



**Hitachi Freedom Storage™
Lightning 9900™ V Series
HP-UX® Configuration Guide**

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Referenced Documents

- *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager and LUN Security User's Guide (MK-92RD105)*
- *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Expansion (LUSE) and Virtual LVI/LUN User's Guide (MK-92RD104)*
- *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide (MK-92RD100)*
- *Hitachi Freedom Storage™ Hitachi RapidXchange (HRX) User's Guide (MK-91RD052)*
- *Hitachi Freedom Storage™ Hitachi Dynamic Link Manager User's Guide (MK-92RDLM112)*

Preface

The *Hitachi Lightning 9900™ V Series HP-UX® Configuration Guide* describes and provides instructions for configuring the devices on the Hitachi Lightning 9900™ V Series (9900V) disk array subsystem for operation with the HP-UX® operating system. This configuration guide assumes that:

- the user has a background in data processing and understands direct-access storage device subsystems and their basic functions,
- the user is familiar with the Hitachi Lightning 9900™ V Series array subsystem,
- the user is familiar with the HP-UX® operating system, the HP® 9000 system, and the fibre-channel adapters, and
- the user is familiar with the UNIX® file system, system commands, and utilities.

Note: The term “9900V” refers to the entire Hitachi Lightning 9900™ V Series subsystem family, unless otherwise noted. Please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide (MK-92RD100)* for further information on the 9900V disk array subsystems.

Note: For further information on the HP-UX® operating system, please consult the HP-UX® user documentation, or contact HP® technical support.

Microcode Level

This document revision applies to 9900V microcode versions 21-01-XX and higher.

COMMENTS

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Thank you!

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Chapter 1 Overview of 9900V HP-UX® Configuration

1.1 9900V HP-UX® Configuration

This document describes the requirements and procedures for connecting the Lightning 9900™ V Series (9900V) subsystem to an HP-UX® system and configuring the new 9900V devices for operation with the HP-UX® operating system. The Hitachi Data Systems representative performs the physical installation of the 9900V subsystem. The user prepares for 9900V subsystem installation, and then configures the new 9900V devices with assistance as needed from the Hitachi Data Systems representative.

Configuration of the 9900V disk devices for HP-UX® operations includes:

- Verifying new device recognition (see section 3.1),
- Verifying the device files and driver (see section 3.2),
- Partitioning the disk devices (see section 3.3),
- Creating the file systems for the new volumes (see section 3.4),
- Setting the device parameters for the disk devices (see section 3.5),
- Creating the mount directories (see section 3.6),
- Mounting and verifying the file systems (see section 3.7), and
- Setting and verifying the auto-mount parameters (see section 3.8).

Note on the term “SCSI disk”: The 9900V logical devices are defined to the host as SCSI disk devices, even though the interface is fibre channel.

1.2 Hitachi Lightning 9900™ V Series Subsystem

The Hitachi Lightning 9900™ V Series RAID subsystem supports concurrent attachment to multiple UNIX®-based and PC-server platforms. Please contact your Hitachi Data Systems account team for the latest information on platform support. The 9900V subsystem provides continuous data availability, high-speed response, scaleable connectivity, and expandable capacity for PC server and open-system storage. The 9900V subsystem can operate with multihost applications and host clusters, and is designed to handle very large databases as well as data warehousing and data mining applications that store and retrieve terabytes of data.

The Hitachi Lightning 9900™ V Series subsystem can be configured with fibre-channel, FICON™, and/or Extended Serial Adapter™ (ExSA™) (compatible with ESCON® protocol) ports to provide connectivity with S/390® mainframe hosts as well as open-system hosts. For further information on the 9900V subsystem, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100), or contact your Hitachi Data Systems account team.

1.3 Device Types and Configuration Procedures

The 9900V subsystem allows the following types of logical devices (also called volumes) to be installed and configured for operation with the HP-UX[®] operating system. Table 1.1 lists the device specifications for the 9900V devices. Table 1.2 shows the volume usage (i.e., file system or raw device) for the 9900V devices.

OPEN-x Devices. The OPEN-x logical units (LUs) (e.g., OPEN-3, OPEN-9) are disk devices of predefined sizes. The 9900V subsystem currently supports OPEN-3, OPEN-9, OPEN-E, and OPEN-L devices. Please contact your Hitachi Data Systems account team for the latest information on supported LU types.

LUSE Devices (OPEN-x*n). The LUSE devices are combined LUs which can be from 2 to 36 times larger than standard OPEN-x LUs. The Logical Unit Size Expansion (LUSE) feature of the 9900V subsystem enables you to configure these custom-size devices. LUSE devices are designated as OPEN-x*n, where x is the LU type (e.g., OPEN-9*n) and $2 \leq n \leq 36$. For example, a LUSE device created from ten OPEN-3 LUs would be designated as an OPEN-3*10 disk device. This capability enables the server host to combine logical devices and access the data stored on the 9900V subsystem using fewer LU numbers (LUNs). For further information on the LUSE feature, please refer to the *Hitachi Lightning 9900V LUN Expansion and Virtual LVI/LUN User's Guide* (MK-92RD104).

VLL Devices (OPEN-x VLL). The VLL devices are custom-size LUs that are smaller than standard OPEN-x LUs. The Virtual LVI/LUN (VLL) Remote Console software enables you to configure VLL devices by "slicing up" a single LU into several smaller LUs. You can choose the device size that best fits your application needs to improve your host access to frequently used files. For further information on VLL, please refer to the *Hitachi Lightning 9900™ V Series LUN Expansion (LUSE) and Virtual LVI/LUN User's Guide* (MK-92RD104).

Note: The product name for the OPEN-x VLL devices is OPEN-x-CVS (CVS stands for custom volume size).

Note: The OPEN-L LUs do not support Virtual LVI/LUN.

VLL LUSE Devices (OPEN-x*n VLL). The VLL LUSE devices combine VLL devices (instead of standard OPEN-x LUs) into LUSE devices. The Virtual LVI/LUN software is used first to create custom-size VLL devices, and then the LUSE software is used to combine (concatenate) these VLL devices. The user can combine from 2 to 36 VLL devices into one VLL LUSE device. For example, an OPEN-3 LUSE volume created from ten OPEN-3 VLL volumes would be designated as an OPEN-3*10 VLL device.

Configuration of the 9900V disk devices for HP-UX[®] operations includes:

- Verifying new device recognition (see section 3.1),
- Verifying the device files and driver (see section 3.2),
- Partitioning the disk devices (see section 3.3),
- Creating the file systems for the new volumes (see section 3.4),
- Setting the device parameters for the disk devices (see section 3.5),
- Creating the mount directories (see section 3.6),
- Mounting and verifying the file systems (see section 3.7), and
- Setting and verifying the auto-mount parameters (see section 3.8).

HRX Devices (3390-3A/B/C, OPEN-x-HRXoto). The Hitachi RapidXchange (HRX) feature of the 9900V subsystem enables user data to be shared across S/390®, UNIX®, and PC server platforms using special multiplatform volumes. The Virtual LVI/LUN feature can also be applied to HRX devices for maximum flexibility in volume size. For further information on HRX, please refer to the *Hitachi Freedom Storage® RapidXchange (HRX) User's Guide (MK-91RD052)*, or contact your Hitachi Data Systems account team.

The HRX devices must be installed and accessed as raw devices. UNIX®/PC server hosts must use HRX to access the HRX devices as raw devices (i.e., no disk partition, no file system, no mount operation).

Note: The 3390-3B device is write-protected from UNIX®/PC server access. The 9900V subsystem will reject all UNIX®/PC server write operations (including fibre-channel adapters) for the 3390-3B device.

WARNING: The 3390-3A/C and OPEN-x-HRXoto devices are *not* write-protected for UNIX®/PC server access. Do not execute any write operations on these devices. Do not create a partition or file system on these devices. This will overwrite any data on the HRX device and also prevent the HRX software from accessing the device.

Configuration of the 9900V HRX (raw) devices for HP-UX® operations includes:

- Verifying new device recognition (see section 3.1), and
- Verifying the device files and driver (see section 3.2).

Table 1.1 9900V Device Specifications (continues on the next page)

Device Type (Note 1)	Category (Note 2)	Vendor Name	Product Name (Note 3)	# of Blocks (512-byte blk)	Sector Size (bytes)	# of Data Cylinders	# of Heads	# of Sectors per Track	Capacity MB (Note 4)
OPEN-3	SCSI disk	HITACHI	OPEN-3	4806720	512	3338	15	96	2344
OPEN-9	SCSI disk	HITACHI	OPEN-9	14423040	512	10016	15	96	7040
OPEN-E	SCSI disk	HITACHI	OPEN-E	28452960	512	19759	15	96	13888
OPEN-L	SCSI disk	HITACHI	OPEN-L	71192160	512	49439	15	96	34756
OPEN-3*n	SCSI disk	HITACHI	OPEN-3*n	4806720*n	512	3338*n	15	96	S1
OPEN-9*n	SCSI disk	HITACHI	OPEN-9*n	14423040*n	512	10016*n	15	96	S1
OPEN-E*n	SCSI disk	HITACHI	OPEN-E*n	28452960*n	512	19759*n	15	96	S1
OPEN-L*n	SCSI disk	HITACHI	OPEN-L*n	71192160*n	512	49439*n	15	96	S1

Table 1.1 9900V Device Specifications (continued)

Device Type (<i>Note 1</i>)	Category (<i>Note 2</i>)	Vendor Name	Product Name (<i>Note 3</i>)	# of Blocks (512-byte blk)	Sector Size (bytes)	# of Data Cylinders	# of Heads	# of Sectors per Track	Capacity MB (<i>Note 4</i>)
OPEN-3 VLL	SCSI disk	HITACHI	OPEN-3-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	96	S1
OPEN-9 VLL	SCSI disk	HITACHI	OPEN-9-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	96	S1
OPEN-E VLL	SCSI disk	HITACHI	OPEN-E-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	96	S1
OPEN-3*n VLL	SCSI disk	HITACHI	OPEN-3*n-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	96	S1
OPEN-9*n VLL	SCSI disk	HITACHI	OPEN-9*n-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	96	S1
OPEN-E*n VLL	SCSI disk	HITACHI	OPEN-E*n-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	96	S1
3390-3A	HRXotm/mto	HITACHI	3390-3A	5820300	512	3345	15	116	--
3390-3B	HRXmto	HITACHI	3390-3B	5816820	512	3343	15	116	--
3390-3C	HRXotm	HITACHI	OP-C-3390-3C	5820300	512	3345	15	116	--
HRX OPEN-3	HRXoto	HITACHI	OPEN-3	4806720	512	3338	15	96	--
3390-3A VLL	HRXotm/mto	HITACHI	3390-3A-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	116	--
3390-3B VLL	HRXmto	HITACHI	3390-3B-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	116	--
3390-3C VLL	HRXotm	HITACHI	OP-C-3390-3C- CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	116	--
HRX OPEN-3 VLL	HRXoto	HITACHI	OPEN-3-CVS	<i>Note 5</i>	512	<i>Note 6</i>	15	96	--

Note 1: The availability of a specific 9900V device type depends on the level of microcode installed on the 9900V subsystem.

Note 2: The category of a device (SCSI disk or HRX) determines its volume usage. Table 1.2 shows the volume usage for SCSI disk devices and HRX devices. The SCSI disk devices (OPEN-x, VLL, LUSE, VLL LUSE) are usually formatted with file systems for HP-UX® operations. The HRX devices (3390-3A/B/C, and OPEN-x-HRXoto) must be installed as raw devices and can only be accessed using the HRX software. Do not partition or create a file system on any device used for HRX operations.

Note on the term “SCSI disk”: The 9900V logical devices are defined to the host as SCSI disk devices, even though the interface is fibre-channel.

Table 1.2 Volume Usage for Device Categories

Category	Device Type	Volume Usage
SCSI Disk	OPEN-x, OPEN-x VLL, OPEN-x*n LUSE, OPEN-x*n VLL LUSE	File System*
HRX	3390-3A/B/C 3390-3A/B/C VLL OPEN-x for HRXoto, OPEN-x VLL for HRXoto	Raw Device

***Note:** The SCSI disk devices can also be used as raw devices (e.g., some database applications use raw devices).

Note 3: The 9900V command device (used for Command Control Interface (CCI) operations) is distinguished by **-CM** on the product name (e.g., OPEN-3-CM, OPEN-3-CVS-CM). The product name for VLL devices is OPEN-x-CVS, where CVS = custom volume size.

Note 4: This capacity is the maximum size which can be entered using the **lvcreate** command. The device capacity can sometimes be changed by the BIOS or host bus adapter. Also, different capacities may be due to variations such as 1 MB = 1000² or 1024² bytes.

Note 5: The number of blocks for a Virtual LVI/LUN volume is calculated as follows:

$$\# \text{ of blocks} = (\# \text{ of data cylinders}) \times (\# \text{ of heads}) \times (\# \text{ of sectors per track})$$

Example: For an OPEN-3 VLL volume (e.g., OPEN-3-CVS) with capacity = 37 MB:

$$\# \text{ of blocks} = (53 \text{ cylinders-see Note 5}) \times (15 \text{ heads}) \times (96 \text{ sectors per track}) = 76320$$

Note 6: The number of data cylinders for a Virtual LVI/LUN volume is calculated as follows (↑...↑ means that the value should be rounded up to the next integer):

- The number of data cylinders for an OPEN-x VLL volume =
 $\# \text{ of cylinders} = \uparrow (\text{capacity (MB) specified by user}) \times 1024/720 \uparrow$
 Example: For an OPEN-3 VLL volume (e.g., OPEN-3-CVS) with capacity = 37 MB:
 $\# \text{ of cylinders} = \uparrow 37 \times 1024/720 \uparrow = \uparrow 52.62 \uparrow$ (rounded up to next integer) = 53 cylinders
- The number of data cylinders for a VLL LUSE volume =
 $\# \text{ of cylinders} = \uparrow (\text{capacity (MB) specified by user}) \times 1024/720 \uparrow \times n$
 Example: For an OPEN-3 VLL LUSE volume with capacity = 37 MB and n = 4 (e.g., OPEN-3*4-CVS):
 $\# \text{ of cylinders} = \uparrow 37 \times 1024/720 \uparrow \times 4 = \uparrow 52.62 \uparrow \times 4 = 53 \times 4 = 212$
- The number of data cylinders for a 3390-3A/C VLL volume =
 $\# \text{ of cylinders} = (\text{number of cylinders specified by user}) + 9$
- The number of data cylinders for a 3390-3B VLL volume =
 $\# \text{ of cylinders} = (\text{number of cylinders specified by user}) + 7$

S1 = maximum **lvcreate** size value for VLL, LUSE, and VLL LUSE devices. Calculate the maximum size value (in MB) as follows: $S1 = (\text{PE Size}) \times (\text{Free PE})$

Note: Do not exceed the maximum **lvcreate** size value of 128 GB.

Chapter 2 Preparing for New Device Configuration

2.1 Configuration Requirements

The requirements for 9900V HP-UX® configuration are:

- **Hitachi Lightning 9900™ V Series subsystem**, all-open or multiplatform configuration:
 - The 9900V LUN Manager software is used to configure the fibre-channel (FC) ports. If the remote LUN Manager feature is not installed, please contact your Hitachi Data Systems account team for information on LUN and fibre-channel configuration services.

Note: The availability of 9900V features and devices depends on the level of microcode installed on the 9900V subsystem.

- **HP® 9000/800 series system.** **Note:** Connectability of the 9900V subsystem to model E35 of the HP® 9000/800 Series has been verified. For assistance with other HP® models, please contact the Hitachi Data Systems Support Center.
- **HP-UX® operating system**, version 10.20, 11.0, or 11i. **Important:** Please contact HP® support to make sure the most current OS patches are installed on the HP® system(s).
 - **root** log-in (superuser) access to the HP® system is required.

Note: For the latest information on HP-UX® version support, please contact your Hitachi Data Systems account team.

- **Fibre-channel adapters.** Make sure to install all utilities, tools, and drivers that come with the adapter(s). For information on driver requirements for the adapters, please refer to the user documentation for the adapter or contact the vendor.
 - The 9900V subsystem supports: 2 Gbps fibre-channel interface, including shortwave non-OFC (open fibre control) optical interface and multimode optical cables with LC connectors; and 1 Gbps fibre-channel interface, including shortwave non-OFC optical interface and multimode optical cables with SC connectors. Do not connect any OFC-type fibre-channel interface to the 9900V subsystem.
 - For information on supported fiber-channel adapters (FCAs), optical cables, hubs, and fabric switches, please contact your Hitachi Data Systems account team or the Hitachi Data Systems Support Center (see section 5.2).

Note: If you plan to connect different types of servers to the 9900V subsystem via the same fabric switch, you must use the **zoning** function of the fabric switch. You must use the appropriate host bus adapter (HBA) and install the necessary patches from the vendor. Refer to the HBA vendor's web site for details.

2.2 Installing the 9900V Subsystem

The 9900V subsystem comes with all hardware and cabling required for installation. Installation of the 9900V subsystem involves the following activities:

1. **Hardware installation.** The Hitachi Data Systems representative performs hardware installation as specified in the 9900V maintenance manual. Follow all precautions and procedures in the 9900V maintenance manual. Check all specifications to ensure proper installation and configuration. Hardware installation includes:

- Assembling all hardware and cabling.
- Installing and formatting the logical devices (LDEVs) using the SVP. Make sure to get the desired LDEV configuration information from the user, including the desired number of OPEN-x, LUSE, VLL, VLL LUSE, and multiplatform (HRX) devices.
- Installing the fibre-channel adapters and cabling: The total fibre cable length attached to each fibre-channel adapter must not exceed 500 meters (1,640 feet). Do not connect/disconnect fibre-channel cabling that is being actively used for I/O. This can cause the HP-UX® system to hang. Always confirm that the devices on the fibre cable are offline before connecting/disconnecting the fibre cable.

9900V FC Port: The fibre topology parameters for each 9900V fibre-channel port depend on the type of device to which the 9900V port is connected. Determine the topology parameters supported by the device, and set your topology accordingly (see section 2.3.2). The type of 9900V port is also important.

Note: The Hitachi Data Systems representative must use the 9900V Maintenance Manual during all installation activities. Follow all precautions and procedures in the maintenance manual, and always check all specifications to ensure proper installation and configuration.

2. **LUN Manager software installation.** The user can perform this activity. You will use the LUN Manager software to configure the 9900V fibre-channel ports. For instructions on installing the LUN Manager Remote Console software, please refer to the *Hitachi Lightning 9900™ V Series LUN Manager and LUN Security User's Guide (MK-92RD105)*.

Note: If remote LUN Manager is not installed, please contact your Hitachi Data Systems account team for further information on fibre-channel configuration services.

2.3 Preparing to Connect the 9900

Before the 9900V is connected to the HP® system, you must perform the following tasks:

- Set the host mode for the 9900V fibre-channel port(s) (see section 2.3.1),
- Configure the 9900V fibre-channel ports (see section 2.3.2),
- Verify the host fibre-channel adapter installation (see section 2.3.3), and
- Verify the system diagnostics setting (see section 2.3.4).

You will use the LUN Manager Remote Console software to set the host modes for and configure the 9900V fibre ports. For instructions on using the LUN Manager software, please refer to the *Hitachi Lightning 9900™ V Series LUN Manager and LUN Security User's Guide* (MK-92RD105). After completing these steps, you will shut down the HP® system, connect the 9900V subsystem, and then restart the HP® system (see section 2.4).

Note: If the LUN Manager feature is not installed, please contact your Hitachi Data Systems account team for information on fibre-channel configuration services.

2.3.1 Setting the Host Mode for the 9900V Ports

The 9900V ports have special modes which must be set for the connected operating system. Use the LUN Manager Remote Console software to set the host mode for each port. The required host mode setting for 9900V HP-UX® operations is **03** (see Figure 2.1).

Note: If you plan to connect different types of servers to the 9900V subsystem via the same fabric switch, you must use the **zoning** function of the fabric switch.

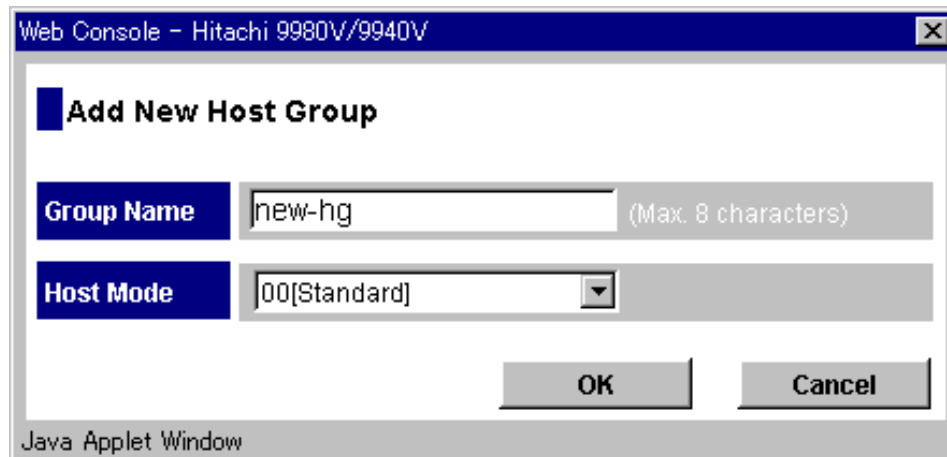


Figure 2.1 Setting the Host Mode

2.3.2 Configuring the 9900V Fibre-Channel Ports

You also need to configure the 9900V FC ports to define the fibre parameters (see Figure 2.2, Table 2.1, and Table 2.2). You will use the LUN Manager Remote Console software to configure the 9900V FC ports. For instructions on using LUN Manager, please refer to the *Hitachi Lightning 9900™ V Series LUN Manager and LUN Security User's Guide* (MK-92RD105).

Fibre topology. Figure 2.2 shows the LUN Manager panel used to define the port parameters, and Table 2.2 explains the fibre-parameter settings on this panel. You will select the appropriate settings for each 9900V FC port based on the device to which the port is connected. Determine the topology parameters supported by the device, and set your topology accordingly. The type of 9900V port is also important. **Note:** If you plan to connect different types of servers to the 9900V via the same fabric switch, you must use the **zoning** function of the fabric switch.

Port address. In fabric environments, the port addresses are assigned automatically by fabric switch port number and are not controlled by the 9900V port settings. In arbitrated loop environments, the port addresses are set by entering an AL-PA (arbitrated-loop physical address, or loop ID). Table 2.2 shows the available 9900V AL-PA values ranging from 01 to EF. Fibre-channel protocol uses the AL-PAs to communicate on the fibre-channel link, but the software driver of the platform host adapter translates the AL-PA value assigned to the 9900V port to a SCSI target ID (TID). See Appendix A for a description of the AL-PA-to-TID translation for HP-UX® systems.

Note on loop ID conflict: The HP® system assigns port addresses from lowest (01) to highest (EF). To avoid loop ID conflict, assign the port addresses from highest to lowest (i.e., starting at EF). The AL-PAs should be unique for each device on the loop to avoid conflicts. Do not use more than one port address with the same TID in same loop (e.g., addresses EF and CD both have TID 0, refer to Table 2.2).

Table 2.1 Fibre Parameter Settings for the 9900V

Fabric Parameter	Connection Parameter	Provides:
ON	FC-AL	FL-port (Fabric port)
ON	Point-to-Point	F-port (Fabric port)
OFF	FC-AL	NL-port (private arbitrated loop)
OFF	Point-to-Point	Not supported

Note: Please contact Hitachi Data Systems for detail information about port topology configurations supported by each host bus adapter/switch combination. Not all types of switches support F-port connection.

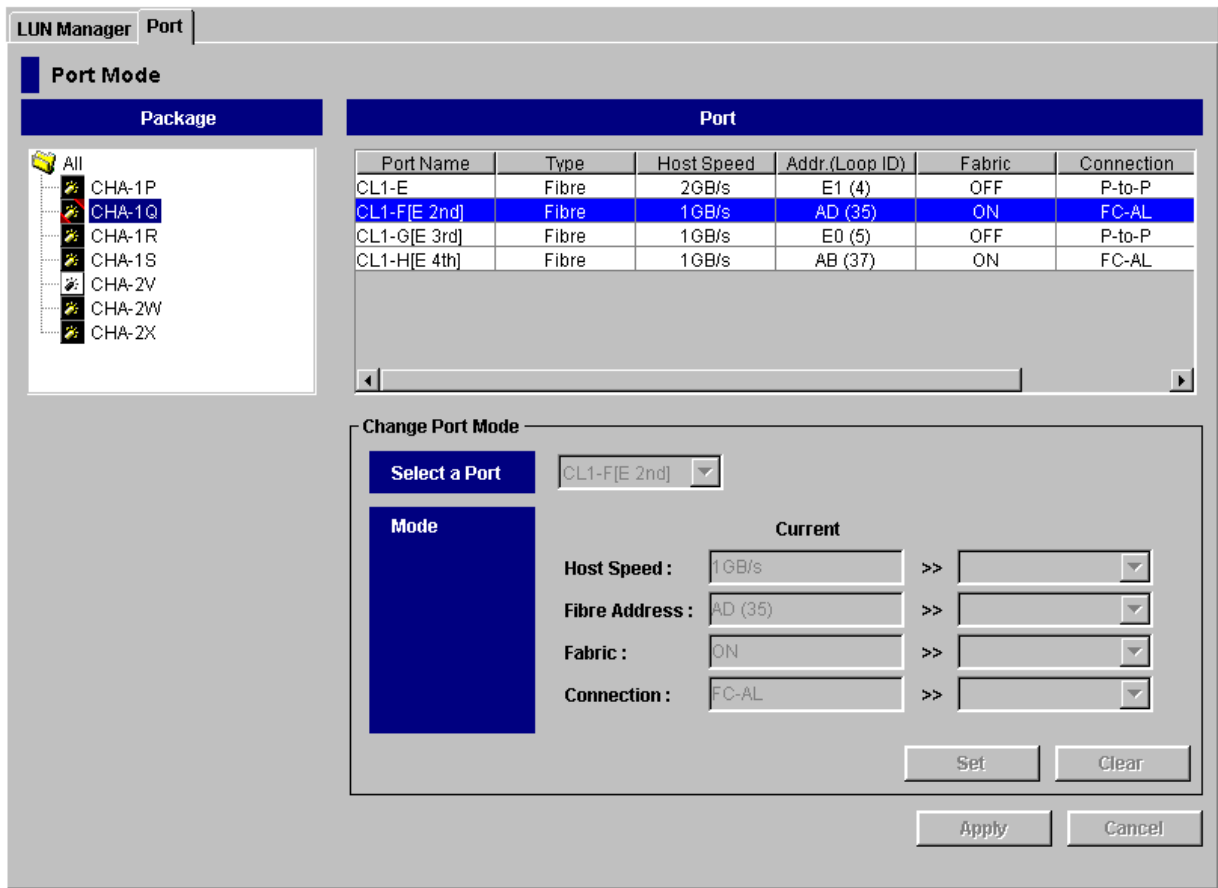


Figure 2.2 Setting the Fibre-Channel Port Parameters

Table 2.2 Available AL-PA Values

EF	CD	B2	98	72	55	3A	25
E8	CC	B1	97	71	54	39	23
E4	CB	AE	90	6E	53	36	1F
E2	CA	AD	8F	6D	52	35	1E
E1	C9	AC	88	6C	51	34	1D
E0	C7	AB	84	6B	4E	33	1B
DC	C6	AA	82	6A	4D	32	18
DA	C5	A9	81	69	4C	31	17
D9	C3	A7	80	67	4B	2E	10
D6	BC	A6	7C	66	4A	2D	0F
D5	BA	A5	7A	65	49	2C	08
D4	B9	A3	79	63	47	2B	04
D3	B6	9F	76	5C	46	2A	02
D2	B5	9E	75	5A	45	29	01
D1	B4	9D	74	59	43	27	
CE	B3	9B	73	56	3C	26	

2.3.3 Verifying the Host Fibre-Channel Adapter Installation

After configuring the fibre-channel ports on the 9900V subsystem, you need to verify that the host fibre-channel adapters are installed properly using the `ioscan -f` command (see Figure 2.3). Please verify that the underlined items are displayed as a result of `ioscan -f` command. If these items are not displayed, the host environment may not be installed properly. In this case, check the host adapter installation (hardware and driver installation) or the host configuration.

```
# ioscan -f
Class  I   H/W Path          Driver      S/W State H/W Type  Description
-----
bc      0                   root        CLAIMED   BUS_NEXUS
bc      1   8                 bc          CLAIMED   BUS_NEXUS  Pseudo Bus Converter
bc      2   8/0              bc          CLAIMED   BUS_NEXUS  Bus Converter
tty     0   8/0.0            mux2       CLAIMED   INTERFACE  MUX
ext_bus 0   8/4              c720       CLAIMED   INTERFACE  GSC add on Fast/Wide SCSI INTERFACE
target  0   8/4.5            tgt        CLAIMED   DEVICE
disk    0   8/4.5.0          sdisk      CLAIMED   DEVICE      SEGATE ST321S1W
target  1   8/4.7            tgt        CLAIMED   DEVICE
ctl     0   8/4.7.0          sct1      CLAIMED   DEVICE      Initiator
fc      0   8/12             fcT1      CLAIMED   INTERFACE  HP Fibre Channel Mass Storage Adapter
lan     1   8/12.5           fcT1_cntl CLAIMED   INTERFACE  HP Fibre Channel Mass Storage Cntl
fcp     0   8/12.8           fcp       CLAIMED   INTERFACE  FCP Protocol Adapter
ext_bus 2   8/12.8.0.255.0  fcpdev    CLAIMED   INTERFACE  FCP Device Interface
target  7   8/12.8.0.255.0.6  tgt       CLAIMED   DEVICE
target  8   8/12.8.0.255.0.8  tgt       CLAIMED   DEVICE
target  9   8/12.8.0.255.0.9  tgt       CLAIMED   DEVICE
#
```

Figure 2.3 Verifying Host Fibre-Channel Adapter Installation

2.3.4 Verifying System Diagnostics

Before connecting the 9900V subsystem to an HP® 9000 N4000 enterprise server system, verify the following parameter in the `/etc/rc.config.d/diagnostic` file:

- DIAGNOSTICS = 0

If DIAGNOSTICS = 1, then change the value to 0, and reboot the HP® server.

Note: Setting the DIAGNOSTICS parameter to zero (0) disables error logging for FC. If FC problems occur, you might need to re-enable the DIAGNOSTICS parameter.

2.4 Connecting the 9900V Subsystem to the HP® System

After you have configured the 9900V fibre ports and verified the host fibre-channel adapter installation, you are ready to connect the 9900V subsystem to the HP-UX® system. The 9900V subsystem comes with all hardware and cabling required for connection to the host system(s).

Note: If you want to set up the HP® system to boot from the 9900, please see Appendix B.

To connect the 9900V subsystem:

1. **Verify subsystem installation.** The Hitachi Data Systems representative that the status of the fibre ports and LDEVs is normal. The Hitachi Data Systems representative should also check the fibre device parameters to make sure that all 9900V LDEVs are unique for each host system.
2. **Shut down and power off the HP-UX® system.** The user should perform this activity. You must shut down and power off the HP-UX® system before connecting the 9900:
 - a) Shut down the HP® system (see Figure 2.4).
 - b) When shutdown is complete, power off the HP® display.
 - c) Power off all peripheral devices except for the 9900V subsystem.
 - d) Power off the HP® system. You are now ready to connect the 9900V subsystem.
3. **Connect the 9900V to the HP® system.** The Hitachi Data Systems representative installs the fibre-channel cables between the 9900V and the HP-UX® system. **Note:** The Hitachi Data Systems representative must use the 9900V Maintenance Manual during all installation activities. Follow all precautions and procedures in the Maintenance Manual, and always check all specifications to ensure proper installation and configuration.
4. **Power on the HP® system.** The user or Hitachi Data Systems representative can perform this activity. To power on the HP® system after connecting the 9900V subsystem:
 - a) Power on the HP® system display.
 - b) Power on all peripheral devices. The 9900V subsystem should already be on, and the 9900V fibre-channel ports should already be configured. If the ports are configured after the HP® system is powered on, you may need to restart the system in order to recognize the new devices.
 - c) Confirm the ready status of all devices.
 - d) Power on the HP® system. You are now ready to configure the new 9900V devices.

```
# cd
# shutdown -h now                               ← Shut down the HP® system.
:
System has halted
OK to turn off power or reset system             ← Power off the system.
UNLESS "WAIT for UPS to turn off power" message was printed above
```

Figure 2.4 Shutting Down and Powering Off the HP® System

Chapter 3 Configuring the New Devices

Configuration of the 9900V disk devices is performed by the user and requires root (superuser) access to the HP-UX® system. The host modes for the 9900V fibre ports must already be set, the 9900V fibre ports must already be configured, and the host adapter(s) must already be verified (see section 2.3). If any of these steps is performed after the HP® system is powered on, you must halt and restart the system before configuring the new devices.

The activities involved in 9900V device configuration are:

- Verifying new device recognition (see section 3.1),
- Verifying the device files and driver (see section 3.2),
- Partitioning the disk devices (see section 3.3),
- Creating the file systems for the new volumes (see section 3.4),
- Setting the device parameters for the disk devices (see section 3.5),
- Creating the mount directories (see section 3.6),
- Mounting and verifying the file systems (see section 3.7), and
- Setting and verifying the auto-mount parameters (see section 3.8).

AL-PA to SCSI TID mapping. For information on the fibre-channel AL-PA to SCSI TID mapping, please refer to Appendix A.

Booting from the 9900V. For information on configuring the HP-UX® 11.0 boot disk on the 9900V subsystem, please refer to Appendix B.

HP® System Administrator Manager (SAM). This chapter provides instructions for configuring the new devices using UNIX® commands. For information on using the HP® System Administrator Manager (SAM) instead of UNIX® commands to configure the 9900V SCSI disk devices, please refer to Appendix C.

Online device installation. For information on configuring newly installed 9900V devices without rebooting the HP® system, please refer to Appendix D.

Note on the term “SCSI disk”: The 9900V logical devices are defined to the host as SCSI disk devices, even though the interface is fibre-channel.

3.1 Verifying New Device Recognition

The first step in configuring the 9900V devices for HP-UX® operations is to verify that the HP® system recognizes the new devices on the 9900V subsystem. The devices must be installed and formatted and the fibre-channel ports defined before the host system is powered on. If the fibre ports are configured after the HP® system is powered on, the user must halt and restart the system to allow the system to recognize the new devices.

To verify that the HP® system recognizes the new 9900V devices:

1. Login to the HP® system as **root** as shown in Figure 3.1.
2. Display the device data using the **ioscan -f** command, and verify that the system recognizes the newly installed devices on the 9900V subsystem (see Figure 3.2). If desired, use the **-C disk** command option (**ioscan -fnC disk**) to limit the output to disk devices only.

Note: If UNKNOWN is displayed as the Class type, the HP® system may not be configured properly. Please refer to the HP® documentation or contact HP® technical support.

Note: If information for unused devices remains in the system, get the system administrator's permission to renew the device information. To renew the device information, delete the **/etc/ioconfig** and **/stand/ioconfig** files (**rm** command), reboot the server, and then issue the **ioinit -c** command. Now issue the **ioscan -f** command to recognize the logical devices again.

3. Make a blank table (see Table 3.1) for recording the 9900V device data. The table must have nine columns for the following data: bus number, bus instance number, disk number, H/W path, driver, device type, target ID, LUN, and device file name. You will need three more columns for entering the major and minor numbers later.
4. Enter the device data for each 9900V device (disk devices and raw/HRX devices) in your table, including the device file name. The device file name has the following structure: File name = cXtYdZ, where X = bus instance #, Y = target ID, Z = LUN. The "c" stands for controller, the "t" stands for target ID, and the "d" stands for device. The SCSI target IDs are hexadecimal (0 through F), and the LUN is decimal (0 through 7).
5. Verify that the SCSI TIDs correspond to the assigned port address for all connected ports (see mapping in Appendix A). If so, the logical devices are recognized properly. If not:
 - a) Check the AL-PA for each port using the LUN Manager software. If the same port address is set for multiple ports on the same loop (AL with HUB), all port addresses except one changed to another value, and the relationship between AL-PA and TID does not correspond to the mapping given in Appendix A. Set a different address for each port, reboot the server, and then verify new device recognition again.
 - b) If unused device information remains, the TID-to-AL-PA mapping will not correspond to the mapping given in Appendix A. Renew the device information (see step (2) for instructions), and then verify new device recognition again.

```

The system is ready.

GenericSysName [HP Release B.10.20] (see /etc/issue)
Console Login: root
Password:
Please wait...checking for disk quotas
(c)Copyright 1983-1995 Hewlett-Packard Co., All Rights Reserved.
:
#

```

Figure 3.1 Log In as Root

```

# ioscan -fn
Class      I  H/W Path      Driver      S/W State H/W Type  Description
=====
bc         0                root        CLAIMED   BUS_NEXUS
bc         1  8              bc          CLAIMED   BUS_NEXUS Bus Converter
fc         0  8/12           fcT1       CLAIMED   INTERFACE HP Fibre Channel Mass Storage
fcP        0  8/12.8         fcP        CLAIMED   INTERFACE FCP Protocol Adapter
ext_bus    2  8/12.8.0.255.0 fcPdev     CLAIMED   INTERFACE FCP Device Interface
target     7  8/12.8.0.255.0.6 tgt         CLAIMED   DEVICE
disk       3  8/12.8.8.255.0.6.0 sdisk      CLAIMED   DEVICE          HITACHI OPEN-9
                /dev/dsk/c2t6d0 /dev/rdisk/c2t6d0
disk       4  8/12.8.8.255.0.6.1 sdisk      CLAIMED   DEVICE          HITACHI OPEN-9
                /dev/dsk/c2t6d1 /dev/rdisk/c2t6d1
disk       5  8/12.8.8.255.0.8.0 sdisk      CLAIMED   DEVICE          HITACHI 3390*3B
                /dev/dsk/c2t8d0 /dev/rdisk/c2t8d0
:
#

```

This sample screen shows the following new 9900V devices recognized:

- HITACHI OPEN-9 device: bus number = 8/12, bus instance = 2, target ID = 6, LUN = 0, driver = sdisk.
- HITACHI OPEN-9 device: bus number = 8/12, bus instance = 2, target ID = 6, LUN = 1, driver = sdisk.
- HITACHI 3390-3B device: bus number = 8/12, bus instance = 2, target ID = 8, LUN = 0, driver = sdisk.

Figure 3.2 Verify New Device Recognition

Table 3.1 Device Data Table (Sample)

Bus No.	Instance (XX)	Disk No.	H/W Path	Driver	Device Type	TID (Y)	LUN (Z)	Device File	Major # for Char. Files	Major # for Block Files	Minor # 0xXX Y Z 00
8/12	02	3	8/12.8.8.255.0.6.0	sdisk	OPEN-9	6	0	c2t6d0			
8/12	02	4	8/12.8.8.255.0.6.1	sdisk	OPEN-9	6	1	c2t6d1			
8/12	02	5	8/12.8.8.255.0.8.0	sdisk	3390-3B	8	0	c2t8d0			

Note: This table shows the device data for the devices displayed in Figure 3.2.

3.2 Verifying the Device Files and Driver

The device files for all new devices (SCSI disk and raw/HRX) should be created automatically during system startup. Each device should have a block-type device file in the `/dev/dsk` directory and a character-type device file in the `/dev/rdsk` directory. The SCSI disk devices must have both device files. Raw/HRX devices only require the character-type device file.

Note: Some HP-compatible systems do not create the device files automatically. If the device files were not created automatically, follow the instructions in section 3.2.1 to create the device files manually.

To verify that the device files for the 9900V devices were successfully created:

1. Display the block-type device files in the `/dev/dsk` directory using the `ll` command (equivalent to `ls -l`) with the output piped to `more` (see Figure 3.3). Verify that there is one block-type device file for each 9900V device.
2. Use your completed device data table (refer to section 3.2.1 and Table 3.2) to verify that the block-type device file name for each device is correct.
3. Display the character-type device files in the `/dev/rdsk` directory using the `ll` command with the output piped to `more` (see Figure 3.4). Verify that there is one character-type device file for each 9900V device.
4. Use your completed device data table (refer to section 3.2.1 and Table 3.2) to verify that the character-type device file name for each device is correct.
5. After verifying the block-type and character-type device files, verify the HP-UX[®] driver for the 9900V subsystem using the `ioscan -fn` command (see Figure 3.5).

```
# ll /dev/dsk | more                               ← Check block-type files.
total 0
brw-r----- 1 bin  sys   28 0x000000 Oct  4 11:01 c0t0d0
brw-r----- 1 bin  sys   28 0x006000 Dec  6 15:08 c0t6d0
brw-r----- 1 bin  sys   28 0x006100 Dec  6 15:08 c0t6d1 ← Block-type device file.
      Bus instance # = 0, SCSI target ID = 6, LUN = 1 ↗
```

Figure 3.3 Verifying the Block-Type Device Files

```
# ll /dev/rdsk | more                               ← Check character-type files.
total 0
crw-r----- 1 bin  sys  177 0x000000 Oct  4 11:01 c0t0d0
crw-r----- 1 bin  sys  177 0x006000 Dec  6 15:08 c0t6d0
crw-r----- 1 bin  sys  177 0x006100 Dec  6 15:08 c0t6d1 ← Character-type device file.
      Bus instance # = 0, SCSI target ID = 6, LUN = 1 ↗
```

Figure 3.4 Verifying the Character-Type Device Files

```

# ioscan -fn
Class      I   H/W Path          Driver S/W State H/W Type  Description
=====
bc         0                               root   CLAIMED   BUS_NEXUS
bc         1   8                 bc     CLAIMED   BUS_NEXUS Bus Converter
fc         0   8/12              fcT1   CLAIMED   INTERFACE HP Fibre Channel Mass Storage
fcp        0   8/12.8            fcp    CLAIMED   INTERFACE FCP Protocol Adapter
ext_bus    2   8/12.8.0.255.0    fcpdev CLAIMED   INTERFACE FCP Device Interface
target     7   8/12.8.0.255.0.6  tgt    CLAIMED   DEVICE
disk       3   8/12.8.8.255.0.6.0 sdisk CLAIMED   DEVICE      HITACHI OPEN-9
                /dev/dsk/c2t6d0    /dev/rdisk/c2t6d0
disk       4   8/12.8.8.255.0.6.1 sdisk CLAIMED   DEVICE      HITACHI OPEN-9
                /dev/dsk/c2t6d1    /dev/rdisk/c2t6d1
disk       5   8/12.8.8.255.0.8.0 sdisk CLAIMED   DEVICE      HITACHI 3390*3B
                /dev/dsk/c2t8d0    /dev/rdisk/c2t8d0
:
#

```

Figure 3.5 Verifying the HP-UX® Driver

3.2.1 Creating the Device Files

If the device files were not created automatically when the HP® system was restarted, issue the `insf -e` command in the `/dev` directory (see Figure 3.6) to instruct the HP® system to create the device files. After executing this command, repeat the procedures in sections 3.1 and 3.2 to verify new device recognition and the device files and driver.

```
# cd /dev
# insf -e
insf: Installing special files for mux2 instance 0 address 8/0/0
      :           :           :           :
      :           :           :           :
#
```

Figure 3.6 Creating Device Files Automatically

If the device files for the new 9900V devices cannot be created automatically, you must create the device files manually using the `mknod` command as follows:

1. Get your Device Data table on which you recorded the data for the new 9900V devices (Table 3.2 in section 3.2.1). You should already have the following information for all new devices: bus number, bus instance number, disk number, driver, device type, target ID, and LUN.
2. If you have not already done so, construct the device file name for each device, and enter the device file names into your table.
File name = cXtYdZ, where X = bus instance #, Y = target ID, Z = LUN.
3. Construct the minor number for each device, and enter the minor numbers into your table. The minor number is constructed as follows:
0xXXYZ00, where XX = bus instance number, Y = SCSI target ID, and Z = LUN.
4. Display the driver information for the system using the `lsdev` command (see Figure 3.7).
5. Enter the major numbers for the device drivers into your table. You should now have all required device and driver information in your table (see Table 3.2).
6. Create the device files for all 9900V devices (SCSI disk and raw/HRX devices) using the `mknod` command (see Figure 3.8). Make sure to create the block-type device files in the `/dev/dsk` directory and the character-type device files in the `/dev/rdsk` directory.

Note: The character-type device file is **required** for volumes used as raw devices (e.g., 3390-3A/B/C). The block-type device file is not required for volumes used as raw devices.

Note: If you need to delete a device file, use the `rm -i` command.

```

# lsdev                                     ← Display driver information.
Character      Block      Driver      Class
:             :             :             :
188          31          sdisk       disk
  ⚡ Major # for character-type files = 188, major # for block-type files = 31
    ⚡ Driver for HITACHI devices = sdisk
#

```

Note: This sample screen shows the following system information for the “sdisk” device driver:
 The major number of driver **sdisk** for character-type files is **188**.
 The major number of driver **sdisk** for block-type files is **31**.

Figure 3.7 Displaying the Driver Information

Table 3.2 Completed Device Data Table (Sample)

Bus No.	Instance (XX)	Disk No.	H/W Path	Driver	Device Type	TID (Y)	LUN (Z)	Device File	Minor # 0xXYZ00	Major # for Char. Files	Major # for Block Files
8/12	02	3	8/12.8.8.255.0.6.0	sdisk	OPEN-9	6	0	c2t6d0	0x026000	188	31
8/12	02	4	8/12.8.8.255.0.6.1	sdisk	OPEN-9	6	1	c2t6d1	0x026100	188	31
8/12	02	5	8/12.8.8.255.0.8.0	sdisk	3390-3B	8	0	c2t8d0	0x028000	188	31

```

# cd /dev/dsk                               ← Go to /dev/dsk directory.
# mknod /dev/dsk/c2t6d0 b 31 0x026000      ← Create block-type file.
  ⚡ File name ⚡ b = block-type, 31 = major #, 0x026000 = minor #
:
# mknod /dev/dsk/c2t8d0 b 31 0x028000
  ⚡ File name ⚡ b = block-type, 31 = major #, 0x028000 = minor #

```

```

# cd /dev/rdisk                             ← Go to /dev/rdisk directory.
# mknod /dev/rdisk/c2t6d0 c 188 0x026000   ← Create character-type file.
  ⚡ File name ⚡ c = character-type, 177 = major #, 0x026000 = minor #
:
# mknod /dev/rdisk/c2t8d0 c 188 0x028000
  ⚡ File name ⚡ c = character-type, 188 = major #, 0x028000 = minor #

```

Figure 3.8 Creating the Block-Type and Character-Type Device Files Manually

3.3 Partitioning the Disk Devices

The HP-UX[®] system uses the Logical Volume Manager (LVM) to manage the disk devices on all peripheral storage devices, including the Lightning 9900™ V Series subsystem. Under LVM disk management, a volume group consisting of multiple disks is formed, and then the volume group is divided into logical partitions and managed as a logical volume. These procedures should be executed for all device files corresponding to the new 9900V SCSI disk devices.

WARNING: Do not partition the raw/HRX devices (e.g., 3390-3A/B/C, OPEN-x-HRXoto). These volumes are not managed by LVM and do not need any further configuration after their character-type device files have been created and verified.

To partition the 9900V SCSI disk devices for LVM operations, you need to:

- Create a physical volume for each new SCSI disk device (see section 3.3.1).
- Create new volume groups as desired (see section 3.3.2). If you need to increase the maximum volume groups (**maxvgs**) setting, please see section C.2 for instructions.
- Create a logical volume for each new SCSI disk device (see section 3.3.3).

This section provides general instructions and basic examples for partitioning the 9900V SCSI devices for LVM operations using UNIX[®] commands. These instructions do not explicitly cover all LVM configuration issues. For further information on LVM configuration, please refer to the appropriate user documentation, or contact HP[®] technical support.

Note: If desired, the HP[®] System Administrator Manager (SAM) can be used instead of UNIX[®] commands to configure the 9900V SCSI disk devices. See Appendix C for information on using System Administration Manager (SAM) to configure the 9900V devices for LVM operations.

3.3.1 Creating the Physical Volumes

The first step in partitioning the new devices is to create a physical volume for each new disk device. Once the physical volumes have been created, you will be able to assign these new physical volumes to new or existing volume groups for management by LVM.

Note: Do not create physical volumes for the raw/HRX devices (e.g., 3390-3A/B/C).

To create the physical volumes for the new 9900V disk devices:

1. Create the physical volume using the **pvcreate** command with the character-type device file as the argument (see Figure 3.9). Make sure to specify the **/dev/rdisk** directory for the character file. You can only create one physical volume at a time.

WARNING: Do not use the **-f** (force) option with the **pvcreate** command. This option creates a new physical volume forcibly and overwrites the existing volume.

2. Repeat step (1) for each new disk device on the 9900V subsystem.

```
# pvcreate /dev/rdisk/c2t6d0                                ← Create physical volume.
      ↖ Character-type file for disk device.
Physical volume "/dev/rdisk/c2t6d0" has been successfully created.
# pvcreate /dev/rdisk/c2t6d1
Physical volume "/dev/rdisk/c2t6d1" has been successfully created.
:
```

Figure 3.9 Creating Physical Volumes

3.3.2 Creating Volume Groups

After the physical volumes for the disk devices have been created, you can begin creating new volume groups for the new physical volumes as needed. If desired, you can also add any of the new physical volumes on the 9900V subsystem to existing volume groups using the **vgextend** command. The physical volumes, which make up one volume group, can be located in the same disk subsystem or in different disk subsystems.

Note: You may need to modify the HP® system kernel configuration (**maxvgs** setting) to allow more volume groups to be created. Please see section C.2 in Appendix C for instructions.

Note: Do not assign the raw/HRX devices (e.g., OPEN-x-HRXoto) to volume groups.

To create a volume group:

1. Display the existing volume groups using the **ls** command (see Figure 3.10).
2. Create the directory for the new volume group using the **mkdir** command (see Figure 3.11). Choose a name for the new volume group that is different than all other group names. Be careful not to use an existing volume group name.
Note: If you need to delete a directory, use the **rmdir** command (e.g., `rmdir /dev/vgnn`).
3. Verify the new directory using the **ls** command (see Figure 3.11).
4. Verify the minor numbers for existing group files using the **ll** command with the output piped to **grep** to display only the files containing "group" (see Figure 3.12).
5. Choose a minor number for the new group file in sequential order (i.e., when existing volume groups are vg00-vg05 and next group name is vg06, use minor number 06 for the vg06 group file). Be careful not to duplicate any minor numbers. Note that the minor numbers are hexadecimal (e.g., the tenth minor number is 0x0a0000, not 0x100000).
6. Create the group file for the new directory using the **mknod** command (see Figure 3.13). Make sure to specify the correct volume group name, major number, and minor number. The major number for all group files is **64**.
Note: If you need to delete a group file, use the **rm -r** command to delete the group file and the directory at the same time (e.g., `rm -r /dev/vgnn`), and start again at step (2).
7. Repeat steps (5) and (6) for each new volume group.
8. Create the volume group using the **vgcreate** command (see Figure 3.14).
To allocate more than one physical volume to the new volume group, add the other physical volumes separated by a space (e.g., `vgcreate /dev/vg06 /dev/dsk/c0t6d0 /dev/dsk/c0t6d1`).
For LUSE volumes with more than 17 OPEN-9 LDEVs or more than 7043 MB (OPEN-9*n-CVS), use the **-s** and **-e** physical extent (PE) parameters of **vgcreate** (see Figure 3.14). Table 1.1 lists the PE and maximum PE (MPE) parameters for the 9900V LUSE devices.
Note: If you need to delete a volume group, use the **vgremove** command (e.g., `vgremove /dev/vgnn`). If the **vgremove** command does not work because the volume group is not active, use the **vgexport** command (e.g., `vgexport /dev/vgnn`).
9. Verify that the volume group was created correctly using the **vgdisplay** command (see Figure 3.15). The **-v** option displays the detailed volume group information.

```
# ls /dev                                     ← Display existing volume group names.
vg00
:
vg05
#
```

Figure 3.10 Displaying the Existing Volume Group Names

```
# mkdir /dev/vg06                             ← Make directory for new volume group.
# ls /dev                                     ← Verify directory for new volume group.
vg00
:
vg06
#
```

Figure 3.11 Creating and Verifying a Directory for the New Volume Group

```
# ll /dev/vg* | grep group                    ← Display existing group files.
crw-rw-rw  1 root  root  64 0x000000 Nov 7 08:13 group
                                                    ↖ Minor number of existing group file = 00
:
#
```

Figure 3.12 Displaying the Minor Numbers for the Existing Group Files

```
# mknod /dev/vg06/group c 64 0x060000      ← Create new group file.
                                                    ↖ Group name = vg06, major number of group file = 64,
                                                    ↖ Minor number of new group file = 06
:
#
```

Figure 3.13 Creating the Group File for the New Volume Group

```
# vgcreate /dev/vg06 /dev/dsk/c2t6d0        ← Create new volume group.
                                                    ↖ Vol group name ↖ Device file name

Volume group "/dev/vg06" has been successfully created.
Volume group configuration for /dev/vg06 has been saved in /etc/lvmconf/vg06.cof.
:
# vgcreate -s 8 -e 15845 /dev/vg09 /dev/dsk/c2t7d0 ← Example for LUSE with n=18.
                                                    ↖ PE Size ↖ Max Physical Extent Size (MPE)
Volume group "/dev/vg09" has been successfully created.
Volume Group configuration for /dev/vg09 has been saved in /etc/lvmconf/vg09.cof
```

Figure 3.14 Creating the New Volume Group

```

# vgsdisplay /dev/vg06                                     ← Verify new volume group.
--- Volume groups ---
VG Name           /dev/vg06
VG Write Access   read/write
VG Status         available
Max LV            255
Cur LV           0
Open LV           0
Max PV            16
Cur PV           1
Act PV            1
Max PE per PV     1016                                     ← Verify MPE for LUSE devices.
VGDA              2
PE Size (Mbytes)  4                                       ← Verify PE for LUSE devices.
Total PE          586
Alloc PE          0
Free PE           586
Total PVG         0

```

Figure 3.15 Verifying the New Volume Group

Table 3.3 PE and MPE Parameters for LUSE Devices

Device Type	Physical Extent Size (PE)	Max Number of Physical Extents (MPE)
OPEN-3/9/E OPEN-3*n (n= 2 to 36) OPEN-3-CVS OPEN-3*n-CVS (n= 2 to 36)	default	default
OPEN-9*n	n = 2 to 17 n = 18	default 15845
OPEN-E*n	n = 2 to 9	default
OPEN-L*n	n=2 to 3	default
OPEN-9/E-CVS	default	default
OPEN-9/E*n-CVS (n = 2 to 36)	70-119731(MB) × N1	8
	119732- (MB) × N1	8
		N2

N1 = [Virtual LVI/LUN volume capacity (in MB)] × n

N2 = $\lceil N1 / PE \rceil$ ($\lceil \lceil$ means round up to next integer.)

Example: Volume capacity is 6000 MB for OPEN-9*22-CVS volume:

N1 = 6000 × 22 = 132000

N2 = $\lceil 132000/8 \rceil = 16500$

3.3.3 Creating the Logical Volumes

After the desired new volume groups have been created, you can begin creating the logical volumes for each new disk device on the 9900V subsystem.

Note: Do not create logical volumes for the raw/HRX devices (e.g., 3390-3A/B/C).

To create the logical volumes:

1. Create the logical volume using the **lvcreate -L** command, and specify the volume size and volume group for the new logical volume (see Figure 3.16). The HP® system assigns the logical volume numbers automatically (lv1, lv2, lv3, ...). Use the capacity values specified in Table 1.1 for the size parameter (OPEN-3 = 2344, OPEN-9 = 7004, OPEN-E = 13888, OPEN-L = 34756). To calculate **S1** for VLL, LUSE, and VLL LUSE volumes:

Use the **vgdisplay** command to display the physical extent size (**PE Size**) and usable number of physical extents (**Free PE**) for the volume (see Figure 3.17). Calculate the maximum size value (in MB) as follows: $S1 = (\text{PE Size}) \times (\text{Free PE})$

2. Verify that the logical volume was created correctly using the **lvdisplay** command (see Figure 3.18). If desired, you can wait until all logical volumes have been created and then verify all volumes at one time by using the ***** wildcard character with the **lvdisplay** command (e.g., **lvdisplay /dev/vg06/lvol***).
3. Repeat steps (1) and (2) for each logical volume to be created. You can only create one logical volume at a time, but you can verify more than one logical volume at a time.

Note: To delete a logical volume, use the **lvremove** command (e.g., **lvremove /dev/vg06/lvolx**). To increase the size of an existing logical volume, use the **lvextend** command (e.g., **lvextend -L size /dev/vg06/lvolx**). To decrease the size of an existing logical volume, use the **lvreduce** command (**lvreduce -L size /dev/vg06/lvolx**).

```
# lvcreate -L 2344 /dev/vg06                               ← Create new logical volume.
      ↖ Size of volume = 2344 MB (OPEN-3)
Logical volume "/dev/vg06/lvol1" has been successfully created with character device
"/dev/vg06/rlvol1".
Logical volume "/dev/vg06/lvol1" has been successfully extended.
Volume Group configuration for /dev/vg06 has been saved in /etc/lvmconf/vg06.cof.
```

Figure 3.16 Creating a Logical Volume

```

# vgdisk /dev/vg01

--- Volume groups ---
VG Name          /dev/vg01
VG Write Access  read/write
VG Status        available
Max LV           255
Cur LV          0
Open LV          0
Max PV           16
Cur PV          1
Act PV           1
Max PE per PV    1016
VGDA             2
PE Size (Mbytes) 4
Total PE         586
Alloc PE         0
Free PE          586
Total PVG        0

```

← Physical extent size.

← Number of physical extents.

This example shows the following information for /dev/vg01: physical extent size = 4, usable number of physical extents = 586. Therefore, maximum size value = $4 \times 586 = 2344$

Figure 3.17 Calculating the Volume Size for VLL, LUSE, and VLL LUSE Devices

```

# lvdisplay /dev/vg06/lvol1
--- Logical volume ---
LV Name          /dev/vg06/lvol1
VG Name          /dev/vg06
LV Permission    read/write
LV Status        available/syncd
Mirror copies    0
Consistency Recovery MWC
Schedule         parallel
LV Size (Mbytes) 2344      (7040 for OPEN-9)
Current LE       586      (1760 for OPEN-9)
Allocated PE     586      (1760 for OPEN-9)
Stripes          0
Stripe Size (Kbytes) 0
Bad block        on
Allocation       strict

```

← Verify new logical volume.

← $2344 = 586 \times 4 = \text{OPEN-3}$

← LE = logical extent

← PE = physical extent

Figure 3.18 Verifying a Logical Volume

3.4 Creating the File Systems

Once the logical volumes have been created, you can create the file system for each new logical volume on the 9900V subsystem. The default file system types are:

- HP-UX® OS version 10.20 = hfs or vxfs, depending on entry in `/etc/defaults/fs` file.
- HP-UX® OS version 11.0 or 11i = vxfs

Note: Do not create file systems for the raw/HRX devices (e.g., 3390-3A/B/C, OPEN-x-HRXoto).

To create the file system on a new logical volume:

1. Create the file system using the `newfs` command with the logical volume as the argument. Figure 3.19 shows an example of creating the file system for an OPEN-3 volume. Figure 3.20 shows an example of creating the file system for an OPEN-9 volume. Figure 3.21 shows examples of specifying the file system type (vxfs or hfs) with the `newfs` command.
2. Repeat step (1) for each new logical volume on the 9900V subsystem.

```
# newfs /dev/vg06/rlvol1                                ← Create file system.
newfs: /etc/default/fs is used for determining the file system type
mkfs (hfs): Warning -272 sector(s) in the last cylinder are not allocated.
mkfs (hfs): /dev/vg06/rlvol1 - 2400256 sectors in 3847 cylinders of 16 tracks,
2457.9MB in 241 cyl groups (16 c/g, 10.22Mb/g, 1600 i/g)
Super block backups (for fsck -b) at:
    16, 10040, 20064, 30038, 40112, 50136, 60160, 70184, 80208, 90232,
    ...
2396176
#
```

Figure 3.19 Creating a File System (default file system, OPEN-3 shown)

```
# newfs /dev/vg06/rlvol1                                ← Create file system.
newfs: / etc/default/fs is used for determining the file system type
mkfs (hfs): ...
:
7188496, 7198520, 7208544
#
```

Figure 3.20 Creating a File System (default file system, OPEN-9 shown)

```
# newfs -F vxfs /dev/vg06/rlvol1                        ← Specify file system type.
:
# newfs -F hfs /dev/vg06/rlvol2
```

Figure 3.21 Specifying the File System Type

3.5 Setting the Device Parameters

When the device files are created, the HP-UX[®] system sets the IO time-out parameter to its default value (20 seconds) and the queue depth parameter to its default value (2 or 8). You need to change these values for all new disk devices on the 9900V subsystem.

Note: Do not change the device parameters for the raw/HRX devices (e.g., 3390-3A/B/C).

3.5.1 Setting the IO Time-Out Parameter

The IO time-out parameter for the disk devices on the 9900V subsystem must be set to **60 seconds**. To change the IO time-out parameter:

1. Verify the current IO time-out value using the **pvdisplay** command (see Figure 3.22).
2. Change the IO time-out value to 60 using the **pvchange -t** command (see Figure 3.23).
3. Verify that the new IO time-out value is 60 seconds (use **pvdisplay**) (see Figure 3.24).
4. Repeat steps (1) through (3) for each new disk device on the 9900V subsystem.

```
# pvdisplay /dev/dsk/c0t6d0          ← Checking current IO time-out value.
--- Physical volumes ---
PV Name                /dev/dsk/c0t6d0
VG Name                /dev/vg06
PV Status              available
Allocatable            yes
VGDA                   2
Cur LV                1
PE Size (Mbytes)      4
Total PE               586          ← This value is 586 for OPEN-3 and 1760 for OPEN-9.
Free PE                0
Allocated PE           586          ← This value is 586 for OPEN-3 and 1760 for OPEN-9.
Stale PE               0
IO Timeout (Seconds)  default      ← Default IO time-out value.
```

Figure 3.22 Checking the Current IO Time-Out Value

```
# pvchange -t 60 /dev/dsk/c0t6d0    ← Change IO time-out value.
Physical volume "/dev/dsk/c0t6d0" has been successfully changed.
Volume Group configuration for /dev/vg06 has been saved in /etc/lvmconf/vg06.cof
```

Figure 3.23 Changing the IO Time-Out Value

```
# pvdisplay /dev/dsk/c0t6d0          ← Verify new IO time-out value.
--- Physical volumes ---
PV Name                /dev/dsk/c0t6d0
VG Name                /dev/vg06
PV Status              available
:
Stale PE               0
IO Timeout (Seconds)  60          ← New IO time-out value.
```

Figure 3.24 Verifying the New IO Time-Out Value

3.5.2 Setting the Queue Depth Parameter

The HP-UX[®] system automatically sets the queue depth to the default value, which may be either 2 or 8 depending on the installed HP[®] options and drivers. The queue depth for the 9900V disk devices must be set as specified in Table 3.4. The `scsictl` command allows you to view and change the queue depth parameter for each device. However, this command only allows you to change the queue depth for one volume at a time, and the queue depth will be reset to the default value the next time the system is restarted. Therefore, you also need to create and register a start-up script (see section 3.5.3) to set the queue depth for the 9900V disk devices each time the system is restarted.

Note: Do not set the queue depth for the raw/HRX devices (e.g., 3390-3A/B/C).

Table 3.4 Queue Depth Requirements for the 9900V Devices

Parameter	Required Value
Queue depth per LU	≤ 8
Queue depth per port	≤ 1024

To set the queue depth parameter for the 9900V devices:

1. If you cannot shut down and restart the system at this time, use the `scsictl` command to set the queue depth for each 9900V device (see Figure 3.25). The `scsictl` commands to set queue depth should be registered as HP-UX[®] start-up script for future reboot.
2. Check the `/sbin/init.d` and `/sbin/rc1.d` directories to see if the script name `queue` is already used (link name `Sxxxqueue` or `Kxxxqueue`) (see Figure 3.26). Choose a unique name for the start-up script as follows:
 - a) If there is no script named `queue` and no link file named `Sxxxqueue` or `Kxxxqueue`, use the name `queue` for the new script, and go to step (3).
 - b) If the script `queue` and the link file `Sxxxqueue` or `Kxxxqueue` already exist and the script is already used for setting the queue depth for other previously installed 9900V subsystems, check the script file to make sure that the queue depth is set to the desired number (per Table 3.4), and add a line for each new 9900V disk device. If necessary, restart the HP[®] system to set the queue depth for the new volumes.
 - c) If the script `queue` and the link file `Sxxxqueue` or `Kxxxqueue` already exist and the script is not used for setting the queue depth for the 9900, use some other name for the new queue-depth script for the 9900V (e.g., `hitachi_q`), and go to step (3).

Note: If the link `Sxxxqueue` and/or `Kxxxqueue` already exists but there is no script file named `queue`, delete the link file(s), use the name `queue` for the new script, and go to step (3).
3. Choose a unique three-digit number for the link name. This number cannot be used in any other links. The link name is derived as follows: **S** stands for “start up script,” **K** stands for “kill script,” the three-digit number is unique to each link, and the script file name follows the three-digit number (e.g., `S890queue` or `S890hitachi_q`).

4. Create and register the new start-up script for the 9900. See section 3.5.3 for an example of the start-up script.
5. Shut down and restart the HP® system, so that the new start-up script sets the queue depth for the 9900V disk devices to the specified value (per Table 3.4).
6. After restarting the system or setting the queue depths manually, verify the queue depth for each 9900V disk device using the `scsictl` command (see Figure 3.27).

```
# /usr/sbin/scsictl -m queue_depth=8 -a /dev/rdisk/c0t6d0 ←Set queue depth per Table 3.4.
                                ↩ Character-type device file
# /usr/sbin/scsictl -m queue_depth=8 -a /dev/rdisk/c0t6d1
# /usr/sbin/scsictl -m queue_depth=8 -a /dev/rdisk/c0t6d2
# /usr/sbin/scsictl -m queue_depth=8 -a /dev/rdisk/c0t6d3
:
:
# /usr/sbin/scsictl -m queue_depth=8 -a /dev/rdisk/c0t8d0
```

Figure 3.25 Changing the Queue Depth for the 9900V Disk Devices

```
# ls /sbin/init.d                                ← Check for QUEUE.
OspfMib      clean_ex  dfs      hpether  names    nis.server savecore  swconfig
SnmpHpunix  clean_tmps diagnostic iforls   ncs      pd        sendmail  syncer
:
clean_adm  ddfa      hparray  mrouted  nis.client rhod      swcluster xntpd
# ls /sbin/rc1.d                                ← Check for SxxxQUEUE and KxxxQUEUE.
K230audio      K340xntpd  K420dfs      K475rarpd      K630named      S420set_date
K240auditing   K356vjed  K430dce      K480rdpd      K660net        S440savecore
K250envd       K358egcd  K435ospfMib  K490gated      K700netttl     S500swap_start
K258diagnostic K360kks   K435SnmpHpunix K500inetd      K770ptydaemon  S520syncer
K270cron       K370vt    K435SnmpMib2 K510mrouted    K780syslogd
K278pd         K380xfs   K440SnmpMaster K570nfs.client K900swagentd
K280lp         K390rbootd K450ddfa     K580nis.client S100localmount
K290hparray    K400iforls K460sendmail K590nis.server S320hostname
K300acct       K410ncls  K470rwhod    K600nfs.core   S400set_prvgrp
```

Figure 3.26 Checking the Existing Script Names and Link Names

```
# /usr/sbin/scsictl -a /dev/rdisk/c0t6d0      ← Verify new queue depth.
                                ↩ Character-type device file
immediate_report = 0; queue_depth = 8        ← Queue depth = 8.
:
:
# /usr/sbin/scsictl -a /dev/rdisk/c0t8d0      ← Verify new queue depth.
immediate_report = 0; queue_depth = 8        ← Queue depth = 8.
```

Figure 3.27 Verifying the Queue Depth for the 9900V Disk Devices

3.5.3 Creating and Registering the Queue Depth Start-Up Script

The `queue` (or `hitachi_q`) start-up script sets the queue depth to 2 for all new volumes (SCSI disk devices) on the 9900V subsystem each time the HP® system is restarted. If the `queue` script already exists for an older (previously installed) 9900V subsystem, check the script file to verify that the queue depth value is set to the desired value (see Table 3.4), and add a line for each new 9900V volume (see Figure 3.28). If the script does not already exist, you must create and register the script as shown in Figure 3.28. You can use the UNIX® `vi` editor or any other similar text editor to create/edit the script.

Note: For questions on creating and registering the start-up script, please refer to the UNIX® and/or HP® user documentation, or ask your Hitachi Data Systems representative for assistance.

```
# cp /sbin/init.d/template /sbin/init.d/queue      ← Copy start-up script template file.
# vi /sbin/init.d/queue                          ← Edit script file as shown below.
-----file(/sbin/init.d/queue)-----
# !/sbin/sh
#
# @(#) $Revision: 78.1 $
#
# NOTE:      This script is not configurable!  Any changes made to this
#            script will be overwritten when you upgrade to the next
#            release of HP-UX.
#
# WARNING:   Changing this script in any way may lead to a system that
#            is unbootable.  Do not modify this script.
#
# <Insert comment about your script here>
#
# Allowed exit values:
#   0 = success; causes "OK" to show up in checklist.
#   1 = failure; causes "FAIL" to show up in checklist.
#   2 = skip; causes "N/A" to show up in the checklist.
#       Use this value if execution of this script is overridden
#       by the use of a control variable, or if this script is not
#       appropriate to execute for some other reason.
#   3 = reboot; causes the system to be rebooted after execution.
# Input and output:
#   stdin is redirected from /dev/null
#   stdout and stderr are redirected to the /etc/rc.log file
#   during checklist mode, or to the console in raw mode.
#
PATH=/usr/sbin:/usr/bin:/sbin
export PATH
#
# NOTE: If your script executes in run state 0 or state 1, then /usr
#       might not be available.  Do not attempt to access commands or
#       files in /usr unless your script executes in run state 2 or
#       greater.  Other file systems typically not mounted until run
#       state 2 include /var and /opt.
#
rval=0
#
# Check the exit value of a command run by this script.  If non-zero,
# the exit code is echoed to the log file and the return value of this
# script is set to indicate failure.
```

Figure 3.28 Example of Start-Up Script with Changes for 9900V Devices (continues on following pages)

```

set_return() {
    x=$?
    if [ $x -ne 0 ]; then
        echo "EXIT CODE: $x"
        rval=1 # script FAILED
    fi
}
# Kill the named process(es).
# $1=<search pattern for your process>

killproc() {
    pid=`ps -el | awk '( )$NF ~ /'"$1"/' && ($4 !=mypid) && ($5 !=
mypid) ){ print $4 }' mypid=$$ `
    if [ "X$pid" != "X" ]; then
        if kill "$pid"; then
            echo "$1 stopped"
        else
            rval=1
            echo "Unable to stop $1"
        fi
    fi
}

case $1 in
'start_msg')
    # Emit a _short_ message relating to running this script with
    # the "start" argument; this message appears as part of the
    # checklist.
    echo "Setting the queue value"
    ;;
'stop_msg')
    # Emit a _short_ message relating to running this script with
    # the "stop" argument; this message appears as part of the
    # checklist.
    echo "Stopping the <specific> subsystem"
    ;;
'start')
    # source the system configuration variables
    if [ -f /etc/rc.config ] ; then
        . /etc/rc.config
    else
        echo "ERROR: /etc/rc.config defaults file MISSING"
    fi

    # Check to see if this script is allowed to run...
    if [ "$CONTROL_VARIABLE" != 1 ]; then
        rval=2
    else

        # Execute the commands to stop your subsystem
        :
    fi

    /usr/sbin/scsictl -m queue_depth=8 /dev/rdisk/c0t6d0
    /usr/sbin/scsictl -m queue_depth=8 /dev/rdisk/c0t6d1
    /usr/sbin/scsictl -m queue_depth=8 /dev/rdisk/c0t8d0
    :
    ;;
'stop')

```

← *Edit text here.*

```

# source the system configuration variables
if [ -f /etc/rc.config ] ; then
    . /etc/rc.config
else
    echo "ERROR: /etc/rc.config defaults file MISSING"
fi

# Check to see if this script is allowed to run...
if [ "$CONTROL_VARIABLE" != 1 ]; then
    rval=2
else

# Execute the commands to stop your subsystem
:
fi

```

← *Delete these lines.*

```

    /usr/sbin/scsictl -m queue_depth=8 /dev/rdisk/c0t6d0
    /usr/sbin/scsictl -m queue_depth=8 /dev/rdisk/c0t6d1
    /usr/sbin/scsictl -m queue_depth=8 /dev/rdisk/c0t8d0
    :
    ;;
'stop')

```

← *Add one line for each
new disk device.*

Figure 3.28 Example of Start-Up Script with Changes for 9900V Devices (continued)

```

# source the system configuration variables
if [ -f /etc/rc.config ] ; then
    . /etc/rc.config
else
    echo "ERROR: /etc/rc.config defaults file MISSING"
fi

# Check to see if this script is allowed to run...
if [ "$CONTROL_VARIABLE" != 1 ]; then
    rval=2
else
    :
# Execute the commands to stop your subsystem

fi
;;
*)
    echo "usage: $0 {start|stop|start_msg|stop_msg}"
    rval=1
    ;;
esac
exit $rval

-----end of file(/sbin/init.d/queue)-----

# ls /sbin/rc1.d                                  ← Check link names.
K230audio      K340xntpd    K420dfs       K475rarpd    K630named     S420set_date
K240auditing   K356vjed    K430dce       K480rdpd     K660net       S440savecore
K250envd       K358egcd    K435ospfMib   K490gated    K700netttl    S500swap_start
K258diagnostic K360kks     K435SnmpHpunix K500inetd    K770ptydaemon S520syncer
K270cron       K370vt      K435SnmpMib2  K510mrouted  K780syslogd
K278pd         K380xfs     K440SnmpMaster K570nfs.client K900swagentd
K280lp         K390rbootd  K450ddfa      K580nis.client S100localmount
K290hparray    K400iforls  K460sendmail  K590nis.server S320hostname
K300acct       K410ncs     K470rwhod     K600nfs.core  S400set_prvgrp

# ln -s /sbin/init.d/queue /sbin/rc1.d/S890queue          ← Create link file.
                                                                ↖ Make sure this file name does not already exist.

```

Figure 3.28 Example of Start-Up Script with Changes for 9900V Devices (continued)

3.6 Creating the Mount Directories

After the file systems have been created and the device parameters have been set, the next step in configuring the new 9900V volumes is to create the mount directory for each volume. Make sure to choose a unique name for each mount directory that identifies the logical volume.

To create the mount directories:

1. Create the mount directory using the **mkdir** command with the new mount directory name as the argument (see Figure 3.29).

Note: If you need to delete a mount directory, use the **rmdir** command.

2. Verify the new mount directory using the **ls -x** command (see Figure 3.29).
3. Repeat steps (1) and (2) for each new device on the 9900V subsystem.

```
# mkdir /9900-LU00                                ← Create new mount directory.
# ls -x                                           ← Verify new mount directory.
9900-LU00  bin      dev      device   etc      export
floppy    home     hstsboof kadb     kernel  lib
#
```

Figure 3.29 Creating and Verifying a Mount Directory

3.7 Mounting and Verifying the File Systems

After the mount directories have been created, you can mount the file system for each new logical volume and then verify the file systems.

To mount and verify the file systems:

1. Use the **mount** command to mount the file system for the volume (see Figure 3.30).
Note: If you need to unmount a file system, use **umount** (e.g., `umount /9900-LU00`).
2. Repeat step (1) for each new logical volume on the 9900V subsystem.
3. Verify that the file systems are correct using the **bdf** command (see Figure 3.31). Make sure that the capacity (listed under **Kbytes**) is correct for each device.
4. As a final verification, perform some basic UNIX® operations (e.g., file creation, copying, and deletion) on each logical device to make sure that the new devices on the 9900V subsystem are fully operational (see Figure 3.32).

```
# mount /dev/vg06/lvol1 /9900-LU00 ← Mount file system.
      ↖ Block-type lvol name ↖ Mount directory name
#
```

Figure 3.30 Mounting a File System

```
# bdf ← Verify file systems.
Filesystem      Kbytes   used   avail  %used  Mounted on
/dev/vg00/lvol1  59797   59364     0   100%  /
:
/dev/vg06/lvol1 2348177     9 2113350    0%  /9900-LU00 ← OPEN-3
/dev/vg07/lvol1 2348177     9 2113350    0%  /9900-LU01 ← OPEN-3
/dev/vg08/lvol1 7052764     9 6347478    0%  /9900-LU02 ← OPEN-9
```

Figure 3.31 Verifying the File Systems

```
# mount /dev/vg06/lvol1 /9900-LU00 ← Mount LUN.
# cd /9900-LU00 ← Go to LUN mount directory.
# cp /bin/vi /9900-LU00/vi.back1 ← Copy any file to LUN.
# ll ← Verify file copy.
drwxr-xr-t  2 root    root      8192 Mar 15 11:35 lost+found
-rwxr-xr-x  1 root    sys       217088 Mar 15 11:41 vi.back1
# cp vi.back1 vi.back2 ← Copy file again.
# ll ← Verify second file copy.
drwxr-xr-t  2 root    root      8192 Mar 15 11:35 lost+found
-rwxr-xr-x  1 root    sys       217088 Mar 15 11:41 vi.back1
-rwxr-xr-t  1 root    sys       217088 Mar 15 11:52 vi.back2
# rm vi.back1 ← Delete first test file.
# rm vi.back2 ← Delete second test file.
```

Figure 3.32 Final Verification of the File System for One Volume

3.8 Setting and Verifying the Auto-Mount Parameters

The final step in configuring the 9900V volumes for LVM operations is to set up and verify the auto-mount parameters for each new volume. The `/etc/fstab` file contains the auto-mount parameters for the logical volumes. If you do not plan to auto-mount the 9900V devices, you can skip this section.

To set and verify the auto-mount parameters:

1. Edit the `/etc/fstab` file to add a line for each new volume (SCSI disk device) on the 9900V subsystem (see Figure 3.33). Table 3.5 shows the auto-mount parameters.
2. Reboot the HP® system after you are finished editing the `/etc/fstab` file. If you cannot reboot at this time, issue the `mount -a` command.
3. Verify the device file systems again using the `bdf` command (refer to Figure 3.31).

```
# cp -ip /etc/fstab /etc/fstab.standard          ← Make backup before editing.
# vi /etc/fstab                                  ← Edit the file (vi shown).
/dev/vg00/lvol1 /          hfs    rw      0      1      # root
/dev/vg00/lvol2 swap    ignore sw    0      0      # primary swap
:
/dev/vg06/lvol1 /9900-LU00 hfs    defaults 0      2      # 9900-LU00
/dev/vg06/lvol2 /9900-LU01 vxfs   defaults 0      2      # 9900-LU01
    ①          ②          ③          ④          ⑤      ⑥      ⑦      ← See Table 3.5.
```

Figure 3.33 Setting the Auto-Mount Parameters

Table 3.5 Auto-Mount Parameters

Parameter #	Name	Enter:
①	Device to mount	Block-type device file name
②	Mount point	Mount directory name
③	File system	Type of file system (e.g., hfs, vxfs)
④	Mount options	Usually "defaults"
⑤	Enhance	"0"
⑥	File system check (fsck pass)	Order for performing file system checks
⑦	Comment	Any comment statement

Chapter 4 Failover and SNMP Configuration

The 9900V subsystem supports industry-standard products and functions which provide host and/or application failover, I/O path failover, and logical volume management (LVM). For the HP-UX[®] environment, the 9900V subsystem currently supports the following products and functions (please contact your Hitachi Data Systems representative for the latest information):

- HP[®] Multi-Computer/ServiceGuard (MC/ServiceGuard) software for application failover.
- Hitachi Dynamic Link Manager software product, and alternate link for I/O path failover (included in the HP-UX[®] OS).
- Logical volume management (included in the HP-UX[®] OS).

The 9900V subsystem also supports the industry-standard simple network management protocol (SNMP) for remote subsystem management from the UNIX[®]/PC server host. SNMP is used to transport management information between the 9900V subsystem and the SNMP manager on the host. The SNMP agent for the 9900V subsystem sends status information to the host(s) when requested by the host or when a significant event occurs.

Note: The user is responsible for configuring the failover and SNMP management software on the UNIX[®]/PC server host. For assistance with failover and/or SNMP configuration on the host, please refer to the user documentation, or contact the vendor's technical support.

4.1 Application Failover

The 9900V subsystem supports the MC/ServiceGuard application failover feature of the HP-UX[®] operating system. The MC/ServiceGuard software is sold separately. Please contact HP[®] for the latest information on the MC/ServiceGuard product.

After 9900V device configuration is complete, make sure to configure the MC/ServiceGuard software on the host server(s) as needed to recognize the new devices on the 9900V subsystem. For assistance with MC/ServiceGuard operations, please refer to the user documentation, or contact HP[®] technical support.

4.2 I/O Path Failover

The 9900V subsystem supports the Hitachi Dynamic Link Manager path failover product as well as the alternate link path failover function for the HP-UX[®] operating system. After 9900V device configuration is complete, make sure to configure alternate links to the 9900V devices as needed using the **vgextend** command.

For assistance with alternate link operations, please refer to the HP-UX[®] user documentation (UNIX[®] man pages), or contact HP[®] technical support. For assistance with Hitachi Dynamic Link Manager or specific configuration issues related to the 9900V subsystem, please refer to the *Hitachi Freedom Storage™ Dynamic Link Manager User's Guide* (MK-92DLM112), or contact your Hitachi Data Systems representative.

4.3 SNMP Remote Subsystem Management

SNMP is a part of the TCP/IP protocol suite that supports maintenance functions for storage and communication devices. The 9900V subsystem utilizes SNMP to transfer status and management commands to the UNIX®/PC server host via the 9900V SVP (see Figure 4.1). When the SNMP manager requests status information or when a service information message (SIM) occurs, the SNMP agent on the 9900V SVP notifies the SNMP manager on the UNIX®/PC server host. Notification of 9900V error conditions is made in real time, providing UNIX® and PC server users with the same level of monitoring and support available to S/390® mainframe users. The SIM reporting via SNMP enables the user to monitor the 9900V subsystem from the UNIX®/PC server host.

When a SIM occurs, the 9900V SNMP agent initiates trap operations, which alert the SNMP manager of the SIM condition. The SNMP manager receives the SIM traps from the SNMP agent, and can request information from the SNMP agent at any time.

Note: The user is responsible for configuring the SNMP manager on the UNIX®/PC server host. For assistance with SNMP manager configuration on the UNIX®/PC server host, please refer to the user documentation, or contact the vendor's technical support.

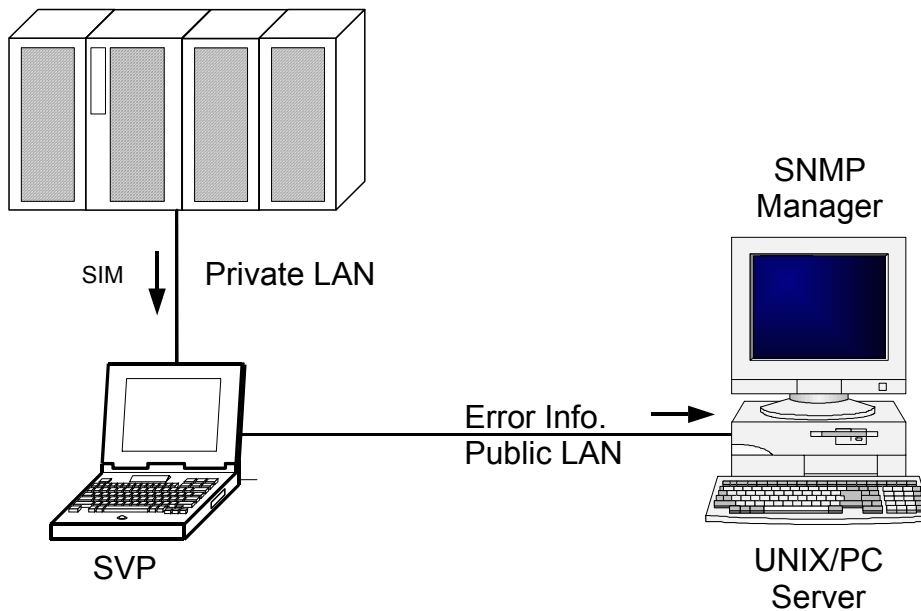


Figure 4.1 9900V SNMP Environment

Chapter 5 Troubleshooting

5.1 Troubleshooting

The Hitachi Lightning 9900™ V Series disk array subsystem provides continuous data availability. For troubleshooting information for the 9900V subsystem, please refer to the *Hitachi Lightning 9900™ V Series User and Reference Guide (MK-92RD100)*.

Table 5.1 lists potential error conditions during 9900V HP-UX® installation and configuration and provides instructions for resolving each condition. If you are unable to resolve an error condition, please consult your Hitachi Data Systems representative, or call the Hitachi Data Systems Support Center for assistance.

Table 5.1 Troubleshooting

Error Condition	Recommended Action
The logical devices are not recognized by the system.	Make sure that the READY indicator lights on the 9900V subsystem are ON. Make sure that the fibre-channel cables are correctly installed and firmly connected.
A physical volume cannot be created (PVCREATE command).	Make sure that the 9900V devices are properly formatted. Make sure that the character-type device file exists. Make sure that the correct character-type device file name is used with pvcreate .
A volume group cannot be created (VGCREATE command).	Make sure that the directory for the new volume group exists. Make sure that the control file exists. Make sure that the correct major # (64) and minor # are used with mknod . Make sure that the block-type file exists and is entered correctly with vgcreate . Make sure that the physical volume is not already allocated to another volume group.
A logical volume cannot be created (LVCREATE command).	Make sure that the specified capacity is not greater than 4096 MB. Make sure that the capacity of the volume group is not less than the capacity of the partitioned logical volume.
File system cannot be created (newfs).	Make sure that the character-type device file is entered correctly with newfs .
The file system is not mounted after rebooting.	Make sure that the system was restarted properly. Make sure that the auto-mount information in the /etc/fstab file is correct.
The HP® system does not reboot properly after hard shutdown.	If the HP® system is powered off without executing the shutdown process, wait three minutes before restarting the HP® system. This allows the 9900's internal time-out process to purge all queued commands so that the 9900V is available (not busy) during system startup. If the HP® system is restarted too soon, the 9900V will continue trying to process the queued commands, and the HP® system will not reboot successfully.

5.2 Calling the Hitachi Data Systems Support Center

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including the circumstances surrounding the error or failure and the exact content of any error messages displayed and/or logged at the host. Please note the reference codes and severity levels of the recent 9900V SIMs.

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
San Diego, California, USA
1-800-348-4357
- Hitachi Data Systems Europe
Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
North Ryde, Australia
011-61-2-9325-3300

Appendix A SCSI TID Map for Fibre-Channel Adapters

When an arbitrated loop (AL) is established or re-established, the port addresses are assigned automatically to prevent duplicate TIDs. With the SCSI over fibre-channel protocol (FCP), there is no longer a need for target IDs in the traditional sense. SCSI is a bus-oriented protocol requiring each device to have a unique address since all commands go to all devices. For fibre channel, the AL-PA is used instead of the TID to direct packets to the desired destination. Unlike traditional SCSI, once control of the loop is acquired, a point-to-point connection is established from initiator to target. To enable transparent use of FCP, the HP-UX[®] system “maps” a TID to each AL-PA.

The host maps SCSI protocol to fibre-channel protocol and detects and accesses fibre-connected devices using device files (`/dev/dsk/c*t*d*` and `/dev/rdisk/c*t*d*`) in the same way as for SCSI-connected devices. The device files for fibre-connected devices are configured in a different way than SCSI-connected devices, because fibre supports 126 addresses per path while SCSI supports 16 TIDs per path.

Table A.1 identifies the fixed mappings between the TID values assigned by the HP-UX[®] system and the FC native addresses (AL_PA/SEL_ID) for FC adapters. For each device file (`/dev/dsk/c*t*d*`), the `c` value is the adapter number, and the `t` value is the target ID. The `c` value depends on the server configuration; a different value is assigned per each column of Table A.1.

Note: The mapping defined in Table A.1 cannot be guaranteed under the following conditions:

- When 9900V devices and other types of devices are connected in the same loop,
- When information for unused devices remains in server system, or
- When multiple ports participate in the same arbitrated loop.

Table A.1 AL-PA to SCSI TID Mapping (t value) for HP-UX® Systems

AL-PA	t value	AL-PA	t value	AL-PA	t value	AL-PA	t value	AL-PA	t value	AL-PA	t value	AL-PA	t value	AL-PA	t value
EF	0	CD	0	B2	0	98	0	72	0	55	0	3A	0	25	0
E8	1	CC	1	B1	1	97	1	71	1	54	1	39	1	23	1
E4	2	CB	2	AE	2	90	2	6E	2	53	2	36	2	1F	2
E2	3	CA	3	AD	3	8F	3	6D	3	52	3	35	3	1E	3
E1	4	C9	4	AC	4	88	4	6C	4	51	4	34	4	1D	4
E0	5	C7	5	AB	5	84	5	6B	5	4E	5	33	5	1B	5
DC	6	C6	6	AA	6	82	6	6A	6	4D	6	32	6	18	6
DA	7	C5	7	A9	7	81	7	69	7	4C	7	31	7	17	7
D9	8	C3	8	A7	8	80	8	67	8	4B	8	2E	8	10	8
D6	9	BC	9	A6	9	7C	9	66	9	4A	9	2D	9	0F	9
D5	10	BA	10	A5	10	7A	10	65	10	49	10	2C	10	08	10
D4	11	B9	11	A3	11	79	11	63	11	47	11	2B	11	04	11
D3	12	B6	12	9F	12	76	12	5C	12	46	12	2A	12	02	12
D2	13	B5	13	9E	13	75	13	5A	13	45	13	29	13	01	13
D1	14	B4	14	9D	14	74	14	59	14	43	14	27	14	00	-
CE	15	B3	15	9B	15	73	15	56	15	3C	15	26	15		

Appendix B Configuring the Boot Disk on the 9900™

You can configure the HP-UX® 11.0 boot disk on the 9900V subsystem under the following conditions:

- **OS version:** The HP-UX® OS version must be 11.0.
Firmware version: The HP® 9000 firmware (BIOS) version must be 38.40 or later.
- The HP-UX® system must recognize the 9900V LU which will be the HP-UX® boot disk.
- The HP-UX® system must also recognize LU 0 which is in the same hardware path group as the 9900V boot disk.

Note: In the following instructions, “LU X” refers to the 9900V LU on which the HP-UX® 11.0 operating system will be installed (the boot disk), and X represents the LU number (LUN) of the LU (e.g., if LU 0 will be the boot disk, X = 0; if LU 3 will be the boot disk, X = 3).

To set up the HP-UX® boot disk on the 9900V subsystem:

1. **Checking the status and hardware path of LU X** (see Figure B.1). Check the status and hardware path of the 9900V LU X (LU X will be the new boot disk) using the `ioscan -fnC disk` command. The status of LU X must be **claimed**, and the hardware path of LU X must exist. Also check the status and hardware path of LU 0 in the same hardware path group as LU X. The status of LU 0 must be **claimed**, and the hardware path of LU 0 must exist. If you verified both LU X and LU 0, write down the hardware path of LU X, and shut down the HP® 9000 server (`shutdown -h now`).

Note: If you cannot verify LU 0, you cannot set up the 9900V as the boot disk, because HP-UX® requires the existence of LU 0 in the same hardware path group as the boot disk.

2. **Installing HP-UX® 11.0 on the 9900.** After shutting down the HP® system, install the HP-UX® OS version 11.0 on LU X of the 9900. For information on HP-UX® 11.0 installation, please refer to the HP-UX® 11.0 user documentation. When HP-UX® OS installation is complete, shut down the HP® 9000 server (`shutdown -h now`).
3. **Confirming the HP® 9000 BIOS configuration** (see Figure B.2). After shutdown is complete, restart the HP® 9000 server. If the **To discontinue, press any key within 10 seconds** message is displayed, press **Esc**. Confirm that the HP® 9000 firmware (BIOS) version is 38.40 or later. If not, you cannot set up the 9900V as the HP-UX® boot disk.

Note: If you did not press **Esc** within 10 seconds, the system boots from the old boot disk, and you will not be able to set up the 9900V boot disk. If this happens, you must reboot the system (**reboot**) and make sure to stop the boot process using the **Esc** button.

4. **Setting the New Boot Disk** (see Figure B.3). After confirming the firmware (BIOS) version, enter the `path` command at the **Main Menu** prompt, and then enter the `path primary` command specifying the hardware path of LU X (refer to step 1). After the `path primary` command is entered, the system displays back the description. Confirm the new configuration by entering the `path` command again. If the configuration is not correct, set the new configuration again using the `path primary` command. If the configuration is correct, turn off the HP® 9000 server’s power switch.
5. **Booting from the 9900.** Wait a few minutes after power-off, and then restart the HP® 9000 server. Confirm that the HP® system is booting from LU X on the 9900V subsystem (see Figure B.4).

```

# ioscan -fnC disk
Class   I  H/W Path          Driver      S/W State  H/W Type  Description
=====
disk    0  8/4.5.0            sdisk       CLAIMED    DEVICE    SEAGATE ST34573WC
        /dev/dsk/c0t5d0    /dev/rdisk/c0t5d0
disk    1  8/4.8.0            sdisk       CLAIMED    DEVICE    SEAGATE ST34573WC
        /dev/dsk/c0t8d0    /dev/rdisk/c0t8d0
disk    2  8/4.9.0            sdisk       CLAIMED    DEVICE    SEAGATE ST34573WC
        /dev/dsk/c0t9d0    /dev/rdisk/c0t9d0
disk    4  8/12.8.0.3.0.0.0  sdisk       CLAIMED    DEVICE    HITACHI OPEN-3
        /dev/dsk/c4t0d0    /dev/rdisk/c4t0d0
disk    317 8/12.8.0.3.0.0.1  sdisk       CLAIMED    DEVICE    HITACHI OPEN-3
        /dev/dsk/c4t0d1    /dev/rdisk/c4t0d1
disk    318 8/12.8.0.3.0.0.2  sdisk       CLAIMED    DEVICE    HITACHI OPEN-3
        /dev/dsk/c4t0d2    /dev/rdisk/c4t0d2
        .             .             .             .             .             .
        .             .             .             .             .             .
disk    323 8/12.8.0.3.0.0.7  sdisk       CLAIMED    DEVICE    HITACHI OPEN-3
        /dev/dsk/c4t0d7    /dev/rdisk/c4t0d7
disk    3  8/16/5.2.0        sdisk       CLAIMED    DEVICE    TOSHIBA CD-ROM XM-5701TA
        /dev/dsk/clt2d0    /dev/rdisk/clt2d0
#

```

Figure B.1 Checking the Status and Path of LU X and LU 0

```

Firmware Version 38.40                               ← Verify firmware (BIOS) version.
Duplex Console IO Dependent Code (IODC) revision 1
-----
(c) Copyright 1996-1999, Hewlett-Packard Company All rights reserved
Processor Speed  Coprocessor State  Cache Size
-----
160 MHz          Functional          64 KB
                                     1 MB additional
Model: D330/1

Available memory (bytes)   : 536870912

Primary boot path: 8/4.5 (dec)
Alternate boot path: 8/16/5.0 (dec)
Console path: 8/0/0.0 (dec)
Keyboard path: 8/16/7.0 (dec)

Processor is booting from first available device.

To discontinue, press any key within 10 seconds.       ← Press Esc within 10 seconds.

```

Figure B.2 Confirming the Firmware (BIOS) Version


```

Main Menu: Enter command > path                                     ← Enter path command.

Primary boot path   :   8/4.5 (dec)                                ← Default configuration.
                    :   08/04.5 (hex)
Alternate boot path :   8/16/5.0 (dec)
                    :   08/10/05.0 (hex)
Console path       :   8/0/0.0 (dec)
                    :   08/0/0.0 (hex)
Keyboard path      :   8/16/7.0 (dec)
                    :   08/10/07.0 (hex)

Main Menu: Enter command > path primary 8/12.8.3.0.0.X           ← Set new boot disk.

If boot disk = LU 0:
  Primary boot path : 8/12.8.3 (dec)                               ← Special short expression for LU 0.
                    : 08/0c.8.3 (hex)

If boot disk = LU X:
  Primary boot path : 8/12.8.3.0.0.X (dec)
                    : 08/0c.8.3.0.0.X (hex)

Main Menu: Enter command > path                                   ← Verify new configuration.

If boot disk = LU 0:
  Primary boot path : 8/12.8.3 (dec)                               ← Special short expression for LU 0.
                    : 08/0c.8.3 (hex)

If boot disk = LU X:
  Primary boot path : 8/12.8.3.0.0.X (dec)                         ← New configuration.
                    : 08/0c.8.3.0.0.X (hex)
Alternate boot path : 8/16/5.0 (dec)
                    : 08/10/05.0 (hex)
Console path       : 8/0/0.0 (dec)
                    : 08/0/0.0 (hex)
Keyboard path      : 8/16/7.0 (dec)
                    : 08/10/07.0 (hex)

```

Figure B.3 Setting the New Boot Disk

```

Trying Primary Boot Path
-----
Booting ...
Boot IO Dependent Code (IODC) revision 144

HARD Booted.

ISL booting hpux

Boot
:disc(8/12.8.0.3.0.0.X)/stand/vmunix.                               ← Verify new boot disk.

4325948 + 561152 + 368416 start 0x175b68

```

Figure B.4 Confirming Boot from 9900V LU X

Appendix C Reference Information for SAM

The HP® System Administrator Manager (SAM) (see Figure C.1) allows you to perform the HP® system administration functions, including setting up users and groups, configuring the disks and file systems, performing auditing and security activities, and editing the system kernel configuration. This appendix provides instructions for:

- Using System Administration Manager (SAM) to configure the 9900V disk devices (see section C.1), and
- Using SAM to set the maximum number of volume groups (see section C.2).

Note: The information in this appendix is provided for reference use only and is not intended to be complete. For further information on using SAM, please refer to the online help and/or user documentation for this product, or contact HP® technical support.

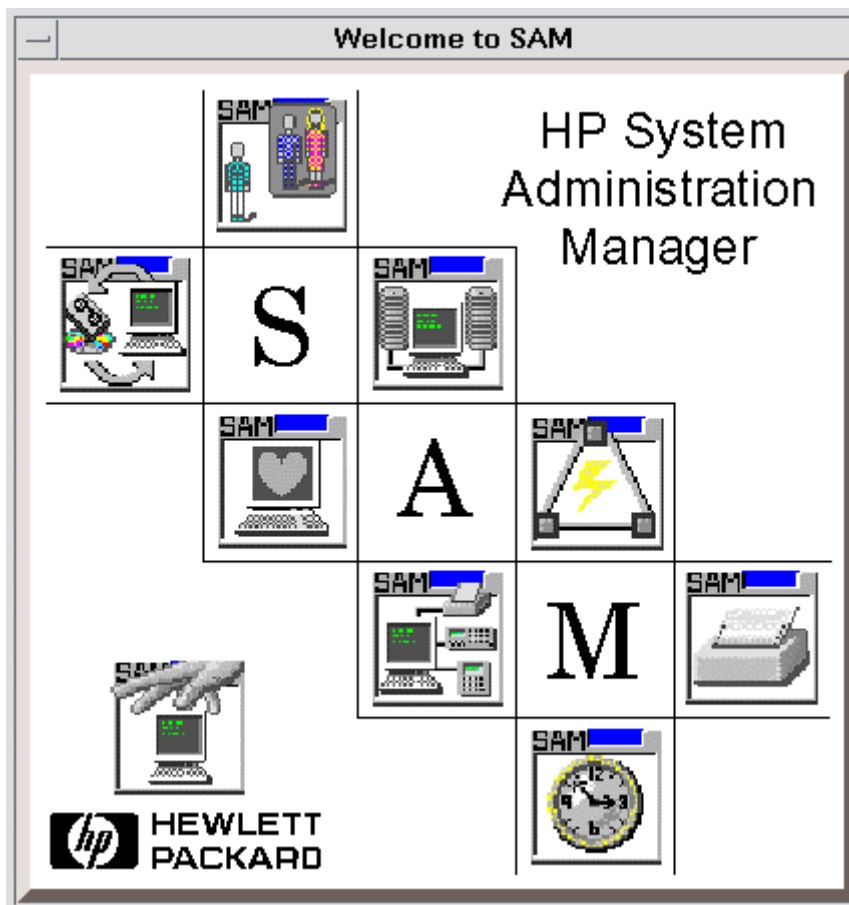


Figure C.1 Welcome to SAM

C.1 Configuring the 9900V Devices Using SAM

The SAM Areas window (see Figure C.2) displays the system administration functions and allows you to select the desired function. The **Disks and File Systems** function (selected in Figure C.2) allows you to configure the new disk devices for LVM operations.

Note: Do not configure the raw/HRX devices (e.g., OPEN-x-HRXoto) for LVM operations.

To configure the new 9900V SCSI disk devices using SAM:

1. Select the **Disks and File Systems** function, and select **Disk Devices** (see Figure C.3).
2. Verify that the new 9900V devices are displayed on the Disk Devices panel.
3. Select the device to configure, select the **Actions** menu, select **Add**, and then select the **Using the Logical Volume Manager** option.
4. On the Add a Disk Using LVM panel, select **Create or Extend a Volume Group...**
5. On the Create a Volume Group panel, enter the name of the new or existing volume group to assign the new device to, and then select **OK** twice. The Add a Disk Using LVM panel now displays the volume group name.
6. Select **Add New Logical Volume...** to open the Create New Logical Volumes panel.
7. On the Create New Logical Volumes panel, enter the name, size (e.g., 2344 MB for OPEN-3), and mount directory for the new logical volume. Select **Add**, and then select **OK** twice.
8. Repeat steps (3) through (7) for each new disk device on the 9900V subsystem.

C.2 Setting the Maximum Number of Volume Groups Using SAM

The HP® system kernel specifies the maximum number of volume groups that can be created (default = 10). The **Kernel Configuration** function (next to **Disks and File Systems** in Figure C.2) allows you to change the maximum number of volume groups as needed, for example, to accommodate the new devices on the 9900V subsystem.

To change the maximum number of volume groups using SAM:

1. Select the **Kernel Configuration** function, and then select **Configurable Parameters**.
2. On the Configurable Parameters panel, select the **maxvgs** parameter, select the **Actions** menu, and then select **Modify Configurable Parameter...**
3. On the Modify Configurable Parameter panel, enter the desired maximum number of volume groups in the **Formula/Value** field, and then select **OK**.
4. On the Configurable Parameters panel, make sure that none of the parameters is selected, and then select the **Actions** menu, and select **Create New Kernel**.
5. When the confirmation panel opens, select **Yes** to create the new kernel (or select **No** to return to the Configurable Parameters panel).
6. When the Reboot the System panel opens, select **OK** to move the new kernel into place and reboot the system.

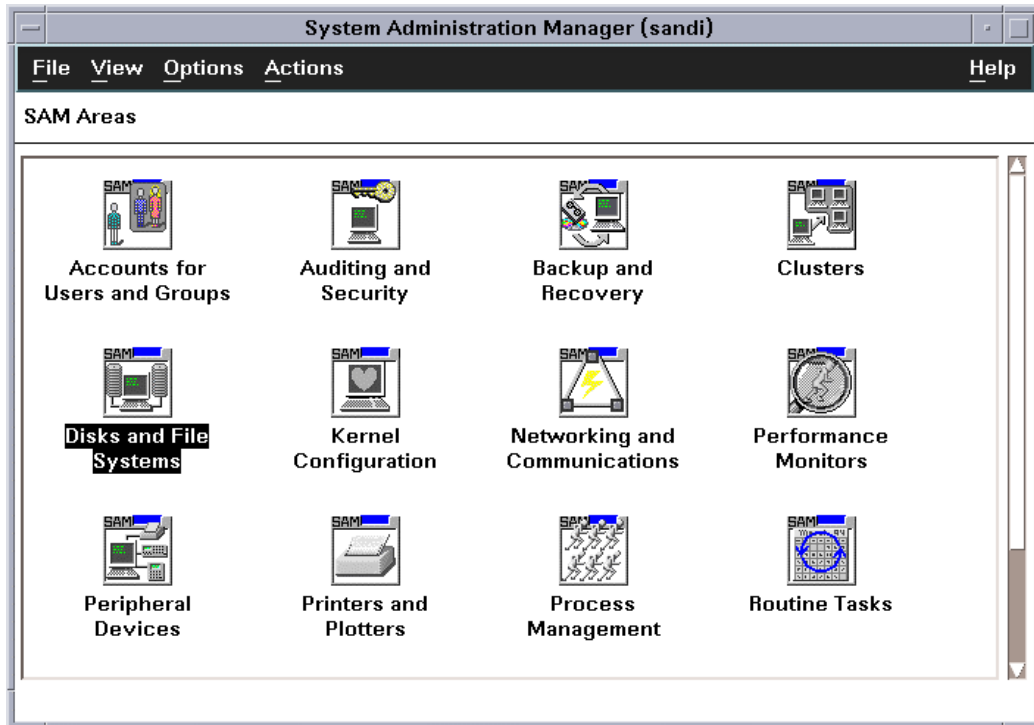


Figure C.2 SAM Areas

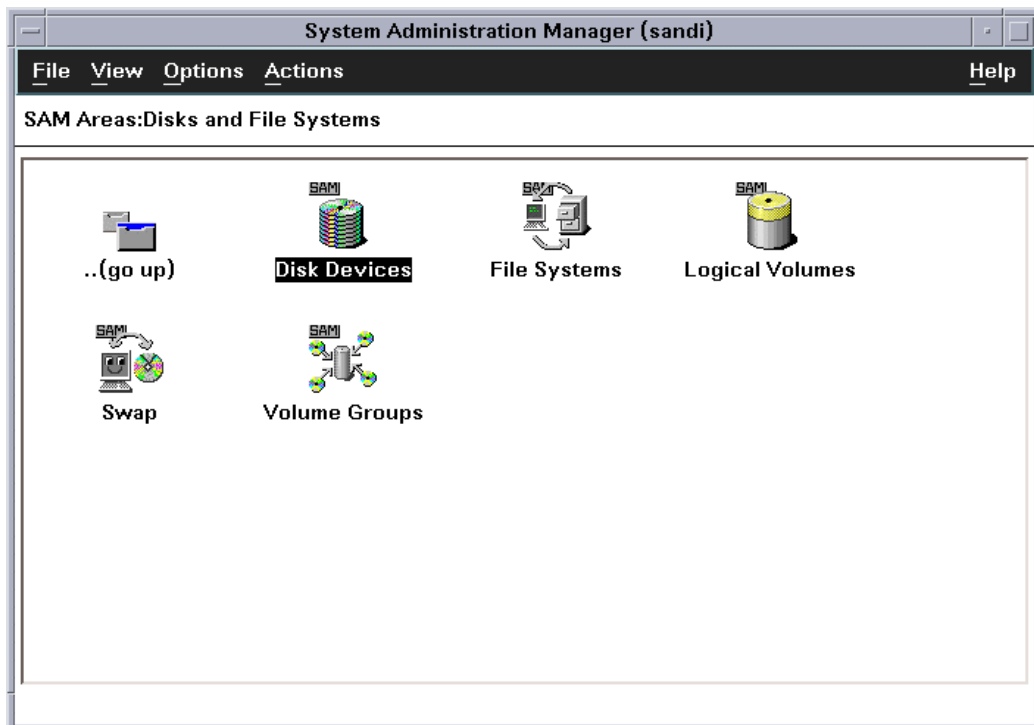


Figure C.3 SAM Areas: Disks and File Systems

Appendix D Online Device Installation

This appendix provides instructions for configuring new 9900V SCSI disk devices without rebooting the HP-UX® system. Please use the normal disruptive device configuration procedure in the following cases:

- **Fibre:** If a new fibre-channel connection is being installed. New fibre-channel connections can only be installed when the host system is powered off. New devices under existing fibre-channel ports can be installed and configured nondisruptively.
- **Maxvgs:** If the **maxvgs** parameter needs to be changed. The procedure for changing the **maxvgs** value in the system kernel requires a system reboot (refer to Appendix B).

To perform online device installation and configuration:

1. Verify that the new devices on the 9900V subsystem are ready to be configured. The Hitachi Data Systems representative should have completed hardware installation and verified the normal status of the new devices (refer to section 2.2).
2. Make sure that you are logged in as **root**.
3. Enter the **insf -e** command to perform online device recognition. The **insf -e** command creates device files for the new devices on the existing fibre busses (refer to section 3.2.1).
4. Configure the new 9900V disk devices for HP-UX® operations as described in sections 3.2 through 3.8. For new raw/HRX devices, you only need to verify the device files and driver. Do not partition or create a file system on any raw/HRX device.
5. Remember to configure the application failover, path failover (i.e., **vgextend**), and/or SNMP software on the HP® system as needed to recognize the new disk devices.

Acronyms and Abbreviations

AL	arbitrated loop
AL-PA	arbitrated loop physical address
CVS	custom volume size
ESCON®	Enterprise System Connection (IBM trademark for optical channels)
FC	fibre-channel
FCA	fibre-channel adapter
FC-AL	fibre-channel arbitrated loop
FCP	fibre-channel protocol
Gb	gigabit
GB	gigabyte
Gbps	gigabits per second
H/W	hardware
HP	Hewlett-Packard Company
HRX	Hitachi RapidXchange
I/O, IO	input/output
LDEV	logical device
LU	logical unit
LUN	logical unit number, logical unit
LUSE	LU Size Expansion
LVM	Logical Volume Manager, logical volume management
MB	megabytes
MPE	maximum number of physical extents
OFC	open fibre control
P-P	point-to-point
PA	physical address
PC	personal computer system
PE	physical extent
PV	physical volume
R-SIM	remote service information message
RAID	redundant array of independent disks
RCU	remote control unit (used for Hitachi TrueCopy operations)
SAM	System Administration Manager
SCSI	small computer system interface
SIM	service information message
SNMP	simple network management protocol
SVP	service processor

TID	target ID
VLL	Virtual LVI/LUN