following is an example of the line:

```
ARCH_04106 = 1, 0x2C, 0, 0x09639, 4, 0x00, 0x8C, 0x8C, 0x8C, 3;
```

Modifying the st.conf file so that Solaris discovers devices on two LUNS

The following procedure describes how to modify the `st.conf` file so that Solaris discovers devices on two LUNS.

To modify the st.conf file so that Solaris discovers devices on two LUNS

- 1 Find the following line in the st.conf file:

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

- 2 Replace that line and the following lines through target 5 with the following. Doing so modifies the st.conf file to include searches on non-zero LUNs.

```
name="st" class="scsi" target=0 lun=0;
name="st" class="scsi" target=0 lun=1;
name="st" class="scsi" target=1 lun=0;
name="st" class="scsi" target=1 lun=1;
name="st" class="scsi" target=2 lun=0;
name="st" class="scsi" target=2 lun=1;
name="st" class="scsi" target=3 lun=0;
name="st" class="scsi" target=3 lun=1;
name="st" class="scsi" target=4 lun=0;
name="st" class="scsi" target=4 lun=1;
name="st" class="scsi" target=5 lun=0;
name="st" class="scsi" target=5 lun=1;
name="st" parent="fp" target=0;
name="st" parent="fp" target=1;
name="st" parent="fp" target=2;
name="st" parent="fp" target=3;
name="st" parent="fp" target=4;
name="st" parent="fp" target=5;
name="st" parent="fp" target=6;
```

Uninstalling the sg driver

You can **uninstall** the sg driver. If you do, NetBackup performance suffers. The following procedure describes how to uninstall the sg driver.

To uninstall the sg driver

- ◆ Invoke the following command:

```
/usr/sbin/rem_drv sg
```

Solaris command summary

The following is a summary of commands that may be useful when you configure and verify devices:

- `/usr/sbin/modinfo | grep sg`
Displays whether or not the sg driver is installed.
- `/usr/opensv/volmgr/bin/driver/sg.install`
Installs the sg driver or updates the sg driver.
- `/usr/sbin/rem_drv sg`
Uninstalls the sg driver. This command usually is not necessary because `sg.install` uninstalls the old driver before it upgrades a driver.
- `/usr/opensv/volmgr/bin/sg.build all -mt max_target -ml max_lun`
Updates `st.conf`, `sg.conf`, and `sg.links`, and generates SCSI Target IDs with multiple LUNs.
- `/usr/opensv/volmgr/bin/sgscan all`
Scans all connected devices with an SCSI inquiry and provides correlation between physical and the logical devices that use all device files in `/dev/sg`. Also checks for the devices that are connected to the Sun StorEdge Network Foundation HBA that are not configured for use by Symantec products.
- `boot -r` or `reboot -- -r`
Reboot the system with the reconfigure option (`-r`). The kernel's SCSI disk (`sd`) driver then recognizes the drive as a disk drive during system initialization.

See the procedures in this chapter for examples of their usage.

Windows

This chapter includes the following topics:

- [Before you begin configuring NetBackup on Windows](#)
- [About tape device drivers on Windows](#)
- [Attaching devices to a Windows system](#)

Before you begin configuring NetBackup on Windows

Observe the following points when performing the configurations described in this chapter:

- Verify that NetBackup supports your server platform and devices. Download the NetBackup hardware and operating system compatibility lists. See [“About the NetBackup compatibility lists”](#) on page 15.
- For NetBackup to recognize and communicate with connected devices and for device discovery to discover devices, NetBackup issues SCSI pass-through commands to the devices in a configuration. A tape driver must exist for each tape device. Attached devices appear in the registry.
- Use the Microsoft Windows device applications to verify that the devices are configured correctly. The device applications available on your server may differ depending on your Windows operating system. Make sure that Windows detects the devices on the SAN before you configure the NetBackup Shared Storage Option.
- If you have multiple devices connected to a fibre bridge, Windows may only see one LUN. This will normally be the device with the lowest-ordered LUN. This limitation occurs because of the default install settings for the device driver for some fibre channel HBAs. See your vendor documentation to verify the settings.

- Information about how to configure API robot control over a LAN is available. See the "ADIC Automated Media Library (AML)" topic in this guide.
See the "IBM Automated Tape Library (ATL)" topic in this guide.
See the "Sun StorageTek ACSLS robots" topic in this guide.

After configuring the hardware, add the drives and robots to NetBackup.

About tape device drivers on Windows

Symantec does not provide device drivers for Windows hosts. If you require drivers, contact Microsoft or the tape drive vendor.

Attaching devices to a Windows system

The following procedure describes a general method for attaching devices to a Windows computer. The Microsoft Windows device applications available on the server that you use in these steps may differ depending on your Windows operating system.

To attach devices to a Windows system

- 1 Use the appropriate Windows application to obtain information on any currently attached SCSI devices.
- 2 If you attach a new robotic library or drive to a NetBackup media server, follow the vendor's instructions for attaching the device.

Shut down the server and physically attach the supported device. Ensure that SCSI targets and termination settings are consistent with adapter card and peripheral vendor recommendations.
- 3 Reboot the server and answer the prompts for adapter card peripheral configuration options. Watch the display to ensure that the adapter card recognizes the attached peripherals.
- 4 If you add drives, install the tape drivers and use the appropriate Windows application to verify that the drive was recognized.

Robotic storage devices

- Chapter 7. Robot overview
- Chapter 8. ADIC Automated Media Library (AML)
- Chapter 9. IBM Automated Tape Library (AML)
- Chapter 10. Sun StorageTek ACSLS robots
- Chapter 11. Device configuration examples

DRAFT

Robot overview

This chapter includes the following topics:

- [About NetBackup robot types](#)
- [Robot attributes](#)
- [Table-driven robotics](#)
- [Robotic test utilities](#)
- [Robotic processes](#)

About NetBackup robot types

A robot is a peripheral device that mounts and unmounts media in tape drives. NetBackup uses robotic control software to communicate with the robot firmware. NetBackup classifies robots according to one or more of the following characteristics:

- The communication method the robotic control software uses; SCSI and API are the two main methods.
- The physical characteristics of the robot. Library usually refers to a larger robot, in terms of slot capacity or number of drives. Stacker usually refers to a robot with one drive and low media capacity (6 - 12 media slots).
- The media type commonly used by that class of robots. HCART (1/2-inch cartridge tape) and 8 mm are examples of media types.

[Table 7-1](#) lists the NetBackup robot types, with drive and slot limits for each type.

To determine which robot type applies to the model of robot that you use, see the NetBackup hardware compatibility list for your NetBackup release. The HCL is available on the [NetBackup landing page](#) on the Symantec support Web site at the following URL:

<http://symantec.com>**Table 7-1** NetBackup robot types

Robot type	Description	Drive limits	Slot limits	Note
ACS	Automated Cartridge System	1680	No limit	API control. The ACS library software host determines the drive limit.
TL4	Tape library 4mm	2	15	SCSI control.
TL8	Tape library 8mm	No limit	16000	SCSI control.
TLD	Tape library DLT	No limit	32000	SCSI control.
TLH	Tape library Half-inch	256	No limit	API control.
TLM	Tape library Multimedia	250	No limit	API control.

Robot attributes

NetBackup configures and controls robots differently depending on the robot type. The following tables list the attributes that dictate how these robot types differ.

For more detailed information about supported devices, firmware levels, and platforms, see the NetBackup release notes or visit the Symantec support web site.

ACS robots

ACS robots are supported on NetBackup Enterprise Server only.

Unlike other robot types, NetBackup does not track slot locations for the media in ACS robots. The ACS library software tracks slot locations and reports them to NetBackup.

The following table describes the ACS robot attributes.

Table 7-2 ACS robot attributes

Attribute	NetBackup Enterprise Server
API robot	Yes
SCSI control	No

Table 7-2 ACS robot attributes (*continued*)

Attribute	NetBackup Enterprise Server
LAN control	Yes
Remote Robot control	No. Each host that has ACS drives that are attached to it has robotic control.
NDMP support	Yes
Shared drives support	Yes
Drive cleaning support	No. The ACS library software manages drive cleaning.
Media access port support	Yes, for eject only.
NetBackup tracks slots	No
Media type support	DLT, DLT2, DLT3, HCART, HCART2, and HCART3.
Hosts Supported	Windows, UNIX, and Linux. Windows servers require STK LibAttach software. See the Symantec support web site for the latest compatibility information and obtain the appropriate LibAttach software from STK.
Barcode Support	Yes. Depends on ACS library software to obtain NetBackup media IDs. Barcodes must be the same as the media ID (1 to 6 characters).
Robot Examples	Oracle SL500, Oracle SL3000, and Oracle SL8500

TL4 robots

The following table describes the tape library 4mm attributes.

Table 7-3 TL4 robot attributes

Attribute	NetBackup Server	NetBackup Enterprise Server
API robot	No	No
SCSI control	Yes	Yes
LAN control	Not Applicable	No

Table 7-3 TL4 robot attributes (*continued*)

Attribute	NetBackup Server	NetBackup Enterprise Server
Remote robot control	Not Applicable	No
NDMP support	No	No
Shared drives support	Not Applicable	No
Drive cleaning support	Yes	Yes
Media access port support	No	No
NetBackup tracks slots	Yes	Yes
Media type support	4MM	4MM
Hosts supported	Windows, UNIX, and Linux	Windows, UNIX, and Linux
Barcode support	No, but the robot has inventory capability and can report whether a slot in the robot contains media.	No, but the robot has inventory capability and can report whether a slot in the robot contains media.
Robot examples	HP DAT Autochanger	HP DAT Autochanger

TL8 robots

The following table describes the tape library 8mm attributes.

Table 7-4 TL8 robot attributes

Attribute	NetBackup Server	NetBackup Enterprise Server
API robot	No	No
SCSI control	Yes	Yes
LAN control	Not Applicable	No
Remote robot control	Not Applicable	Yes
NDMP support	Yes	Yes
Shared drives support	Not Applicable	Yes
Drive cleaning support	Yes	Yes

Table 7-4 TL8 robot attributes (*continued*)

Attribute	NetBackup Server	NetBackup Enterprise Server
Media access port support	Yes	Yes
NetBackup tracks slots	Yes	Yes
Media type support	8MM, 8MM2, 8MM3	8MM, 8MM2, 8MM3
Hosts supported	Windows, UNIX, and Linux	Windows, UNIX, and Linux
Barcode support	Yes. Barcodes can be from 1 to 16 characters. The Media Manager media ID is six or fewer characters.	Yes. Barcodes can be from 1 to 16 characters. The Media Manager media ID is six or fewer characters.
Robot examples	Spectra Logic 64K and Sony LIB-162	Spectra Logic 64K and Sony LIB-162

TLD robots

The following table describes the tape library DLT attributes.

Table 7-5 TLD robot attributes

Attribute	NetBackup Server	NetBackup Enterprise Server
API robot	No	No
SCSI control	Yes	Yes
LAN control	Not Applicable	No
Remote robot control	Not Applicable	Yes
NDMP support	Yes	Yes
Shared drives support	Not Applicable	Yes
Drive cleaning support	Yes	Yes
Media access port support	Yes	Yes
NetBackup tracks slots	Yes	Yes

Table 7-5 TLD robot attributes (*continued*)

Attribute	NetBackup Server	NetBackup Enterprise Server
Hosts supported	Windows, UNIX, and Linux.	Windows, UNIX, and Linux.
Media type support	DLT, DLT2, DLT3, DTF, 8MM, 8MM2, 8MM3, QIC, HCART, HCART2, HCART3	DLT, DLT2, DLT3, DTF, 8MM, 8MM2, 8MM3, QIC, HCART, HCART2, HCART3
Barcode support	Yes. Barcodes can be from 1 to 16 characters in length. The Media Manager media ID is six or fewer characters.	Yes. Barcodes can be from 1 to 16 characters in length. The Media Manager media ID is six or fewer characters.
Robot examples	HP MSL, Fujitsu FibreCAT TX48, IBM TotalStorage3583, Spectra Logic T680, Sun/Oracle SL3000	HP MSL, Fujitsu FibreCAT TX48, IBM TotalStorage3583, Spectra Logic T680, Sun/Oracle SL3000

TLH robots

TLH robots are supported on NetBackup Enterprise Server only.

The following table describes the tape library half-inch attributes.

Table 7-6 TLH robot attributes

Attribute	NetBackup Enterprise Server
API robot	Yes
SCSI control	No
LAN control	Yes
Remote robot control	Yes
NDMP support	Yes
Shared drives support	Yes
Drive cleaning support	No. The robotic library manages drive cleaning.
Media access port support	Yes
NetBackup tracks slots	No

Table 7-6 TLH robot attributes (*continued*)

Attribute	NetBackup Enterprise Server
Media type support	HCART, HCART2, HCART3
Hosts supported	Windows, UNIX, and Linux.
Barcode support	Yes. Depends on IBM ATL software to obtain the Media Manager media ID. Barcodes must be the same as the media ID (1 to 6 characters).
Robot examples	IBM 3494 and IBM VTS

TLM robots

TLM robots are supported on NetBackup Enterprise Server only.

The following table describes the tape library multimedia attributes:

Table 7-7 TLM robot attributes

Attribute	NetBackup Enterprise Server
API robot	Yes
SCSI control	No
LAN control	Yes
Remote robot control	No. Each server that has TLM drives that are attached to it has robotic control.
NDMP support	No
Shared drives support	Yes
Drive cleaning support	Yes
Media access port support	Yes
NetBackup tracks slots	No
Media type support	4MM, 8MM, 8MM2, 8MM3, DLT, DLT2, DLT3, DTF, HCART, HCART2, HCART3, REWR_OPT (HP9000-800 only), WORM_OPT (HP9000-800 only).
Hosts supported	Windows, UNIX, and Linux

Table 7-7 TLM robot attributes (*continued*)

Attribute	NetBackup Enterprise Server
Barcode support	Yes. Depends on DAS/SDLC software to obtain the Media Manager media ID. Barcodes must be the same as the media ID (1 to 6 characters).
Robot examples	ADIC Scalar 10000.

Table-driven robotics

Table-driven robotics provides support for new robotic library devices without the need to modify any library control binary files. This feature uses a device mapping file for supported robots and drives.

You may be able to add support for new or upgraded devices without waiting for a maintenance patch from Symantec. The device mapping file includes the information that relates to the operation and control of libraries. Therefore, you can download an updated mapping file to obtain support for newly NetBackup-certified devices.

Robotic test utilities

You can use robotic test utilities for testing robots already configured in NetBackup.

Invoke the test utilities as follows:

- `/usr/openv/volmgr/bin/robtest` (UNIX and Linux)
- `install_path\Veritas\Volmgr\bin\robtest.exe` (Windows)

From each test utility, you can obtain a list of available test commands by entering a question mark (?).

The following point applies only to NetBackup Enterprise Server.

Use the `drstat` command to determine the drive addressing parameters for ACS, TLH, and TLM robot types. This command is available in the robotic test utilities for these robot types.

NetBackup addresses drives as follows:

- For ACS robot types, by ACS, LSM, Panel, and Drive number
- For TLH robot types, by the IBM device number
- For TLM robot types, by the DAS/SDLC drive name

- For other robot types, by the robot drive number

Robotic processes

A NetBackup robotic process and possibly a robotic control process exist on a NetBackup media server for each robot that you install, as follows:

- Every media server that has a drive in a robotic library has a robotic process for that robotic library. The robotic process receives requests from the NetBackup Device Manager (`ltid`) and sends necessary information directly to the robotics or to a robotic control process.
- Robotic control processes exist only for the robot types that support library sharing (or robot sharing).

When the NetBackup Device Manager starts, it starts the robotic processes and the robotic control processes for all of the configured robots on that host. When the Device Manager stops, the robotic processes and the robotic control processes stop. (On UNIX, the name is Media Manager Device daemon.)

The **Daemons** (UNIX and Linux) tab or **Services** (Windows) tab of the NetBackup **Activity Monitor** has commands to start and stop this daemon or service. You can also start and stop this daemon or service by using the Device Monitor **Actions** menu or the **Media and Device Management Actions** menu. In addition, the *NetBackup Commands Reference Guide* describes commands to control the robotic processes that run on Windows media servers.

You can determine if a robotic process or robotic control process is active by using the NetBackup **Activity Monitor Processes** tab.

You can determine the control state of NetBackup by using the **Device Monitor Drive paths** pane or **Drive status** pane. If the value in the **Control** column for a drive shows the control mode, the robotic process is running and the drive is usable. For example, for a TLD robot the control mode is **TLD**.

Other values such as **AVR** or **DOWN** may indicate that the drive is unusable. For the possible values and their explanations, see the online help for the **Device Monitor**.

See [“Processes by robot type”](#) on page 93.

See [“Robotic process example”](#) on page 95.

Processes by robot type

The following table describes the robotic processes and robotic control processes for each robot type.

Table 7-8 Robotic processes and robotic control processes

Robot type	Process	Description
Automated Cartridge System (ACS)	acsd	The NetBackup ACS daemon <code>acsd</code> provides robotic control to mount and dismount volumes. It also requests inventories of the volumes that are under the control of ACS library software.
	acsse1	The NetBackup ACS storage server interface (SSI) event logger <code>acsse1</code> logs events. UNIX and Linux only.
	acsssi	The NetBackup ACS storage server interface (SSI) <code>acsssi</code> communicates with the ACS library software host. <code>acsssi</code> processes all RPC communications from <code>acsd</code> or from the ACS robotic test utility that are intended for the ACS library software. UNIX and Linux only.
Tape library DLT (TLD)	tldd	The tape library DLT daemon <code>tldd</code> runs on a NetBackup server that has a drive in the tape library DLT. This process receives NetBackup Device Manager requests to mount and unmount volumes, and sends these requests to the robotic-control process, <code>tlcdc</code> .
	tlcdc	The tape library DLT Control daemon <code>tlcdc</code> communicates with the tape library DLT robotics through a SCSI interface. For library sharing, <code>tlcdc</code> runs on the NetBackup server that has the robotic control.
Tape library 4MM (TL4)	tl4d	The tape library 4MM daemon <code>tl4d</code> runs on the host that has a tape library 4MM. This process receives NetBackup Device Manager requests to mount and unmount volumes and communicates these requests to the robotics through a SCSI interface.
Tape library 8MM (TL8)	tl8d	The tape library 8MM daemon <code>tl8d</code> runs on a NetBackup server that has a drive in the tape library 8MM. This process receives NetBackup Device Manager requests to mount and unmount volumes, and sends these requests to the robotic-control process, <code>tl8cd</code> .
	tl8cd	The tape library 8MM Control daemon <code>tl8cd</code> communicates with the TL8 robotics through a SCSI interface. For library sharing, <code>tl8cd</code> runs on the NetBackup server that has the robotic control.
Tape library Half-inch (TLH)	tlhd	The tape library Half-inch daemon <code>tlhd</code> runs on each NetBackup server that has a drive in the tape library Half-inch. This process receives NetBackup Device Manager requests to mount and unmount volumes and sends these requests to the robotic-control process.

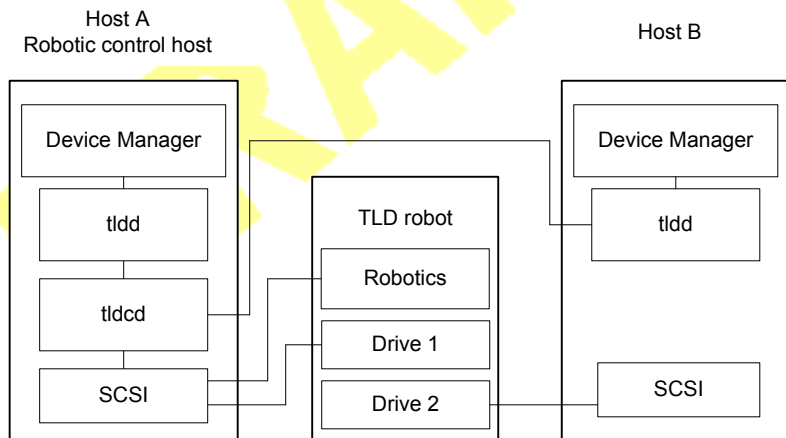
Table 7-8 Robotic processes and robotic control processes (*continued*)

Robot type	Process	Description
	tlhcd	The tape library half-inch control daemon <code>tlhcd</code> runs on the NetBackup server that has the robotic control. It communicates with the TLH robotics through a SCSI interface
Tape library Multimedia (TLM)	tlmd	<code>tlmd</code> runs on the NetBackup server and communicates mount and unmount requests to the host that controls the TLM robotics.

Robotic process example

Each drive in a tape library DLT (TLD) robot can be attached to a different host, and a `tldd` process runs on each host. However, only one host controls the robotics, and the `tlbcd` robotic control process runs on that host only. To mount a tape, the `tldd` process on the host to which the drive is attached sends control information to the `tlbcd` process on the robotic control host.

The following figure shows the processes and where they run for a TLD robot.

Figure 7-1 TLD robot control process example

The following describes this example:

- Each host connects to one drive, and a `tldd` robotic process runs on each host.
- The robotic control and therefore the robotic control process, `tlbcd`, is on host A.

The NetBackup Device Manager services on host A and B start `tladd`. The `tladd` process on host A also starts `tladdcd`. Requests to mount tapes from host B go to `tladd` on host B, which then sends the robotic command to `tladdcd` on host A.

DRAFT

ADIC Automated Media Library (AML)

This chapter includes the following topics:

- [About ADIC Automated Media Library](#)
- [Sample TLM configuration](#)
- [Media requests for a TLM robot](#)
- [Configuring TLM robotic control](#)
- [Configuring TLM drives on the host](#)
- [Configuring TLM drives in NetBackup](#)
- [Configuring shared TLM drives](#)
- [Providing common access to volumes](#)
- [Adding tapes to a TLM robot](#)
- [Removing tapes from a TLM robot](#)
- [Robot inventory operations on TLM robots](#)

About ADIC Automated Media Library

Applies only to NetBackup Enterprise Server.

The ADIC Automated Media Libraries that are controlled by the following ADIC robotics are NetBackup robot type Tape Library Multimedia (TLM):

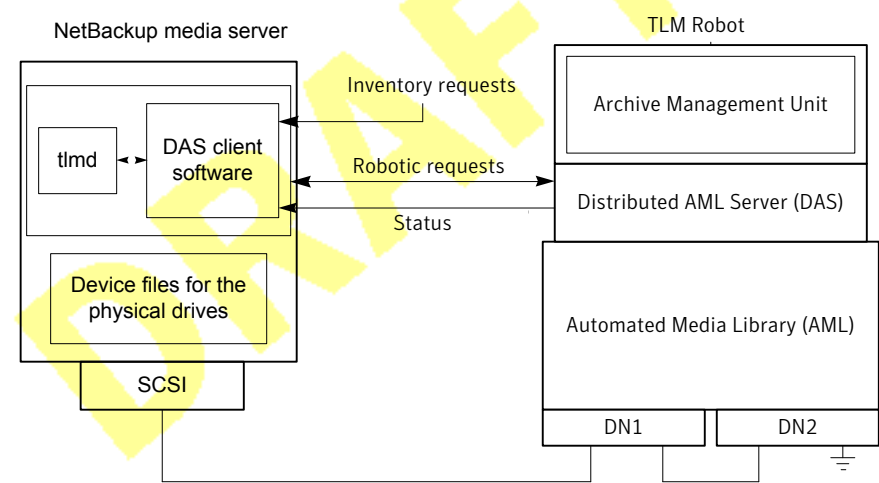
- Distributed AML Server (DAS)

- Scalar Distributed Library Controller (DLC)
- TLM robots are API robots (a NetBackup robot category in which the robot manages its own media).
- Support for these devices is different than for other types of robots. This chapter provides an overview of those differences.

Sample TLM configuration

- The sample TLM configuration includes the following:
- A configuration that uses Distributed AML Server software.
See [Figure 8-1](#) on page 98.
 - An explanation of the major components in the sample configuration.
See [Table 8-1](#) on page 99.

Figure 8-1 Typical ADIC DAS configuration



The following table describes the ADIC configuration components.

Table 8-1 ADIC configuration component description

Component	Description
NetBackup media server	A host that has NetBackup media server software and is a client to the DAS or Scalar DLC server. The Media Manager device daemon (UNIX) or NetBackup Device Manager (Windows) ltid forwards mount and dismount requests to the TLM daemon (tlmd).
TLM daemon or service (tlmd)	This NetBackup daemon or service uses the ADIC client software to pass mount and dismount requests to the DAS or Scalar DLC server. It also processes return status. tlmd also receives and processes robot inventory requests.
Archive Management Unit (AMU)	A PC that runs an IBM OS/2 or Windows operating system, usually located in or near the AML cabinet. The DAS or Scalar DLC server runs on the AMU.
Distributed AML Server (DAS) Scalar Distributed Library Controller (DLC)	These are two ADIC client and server software products that reside in the Archive Management Unit. They provide shared access to the Automated Media Libraries (AML).
Automated Media Library (AML)	An ADIC multimedia robotic library.

Media requests for a TLM robot

The following is the sequence of events for a media request for a TLM robot:

- The Media Manager device daemon (UNIX) or NetBackup Device Manager service (Windows) ltid receives the request from bptm.
- ltid sends a mount request to the TLM daemon tlmd. tlmd uses the ADIC client software to pass the request to the DAS or Scalar DLC server software that resides in the Archive Management Unit.
- The DAS or Scalar DLC server locates the media and directs the robotics to mount the media in the drive.
- When the NetBackup media server receives a successful response from the server, it allows NetBackup to start sending data to the drive.

Configuring TLM robotic control

Before you add a robot to NetBackup, ensure that the ADIC Automated Media Library has been physically connected and configured.

For information about how to configure the ADIC components of the Automated Media Library, see the ADIC installation and administration guides.

For information on platform support for TLM robotic control, see the *NetBackup Release Notes*.

Configuring TLM drives on the host

Before you configure the drives in NetBackup, you must do the following:

- Install the appropriate ADIC library files on the NetBackup media server that functions as the device host. The libraries provide the client functionality in the ADIC client and server architecture.
- Configure environment variables on that NetBackup media server.
- Allocate the drives on the DAS or Scalar DLC server so they are available to that NetBackup media server. That media server is the DAS or Scalar DLC client.

For more information about how to configure the DAS or Scalar DLC server and client, see the ADIC documentation.

For information about how to install the ADIC client software, configure the DAS or Scalar DLC client name, and allocate TLM drives on a DAS or Scalar DLC server, see the following:

- Installing ADIC client software on UNIX
See [“Installing ADIC client software on UNIX”](#) on page 101.
- Installing ADIC client software on Windows
See [“Installing ADIC client software on Windows”](#) on page 101.
- Configuring the DAS or Scalar DLC client name
See [“Configuring the DAS or Scalar DLC client name”](#) on page 102.
- Allocating TLM drives on a DAS server
See [“Allocating TLM drives on a DAS server”](#) on page 103.
- Allocating TLM drives on a Scalar DLC server
See [“Allocating TLM drives on a Scalar DLC server”](#) on page 104.

Installing ADIC client software on UNIX

For NetBackup compatibility information for the ADIC client software, see the Compatibility List for NetBackup Enterprise Server. You can download the Compatibility List from the following Web site:

<http://entsupport.symantec.com>

Ensure that your ADIC client software is compatible with your version of NetBackup.

Use the following procedure to install the ADIC client software on a UNIX NetBackup media server:

To install and configure ADIC client software on UNIX

- 1 Install the ADIC library (`libaci.so`) in the operating system folder `/usr/lib`.

On HP-UX systems, the ADIC library is named `libaci.sl`.

- 2 Set the following system environment variables and values:

DAS_CLIENT *name_of_NetBackup_media_server*

DAS_SERVER *name_of_DAS_server*

- 3 Set any other environment variables that ADIC requires.

Installing ADIC client software on Windows

For NetBackup compatibility information for the ADIC client software, see the Compatibility List for NetBackup Enterprise Server. You can download the Compatibility List from the following Web site:

<http://entsupport.symantec.com>

Ensure that your ADIC client software is compatible with your version of NetBackup.

Use the following procedure to install ADIC software on a Windows NetBackup media server. Also refer to the ADIC users guide for Windows DAS clients.

To install and configure client ADIC software on Windows

- 1 Set the following system environment variables and values on the Windows media server host computer:

DAS_CLIENT	<i>name_of_NetBackup_media_server</i>
DAS_SERVER	<i>name_of_DAS_server</i>

- 2 Set any other environment variables that ADIC requires.
- 3 Copy the following DLLs from the software media that came with the ADIC library to the `Windows\System32` directory or the `install_path\Volmgr\bin` directory:

```
aci.dll  
ezrpcw32.dll  
winrpc32.dll  
aci64.dll (64-bit Windows only)
```

- 4 Run the `portinst.exe` command that is provided with the Windows DAS client.

This command installs the NobleNet Portmapper for TCP service. NobleNet Portmapper is provided with the Windows DAS client.

- 5 Use Windows Computer Management to set the NobleNet Portmapper for TCP service to start automatically when the host is started.

Configuring the DAS or Scalar DLC client name

The DAS or Scalar DLC client name is required for the NetBackup media server. The client name is stored in the configuration file on the DAS or Scalar DLC server. This name must be the same name for the server that NetBackup uses, and it must be a valid client name.

By default, the NetBackup server uses as its DAS or Scalar DLC client name the host name that NetBackup obtains from the `gethostname()` system call. This name is usually the one that you use for the client name in the configuration file on the DAS or Scalar DLC server.

However, if this name is invalid for DAS or Scalar DLC clients, you must use another name. For example, DAS 1.30C1 does not allow hyphens in client names.

A similar problem exists if a NetBackup server's short host name is used as the client name but `gethostname()` returns the long host name.

To configure the DAS or Scalar DLC client name

- 1 In the configuration file on the DAS or Scalar DLC server, change the name of the client system that is the NetBackup media server.

For instructions on how to change a client name, see the ADIC documentation.
- 2 On the NetBackup media server, change the client name. It must be the same as the client name in the configuration file on the DAS or Scalar DLC server. How to change the client name depends on the operating system type, as follows:
 - UNIX. Add the new client name by using a DAS_CLIENT entry in the /usr/openv/volmgr/vm.conf file.
These entries are of the form:
`DAS_CLIENT = DASclientname`
Where *DASclientname* is the name that you want the NetBackup media server to use as its DAS or Scalar DLC client name.
 - Windows. Set the DAS_CLIENT environment variable to the new client name.
- 3 Stop and start the ltid daemon (UNIX) or service (Windows) to enable the TLM daemon to use the new client name.
- 4 When the client names are correct, restart the DAS or Scalar DLC server and then allocate the drives to the NetBackup media server.

Allocating TLM drives on a DAS server

After you install the ADIC client software and configure the client names, allocate the drives to the NetBackup media server. To do so, use the DASADMIN administrative command on the DAS server.

To allocate TLM drives on a DAS server

- 1 Use the `dasadmin listd` command to list the clients and drives available.

For example, the following shows two drives and the clients to which they are allocated. DN1 and DN2 are the drives, and grouse and mouse are the clients (grouse is a NetBackup media server).

```
./dasadmin listd
==>listd for client: successful
    drive: DN1 amu drive: 01 st: UP type: N sysid:
      client: grouse volser: cleaning 0 clean_count: 17
    drive: DN2 amu drive: 02 st: UP type: N sysid:
      client: mouse volser: cleaning 0 clean_count: 4
```

- 2 Use the `dasadmin allocd` command to allocate the drive.

For example, the following two commands deallocate drive DN2 from client mouse and allocate it to client grouse (the NetBackup media server):

```
./dasadmin allocd DN2 DOWN mouse
./dasadmin allocd DN2 UP grouse
```

Allocating TLM drives on a Scalar DLC server

Use the following procedure to allocate the drives for the NetBackup media server.

To allocate TLM drives on a Scalar DLC server

- 1 Start the Scalar DLC console and expand **Configuration > Clients**.
Enter the client name for the value of Name.
Enter the network host name for the value of Client Host Name.
- 2 Select the **Drive Reservation** tab on the client and choose UP for the drives that you want to allocate to this client.

Configuring TLM drives in NetBackup

A TLM robot can have several different types of drives (UNIX) or half-inch cartridge tape drives (Windows), usually with a SCSI interface.

Before you configure drives in NetBackup, configure the operating system tape drivers and device files for those drives. For information about how to do so, refer to the operating system documentation. For guidance about the NetBackup requirements, see the information about the host operating system in this guide.

Use the same methods to create device files or add tape drivers for these drives as for other drives. If the drives are SCSI and connect to the robot through a control unit, the drives share the same SCSI ID. Therefore, you must specify the logical unit number (LUN) for each drive.

Symantec recommends that you use the NetBackup **Device Configuration Wizard** to configure the robots and drives in NetBackup.

Determining drive designations

You may need to add drives to your configuration manually for the following:

- Older drives
- The DAS or Scalar DLC servers that do not support serialization

You must determine the drive designations so you know which drives to add to NetBackup.

To add the drives to NetBackup, see the *NetBackup Administrator's Guide, Volume I*.

Warning: When you add drives to NetBackup, ensure that you assign the correct DAS or Scalar DLC drive name to each drive. If the drive name is incorrect, tape mounts or backups may fail.

Use the NetBackup TLM test utility to determine the DAS or Scalar DLC drive designations. The following example uses `tlmtest`:

```
tlmtest -r dasos2box
```

The following is the output from this utility (the user entered the `drstat` command on the third line).

```
Current client name is 'grouse'.
Enter tlm commands (? returns help information)
drstat
Drive 1: name = DN1, amu_name = 01, state = UP, type = N,
        client = grouse, volser = , cleaning = NO, clean_count = 17
Drive 2: name = DE3, amu_name = 03, state = UP, type = E,
        client = grouse, volser = , cleaning = NO, clean_count = 480
Drive 3: name = DE4, amu_name = 04, state = UP, type = E,
        client = grouse, volser = , cleaning = NO, clean_count = 378
DRIVE STATUS complete
```

This output shows that you should use DAS or Scalar DLC drive names DN1, DE3, and DE4 should be used. It also shows that you should use grouse as the client name of the NetBackup media server.

Configuring shared TLM drives

To share TLM drives, you must configure the ADIC DAS server to allow simultaneous drive allocation to all NetBackup media servers that share the drives. For the ADIC software, the NetBackup media servers are considered clients. The NetBackup Shared Storage Option allows shared drives.

Use one of the following procedures depending on which ADIC robotic control software you use:

- Configuring the ADIC DAS server
See [“Configuring the ADIC DAS server”](#) on page 106.
- Configuring the ADIC Scalar DLC server
See [“Configuring the ADIC Scalar DLC server”](#) on page 107.
- Configuring the drives in NetBackup
See [“Configuring the shared drives in NetBackup”](#) on page 108.

Configuring the ADIC DAS server

To use the following procedure, DAS server software version 3.01.4 or later is required.

To configure the ADIC DAS server

- 1 Modify the DAS server's \ETC\CONFIG file to create a shared client entry.
For example, the following creates a client entry named NetBackupShared.

```
client client_name = NetBackupShared
# ip address = 000.000.000.000
hostname = any
```

- 2 Place the IP addresses of all NetBackup media servers that use the shared client entry in the \MPTN\ETC\HOSTS file on the DAS server.

For example, the following adds two servers:

```
192.168.100.100 server_1
192.168.100.102 server_2
```

- 3 In the DASADMIN interface, choose UP for the drives that you want to allocate to the shared client (NetBackupShared from the example in step 1).
- 4 On each of the NetBackup media servers that share the drives, create an entry in the vm.conf file with the shared DAS client name.

For example, the following adds NetBackupShared as a DAS client:

```
DAS_CLIENT = NetBackupShared
```

- 5 Test the DAS configuration by using the NetBackup robtest and tlmtest utilities:
 - For example, set the client name (use client NetBackupshared in tlmtest) and run the drive status command drstat.
 - On Windows media servers, the client name is obtained from the DAS_CLIENT environment variable so the client command is not needed in tlmtest.

Configuring the ADIC Scalar DLC server

To use the following procedure, Scalar DLC software version 2.3 or later is required.

To configure the Scalar DLC server

- 1 In the Scalar DLC console, create a new, shared client by using the following values:

Name	<i>name_of_client</i> (such as NetBackupShared)
Client Host Name	any

- 2 In the Scalar DLC console, select the **Drive Reservation** tab for the shared client (NetBackupShared).
- 3 Choose UP for the drives that you want to allocate to the shared client.
- 4 Configure the shared client name on the NetBackup media servers that share the drives, as follows:
 - UNIX. Create an entry in the vm.conf file with the shared client name, such as the following:
DAS_CLIENT = NetBackupShared
 - Windows. Set the DAS_CLIENT Windows operating system environment variable to the shared client name, such as NetBackupShared.
- 5 Test the Scalar DLC configuration using robtest and tlmtest:

- For example, set the client name (use client NetBackupshared in tlmtest) and run the drive status command drstat.
- On Windows media servers, the client name is obtained from the `DAS_CLIENT` environment variable so the client command is not needed in tlmtest.

Configuring the shared drives in NetBackup

To configure the shared drives in NetBackup, you can use the NetBackup **Device Configuration Wizard**. The wizard discovers the tape drives that are available. For the robot types that support serialization, the wizard also discovers the positions of the drives within the library.

If the DAS or Scalar DLC server does not support serialization, use the following procedure to configure shared drives. Usually, the NetBackup Shared Storage Option (SSO) for Tape requires shared drives. This procedure can significantly reduce the amount of manual configuration that is required in an SSO environment. For example, for 20 drives that 30 hosts share, these configuration steps require that you configure only 20 device paths rather than 600 device paths.

A SAN (including switches rather than direct connection) can increase the possibility of errors. If errors occur, you can define the tape drive configuration manually by using the **NetBackup Administration Console** or NetBackup commands.

Take care to avoid any errors. With shared drives, the device paths must be correct for each server. Also, ensure that the drives are defined correctly to avoid errors.

To configure shared drives in a nonserialized configuration

- 1 Run the NetBackup **Device Configuration Wizard** on one of the hosts to which drives in an TLM-controlled library are attached. Allow the drives to be added as stand-alone drives.
- 2 Add the TLM robot definition and update each drive to indicate its appropriate position in the robot. Make each drive robotic.

To determine the correct drive addresses and verify the drive paths, see "Correlating device files to physical drives" in the *NetBackup Administrator's Guide, Volume I*.

- 3 After you verify the drive paths on one host, run the NetBackup **Device Configuration Wizard** again. Scan all of the hosts that have TLM drives in the library.

The wizard adds the TLM robot definition and the drives to the other hosts and uses the correct device paths.

For this process to work correctly, the following must be true:

- The wizard discovered the devices and their serial numbers successfully the first time.
- You configured the drive paths correctly on the first host.

Providing common access to volumes

All NetBackup media servers use the same database. Therefore, all media servers that share drives must have access to the same sets of volumes (volsers) in the DAS or Scalar DLC configuration. If they do not have access to the same volsers, NetBackup operational problems may occur. For example, if you update the NetBackup volume configuration from one of the servers, NetBackup moves to stand-alone the volumes that are not configured for that server. Although the volumes are configured correctly for a different server, NetBackup still moves them to stand-alone.

As a test, inventory the robot from each NetBackup media server and compare the results. If any of the reports differ, correct the DAS or Scalar DLC configuration. Then, perform a shutdown and restart of the DAS or Scalar DLC server.

Adding tapes to a TLM robot

The following is an overview of how to add tapes to a TLM robot and then add those tapes to NetBackup:

- Add barcode labels to the media and insert the media into the robot by using the media access port (insert area).
- Do one of the following to empty the media access port:
 - In the **NetBackup Administration Console**, select the robot inventory update inventory function and select **Empty media access port prior to update**.
 - Issue the DAS insert directive from a DAS administrative interface. You can obtain the insert area name from the DAS configuration file.
 - Issue the DAS insert directive from the NetBackup `tlmtest` utility. You can obtain the insert area name from the DAS configuration file.

The AMU Archive Management Software then reads the bar codes, classifies the media by media type, and tracks storage cell locations for the media.

- Define the media in NetBackup by using the DAS or Scalar DLC volser as media IDs. To define the media, do one of the following:

- Update the volume configuration by using the robot inventory function.
See the *NetBackup Administrator's Guide, Volume I*.

- Add new volumes.

See the *NetBackup Administrator's Guide, Volume I*.

Because the DAS or Scalar DLC volser and bar codes are the same, NetBackup has a record of the bar codes for the media. Note that you do not enter slot locations; the ADIC software manages them.

- To verify your configuration, use **Show Contents** and **Compare Contents with Volume Configuration** from the **Robot Inventory** dialog box in NetBackup. Also, use these options to update the NetBackup volume configuration when media has moved. The configuration update maintains consistency between the DAS or Scalar DLC database and the NetBackup EMM database. See ["About ADIC Automated Media Library"](#) on page 97.

Removing tapes from a TLM robot

You can remove tapes by using a DAS or Scalar DLC administrative interface or by using NetBackup.

To remove tapes from a TLM robot

- 1 Physically remove the media from the library by using one of the following:
 - **Actions > Eject Volumes From Robot** in the NetBackup **Administration Console**.
 - The NetBackup `vmchange` command.
For usage, see the *NetBackup Commands Reference Guide* guide.
 - The `eject` command in the NetBackup `tlmtest` utility.
 - A DAS or Scalar DLC administrative interface.
- 2 If you use a DAS or Scalar DLC administrative interface or the NetBackup `tlmtest` utility, update the volume location to stand alone in NetBackup. To do so, do one of the following:
 - Update the volume configuration by using the robot inventory function.
 - Move the volumes.

See the *NetBackup Administrator's Guide, Volume I*.

If you do not update the EMM database, NetBackup does not know the new location of the media and may issue mount requests for it. The result is an error such as Misplaced Tape.

Robot inventory operations on TLM robots

In NetBackup, a TLM robot type supports barcodes.

The following occurs when you inventory a TLM robot in NetBackup:

- NetBackup requests volume information from the DAS server or SDLC server through a DAS or Scalar DLC application library call.
- The server responds by providing a list of volume IDs and associated information from its database. NetBackup filters out the volumes that are not occupied in their home cell locations or in drives. NetBackup then displays a list of the volumes and their media types according to the DAS or Scalar DLC server.

The following are examples of the type of information received.

TLM volume ID	TLM media type
A00250	3480
J03123	3590
DLT001	DECDLT
MM1200	8MM
NN0402	4MM
002455	UNKNOWN

- NetBackup translates the volsers directly into media IDs and barcodes. In the previous table, volser A00250 becomes media ID A00250, and the barcode for that media ID is also A00250.
- If the operation does not require updating the volume configuration, NetBackup uses the media type defaults for TLM robots when it creates an inventory report.
- If the operation requires a volume configuration update, NetBackup maps the TLM media types to the default NetBackup media types
Information about the default media type mappings and how to change them is available.

See the *NetBackup Administrator's Guide, Volume I*.

DRAFT

IBM Automated Tape Library (AML)

This chapter includes the following topics:

- [About IBM Automated Tape Library](#)
- [Sample TLH configurations](#)
- [Media requests for a TLH robot](#)
- [About configuring robotic control](#)
- [About configuring TLH drives](#)
- [About cleaning drives](#)
- [Adding tapes to TLH robots](#)
- [Removing tapes from TLH robots](#)
- [Robot inventory operations on TLH robots](#)

About IBM Automated Tape Library

Applies only to NetBackup Enterprise Server.

The IBM Automated Tape Library (ATL) is NetBackup robot type Tape Library Half-inch (TLH). ATL robots include the IBM Magstar 3494 Tape Library.

TLH robots are API robots (a NetBackup robot category in which the robot manages its own media).

Support for these devices is different than for other types of robots. This topic provides an overview of those differences.

Sample TLH configurations

The following topics show example ATL configurations and explain their major components.

UNIX system example configurations

The UNIX TLH examples include the following:

- Two possible ATL configurations, as follows:
 - The robotic control host communicates directly to robot
See [Figure 9-1](#) on page 115.
 - Robotic control and robot connection on separate hosts.
See [Figure 9-2](#) on page 116.
- An explanation of the major components in those configurations.
See [Table 9-1](#) on page 117.

DRAFT

Figure 9-1

Robotic control host communicates directly to robot

This server can be an AIX, HP-UX, Windows, Linux, or Solaris SPARC server.

This server can be a NetBackup master or media server (or SAN media server).

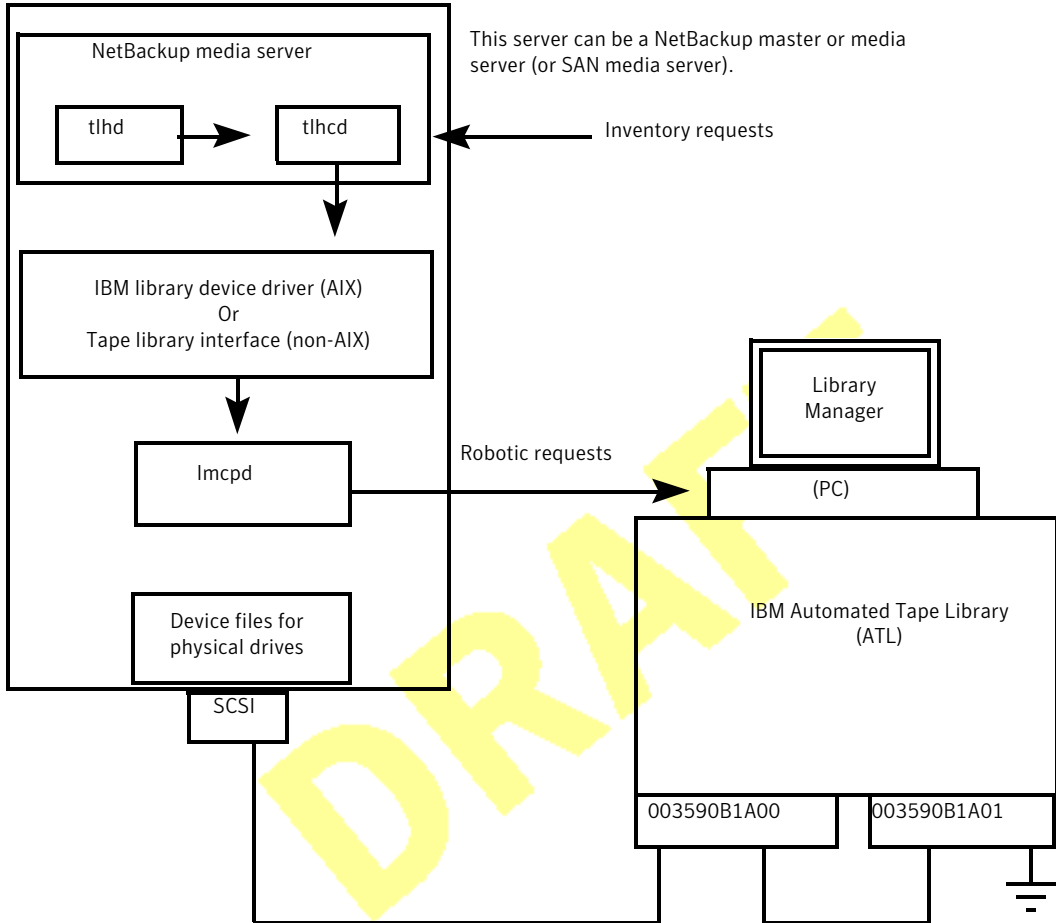
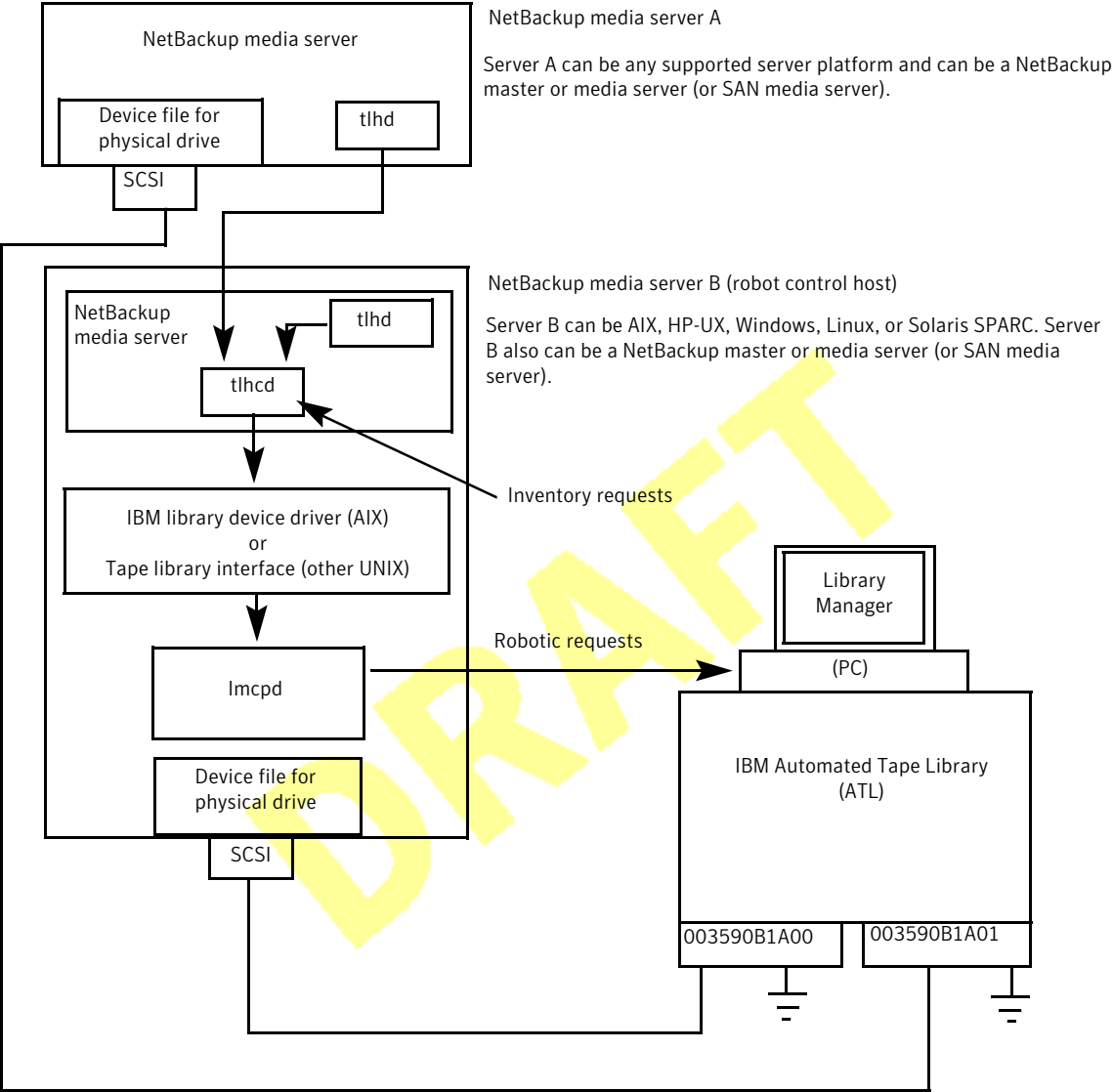


Figure 9-2 Robotic control and robot connection on separate hosts



The following table describes the UNIX TLH configuration components.

Table 9-1 UNIX TLH configuration component description

Component	Description
NetBackup media server	A host that has NetBackup media server software and is a client to the ATL through the Library Manager Control Point daemon (lmcpd). The NetBackup Media Manager device daemon, ltid, forwards mount and dismount requests to the Tape Library Half-inch daemon (tlhd).
Tape Library Half-inch daemon (tlhd)	This daemon resides on a NetBackup media serve. It passes mount and dismount requests to the tape library half-inch control daemon (tlhcd) on the robotic control host.
Tape Library Half-inch control daemon (tlhcd)	This daemon receives mount or dismount requests from tlhd or robot inventory requests through an external socket interface. tlhcd must reside on the same system that communicates with lmcpd. Communication occurs by using the IBM Library Device Driver interface (on AIX) or IBM Tape Library system calls (other UNIX systems).
Library Manager Control Point daemon (lmcpd)	A component of IBM ATL support. This software handles all communications with the Library Manager and must run on any system from which the Automatic Tape Library is directly controlled.
Library manager	A component of IBM ATL support that provides control of the robotics and the robotic library. The Library Manager is a PC that usually is located within the robot cabinet.
IBM Automated Tape Library (ATL)	An IBM physical library under automated robotic control.

Windows system example configurations

The Windows TLH examples include the following:

- Two possible ATL configurations, as follows:
 - Robotic control on host with ATL drives.
See [Figure 9-3](#) on page 118.
 - Robotic control and robot connection on separate hosts.
See [Figure 9-4](#) on page 119.
- An explanation of the major components in those configurations.
See [Table 9-2](#) on page 120.

Figure 9-3 Robotic control on host with ATL drives

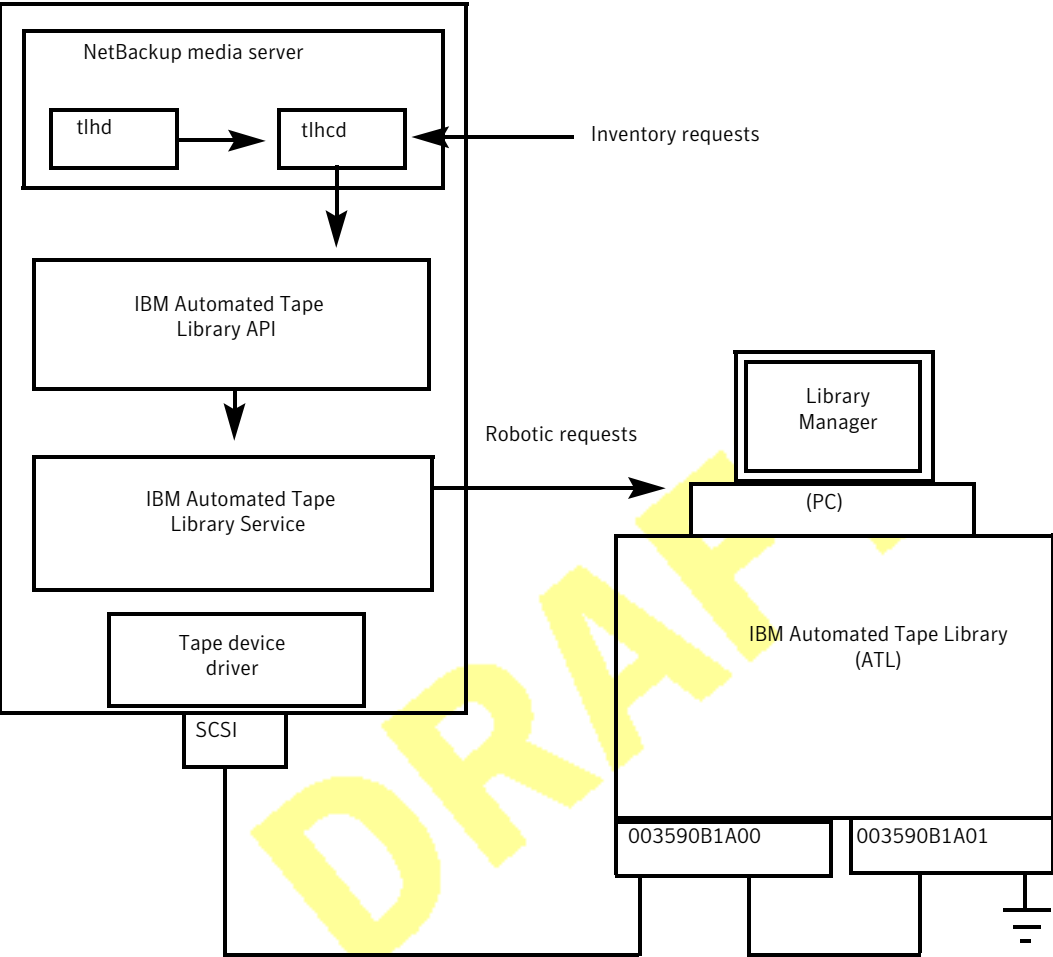
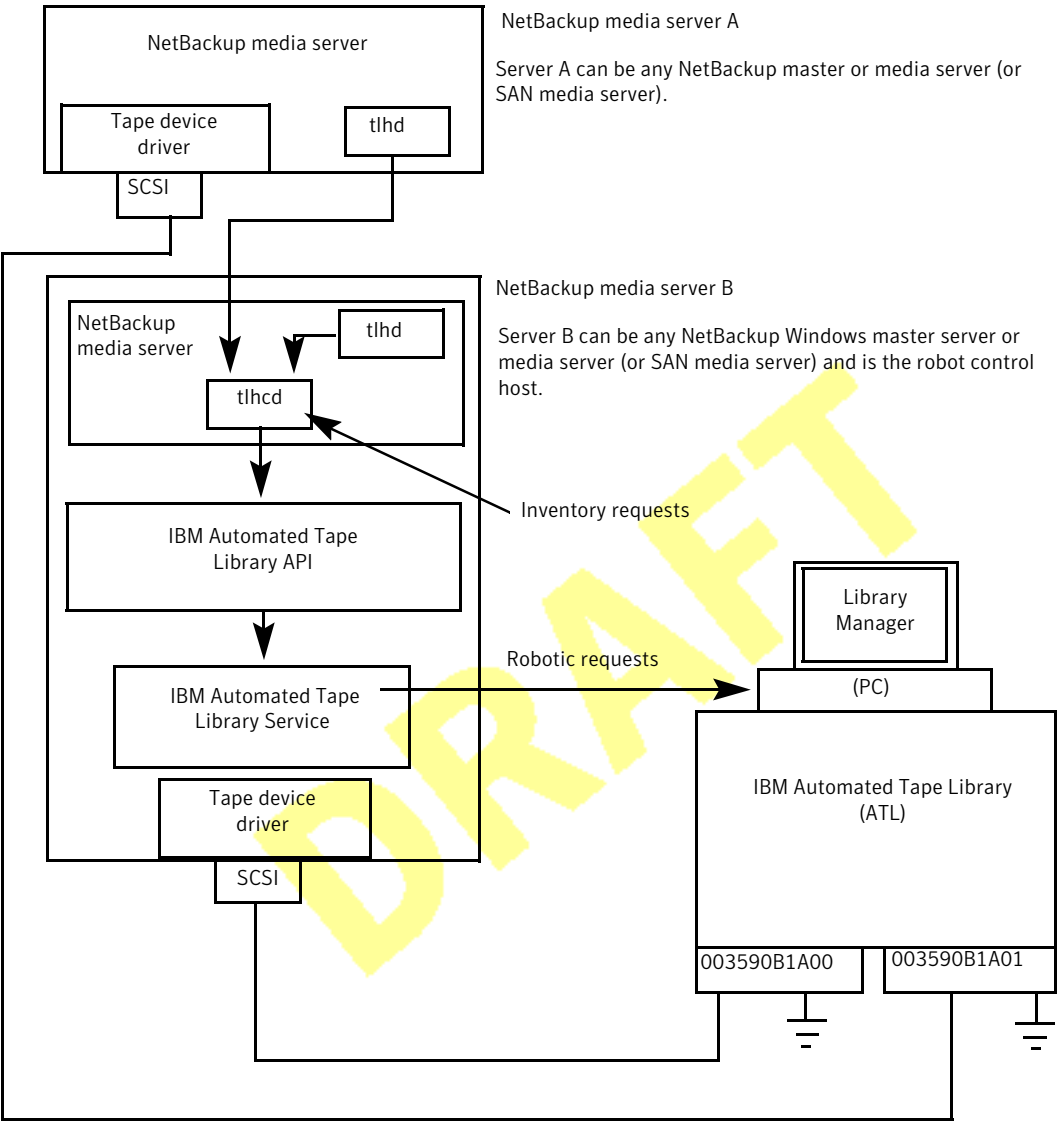


Figure 9-4 Robotic control and robot connection on separate hosts



The following table describes the Windows TLH configuration components.

Table 9-2 Windows TLH configuration component description

Component	Description
NetBackup media server	A host that has NetBackup media server software and is a client to the Automated Tape Library through the IBM ATL service. The NetBackup Device Manager service (ltid) forwards mount and dismount requests to the Tape Library Half-inch service (tlhd).
Tape Library Half-inch process (tlhd)	This process resides on a NetBackup media server. It passes mount and dismount requests to the Tape Library Half-inch control process (tlhcd) on the robotic control host.
Tape Library Half-inch control process (tlhcd)	This process receives mount or dismount requests from tlhd or robot inventory requests through an external socket interface. tlhcd must reside on the same system that communicates with the IBM ATL service.
IBM Automated Tape Library service	A component of IBM ATL support. This software handles all communications with the Library Manager and must be running on any system from which the Automatic Tape Library is directly controlled.
Library Manager	A component of IBM ATL support that provides control of the robotics and the robotic library. The Library Manager is a PC that is usually located within the robot cabinet.
IBM Automated Tape Library (ATL)	An IBM physical library under automated robotic control.

Media requests for a TLH robot

- The following is the sequence of events for a media request for a TLH robot:
- The Media Manager device daemon (UNIX) or NetBackup Device Manager service (Windows) ltid receives the request from the NetBackup bptm process.
 - ltid sends a mount request to the NetBackup TLH daemon tlhd.
 - tlhd passes the request to the NetBackup TLH control daemon tlhcd. tlhcd resides on the host to which the Automatic Tape Library is connected. This host can be the same host on which tlhd is running or another host.
 - tlhcd communicates with the robotic library as follows:
 - AIX. The control daemon communicates with the Library Manager Control Point daemon lmcpd by using the Library Device Driver interface.

- UNIX. The control daemon communicates with the Library Manager Control Point daemon `lmcpd` through Tape Library system calls from an application library interface.
- Windows. The control process communicates with the IBM ATL service through Tape Library system calls from an application library interface.
- `lmcpd` (UNIX) or the IBM ATL service (Windows) passes the information to the Library Manager. The Library Manager then locates the media and directs the TLH robotics to mount the media in the drive.
- When the NetBackup media server receives a successful response from the Library Manager, it allows NetBackup to start sending data to the drive.

About configuring robotic control

When you add a TLH robot to NetBackup, ensure the following:

- The IBM Automated Tape Library is physically connected and configured correctly.
For information about how to configure the IBM components of the Automated Tape Library, see the IBM documentation. The documentation includes *SCSI Tape Drive, Medium Changer, and Library Device Drivers Installation and User's Guide* (or any related publications).
For information on platform support for TLH robotic control, see the NetBackup release notes and the Symantec support Web site:
<http://entsupport.symantec.com>
- You use a recommended version of the Automated Tape Library. To locate the recommended levels, see the Symantec support Web site.

Robotic control on an AIX system

The following topics explain how to configure robotic control when the NetBackup media server is installed on an AIX system.

Determine the path to the LMCP device file

Use the Library Manager Control Point (LMCP) device file as the robotic device file in NetBackup. This file is set up when the Automated Tape Library is first configured.

Use the `lsdev` command (or `smit`) to determine the LMCP device file.

The following example uses the `lsdev` command:

```
/etc/lsdev -C | grep "Library Management"
```

The following is the output from this command:

```
lmcp0 Available LAN/TTY Library Management Control Point
```

Verify library communications on an AIX computer

After you determine the path to the LMCP device file, verify library communications through the IBM-provided `mtlib` interface. Resolve all errors before attempting to configure IBM 3494 support in Media Manager.

To verify communications with a specific library, specify the Library Manager Control Point device file with the `mtlib` command. For example, if the LMCP device path is `/dev/lmcp0`, the following command verifies communication with the library:

```
/usr/bin/mtlib -l /dev/lmcp0 -qL
```

The following is the output from this command:

```
Library Data:
state..... Automated Operational State
              Dual Write Disabled

input stations.....1
output stations.....1
input/output status.....ALL input stations empty
                      ALL output stations empty

machine type.....3494
sequence number.....11398
number of cells.....141
available cells.....129
subsystems.....2
convenience capacity.....30
accessor config.....01
accessor status.....Accessor available
                      Gripper 1 available
                      Gripper 2 available
                      Vision system operational

comp avail status.....Primary library manager installed.
                      Primary library manager available.
                      Primary hard drive installed.
                      Primary hard drive available.
                      Convenience input station installed.
                      Convenience input station available.
                      Convenience output station installed.
                      Convenience output station available.
```

```
avail 3490 cleaner cycles..0
avail 3590 cleaner cycles..92
```

Configure the robotic device file on AIX

Configure the robotic path.

See the *NetBackup Administrator's Guide, Volume I*.

When the configuration is complete, you can view the robotic device information.

The following example uses `tpconfig -d` to view the robotic device information. In this example, the first two drives are stand-alone drives. The drive with drive index 31 is under TLH robotic control and the drive with drive index 78 is under TL4 control.

```
# /usr/opensv/volmgr/bin/tpconfig -d
Id DriveName Type Residence Drive Path Status
*****
  5 Drive0 hcart TLH(8) 003590B1A00 /dev/rmt4.1 DOWN
 13 Drive2 hcart TLH(8) 003590B1A00 /dev/rmt8.1 DOWN
 31 Drive1 hcart TLH(8) 003590B1A00 /dev/rmt12.1 DOWN
 78 Drive1 4mm TL4(77) DRIVE=1 /dev/rmt11.1 UP

Currently defined robotics are:
  TL4(77) robotic path = /dev/ovpass0
  TLH(8) LMCP device path = /dev/lmcp0
EMM Server = maui
```

In this example, note the following lines:

```
TLH(8) LMCP device path = /dev/lmcp0
EMM Server = maui
```

Where `/dev/lmcp0` is the path to the robotic device file and `maui` is the EMM server for this robot.

Robotic control on a UNIX system

The following topics explain the steps for configuring robotic control when the NetBackup media server is a UNIX system other than AIX.

Determine the ATL library name on UNIX

Use the library name instead of the robotic device file when you configure the storage device in NetBackup. This name is set up when the Automated Tape Library is first configured (see your IBM system documentation). The library name is

configured in the `/etc/ibmatl.conf` file; determine the library name by viewing the contents of the file.

The following is an example entry in that file:

```
3494AH          176.123.154.141      ibmpc1
```

The following describes the example entry:

- 3494AH is the library name.
- 176.123.154.141 is the IP address of the PC workstation that is running the Library Manager software.
- ibmpc1 is the host name of the PC workstation that is running the Library Manager software.

Verify library communications on a UNIX computer

After you determine the library name, verify library communications through the IBM-provided `mtlib` interface. Resolve all errors before attempting to configure IBM 3494 (TLH) support in NetBackup.

To verify communications with a specific library, specify the library name with the `mtlib` command. For example, if the library name is 3494AH, the following command verifies communications with the library:

```
/usr/bin/mtlib -l 3494AH -qL
```

The following is the output from this command:

```
Library Data:
state.....Automated Operational State
                        Dual Write Disabled
input stations.....1
output stations.....1
input/output status.....ALL input stations empty
                        ALL output stations empty
machine type.....3494
sequence number.....11398
number of cells.....141
available cells.....129
subsystems.....2
convenience capacity.....30
accessor config.....01
accessor status.....Accessor available
                        Gripper 1 available
                        Gripper 2 available
```

```

Vision system operational
comp avail status..... Primary library manager installed.
                          Primary library manager available.
                          Primary hard drive installed.
                          Primary hard drive available.
                          Convenience input station installed.
                          Convenience input station available.
                          Convenience output station installed.
                          Convenience output station available.

avail 3490 cleaner cycles..0
avail 3590 cleaner cycles..92

```

Configure the robotic device file on other UNIX systems

Configure the robotic path.

See the *NetBackup Administrator's Guide, Volume I*.

When the configuration is complete, you can view the robotic device information.

The following example uses `tpconfig -d` to view the robotic device information. This example has one TLH drive and one TLD drive.

```

/usr/opensv/volmgr/bin/tpconfig -d

```

Id	DriveName	Type	Residence	Status
	Drive Path			

6	Drive2	hcart	TLH(0) 003590B1A00	
	/dev/rmt/17cbn			UP
55	Drive1	dlt	TLD(5) DRIVE=1	
	/dev/rmt/15cbn			UP

```

Currently defined robotics are:
    TLH(0)    library name = 3494AH
    TLD(5)    robotic path = /dev/sg/c2t010
    EMM Server = glozer

```

In this example, note the following lines:

```

TLH(0)    library name = 3494AH
EMM Server = glozer

```

Where 3494AH is the library name and glozer is the EMM server for this robot.

Robotic control on a Windows system

The following topics explain how to configure robotic control when the NetBackup media server is on a Windows system.

Determine the ATL name on Windows

Use the library name when you configure the robot in NetBackup. This name is set up when the Automated Tape Library is first configured (see the IBM system documentation). The library name is configured in the `C:\winnt\ibmatl.conf` file; determine the library name by viewing the contents of the file.

The following is an example entry in that file:

```
3494AH          176.123.154.141      ibmpc1
```

The following describes the example entry:

- 3494AH is the library name.
- 176.123.154.141 is the IP address of the PC workstation that is running the Library Manager software.
- ibmpc1 is the host name of the PC workstation that is running the Library Manager software.

Verify library communications on a Windows computer

After you determine the library name, verify library communications through the IBM-provided `mtlib` interface. Resolve all errors before attempting to configure IBM 3494 (TLH) support in NetBackup.

To verify communications with a specific library, specify the library name with the `mtlib` command. For example, if the library name is 3494AH, the following command verifies communications with the library:

```
mtlib -l 3494AH -qL
```

The following is the output from this command:

```
Library Data:
operational state.....Automated Operational State
                        Dual Write Disabled
functional state.....000
input stations.....1
output stations.....1
input/output status.....ALL input stations empty
                        ALL output stations empty
```

```

machine type.....3494
sequence number.....11398
number of cells.....141
available cells.....129
subsystems.....2
convenience capacity.....30
accessor config.....01
accessor status.....Accessor available
                        Gripper 1 available
                        Gripper 2 available
                        Vision system operational
comp avail status.....Primary library manager installed.
                        Primary library manager available.
                        Primary hard drive installed.
                        Primary hard drive available.
                        Convenience input station installed.
                        Convenience input station available.
                        Convenience output station installed.
                        Convenience output station available.
library facilities.....00
bulk input capacity.....0
bulk input empty cells....0
bulk output capacity.....0
bulk output empty cells....0
avail 3490 cleaner.....0
avail 3590 cleaner.....92

```

Configure the robotic library name

Configure the robotic path.

See the *NetBackup Administrator's Guide, Volume I*.

When the configuration is complete, you can view the robotic device information.

The following example uses `tpconfig -d` to view the robotic device information. This example has one TLH drive and one TLD drive.

```

tpconfig -d

```

Id	DriveName	Type	Residence	Status
SCSI coordinates/Path				

0	DRIVE2	hcart	TLH(0) IBM Device Number=156700	UP
	<1,0,1,0>			
1	DRIVE1	dlt	TLD(5) DRIVE=1	UP

```
<3,1,1,0>  
Currently defined robotics are:  
  TLH(0)      library name = 3494AH  
  TLD(5)      SCSI port=3, bus=1, target=6, lun=0  
EMM Server = glozer
```

In this example, note the following lines:

```
TLH(0)      library name = 3494AH  
EMM Server = glozer
```

3494AH is the library name, and glozer is the EMM server for this robot.

About configuring TLH drives

TLH robots have half-inch cartridge tape drives.

How you configure the drives depends on the operating system, as follow:

- On UNIX systems, create or identify device files for these drives. Use the same methods to create or identify device files for these drives as for other drives.
- On Windows systems, you must install a system tape driver according to the appropriate system and vendor documentation.

Before you configure drives in NetBackup, configure the operating system tape drivers and device files for those drives. For information about how to do so, refer to the operating system documentation. For guidance about the NetBackup requirements, see the information about the host operating system in this guide.

Warning: When you add drives to NetBackup, ensure that you assign the correct IBM device number to each drive. If the IBM device number is incorrect, tape mounts or backups may fail.

Use the NetBackup TLH test utility (`tlhtest`) to determine the TLH drive designations. The following example uses `tlhtest` and shows the drives in the robot that NetBackup controls:

- UNIX: `/usr/opensv/volmgr/bin/tlhtest -r /dev/lmcp0`
- Windows: `tlhtest -r 3494AH`

If the robotic control is configured on a UNIX server other than AIX, use the library name as configured in `/etc/ibmatl.conf`. Do not use the LMCP device path on the call to `tlhtest`.

The following is the output from `tlhtest` (the user entered the `drstat` command on the third line). You would use 156700 and 156600 when you add these drives to NetBackup.

```
Opening /dev/lmcp0 (UNIX)
Opening 3494AH (Windows)
Enter tlh commands (? returns help information)
drstat
Drive information:
  device name:      003590B1A00
  device number:    0x156700
  device class:     0x10 - 3590
  device category:  0x0000
  mounted volser:   <none>
  mounted category: 0x0000
  device states:    Device installed in ATL.
                   Dev is available to ATL.
                   ACL is installed.

Drive information:
  device name:      003590B1A01
  device number:    0x156600
  device class:     0x10 - 3590
  device category:  0x0000
  mounted volser:   <none>
  mounted category: 0x0000
  device states:    Device installed in ATL.
                   Dev is available to ATL.
                   ACL is installed.

QUERY DEVICE DATA complete
```

About cleaning drives

The IBM ATL interface does not allow applications to request or configure drive cleaning. Therefore, you cannot assign cleaning tapes to a TLH robot in the NetBackup. You must configure drive cleaning by using an IBM administrative interface.

Adding tapes to TLH robots

The following table is an overview of how to add tapes to a TLH robot and then add those tapes to NetBackup.

Table 9-3 Adding tapes process

Task	Description
Add barcode labels to the media and insert the media into the robot by using the media access port.	The Library Manager reads the bar codes and classifies the media by media type. A category is assigned to each volume. Some volume categories restrict application access to certain volumes. The Library Manager tracks volume locations.
Define the media in NetBackup by using the ATL volume IDs as media IDs	<p>To define the media, do one of the following:</p> <ul style="list-style-type: none"> ■ Add new volumes by using the Configure Volumes Wizard. ■ Update the volume configuration by using the NetBackup robot inventory function. <p>See the <i>NetBackup Administrator's Guide, Volume I</i>.</p> <p>Because the ATL volume IDs and barcodes are the same, NetBackup has a record of the barcodes for the media. Note that you do not enter slot locations because the ACS library software manages them.</p>
Verify the volume configuration	Use Show Contents and Compare Contents with Volume Configuration from the Robot Inventory dialog.

Removing tapes from TLH robots

Use the following procedure to remove tapes. You can move media from one location to another within the robot. The Automated Tape Library finds the media when NetBackup requests it.

To remove volumes

- 1 Physically remove the media from the library by using one of the following:
 - **Actions > Eject Volumes From Robot** in the **NetBackup Administration Console**.
 - The NetBackup `vmchange` command.
For usage, see the *NetBackup Commands Reference Guide* guide.
 - The `eject` command in the NetBackup `tlhtest` utility.
 - An IBM Library Manager interface.
- 2 If you use the IBM Library Manager interface or the NetBackup `tlhtest` utility, update the volume location to stand alone in NetBackup. To do so, do one of the following:
 - Update the volume configuration by using the robot inventory function.

- Move the volumes.

See the *NetBackup Administrator's Guide, Volume I*.

If you do not update the volume location, NetBackup does not know the new location of the media and may issue mount requests for it. The result is an error such as Misplaced Tape.

Robot inventory operations on TLH robots

In NetBackup, the TLH robot type supports barcodes.

The following sequence of events occurs when you inventory a TLH robot in NetBackup:

- NetBackup requests volume information from the Library Manager through the Library Manager Control Point daemon.
- The Library Manager responds by providing a list of volume IDs and volume attributes from its database. NetBackup filters out the volume categories that cannot be used. NetBackup displays a list of the volumes and a translated version of the volume's media type. The media type is based on the attributes that were returned.

The following table shows an example of the types of information that NetBackup receives:

TLH volume ID	TLH media type
PFE011	3480
303123	3490E
CB5062	3590J
DP2000	3590K

- NetBackup translates the volume IDs into media IDs and barcodes. In the previous table, volume ID PFE011 becomes media ID PFE011, and the barcode for that media ID is also PFE011.
- If the operation does not require updating the volume configuration, NetBackup uses the media type defaults for TLH robots when it creates the inventory report.
- If the operation requires a volume configuration update, NetBackup maps the TLH media types to the default NetBackup media types
Information about the default media type mappings and how to change them is available.

See the *NetBackup Administrator's Guide, Volume I*.

Robot inventory filtering on TLH robots

If you want NetBackup to use only a subset of the volumes under library control, you can filter the volume information from the library. The IBM Library Manager maintains the concept of a volume category, which can be used to classify volumes into pools, including pools by application.

On the NetBackup media server from which you invoke the inventory operation, add an INVENTORY_FILTER entry in the vm.conf file. The following is the usage statement:

```
INVENTORY_FILTER = TLH robot_number BY_CATEGORY value1 [value2 ...]
```

The following describes the filter:

- *robot_number* is the number of the robot in NetBackup.
- *value1* is a filter value of type IBM category (if *filter_type* = BY_CATEGORY).
- *value2* is a second filter value (up to 10 filter values are allowed).

The following is an example:

```
INVENTORY_FILTER = TLH 0 BY_CATEGORY 0xcdb0
```

Sun StorageTek ACSLS robots

This chapter includes the following topics:

- [About StorageTek ACSLS robots](#)
- [Sample ACSLS configurations](#)
- [Media requests for an ACS robot](#)
- [About configuring ACS drives](#)
- [Configuring shared ACS drives](#)
- [Adding tapes to ACS robots](#)
- [About removing tapes from ACS robots](#)
- [Robot inventory operations on ACS robots](#)
- [NetBackup robotic control, communication, and logging](#)
- [ACS robotic test utility](#)
- [Changing your ACS robotic configuration](#)
- [ACS configurations supported](#)
- [Sun StorageTek ACSLS firewall configuration](#)

About StorageTek ACSLS robots

Applies only to NetBackup Enterprise Server.

Note: If you use the access control feature of Sun StorageTek ACSLS controlled robots and the NetBackup media sharing feature, do the following: ensure that all servers in the NetBackup media server share group have the same ACSLS permissions to all the same ACSLS media and ACSLS drives. Any mismatches can cause failed jobs and stranded tapes in drives.

Sun StorageTek Automated Cartridge System Library Software controlled robots are NetBackup robot type ACS.

ACS robots are API robots (a NetBackup robot category in which the robot manages its own media).

Unlike other robot types, NetBackup does not track slot locations for the media in ACS robots. The Automated Cartridge System Library Software tracks slot locations and reports them to NetBackup.

The term automated cartridge system (ACS) can refer to any of the following:

- A type of NetBackup robotic control.
- The Sun StorageTek system for robotic control.
- The highest-level component of the Sun StorageTek ACSLS. It refers to one robotic library or to multiple libraries that are connected with a media pass-through mechanism.

The ACS library software component can be either of the following Sun StorageTek products:

- Sun StorageTek Automated Cartridge System Library Software (ACSL)
- Sun StorageTek Library Station

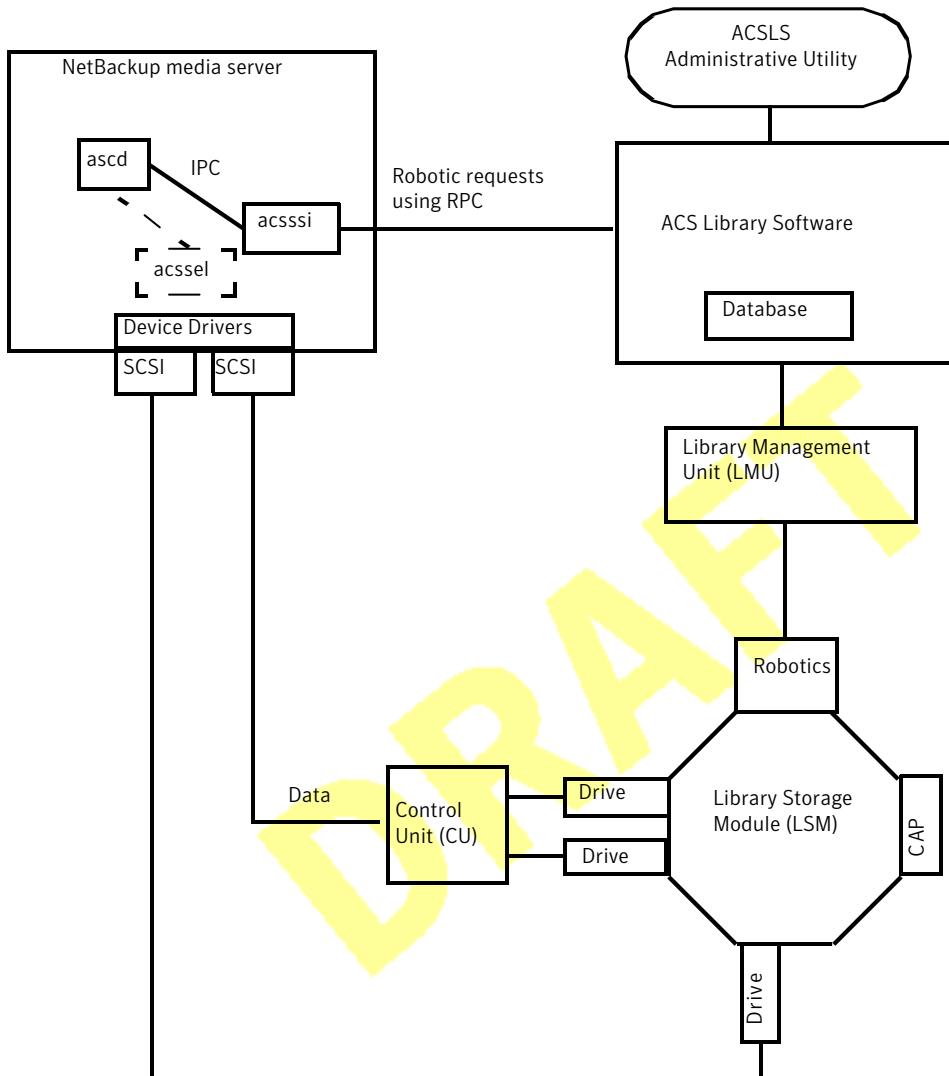
Sample ACSLS configurations

The sample ACSLS configurations show the following:

- A typical UNIX ACSLS configuration.
See [Figure 10-1](#) on page 135.
- A typical Windows ACSLS configuration.
See [Figure 10-2](#) on page 136.
- The major components in typical configurations.
See [Table 10-1](#) on page 137.

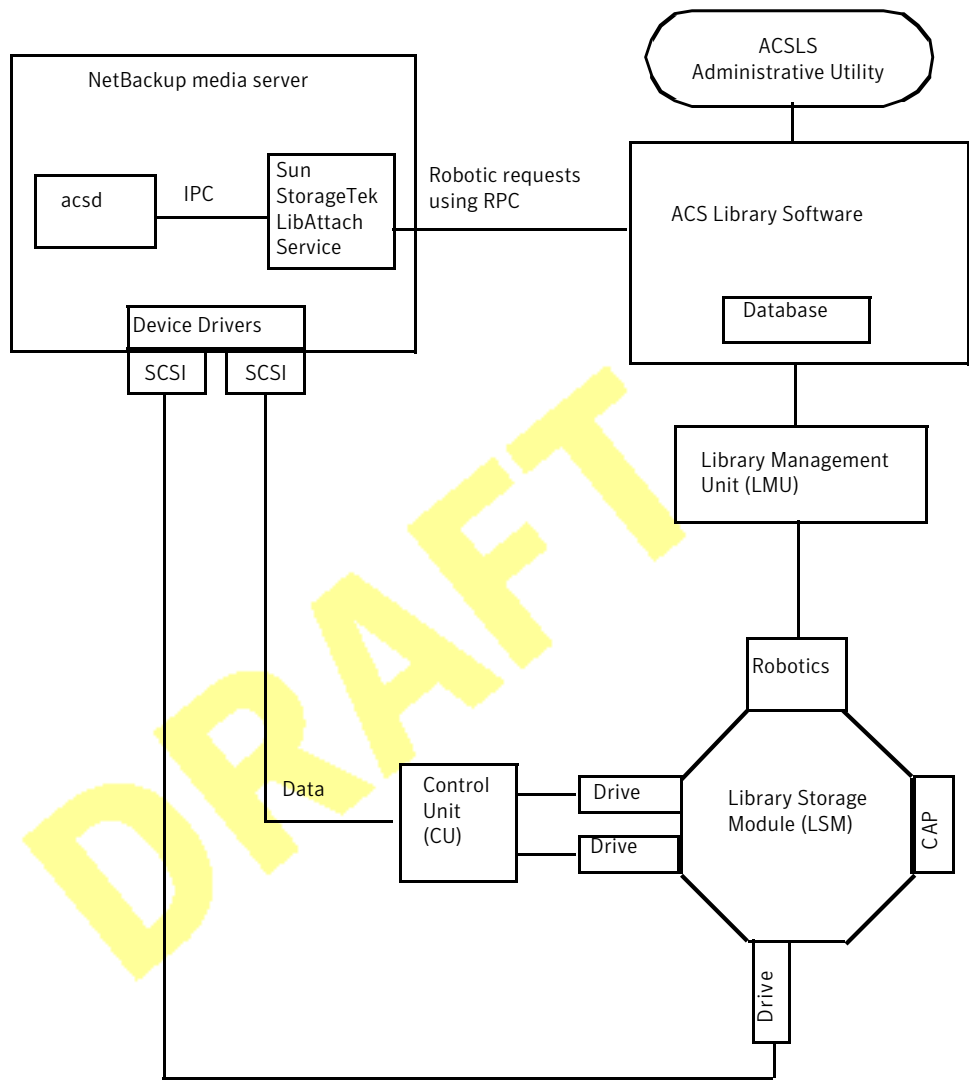
The following figure shows a typical UNIX ACSLS configuration.

Figure 10-1 Typical ACSLS configuration on UNIX



The following figure shows a typical Windows ACSLS configuration.

Figure 10-2 Typical ACSLS configuration on Windows



The following table describes the components of the ACSLS configuration.

Table 10-1 ACSLS configuration component description

Component	Description
NetBackup media server	<p>Specifies a host that has NetBackup media server software and is a client to the ACS library software host.</p> <p>The NetBackup ACS robotic daemon (<code>acsd</code>) formulates requests for mounts, unmounts, and inventories. An API then uses IPC communication to routes these requests to:</p> <ul style="list-style-type: none"> ■ (UNIX) The NetBackup ACS storage server interface (<code>acsssi</code>). The requests are converted into RPC-based communications and sent to the ACS library software. ■ (Windows) the Sun StorageTek LibAttach service. This service sends the requests to the ACS library software.
Sun StorageTek LibAttach Service	Specifies that Library Attach for Windows, an ACS library software client application, enables Windows servers to use the StorageTek Nearline enterprise storage libraries.
Windows computers only	<p>LibAttach provides the connection between Windows and ACS library software through a TCP/IP network.</p> <p>Obtain the appropriate LibAttach software from Sun. See the Symantec support Web site for the latest compatibility information.</p>
<p>The following ACS library software:</p> <ul style="list-style-type: none"> ■ Automated Cartridge System Library Software (ACSL) ■ Sun StorageTek Library Station 	<p>Receives the robotic requests from NetBackup and uses the Library Management Unit to find and mount or unmount the correct cartridge on media management requests.</p> <p>On compatible host platforms, you may be able to configure ACS library software and NetBackup media server software on the same host.</p>
Library Management Unit (LMU)	Provides the interface between the ACS library software and the robot. A single LMU can control multiple ACSLS robots.
Library Storage Module (LSM)	Contains the robot, drives, or media.
Control Unit (CU)	<p>Specifies that the NetBackup media server connects to the drives through device drivers and a control unit (tape controller). The control unit may have an interface to multiple drives. Some control units also allow multiple hosts to share these drives.</p> <p>Most drives do not require a separate control unit. In these cases, the media server connects directly to the drives.</p>
CAP	Specifies the Cartridge Access Port.

Media requests for an ACS robot

The following is the sequence of events for a media request for an ACS robot:

- The Media Manager device daemon (UNIX) or NetBackup Device Manager service (Windows) `ltid` receives the request from `bptm`.
- `ltid` sends a mount request to the NetBackup ACS process `acsd`.
- `acsd` formulates the request.

An API then uses Internal Process Communications (IPC) to send the request on the following systems:

- UNIX. The NetBackup ACS storage server interface `acsssi`. The request is then converted into RPC-based communications and sent to the ACS library software.
- Windows. The Sun StorageTek LibAttach service. This service sends the request to the ACS library software.
- If the Library Storage Module (LSM) in which the media resides is offline, the ACS library software reports this offline status to NetBackup. NetBackup assigns the request a pending status. NetBackup retries the request hourly until the LSM is online and the ACS library software can satisfy the media request.
- The ACS library software locates the media and sends the necessary information to the Library Management Unit (LMU).
- The LMU directs the robotics to mount the media in the drive. When the LibAttach service (Windows) or `acsssi` (UNIX) receives a successful response from the ACS library software, it returns the status to `acsd`.
- The `acsd` child process (that is associated with the mount request) scans the drive. When the drive is ready, `acsd` sends a message to `ltid` that completes the mount request. NetBackup then begins to send data to or read data from the drive.

About configuring ACS drives

An ACS robot supports DLT or 1/2-inch cartridge tape drives. If an ACS robot contains more than one type of DLT or 1/2-inch cartridge tape drive, you can configure an alternate drive type. Therefore, there can be up to three different DLT and three different 1/2-inch cartridge drive types in the same robot. If you use alternate drive types, configure the volumes by using the same alternate media type. Six drive types are possible: DLT, DLT2, DLT3, HCART, HCART2, and HCART3.

Before you configure drives in NetBackup, configure the operating system tape drivers and device files for those drives. For information about how to do so, refer to the operating system documentation. For guidance about the NetBackup requirements, see the information about the host operating system in this guide.

Use the same methods to create or identify device files for these drives as for other drives. If the drives are SCSI and connect to the robot through a shared control unit, the drives share the same SCSI ID. Therefore, you must specify the same logical unit number (LUN) for each drive.

When you configure ACS drives as robotic in NetBackup, you must include the ACS drive coordinate information.

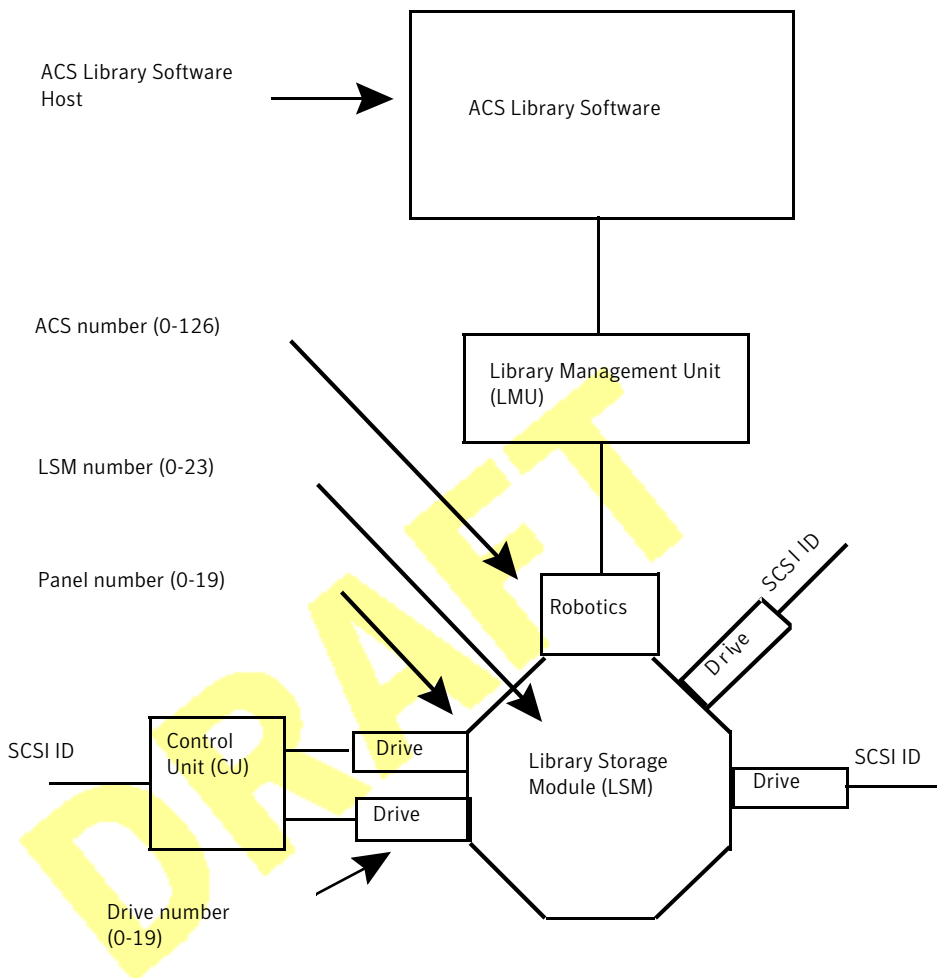
The following table shows the ACS drive coordinates.

Table 10-2 ACS drive coordinates

ACS drive coordinate	Description
ACS number	Specifies the index , in ACS library software terms, that identifies the robot that has this drive.
LSM number	Specifies the Library Storage Module that has this drive.
Panel number	Specifies the panel where the drive is located.
Drive number	Specifies the physical number of the drive in ACS library software terms.

The following figure shows the location of this information in a typical ACS robot.

Figure 10-3 ACSLS robot and drive configuration information



Configuring shared ACS drives

If the ACSLS server does not support serialization, use the following procedure to configure shared drives. Shared drives require the NetBackup Shared Storage Option license. (Sun StorageTek ACSLS versions before 6.1 do not support serialization.) If the server supports serialization, use the NetBackup **Device Configuration Wizard** to configure shared drives.

This procedure can significantly reduce the amount of manual configuration that is required in an SSO environment. For example, for 20 drives that 30 hosts share,

these configuration steps require that you configure only 20 device paths rather than 600 device paths.

During the setup phase, the NetBackup **Device Configuration Wizard** tries to discover the tape drives available. The wizard also tries to discover the positions of the drives within the library (if the robot supports serialization).

A SAN (including switches rather than direct connection) can increase the possibility of errors. If errors occur, you can define the tape drive configuration manually by using the **NetBackup Administration Console** or NetBackup commands.

Take care to avoid any errors. With shared drives, the device paths must be correct for each server. Also, ensure that the drives are defined correctly to avoid errors. (A common error is to define a drive as ACS index number 9 rather than ACS index 0.)

Use the following procedure to configure shared drives in a nonserialized configuration.

To configure shared drives in a nonserialized configuration

- 1 Run the NetBackup **Device Configuration Wizard** on one of the hosts to which drives in an ACS-controlled library are attached. Allow the drives to be added as stand-alone drives.
- 2 Add the ACS robot definition and update each drive to indicate its position in the robot. Make each drive robotic and add the ACS, LSM, Panel, and Drive information.

Information about how to determine the correct drive addresses and how to verify the drive paths is available. See "Correlating device files to physical drives" in the *NetBackup Administrator's Guide, Volume I*.

- 3 After you verify the drive paths on one host, run the **Device Configuration Wizard** again. Scan all hosts that have ACS drives in the library.

The wizard adds the ACS robot definition and the drives to the other hosts and uses the correct device paths.

For this process to work correctly, the following must be true:

- The wizard discovered the devices and their serial numbers successfully the first time.
- You configured the drive paths correctly on the first host.

Adding tapes to ACS robots

ACS robotic control software supports the following characters in a volume ID that are not valid NetBackup media ID characters. (Volume ID is the ACS term for media ID).

Therefore, do not use any of the following characters when you configure ACS volumes:

- Dollar sign (\$)
- Pound sign (#)
- The yen symbol
- Leading and trailing spaces

The following tables is an overview of how to add tapes to an ACS robot and then add those tapes to NetBackup.

Table 10-3 Adding tapes to ACS robots process

Task	Description
Add barcode labels to the media and insert the media into the robot by using the media access port.	The Library Manager reads the bar codes and classifies the media by media type. A category is assigned to each volume. Some volume categories restrict application access to certain volumes. The Library Manager tracks volume locations.
Define the media in NetBackup by using the ACS volume IDs as media IDs.	<p>To define the media, do one of the following:</p> <ul style="list-style-type: none">■ Update the volume configuration by using the robot inventory function.■ Add new volumes by using the Volume Configuration Wizard. <p>See the <i>NetBackup Administrator's Guide, Volume I</i>.</p> <p>Because the ACS volume IDs and bar codes are the same, NetBackup has a record of the bar codes for the media. Note that you do not enter slot locations because the ACS library software manages slot locations.</p>
Verify the volume configuration	Use Show Contents and Compare Contents with Volume Configuration from the Robot Inventory dialog.

About removing tapes from ACS robots

You can remove tapes by using the Sun StorageTek utility or by using NetBackup.

See [“Removing tapes using the ACSLS utility”](#) on page 143.

See [“Removing tapes using NetBackup”](#) on page 143.

Removing tapes using the ACSLS utility

If you remove media from an ACS robot, you must move the media logically to stand alone in NetBackup.

If you do not move media logically, NetBackup does not know that the media were moved. NetBackup may issue mount requests for it, which causes a misplaced tape error.

However, you can move media from one location to another within the robot. The ACS library software finds the requested media if its database is current.

To remove tapes using the SCSLS utility

- ◆ Do one of the following:
 - Update the volume configuration by using the NetBackup robot inventory function.
See the *NetBackup Administrator's Guide, Volume I*.
 - Move the volumes.
See the *NetBackup Administrator's Guide, Volume I*.

Removing tapes using NetBackup

To remove tapes using NetBackup

- ◆ Use one of the following methods:
 - Select **Actions > Eject Volumes From Robot** in the **NetBackup Administration Console**.
 - Use the NetBackup `vmchange` command.
See the *NetBackup Commands Reference Guide* guide.
- Both of these methods performs the logical move and the physical move.

Robot inventory operations on ACS robots

If the ACS library software host is a Sun StorageTek Library Station, an Inventory Robot Filter (`INVENTORY_FILTER`) entry may be required in the `vm.conf` file. Old versions of Library Station do not support queries of all volumes in an ACS robot.

In NetBackup, the ACS robot type supports bar codes.

The following sequence of events occurs when you inventory an ACS robot in NetBackup:

- NetBackup requests volume information from the ACS library software.

- The ACS library software provides a listing of the volume IDs, media types, ACS location, and LSM location from its database.
See [Table 10-4](#) on page 144.
- NetBackup maps the volume IDs into media IDs and bar codes. For example in the previous table, volume ID 100011 becomes media ID 100011 and the barcode for that media ID is also 100011.
- If the operation does not require a volume configuration update, NetBackup uses the media type defaults for ACS robots when it creates its report.
- If the operation requires a volume configuration update, NetBackup does the following:
 - Maps the ACS media types to the default NetBackup media types.
 - Adds the ACS and the LSM locations for new volumes to the EMM database. This location information is used for media and drive selection.

Information about the default media type mappings and how to configure media type mappings is available.

See the *NetBackup Administrator's Guide, Volume I*.

The following table shows an example of the ACS drive coordinates that NetBackup receives.

Table 10-4 ACS drive coordinates

ACS volume ID	ACS media type	ACS	LSM
100011	DLTIV	0	0
200201	DD3A	0	0
412840	STK1R	0	1
412999	STK1U	0	1
521212	JLABEL	0	0
521433	STK2P	0	1
521455	STK2W	0	1
770000	LTO_100G	0	0
775500	SDLT	0	0
900100	EECART	0	0
900200	UNKNOWN	0	0

Configuring a robot inventory filtering on ACS robots

If you want NetBackup to use only a subset of the volumes under ACS library control, you can filter the volume information from the library. To do so, you use the ACSLS administrative interface to assign the volumes you want to use to a scratch pool or pools. Then you configure NetBackup to use only the volumes in those scratch pools.

A NetBackup robot inventory includes the volumes that exist in the ACS scratch pool. The ACS library software moves each volume from the scratch pool after it is mounted.

A partial inventory also includes those volumes that NetBackup can validate exist in the robotic library, including volumes not in the ACS scratch pool. To prevent losing track of previously mounted volumes, the library reports the complete list of volumes that exist in the robotic library.

The following procedure is an example of how to configure an inventory filter.

To configure an inventory filter (example)

- 1 Use the ACSLS administrative interface (ACSSA) command to create a scratch pool. Assign ID 4 and 0 to 500 as the range for the number of volumes, as follows:

```
ACSSA> define pool 0 500 4
```

- 2 Use the ACSLS administrative interface (ACSSA) command to define the volumes in scratch pool 4:

```
ACSSA> set scratch 4 600000-999999
```

- 3 On the NetBackup media server from which you invoke the inventory operation, add an INVENTORY_FILTER entry to the vm.conf file. The following is the usage statement:

```
INVENTORY_FILTER = ACS robot_number BY_ACS_POOL acs_scratch_pool1  
[acs_scratch_pool2 ...]
```

The following define the options and arguments:

- *robot_number* is the number of the robot in NetBackup.
- *acs_scratch_pool1* is the scratch pool ID as configured in the ACS library software.
- *acs_scratch_pool2* is a second scratch pool ID (up to 10 scratch pools are allowed).

For example, the following entry forces ACS robot number 0 to query scratch volumes from Sun StorageTek pool IDs 4 and 5.

```
INVENTORY_FILTER = ACS 0 BY_ACS_POOL 4 5
```

NetBackup robotic control, communication, and logging

NetBackup Enterprise Server only.

How NetBackup uses robotic control, communication, and logging during tape operations depends on the operating system type as follows:

- Windows systems
See [“NetBackup robotic control, communication, and logging for Windows systems”](#) on page 146.
- UNIX systems
See [“NetBackup robotic control, communication, and logging for UNIX systems”](#) on page 146.

NetBackup robotic control, communication, and logging for Windows systems

The NetBackup `acsd` process provides robotic control to mount and dismount volumes. It also requests inventories of the volumes that are under the control of ACS library software. The NetBackup Device Manager service `ltid` starts the `acsd` process and communicates with it.

The `acsd` process requests SCSI tape unloads through the device host's tape driver before it uses the ACS API to request that tape dismounts. This request process accommodates the configurations that have SCSI multiplexors. Loaded tapes are not ejected forcibly when a dismount operation occurs.

NetBackup robotic control, communication, and logging for UNIX systems

On UNIX systems, several NetBackup daemons and processes provide robotic control, communication, and logging.

NetBackup ACS daemon (acsd)

The NetBackup ACS daemon `acsd` provides robotic control to mount and dismount volumes. It also requests inventories of the volumes that are under the control of ACS library software. The Media Manager device daemon `ltid` starts the `acsd` daemon and communicates with it. If `ltid` is active already, you can start `acsd` manually.

The `acsd` daemon requests SCSI tape unloads through the device host's tape driver before it uses the ACS API to request that tape dismounts. This control process accommodates the configurations that have SCSI multiplexors. Loaded tapes are not ejected forcibly when a dismount operation occurs.

When `acsd` starts, it first starts the NetBackup `acssel` process and then starts the `acsssi` process. When it starts `acsssi`, `acsd` passes the ACS library software host name to `acsssi`. One copy of `acsssi` starts for each ACS library software host that appears in the NetBackup device configuration for the media server. If multiple media servers share drives in an ACS robot, `acsssi` must be active on each media server.

NetBackup ACS SSI event logger (acssel)

The NetBackup ACS storage server interface (SSI) event logger `acssel` is modeled after the Sun StorageTek `mini_el` event logger. Therefore, its functional model differs from other NetBackup robotic controls.

The NetBackup `acsd` daemon starts `acssel` automatically. You also can start it manually. Event messages are logged to the following file:

```
/usr/opensv/volmgr/debug/acsssi/event.log
```

Note: Symantec recommends that `acssel` run continuously because it tries to connect on the event logger's socket for its message logging. If `acsssi` cannot connect to `acssel`, NetBackup cannot process requests immediately. Therefore, retry and error recovery situations can occur.

On UNIX systems, only the `kill` command stops `acssel`. The NetBackup `bp.kill_all` utility (UNIX) stops the `acssel` process. On Windows systems, the `bpdown.exe` program stops the `acssel` process.

The full path to the event logger is `/usr/opensv/volmgr/bin/acssel`. The usage format is as follows:

```
acssel [-d] -s socket_name
```

The following describes the options:

- `-d` displays debug messages (by default, debug messages are disabled).
- `socket_name` is the socket name (or IP port) to listen on for messages.

Using `acssel` with a different socket name

If the `vm.conf` file does not contain an `ACS_SEL_SOCKET` entry, `acssel` listens on socket name 13740 by default.

You can change this default by using one of the following methods:

- Modify the `vm.conf` configuration file.
See [To change the default by modifying the `vm.conf` configuration file.](#)
- Add environment variables. This method assumes that one ACS robot is configured and that the SSI default socket name has not been changed. (The `vm.conf` `ACS_SEL_SOCKET` entry can change the default).
See [To change the default by adding environment variables.](#)
`acssel` also has a command line option to specify the socket name. However, because `acsssi` needs to know the event logger socket name, setting an environment variable is preferred.

To change the default by modifying the `vm.conf` configuration file

- 1 Edit the `vm.conf` file and add an `ACS_SEL_SOCKET` entry. The following is an example:

```
ACS_SEL_SOCKET = 13799
```

- 2 Stop the `acsd`, `acsssi`, and `acssel` processes by invoking the following script. (This script stops all NetBackup processes.)

```
/usr/opensv/NetBackup/bin/bp.kill_all
```

- 3 Restart the NetBackup daemons and processes by invoking the following script:

```
/usr/opensv/NetBackup/bin/bp.start_all
```

To change the default by adding environment variables

- 1 Stop the `acsd`, `acsssi`, and `acsse` processes by invoking the following script. (This script stops all NetBackup processes.)

```
/usr/opensv/NetBackup/bin/bp.kill_all
```

- 2 Set the wanted socket name in an environment variable and export it. The following is an example:

```
ACS_SEL_SOCKET = 13799
export ACS_SEL_SOCKET
```

- 3 Start the event logger in the background.

```
/usr/opensv/volmgr/bin/acssse &
```

- 4 Set the ACS library software host name for `acsssi` in an environment variable.

```
CSI_HOSTNAME = einstein
export CSI_HOSTNAME
```

- 5 Start `acsssi` as follows:

```
/usr/opensv/volmgr/bin/acsssi 13741 &
```

- 6 Optionally, start `acstest` by using the `robtest` utility or by using the following command:

```
/usr/opensv/volmgr/bin/acstest -r einstein -s 13741
```

If you request SCSI unloads, you also must specify drive paths on the `acstest` command line.

See “ACS robotic test utility” on page 151.

The `robtest` utility specifies drive paths automatically if ACS drives have been configured.

- 7 Start `ltid` as follows, which starts `acsd`. You can use the `-v` option for verbose message output.

```
/usr/opensv/volmgr/bin/ltid
```

During initialization, `acsd` obtains the SSI Event Logger socket name from `vm.conf` and sets `ACS_SEL_SOCKET` in the environment before it starts `acssse`. If `acsssi` is started manually, it has to use (listen on) the same SSI socket that `acsd` uses to send data.

NetBackup ACS storage server interface (acsssi)

The NetBackup ACS storage server interface (SSI) `acsssi` communicates with the ACS library software host. `acsssi` processes all RPC communications from `acsd` or from the ACS robotic test utility that are intended for the ACS library software.

One copy of `acsssi` must run for each unique ACS library software host that is configured on a NetBackup media server. `acsd` tries to start copies of `acsssi` for each host. However, if an `acsssi` process for a specific ACS library software host exists already, the new `acsssi` processes for that host fails during initialization.

In normal operations, `acsssi` runs in the background and sends log messages to `acssel`.

You can specify the socket name (IP port) used by `acsssi` in any of the following ways:

- On the command line when you start `acsssi`.
- By using an environment variable (`ACS_SSI_SOCKET`).
- Through the default value.

If you configure `acsssi` to use a nondefault socket name, you also must configure the ACS daemon and ACS test utility to use the same socket name.

The ACS library software host name is passed to `acsssi` by using the `CSI_HOSTNAME` environment variable.

`acsssi` is based on the Sun StorageTek storage server interface. Therefore, it supports environment variables to control most aspects of operational behavior.

See “Optional environment variables” on page 151.

About the ACS_SSI_SOCKET configuration option

By default, `acsssi` listens on unique, consecutive socket names; the socket names begin at 13741. To specify socket names on an ACS library software host basis, you can add a configuration entry in the NetBackup `vm.conf` file.

Use the following format:

```
ACS_SSI_SOCKET = ACS_library_software_hostname socket_name
```

The following is an example entry (do not use the IP address of the ACS library host for this parameter):

```
ACS_SSI_SOCKET = einstein 13750
```

Starting acsssi manually

This method is not the recommended method to start `acsssi`. Normally, `acsd` starts `acsssi`.

Before you can start `acsssi` manually, you must configure the `CSI_HOSTNAME` environment variable. The following is a Bourne shell example:

```
CSI_HOSTNAME=einstein
export CSI_HOSTNAME
/usr/opensv/volmgr/bin/acsssi 13741 &
```

Use the following procedure to start `acsssi`.

To start `acsssi`

- 1 Start the event logger, `acsse1`.
- 2 Start `acsssi`. The format is `acsssi socket_name`.

Optional environment variables

If you want individual `acsssi` processes to operate differently, you can set environment variables before the `acsssi` processes are started.

The following table describes the optional environment variables.

Table 10-5 Optional environment variables

Environment variable	Description
<code>SSI_HOSTNAME</code>	Specifies the name of the host where ACS library software RPC return packets are routed for ACS network communications. By default, the local host name is used.
<code>CSI_RETRY_TIMEOUT</code>	Set this variable to a small positive integer. The default is 2 seconds.
<code>CSI_RETRY_TRIES</code>	Set this variable to a small positive integer. The default is five retries.
<code>CSI_CONNECT_AGETIME</code>	Set this variable to a value between 600 seconds and 31536000 seconds. The default is 172800 seconds.

ACS robotic test utility

NetBackup Enterprise Server only.

The `acstest` utility lets you verify ACS communications and provides a remote system administrative interface to an ACS robot. It can also be used to query, enter, eject, mount, unload, and dismount volumes. In addition, `acstest` lets you define, delete, and populate ACS library software scratch pools.

While `acsd` services requests, do not use `acstest`. Communication problems may occur if `acsd` and `acstest` process ACS requests at the same time.

acstest on Windows systems

`acstest` depends on the Sun StorageTek LibAttach service being started successfully. You can verify that this service is started by using the Services tool available in administrative tools in the Windows control panel. `acstest` attempts to communicate with ACS library software by using the LibAttach service.

The usage format follows:

```
acstest -r ACS_library_software_hostname [-d device_name ACS, LSM,  
panel, drive] ... [-C sub_cmd]
```

The following example assumes that the LibAttach service started:

```
install_path\Volmgr\bin\acstest -r einstein -d Tape0 0,0,2,1
```

acstest on UNIX systems

`acstest` depends on `acsssi` being started successfully. You can use the UNIX `netstat -a` command to verify that a process listens on the SSI socket. `acstest` attempts to communicate with ACS library software using `acsssi` and connects on an existing socket.

The usage format follows. You can pass the socket name on the command line. Otherwise, the default socket name (13741) is used.

```
acstest -r ACS_library_software_hostname [-s socket_name] [-d  
drive_path ACS, LSM, panel, drive] ... [-C sub_cmd]
```

The following example assumes that the `acsssi` process has been started by using socket 13741:

```
/usr/opensv/volmgr/bin/acstest -r einstein -s 13741
```

Changing your ACS robotic configuration

UNIX and Linux systems only.

NetBackup Enterprise Server only.

If you change your ACS robot configuration, you should update NetBackup so that `acsssi` can successfully communicate with `acsd`, `acstest`, and ACS library software.

Any `acsssi` processes must be canceled after your changes are made and before the Media Manager device daemon `ltid` is restarted. Also, for the `acstest` utility to function, `acsssi` for the selected robot must be running.

Use the following procedure to update NetBackup after you change your configuration.

To update NetBackup after you change your configuration

- 1 Make your configuration changes.
- 2 Use `/usr/opensv/NetBackup/bin/bp.kill_all` to stop all running processes.
- 3 Restart the NetBackup daemons and processes by invoking the following script:

```
/usr/opensv/NetBackup/bin/bp.start_all
```

ACS configurations supported

UNIX and Linux systems only.

NetBackup Enterprise Server only.

NetBackup supports the following ACS configurations:

- Multiple robots that are controlled from a single ACS host
See “[Multiple ACS robots with one ACS library software host](#)” on page 153.
- Multiple robots that are controlled from multiple ACS hosts
See “[Multiple ACS robots and ACS library software hosts](#)” on page 154.

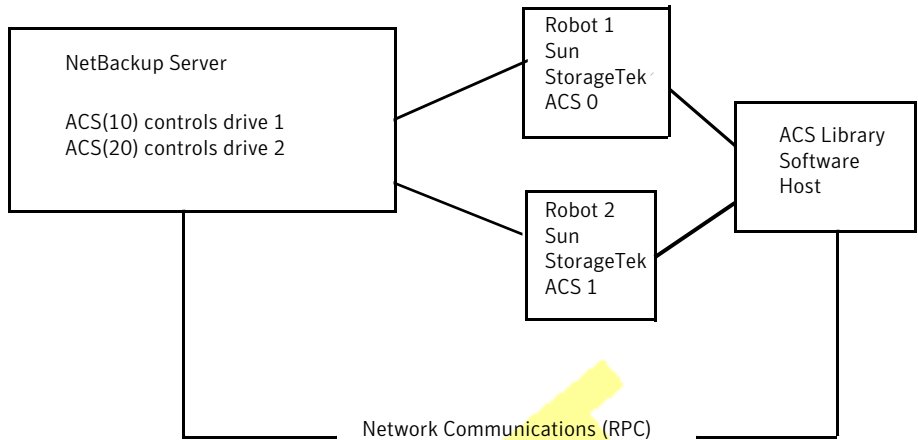
Multiple ACS robots with one ACS library software host

NetBackup supports the following configuration:

- A NetBackup server is connected to drives in multiple ACS robots.
- The robots are controlled from a single ACS library software host.

The following figure shows multiple ACS robots that are controlled from a single ACS library software host.

Figure 10-4 Multiple ACS robots, one ACS library software host



Inventory requests include: the volumes that are configured on the ACS library software host that resides on the ACS robot that is designated in the drive address.

In this example, assume the following about drive 1:

- Has an ACS drive address (ACS, LSM, panel, drive) of 0,0,1,1 in the NetBackup device configuration
- Is under control of robot number 10 (ACS(10)).

If any other robot ACS(10) drives have a different ACS drive address (for example, 1,0,1,0), the configuration is invalid.

NetBackup supports configurations of multiple LSMs in a single ACS robot if a pass-through port exists.

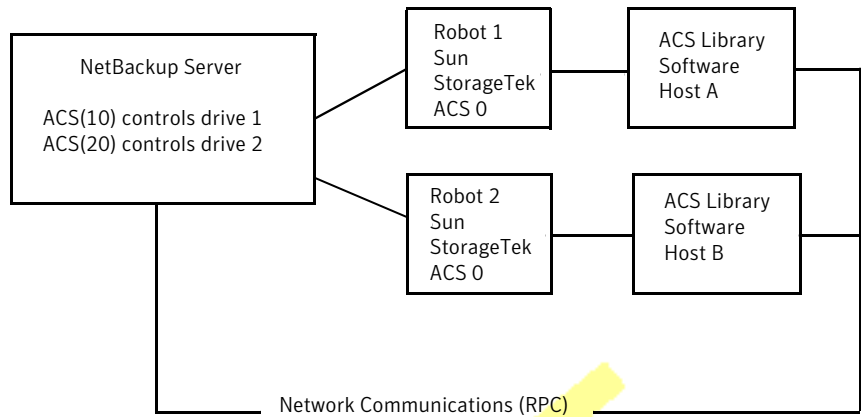
Multiple ACS robots and ACS library software hosts

NetBackup supports the following configuration:

- A NetBackup server is connected to drives in multiple ACS robots.
- The robots are controlled from separate ACS library software hosts.

The following figure shows multiple ACS robots that are controlled from multiple ACS library software hosts.

Figure 10-5 Multiple ACS robots, multiple ACS library software hosts



Inventory requests include the volumes that are configured on the ACS library software hosts (Host A for Robot 1 and Host B for Robot 2). The software hosts reside on the robot (ACS 0 for each) that is designated in the Sun StorageTek drive address.

In this example, assume the following about drive 1:

- Has an ACS drive address (ACS, LSM, panel, drive) of 0,0,1,1 in the NetBackup device configuration
- Is under control of robot number 10 (ACS(10))

If any other robot ACS(10) drives have a different ACS drive address (for example, 1,0,1,0), the configuration is invalid.

NetBackup supports configurations of multiple LSMs in a single ACS robot if a pass-through port exists.

Sun StorageTek ACSLS firewall configuration

NetBackup Enterprise Server only.

To configure an ACS robot in an Sun StorageTek ACSLS firewall environment, use the following NetBackup `vm.conf` file configuration entries to designate TCP port connections:

- `ACS_CSI_HOSTPORT`
- `ACS_SSI_INET_PORT`
- `ACS_TCP_RPCSERVICE`

More information about `vm.conf` entries is available.

See the *NetBackup Administrator's Guide, Volume I*.

The Sun StorageTek ACSLS server configuration options must match the entries in the `vm.conf` file. For example, in a typical ACSLS firewall configuration, you would change the following settings as shown:

- Changes to alter use of TCP protocol...
Set to TRUE - Firewall-secure ACSLS runs across TCP.
- Changes to alter use of UDP protocol...
Set to FALSE - Firewall-secure ACSLS runs across TCP.
- Changes to alter use of the portmapper...
Set to NEVER - Ensures that the ACSLS server does not query the portmapper on the client platform.
- Enable CSI to be used behind a firewall...
Set to TRUE - Allows specification of a single port for the ACSLS server.
- Port number used by the CSI...
The port that the user chooses. The 30031 default value is used most often. This port number must match the port number that you specify in the NetBackup `vm.conf` file.

For complete information about setting up a firewall-secure ACSLS server, refer to your vendor documentation.

Device configuration examples

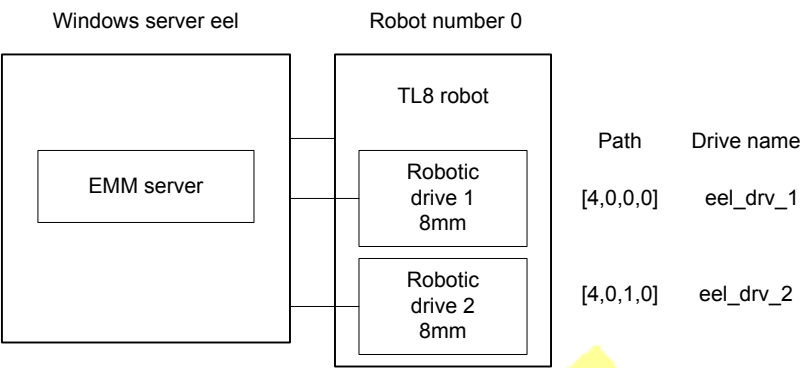
This chapter includes the following topics:

- [A robot on a server example](#)
- [Stand-alone drives on a server example](#)
- [A robot and multiple servers example](#)
- [An ACS robot on a Windows server example](#)
- [An ACS robot on a UNIX server example](#)
- [A TLH robot on a UNIX server example](#)
- [A TLM robot on a UNIX server example](#)

A robot on a server example

The following figure shows a simple configuration.

Figure 11-1 Server and robot configuration example 1



This configuration has a tape library that contains two 8mm tape drives. The robot and drives are connected to a server that runs Microsoft Windows.

The following table shows the attributes for the robot.

Table 11-1 Add Robot dialog box entries (Windows local host)

Dialog box field	Value
Device Host	eel
Robot Type	TL8 (Tape Library 8MM)
Robot Number	0
Robot is controlled locally by this device host	Set (cannot be changed for this robot type)
Robot Device	When you select a robot, the SCSI Port, Bus, Target, and LUN numbers are propagated to the Add Robot dialog for Windows servers.

The following table shows the attributes for drive 1.

Table 11-2 Add Drive dialog entries (drive1) for Windows host

Dialog box field	Value
Device Host	eel
Drive Name	eel_dr_1
Drive Type	8mm Cartridge (8mm)
Path Information	[4,0,0,0]

Table 11-2 Add Drive dialog entries (drive1) for Windows host (*continued*)

Dialog box field	Value
Cleaning Frequency	0 (hours)
Drive is in a Robotic Library	Yes
Robotic Library	TL8(0) - eel
Robot Drive Number	1

The following table shows the attributes for drive 2.

Table 11-3 Add Drive dialog entries (drive2) for Windows host

Dialog box field	Value
Device Host	eel
Drive Name	eel_dr_2
Drive Type	8mm Cartridge (8mm)
Path Information	[4,0,1,0]
Cleaning Frequency	0 (hours)
Drive is in a Robotic Library	Yes
Robotic Library	TL8(0) - eel
Robot Drive Number	2

The following table shows the attributes for the robot if host eel is a UNIX server.

Table 11-4 Add Robot dialog entries (UNIX local host)

Dialog box field	Value
Device Host	eel
Robot Type	TL8 (Tape Library 8MM)
Robot Number	0
Robot is controlled locally by this device host	Set (cannot be changed for this robot type)
Robotic Device File	/dev/sg/c0t4l0

The following table shows the attributes for drive 1 if host eel is a UNIX server.

Table 11-5 Add Drive dialog entries (drive1) for UNIX host

Dialog box field	Value
Device Host	eel
Drive Name	eel_dr_1
Drive Type	8mm Cartridge (8mm)
No Rewind Device	/dev/rmt/5cbn
Cleaning Frequency	25 (hours)
Drive Status	UP
Drive is in a Robotic Library	Yes
Robotic Library	TL8(0) - eel
Robot Drive Number	1

The following table shows the attributes for drive 1 if eel is a UNIX host

Table 11-6 Add Drive dialog entries (drive2) for UNIX host

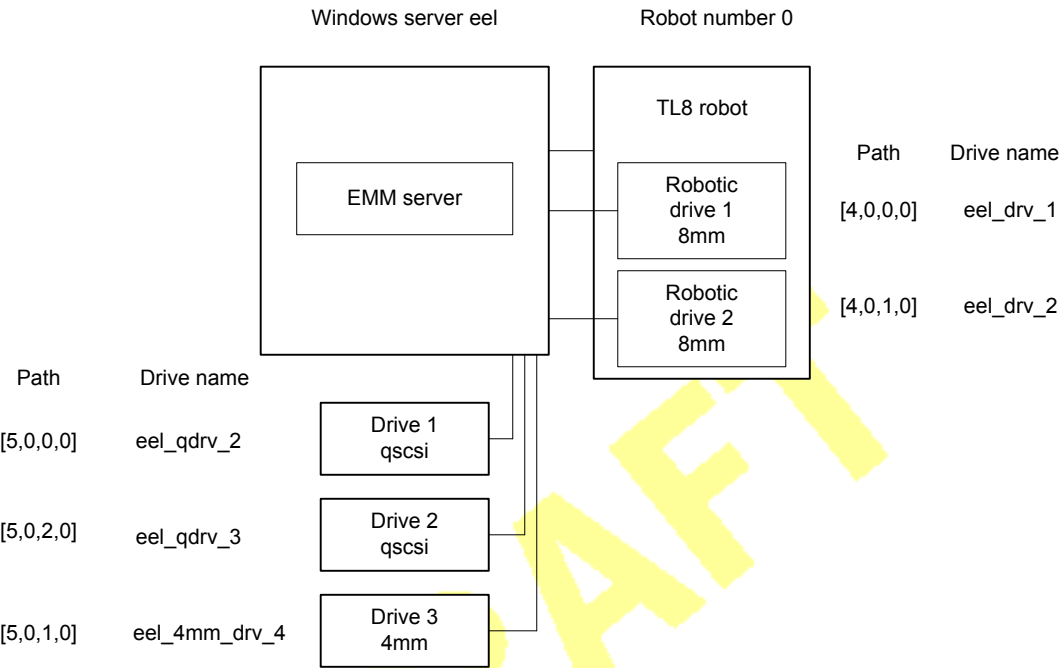
Dialog box field	Value
Device Host	eel
Drive Name	eel_dr_2
Drive Type	8mm Cartridge (8mm)
No Rewind Device	/dev/rmt/6cbn
Cleaning Frequency	25 (hours)
Drive Status	UP
Drive is in a Robotic Library	Yes
Robotic Library	TL8(0) - eel
Robot Drive Number	2

Stand-alone drives on a server example

The following figure shows two standalone drives that were added to the example in the robot and server example.

See “A robot on a server example” on page 157.

Figure 11-2 Server with standalone drives and robot configuration example



The following table shows the attributes for stand-alone drive 1.

Table 11-7 Add Drive dialog entries (drive1) for Windows host

Dialog box field	Value
Device Host	eel
Drive Name	eel_qdrv_2
Drive Type	1/4" Cartridge (qscsi)
Path Information	[5,0,0,0]
Drive is in a Robotic Library	No

The following table shows the attributes for stand-alone drive 2.

Table 11-8 Add Drive dialog entries (drive2) for Windows host

Dialog box field	Value
Device Host	eel
Drive Name	eel_qdrv_3
Drive Type	1/4" Cartridge (qscsi)
Path Information	[5,0,2,0]
Drive is in a Robotic Library	No

The following table shows the attributes for stand-alone drive 3.

Table 11-9 Add Drive dialog entries (drive3) for Windows host

Dialog box field	Value
Device Host	eel
Drive Name	eel_4mm_drv_4
Drive Type	4mm Cartridge (4mm)
Path Information	[5,0,1,0]
Cleaning Frequency	0 (hours)
Drive is in a Robotic Library	No

The following table shows the attributes for stand-alone drive 1 if host eel is a UNIX server.

Table 11-10 Add Drive dialog entries (drive1) for UNIX host

Dialog box field	Value
Device Host	eel
Drive Name	eel_qdrv_2
Drive Type	1/4" Cartridge (qscsi)
No Rewind Device	/dev/rmt/2cbn
Drive Status	UP
Drive is in a Robotic Library	No

The following table shows the attributes for stand-alone drive 2 if host eel is a UNIX server.

Table 11-11 Add Drive dialog entries (drive2) for UNIX host

Dialog box field	Value
Device Host	eel
Drive Name	eel_qdrv_3
Drive Type	1/4" Cartridge (qscsi)
No Rewind Device	/dev/rmt/3cbn
Drive Status	UP
Drive is in a Robotic Library	No

The following table shows the attributes for stand-alone drive 3 if host eel is a UNIX server.

Table 11-12 Add Drive dialog entries (drive3) for UNIX host

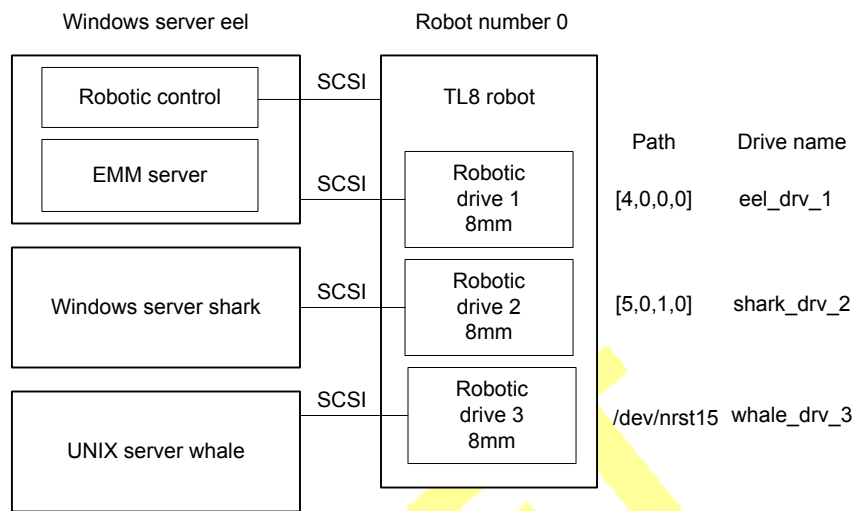
Dialog box field	Value
Device Host	eel
Drive Name	eel_4mm_drv_4
Drive Type	4mm Cartridge (4mm)
No Rewind Device	/dev/rmt/4cbn
Cleaning Frequency	25 (hours)
Drive Status	UP
Drive is in a Robotic Library	No

A robot and multiple servers example

The following example applies only to NetBackup Enterprise Server.

The following figure shows one robot and multiple servers.

Figure 11-3 Multiple servers and one robot configuration example



This example is a more complex configuration than the previous examples because of the following:

- The robotic control is on one NetBackup media server, server eel.
- Two other media servers use the drives.

Following are some things to note when you review this example:

- Media for all devices is configured in an EMM server, which is located on server eel.
- The Robot number is 0 in all three cases because the three servers refer to the same physical robot. In this case, robotic control is on host eel.
- Robot drive numbers correlate to the physical drive assignment within the robot.
- When you add volumes, add them to host eel because the EMM server is on that server.

The configuration attributes for each host are in separate topics.

See [“Configuration on the Windows server eel”](#) on page 165.

See [“Configuration on the Windows server shark”](#) on page 165.

See [“Configuration on the UNIX server whale”](#) on page 166.

Configuration on the Windows server eel

The following table shows the robot attributes for the local Windows server eel.

Table 11-13 Add Robot dialog entries (local host)

Dialog box field	Value
Device Host	eel
Robot Type	TL8 (Tape Library 8MM)
Robot Number	0
Robot is controlled locally by this device host	Set
Robot Device	When you select a robot, the SCSI Port, Bus, Target, and LUN numbers are propagated to the Add Robot dialog for Windows servers.

The following table shows the drive 1 attributes for the local Windows server eel.

Table 11-14 Add Drive dialog entries (drive 1)

Dialog box field	Value
Device Host	eel
Drive Name	eel_drive_1
Drive Type	8mm Cartridge (8mm)
Path Information	[4,0,0,0]
Cleaning Frequency	0 (hours)
Drive is in a Robotic Library	Yes
Robotic Library	TL8(0) - eel
Robot Drive Number	1

See [“A robot and multiple servers example”](#) on page 163.

Configuration on the Windows server shark

The following table shows the robot attributes for the remote Windows server shark.

Table 11-15 Add Robot dialog entries (remote host)

Dialog box field	Value
Device Host	shark
Robot Type	TL8 (Tape Library 8MM)
Robot Number	0
Robot control is handled by a remote host	Set
Robot Control Host	eel

The following table shows the drive 2 attributes for the remote Windows server shark.

Table 11-16 Add Drive Dialog Entries (Drive 2)

Dialog box field	Value
Device Host	shark
Drive Name	shark_drive_2
Drive Type	8mm Cartridge (8mm)
Path Information	[5,0,1,0]
Cleaning Frequency	0 (hours)
Drive is in a Robotic Library	Yes
Robotic Library	TL8(0) - eel
Robot Drive Number	2

See [“A robot and multiple servers example”](#) on page 163.

Configuration on the UNIX server whale

The following table shows the robot attributes for the remote UNIX server whale.

Table 11-17 Add Robot Dialog Entries (remote host)

Dialog box field	Value
Device Host	whale
Robot Type	TL8 (Tape Library 8MM)

Table 11-17 Add Robot Dialog Entries (remote host) (*continued*)

Dialog box field	Value
Robot Number	0
Robot control is handled by a remote host	Set
Robot Control Host	eel

The following table shows the drive 3 attributes for the remote UNIX server whale.

Table 11-18 Add Drive Dialog Entries (Drive 3)

Dialog box field	Value
Device Host	whale
Drive Name	whale_drive_3
Drive Type	8mm Cartridge (8mm)
No Rewind Device	/dev/nrst15
Cleaning Frequency	20 (hours)
Drive Status	UP
Drive is in a Robotic Library	Yes
Robotic Library	TL8(0) - eel
Robot Drive Number	3

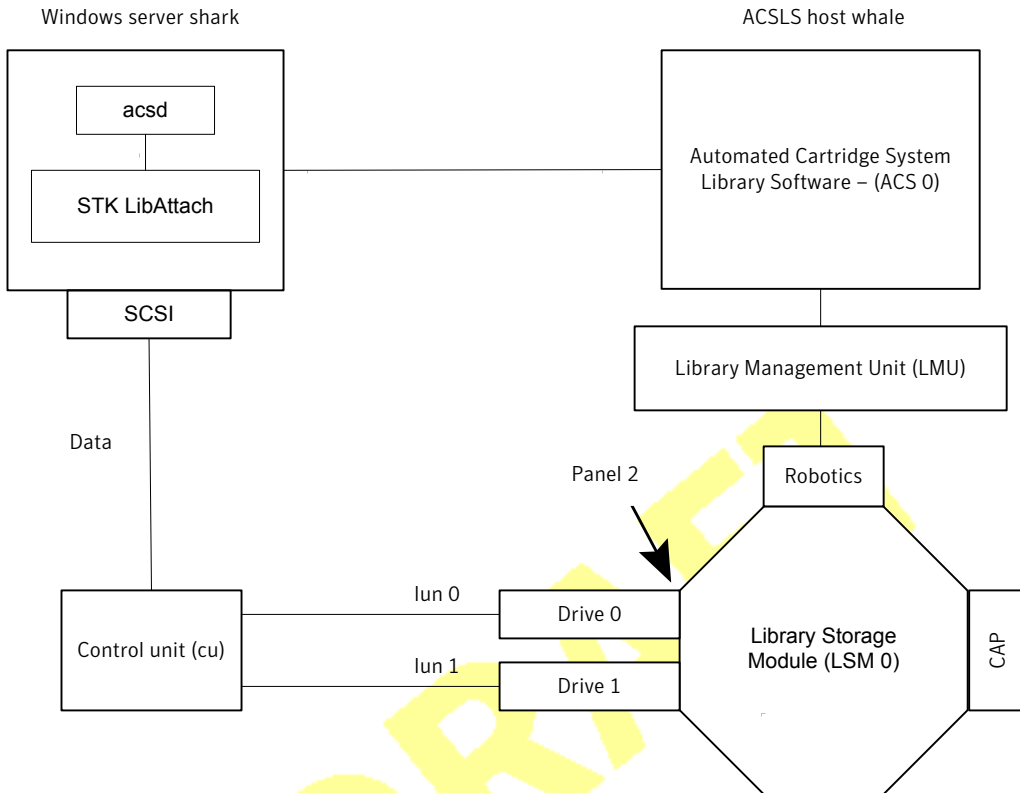
See [“A robot and multiple servers example”](#) on page 163.

An ACS robot on a Windows server example

The following example applies only to NetBackup Enterprise Server.

The following figure shows a Windows server and ACS robot configuration.

Figure 11-4 Windows server and ACS robot configuration example



This configuration uses an Automated Cartridge System (ACS) robot for storage. Server shark can be a Windows NetBackup master server or media server.

The following are items to note when you review this example:

- The Sun StorageTek ACSLS host (in the Add Robot dialog) is host whale, where the ACS library software resides. In this example, Automated Cartridge System Library Software (ACSLs) is installed as the ACS library software.
On some server platforms, you can run NetBackup media server software and ACS library software on the same server. Therefore, you need only one server.
- The ACS, LSM, PANEL, and DRIVE numbers are part of the ACS library software configuration and must be obtained from the administrator of that host.
- Robot number and ACS number are different terms. Robot number is the robot identifier used in NetBackup. ACS number is the robot identifier in ACS library software. These numbers can be different, although they both default to zero.

- If you connect the drives through an independent control unit, you must use the correct Logical Unit Numbers (LUNs) so that the correct tape name is used.
- The Add Robot dialog entries include an ACSLS Host entry so that the ACS library software host communicates by using STK LibAttach software. This software must be installed on each Windows server that has the ACS drives attached to it.

The following table shows the robot attributes for the remote host shark.

Table 11-19 Add Robot dialog entries (remote host)

Dialog box field	Value
Device Host	shark
Robot Type	ACS (Automated Cartridge System)
Robot Number	0
Robot control is handled by a remote host	Set (cannot be changed for this robot type)
ACSLS Host	whale

The following table shows the drive 0 attributes.

Table 11-20 Add Drive dialog entries (drive 0)

Dialog box field	Value
Device Host	shark
Drive Type	1/2" Cartridge (hcart)
Drive Name	shark_drive_0
Path Information	[5,0,1,0]
Drive is in a Robotic Library	Yes
Robotic Library	ACS(0) - whale
ACS	ACS: 0 LSM: 0 PANEL: 2 DRIVE: 0

The following table shows the drive attributes for drive 1.

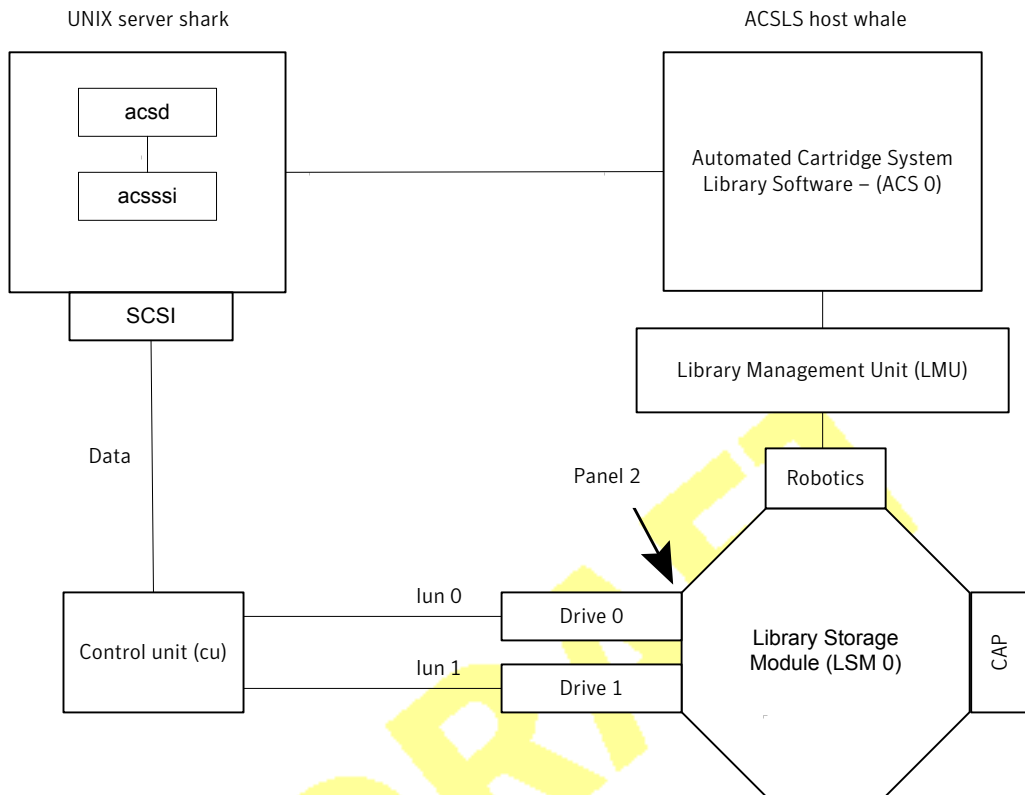
Table 11-21 Add Drive dialog entries (drive 1)

Dialog box field	Value
Device Host	shark
Drive Type	1/2" Cartridge (hcart)
Drive Name	shark_drive_1
Path Information	[4,0,1,1]
Drive is in a Robotic Library	Yes
Robotic Library	ACS(0) - whale
ACS	ACS: 0 LSM: 0 PANEL: 2 DRIVE: 1

An ACS robot on a UNIX server example

The following example applies only to NetBackup Enterprise Server.
The following figure shows a UNIX server and ACS robot configuration.

Figure 11-5 UNIX server and ACS robot configuration example



This configuration uses an Automated Cartridge System (ACS) robot for storage. Host shark can be a UNIX NetBackup master server or media server.

The following are some items to note when you review this example:

- The ACSLS Host (in the Add Robot dialog) is server whale, where the ACS library software resides. In this example, Automated Cartridge System Library Software (ACSLs) is installed as the ACS library software.
On some server platforms, you can run NetBackup media server software and ACS library software on the same server. Therefore, you need only one server.
- The ACS, PANEL, LSM, and DRIVE numbers are part of the ACS library software configuration and must be obtained from that system.
- Robot number and ACS number are different terms. Robot number is the robot identifier used in NetBackup. ACS number is the robot identifier in ACS library software. These numbers can be different, although they both default to zero.

- If you connect the drives through an independent control unit, you must use the correct Logical Unit Numbers (LUNs) so that the correct tape name is used.
- The Add Robot dialog entries include an ACSLS Host entry. That entry configures NetBackup to use the ACS Storage Server Interface (acsssi) to communicate with the ACS library software host.

The following table shows the robot attributes.

Table 11-22 Add Robot dialog entries (remote host)

Dialog box field	Value
Device Host	shark
Robot Type	ACS (Automated Cartridge System)
Robot Number	0
Robot control is handled by a remote host	Set (cannot be changed for this robot type)
ACSLS Host	whale

The following table shows the drive 0 attributes.

Table 11-23 Add Drive dialog entries (drive 0)

Dialog box field	Value
Device Host	shark
Drive Name	shark_drive_0
Drive Type	1/2" Cartridge (hcart)
No Rewind Device	/dev/rmt1.1
Drive is in a Robotic Library	Yes
Robotic Library	ACS(0) - whale
ACS	ACS Number: 0 LSM Number: 2 PANEL Number: 0 DRIVE Number: 0

The following table shows the drive 1 attributes.

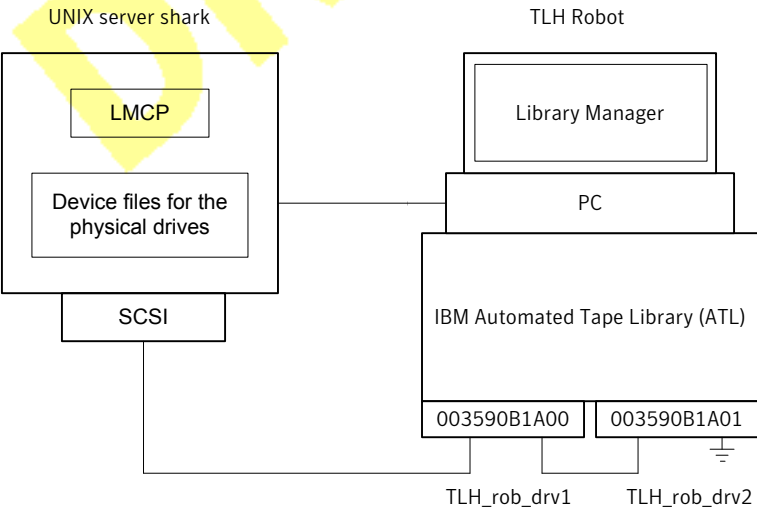
Table 11-24 Add Drive dialog entries (drive 1)

Dialog box field	Value
Device Host	shark
Drive Name	shark_drive_1
Drive Type	1/2" Cartridge (hcart)
No Rewind Device	/dev/rmt1.1
Drive is in a Robotic Library	Yes
Robotic Library	ACS(0) - whale
ACS	ACS Number: 0 LSM Number: 2 PANEL Number: 0 DRIVE Number: 1

A TLH robot on a UNIX server example

The following example applies only to NetBackup Enterprise Server.
The following figure shows a UNIX server and TLH robot.

Figure 11-6 UNIX server and TLH robot configuration example



This configuration adds a TLH robot to the configuration. The server shark can be a UNIX (AIX, Solaris SPARC, HP-UX), Linux, or Windows server, and can be a NetBackup master server or media server.

The following are some things to note when you review this example:

- The robot control host is the server shark. The robotic control (tlhcd) also can exist on a different server.
- The main difference between TLH robot configuration and other robot types is the robotic device file. The robotic device file is the Library Manager Control Point (LMCP) file on AIX systems and is the library name on non-AIX systems. In this example, shark is a AIX server, so the LMCP file is specified for the robotic device file.
If shark was a UNIX server that was not AIX or a Windows server, you would specify the library name (for example 3494AH).
- The drive configuration uses the IBM device number. You cannot assign a cleaning frequency in NetBackup.

The following table shows the robot attributes.

Table 11-25 Add Robot dialog entries (local host)

Dialog box field	Value
Device Host	shark
Robot Type	TLH (Tape Library Half-inch)
Robot Number	0
Robot is controlled locally by this device host	Set
LMCP Device File	/dev/lmcp0

The following table shows the drive 1 attributes.

Table 11-26 Add Drive dialog entries (drive 1)

Dialog box field	Value
Device Host	shark
Drive Name	TLH_rob_drv1
Drive Type	1/2" Cartridge (hcart)
No Rewind Device	/dev/rmt4.1
Drive Status	UP

Table 11-26 Add Drive dialog entries (drive 1) *(continued)*

Dialog box field	Value
Drive is in a Robotic Library	Yes
Robotic Library	TLH(0) - shark
Vendor Drive Identifier	003590B1A00

The following table shows the drive 2 attributes.

Table 11-27 Add Drive dialog entries (drive 2)

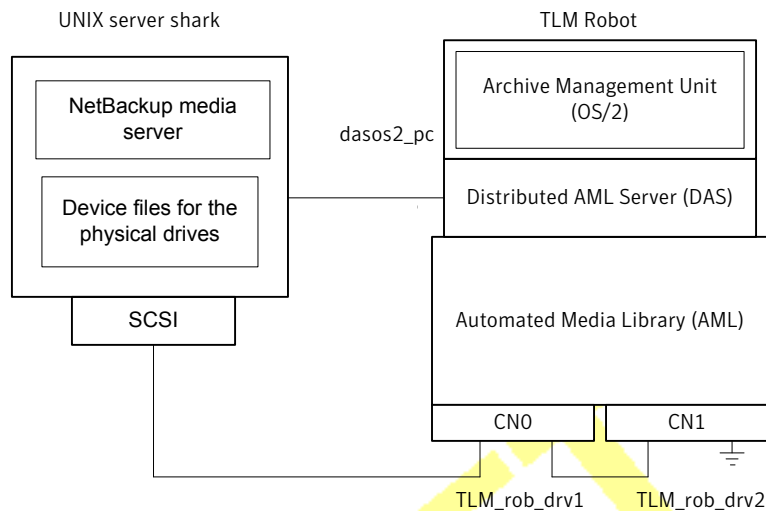
Dialog box field	Value
Device Host	shark
Drive Name	TLH_rob_drv2
Drive Type	1/2" Cartridge (hcart)
No Rewind Device	/dev/rmt1.1
Drive Status	UP
Drive is in a Robotic Library	Yes
Robotic Library	TLH(0) - shark
Vendor Drive Identifier	003590B1A01

A TLM robot on a UNIX server example

The following example applies only to NetBackup Enterprise Server.

The following figure shows a UNIX server and TLM robot.

Figure 11-7 UNIX server and TLM robot configuration example



This configuration adds a TLM robot. The device configuration for this robot is similar to the TL8 robot example.

See “[A robot on a server example](#)” on page 157.

However with a TLM robot, you specify the DAS/SDLC server instead of a robot control host. This server may reside on an IBM OS/2 system, usually in or near the robot cabinet, or on a Windows server.

In this example, the DAS Server entry is dasos2_pc. You must configure the DAS/SDLC server to recognize server shark as a client and allocate the AML drives to shark.

The following table shows the robot attributes.

Table 11-28 Add Robot dialog entries (remote host)

Dialog box field	Value
Device Host	shark
Robot Type	TLM (Tape Library Multimedia)
Robot Number	0
Robot control is handled by a remote host	Set (cannot be changed for this robot type)
DAS Server	dasos2_pc

The following table shows the drive 1 attributes.

Table 11-29 Add Drive dialog entries (drive 1)

Dialog box field	Value
Device Host	shark
Drive Name	TLM_rob_drv1
Drive Type	1/2" Cartridge (hcart)
No Rewind Device	/dev/rmt/rmt0h
Cleaning Frequency	25 (hours)
Drive Status	UP
Drive is in a Robotic Library	Yes
Robotic Library	TLM(0) - shark
Vendor Drive Identifier	CN0

The following table shows the drive 2 attributes.

Table 11-30 Add Drive dialog entries (drive 2)

Dialog box field	Value
Device Host	shark
Drive Name	TLM_rob_drv2
Drive Type	1/2" Cartridge (hcart)
No Rewind Device	/dev/rmt/rmt1h
Cleaning Frequency	25 (hours)
Drive Status	UP
Drive is in a Robotic Library	Yes
Robotic Library	TLM(0) - shark
Vendor Drive Identifier	CN1

DRAFT

Index

Symbols

/etc/ibmatl.conf file 124

A

ACS. *See* Automated Cartridge System

ACS daemon (acsd)

NetBackup 147

ACS drives

configuring 138

ACS robot

ACSLs firewall configuration 155

changing configuration 153

ACS robot on a UNIX server

configuration example 171

ACS robot on a Windows server

configuration example 168

ACS robot type 86

ACS robotic test utility 152

ACS robots 86

adding tapes 142

removing tapes 142

robot inventory filtering 145

robot inventory operations 143

with multiple ACS hosts 154

with single ACS host 153

ACS SSI event logger (acssel)

NetBackup 147

using with a different **socket name** 148

ACS storage server interface (acsssi)

NetBackup 150

starting manually 151

ACS_SSI_SOCKET

configuration option 150

acsd daemon 147

acsd process

NetBackup 146

ACSLs

configurations 134

ACSLs utility

removing tapes 143

acssel 147

using with a different socket name 148

acsssi 150

environment variables 151

starting manually 151

acstest 149, 152

on UNIX systems 152

on Windows systems 152

adding

tapes to a TLM robot 109

adding tapes

to ACS robots 142

to TLH robots 129

ADIC client software

installing on UNIX 101

installing on Windows 101

ADIC DAS server

configuring 106

ADIC Scalar DLC server

configuring 107

agile addressing 32

AIX

adapter number conventions 20

adapter numbers 20

command summary 30

configure robotic device file 123

configuring robotic control device files for IBM

robots 21

configuring tape drive device files 21

disabling SPC-2 SCSI reserve 28

introduction 19

locate-block 23

smit tool 19

tape drive configuration

extended file marks 23

make device files 24

multiple densities 27

variable mode devices 22

AIX computer

verify library communications 122

AIX system

robotic control 121

- AL-PA destination ID
 - Solaris 67
- allocating TLM drives
 - on a DAS server 103
 - on a Scalar DLC server 104
- alternate media types
 - ACS robots 138
- AML. *See* Distributed AML Server
- AMU. *See* Archive Management Unit
- API robots 98, 113, 134
- Archive Management Unit (AMU) 99
- atdd driver
 - HP-UX 50
- ATL. *See* Automated Tape Library
- ATL library name
 - on UNIX 124
- ATL name
 - on Windows 126
- attaching devices
 - to a Windows system 82
- attributes
 - robot 86
- Automated Cartridge System
 - adding volumes 142
 - barcode operations 143
 - configuration example 168, 171
 - configurations supported 153
 - Library Server (ACSLs) 134, 137
 - media requests 138
 - multiple ACS robots with multiple ACS
 - hosts 154
 - multiple ACS robots with single ACS host 153
 - removing tapes 110
 - robot inventory filtering 145
 - Solaris 64
 - special characters 142
 - STK Library Station 134, 137
- Automated Cartridge System (ACS)
 - removing tapes 142
- Automated Tape Library (ATL) 117, 120

B

- Berkeley-style close
 - HP-UX 33
 - Solaris 75
- boot -r
 - Solaris 80

C

- cfdmgr command 30
- chdev command 22, 30
- choosing
 - tape driver 22
- cleaning drives
 - for TLH robots 129
- command summary
 - for AIX 30
 - HP-UX 53
 - Linux 62
 - Solaris 79
- common access
 - to volumes 109
- configuration
 - changing ACS robot 153
 - for Sun StorEdge Network Foundation HBA
 - driver 66
- configuration example
 - ACS robot on a UNIX server 171
 - ACS robot on a Windows server 168
 - for a robot on a server 157
 - for local Windows server 165
 - for remote UNIX server 166
 - for remote Windows server 165
 - robot and multiple servers 163
 - stand-alone drives on a server 160
 - TLH robot on a UNIX server 174
 - TLM robot on a UNIX server 176
- configuration guidelines
 - HP-UX 31
- configuration option
 - ACS_SSI_SOCKET 150
- configurations
 - UNIX system examples 114
- configurations supported
 - Automated Cartridge System 153
- configure
 - robotic device file on AIX 123
 - robotic device file on other UNIX systems 125
 - robotic library name 127
 - TLH drives 128
- configuring
 - ACS drives 138
 - ADIC DAS server 106
 - ADIC Scalar DLC server 107
 - DAS or Scalar DLC client name 102
 - legacy device files 41
 - NetBackup drives 108

- configuring (*continued*)
 - persistent DSFs 36
 - robotic control 121
 - robotic control device files for IBM robots in AIX 21
 - SAN clients to recognize FT media servers 78
 - shared ACS drives 140
 - shared TLM drives 106
 - tape drive device files in AIX 21
 - TLM drives 100
 - TLM drives in NetBackup 104
 - TLM robotic control 100
- control unit
 - ACS 137
- conventions
 - RS/6000 AIX adapter number 20
- creating
 - HP-UX persistent DSFs 36
 - legacy SCSI and FCP robotic controls on HP-UX 41
 - legacy tape drive device files 48
 - no rewind device files for tape drives 24
 - persistent DSF pass-through paths 37
 - sctI device file for FCP (Itanium) 46
 - sctI device file for FCP (PA-RISC) 44
 - sctl device file for SCSI (PA-RISC) 43
 - tape drive pass-through device files 48
- creating device files
 - for SAN clients on HP-UX 40
- D**
 - DAS. *See* Distributed AML Server
 - DAS or Scalar DLC client name
 - configuring 102
 - DAS server
 - allocating TLM drives 103
 - DAS_CLIENT
 - environment variable 103
 - vm.conf entry 103
 - DASADMIN command 103, 107
 - debug mode
 - for st tape driver 58
 - determine path
 - to LMCP device file 121
 - device
 - configuration wizard 140
 - device addressing schemes
 - HP-UX 32
 - device configuration sequence 14
 - device discovery 14
 - device drivers
 - for legacy device files 38
 - for persistent DSFs 34
 - sg
 - Linux 56
 - Solaris 64
 - st
 - Linux 57
 - device drivers and files
 - for persistent DSFs 34
 - device files
 - creating for SAN clients on HP-UX 40
 - creating no rewind 24
 - for legacy tape drives 39
 - Linux (2.6 kernel) robotic control 59
 - Linux (2.6 kernel) tape drive 59
 - no rewind 24
 - device special files
 - persistent 34
 - disable
 - HP-UX EMS Tape Device Monitor for a SAN 52
 - SPC-2 SCSI reserve in HP-UX 52
 - disabling
 - Solaris Multiplexed I/O (MPxIO) 67
 - SPC-2 SCSI reserve in AIX 28
 - SPC-2 SCSI reserve on Solaris 77
 - Distributed AML Server 97
 - See also* Tape Library Multimedia
 - \\ETC\\CONFIG file 106
 - \\MPTN\\ETC\\HOSTS file 106
 - about 97
 - drive cleaning
 - for TLH robots 129
 - drive designations
 - determining 105
 - driver unloading
 - Solaris 72
 - drives
 - Sony S-AIT 29
 - drstat command 92
 - DSFs. *See* device special files 34
- E**
 - Emulex Fibre Channel HBA 61
 - environment variables
 - for acsssi processes 151
 - example
 - robotic process 95

example (*continued*)

- sg.conf file 70
- sg.links file 71
- st.conf file 69
- STK SL500 74
- StorEdge Network Foundation HBA 74
- TLM configuration 98

example configuration

- ACSLS 134

examples

- no rewind device file 26
- SCSI and FCP robotic control device files 73
- TLH configurations 114

extended file marks

- for drives 23

F**fabric assigned destination ID**

- Solaris 67

fast-tape positioning. *See* locate-block**Fibre Channel**

- drivers 72
- HP-UX configuration example 44, 46

fibre channel

- binding process
- Solaris 66

Fibre Channel HBA drivers

- binding 66

firewall configuration

- Sun StorageTek ACSLS 155

fixed length block 22**forward-space-file/record**

- HP-UX 34

H**HBAs**

- Emulex 61

HP-UX

- command summary 53
- configuration guidelines 31
- creating legacy SCSI and FCP robotic controls 41
- creating persistent DSFs 36
- device addressing schemes 32
- disable EMS Tape Device Monitor for a SAN 52
- disable SPC-2 SCSI reserve 52
- legacy device drivers and files 38
- robotic control 32
- SAM utility 52

HP-UX (*continued*)

- SCSI robotic controls 38
- SPC-2 SCSI reserve 52
- Tape drive configuration
 - Berkeley-style close 33
 - make device files 34
- upgrading NetBackup to use persistent DSFs 37

I**IBM Automated Tape Library** 113

- See also* Tape Library Half-inch

IBM Automated Tape Library service 120**IBM device number** 92, 128**installing**

- ADIC client software on UNIX 101
- ADIC client software on Windows 101

introduction

- Linux 55
- Solaris 63

ioscan command

- HP-UX 53

L**legacy device drivers and files**

- HP-UX 38

legacy device files

- configuring 41
- device drivers supported 38

legacy pass-through paths

- for tape drives 40

legacy tape drive device files

- creating 48

legacy tape drives

- device file names 39

Library Management Unit 137**Library Management Unit (LMU)** 138**Library Manager Control Point daemon (LMCPD)** 117**Library Storage Module** 137**Library Storage Module (LSM)** 138**Linux**

- command summary 62
- introduction 55
- loading drivers 57
- robotic controls 59
- SAN clients 60
- SCSI robotic controls 59
- sg driver 56
- st tape driver 57

Linux (*continued*)

- st tape driver buffer size 58
- utilities to test SCSI devices 62
- verifying the device configuration 59

Linux (2.6 kernel)

- robotic controls 59
- tape drive device files 59

LMCP device file

- determine path 121

LMCPD 117**LMU.** *See* Library Management Unit**locate-block**

- on AIX 23
- on Solaris 76

lsattr command 30**lsdev** command

- HP-UX 53
- on AIX 30

LSM. *See* Library Storage Module**lsmdev** command

- Linux 58

M**media** requests

- for an ACS robot 138
- for TLH robot 120

mknode command

- HP-UX 53

modinfo command

- Solaris 80

modprobe command

- Linux 57

mt command

- Linux 62

mtlib command

- IBM 122

multiple tape densities

- using 27

N**NetBackup**

- ACS daemon (acsd) 147
- ACS SSI event logger (acssel) 147
- ACS storage server interface (acsssi) 150
- acsd process 146
- removing tapes 143
- robotic control, communication, and logging 146
- using acssel with different socket name 148

NetBackup Device Configuration wizard 108**NetBackup** drives

- configuring 108

NetBackup Enterprise Server 52**NetBackup** sg driver

- verify installation 65

no rewind device file example 26**no** rewind device files 24

- creating 24

- Solaris 76

nonstandard tape drives 77**O****odmget** command 30**P****pass-through** paths

- for persistent DSFs 35

persistent DSF pass-through paths

- creating 37

persistent DSFs

- configuring 36
- device drivers 34
- device drivers and files 34
- for robotic control 35
- for tape drive access 35
- pass-through paths 35

processes

- by robotic type 93
- robotic 93
- robotic control 93

R**rem_drv** command

- Solaris 80

removing

- tapes from a TLM robot 110
- tapes from ACS robots 142
- tapes using NetBackup 143
- tapes using the ACSLS utility 143

removing tapes

- from TLH robots 130

requirements

- tape drive device files 33

robot

- attributes 86
- process 93

- robot and multiple servers
 - configuration example 163
 - robot inventory operations
 - on ACS robots 143
 - on TLH robots 131
 - robot types 85
 - robotic processes 93
 - robotic
 - control process 93
 - test utilities 92
 - test utilities, ACS 152
 - robotic control
 - for persistent DSFs 35
 - on a UNIX system 123
 - on a Windows system 126
 - on an AIX system 121
 - on HP-UX 32
 - on UNIX systems 146
 - on Windows systems 146
 - robotic control device files
 - for IBM robots in AIX 21
 - robotic control, communication, and logging
 - during tape operations 146
 - robotic controls
 - SCSI
 - HP-UX 38
 - Linux (2.6 kernel) 59
 - on AIX 59, 73
 - Solaris 73
 - robotic device file
 - configure on other UNIX systems 125
 - robotic inventory
 - filtering 132, 145
 - robotic library name
 - configure 127
 - robotic process
 - example 95
 - robotics
 - table-driven 92
 - robots
 - ACS 86
 - Sun StorageTek ACSLS 134
 - TL4 87
 - TL8 88
 - TLD 89
 - TLH 90
 - TLM 91
 - robtest 92, 107, 149
 - robtest utility
 - Linux 62
- ## S
- SAM utility
 - HP-UX 52
 - SAN clients
 - about drivers for Linux 60
 - configuring drivers on HP-UX 40
 - configuring drivers on Solaris 78
 - Scalar DLC server
 - allocating TLM drives 104
 - schgr device driver
 - HP-UX 42
 - Scripts
 - sg.install
 - Solaris 67
 - scripts
 - sgscan 73, 80
 - SCSI
 - pass through driver
 - Solaris 64
 - robotic control
 - HP-UX 38
 - Linux (2.6 kernel) 59
 - on Linux 59
 - on Solaris 73
 - SCSI persistent bindings 61
 - SCSI reservations
 - data integrity 15
 - disabling 15
 - disabling SPC-2 reserve in AIX 28
 - disabling SPC-2 reserve in HP-UX 52
 - disabling SPC-2 reserve on Solaris 77
 - sctl device file
 - creating for FCP (Itanium) 46
 - creating for FCP (PA-RISC) 44
 - creating for SCSI (PA-RISC) 43
 - server and robot
 - configuration example 157
 - sg driver
 - Linux 56
 - Solaris 64
 - uninstalling 79
 - sg.build command
 - Solaris 80
 - sg.conf file
 - example 70

- sg.install script
 - Solaris 67, 80
- sg.links file
 - example 71
- shared ACS drives
 - configuring 140
- shared TLM drives
 - configuring 106
- smit command 22
- Solaris
 - adapter card removal 64
 - binding Fibre Channel HBA drivers 66
 - command summary 79
 - configuring SAN clients 78
 - disabling MPxIO 67
 - disabling SPC-2 reserve on Solaris 77
 - examples of SCSI and FCP robotic control device files 73
 - introduction 63
 - locate-block 76
 - no rewind device files 76
 - preventing driver unloading 72
 - robotic controls 73
 - SCSI pass through driver 64
 - SCSI robotic controls 73
 - sg driver install or reconfigure 67
 - sg.install script 67
 - SPC-2 SCSI reserve 76
 - tape drive configuration 74
 - Berkeley-style close 75
 - using ACS 64
- Solaris Multiplexed I/O (MPxIO)
 - disable 67
- Sony S-AIT drives 29
- SPC-2 SCSI reserve
 - disable in HP-UX 52
 - disabling in AIX 28
 - Solaris 76
- SSO
 - configuring non-serialized shared TLM drives 108
 - configuring shared ACS drives 141
 - configuring TLM robot types 106
- st driver
 - Linux 57
- st tape driver
 - buffer size and performance 58
 - debug mode 58
 - Linux 57
- st.conf file
 - example 69
- stand-alone drives on a server
 - configuration example 160
- STK SL500
 - example 74
- StorEdge Network Foundation HBA
 - example 74
- Sun
 - acctest utility on UNIX 152
 - acctest utility on Windows 152
 - Automated Cartridge System
 - multiple ACS robots with multiple ACS hosts 154
 - multiple ACS robots with single ACS host 153
 - Automated Cartridge System (ACS)
 - configurations supported 153
 - configuring shared ACS drives 140
 - StorageTek ACSLS robots 134
 - Sun StorageTek ACSLS
 - firewall configuration 155
 - Sun StorEdge Network Foundation HBA driver
 - configuration 66
 - switch settings
 - Sony S-AIT
 - on AIX 29
- T**
 - table-driven robotics 92
 - tape device drivers
 - Windows 82
 - tape drive access
 - persistent DSFs 35
 - Tape drive configuration
 - HP-UX
 - no rewind 34
 - tape drive configuration
 - on AIX
 - make device files 24
 - Solaris 74
 - tape drive device files
 - Linux (2.6 kernel) 59
 - requirements 33
 - tape drive device files in AIX
 - configuring 21
 - tape drive pass-through device files
 - creating 48

- tape driver
 - choosing 22
 - tape drives
 - creating no rewind device files 24
 - legacy pass-through paths 40
 - nonstandard 77
 - Tape Library Half-inch (TLH)
 - adding volumes 129
 - cleaning drives 129
 - configuration example 174
 - configuring robotic control 121
 - control daemon 117, 120
 - daemon 117
 - drive mapping 128
 - media requests 120
 - removing tapes 130
 - robot inventory 131
 - service 120
 - Tape Library Multimedia (TLM)
 - about 97
 - adding volumes 109
 - allocating drives 100
 - configuration example 176
 - configuring drives 104
 - configuring robotic control 100
 - daemon 99
 - Drive mapping 105
 - inventory operations 111
 - media requests 99
 - removing tapes 110
 - tapes
 - adding to a TLM robot 109
 - removing from a TLM robot 110
 - removing from ACS robots 142
 - removing using NetBackup 143
 - removing using the ACSLS utility 143
 - text version of this guide 14
 - TL4 robots 87
 - TL8 robots 88
 - TLD robots 89
 - TLH configurations
 - examples 114
 - TLH drives
 - configure 128
 - TLH example configurations
 - Windows 117
 - TLH robot
 - configuring 121
 - TLH robot on a UNIX server
 - configuration example 174
 - TLH robots 90
 - adding tapes 129
 - removing tapes 130
 - robot inventory filtering 132
 - TLM configuration
 - example 98
 - TLM drives
 - configuring 100
 - TLM drives in NetBackup
 - configuring 104
 - TLM robot
 - adding tapes 109
 - media requests 99
 - removing tapes 110
 - TLM robot on a UNIX server
 - configuration example 176
 - TLM robotic control
 - configuring 100
 - TLM robots 91
 - robot inventory operations 111
 - tlmtest 105, 107–110
- ## U
- uninstalling
 - the sg driver 79
 - UNIX
 - acctest utility 152
 - determine ATL library name 124
 - installing ADIC client software 101
 - verify library communications 124
 - UNIX server (remote)
 - configuration example 166
 - UNIX system
 - example configurations 114
 - robotic control 123
 - upgrading
 - NetBackup to use HP-UX persistent DSFs 37
 - using
 - guide 13
 - using the passthru driver
 - capabilities 65
- ## V
- variable length block 22
 - variable-mode devices
 - on AIX 22

- verify library communications
 - on an AIX computer 122
 - on UNIX 124
 - on Windows 126
- verifying
 - device configuration on Linux 59
- vm.conf file
 - DAS_CLIENT entries 103
- volumes
 - providing common access 109

W

- Windows
 - acctest utility 152
 - attaching devices 82
 - determine the ATL name 126
 - installing ADIC client software 101
 - tape device drivers 82
 - TLH example configurations 117
 - verify library communications 126
- Windows server (local)
 - configuration example 165
- Windows server (remote)
 - configuration example 165
- Windows system
 - robotic control 126
- world wide node names (WWNN) 67
- world wide port names (WWPN) 66–67