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Hitachi Freedom Storage™ Lightning 9900™ V Series

Sun® Solaris™ Configuration Guide

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Document Revision Level

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Source Documents for this Revision

N/A

Changes in this Revision

- Updated fibre-channel adapter information (section 2.1).

- Added note on loop ID conflict (section 2.3.2).

- Added items to acronym list.

Referenced Documents

- *Hitachi Lightning 9900™ V Series User and Reference Guide*, MK-92RD100.

- *Hitachi Lightning 9900™ V Series Remote Console – Storage Navigator User's Guide*, MK-92RD101.

- *Hitachi Lightning 9900™ V Series LUN Manager User's Guide*, MK-92RD105.

- *Hitachi Lightning 9900™ V Series LUN Expansion (LUSE) and Virtual LVI/LUN User's Guide*, MK-92RD104.

- *Hitachi Lightning 9900™ V Series Hitachi RapidXchange User's Guide*, MK-91RD052.

- *Hitachi Freedom Storage™ Hitachi Dynamic Link Manager User's Guide for Solaris™*, MK-92DLM114.

Preface

The *Hitachi Lightning 9900™ V Series Sun® Solaris™ Configuration Guide* describes and provides instructions for configuring the devices on the Hitachi Lightning 9900™ V Series array subsystem for operation with the Sun® Solaris™ 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 Sun® Solaris™ operating system and the Sun® SPARCstation™, SPARCserver™, SPARCcenter™, and/or Ultra™ Series systems, and

■ the user is familiar with the UNIX® file system, system commands, and utilities.

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

For further information on the Sun® Solaris™ operating system, please consult the Sun® Solaris™ online help and/or user documentation, or contact Sun® technical support.

Microcode Level

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

COMMENTS

Please send us your comments on this document: doc.comments@hds.com.

Make sure to include the document title, number, and revision.
Please refer to specific page(s) and paragraph(s) whenever possible.

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Thank you!

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1.1 9900 V Solaris™ Configuration

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

Configuration of the Lightning 9900™ V Series disk devices for Solaris™ operations includes:

- Setting and recognizing the LUs (see section 3.1),

- Verifying new device recognition (see section 3.2),

- Partitioning and labeling the disk (see section 3.3), and

- Creating and mounting the file system (see section 3.4).

Note on the term "SCSI disk": The 9900 V 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 9900 V subsystem provides continuous data availability, high-speed response, scaleable connectivity, and expandable capacity for PC server and open-system storage. The 9900 V 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™) ports (compatible with ESCON® protocol) to provide connectivity with S/390® mainframe hosts as well as open-system hosts. For further information on the 9900 V 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 9900 V subsystem allows the following types of logical devices (also called volumes) to be installed and configured for operation with the Sun® Solaris™ operating system. Table 1.1 lists the device specifications for the 9900 V devices. Table 1.2 shows the volume usage (i.e., file system or raw device) for the 9900 V devices.

OPEN-*x* Devices. The OPEN-*x* logical units (LUs) (e.g., OPEN-3, OPEN-9) are disk devices of predefined sizes. The 9900 V 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 LUN Expansion (LUSE) Remote Console software 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 host to combine logical devices and access the data stored on the 9900 V subsystem using fewer LU numbers. For further information on the LUSE feature, please refer to the *Hitachi Lightning 9900™ V Series LUN Expansion and Virtual LVI/LUN User's Guide* (MK-92RD104).

VLL Devices (OPEN-*x* VLL). The VLL devices are custom-size LUs which are smaller than standard OPEN-*x* LUs. The Virtual LVI/LUN 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 the Virtual LVI/LUN feature, 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).

VLL LUSE Devices (OPEN-*x**n VLL). The VLL LUSE devices combine Virtual LVI/LUN devices (instead of standard OPEN-*x* LUs) into LUSE devices. The Virtual LVI/LUN feature is used to create custom-size devices, and then the LUSE feature 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 (product name OPEN-3*10-CVS).

Configuration of the 9900 V disk devices for Solaris™ operations includes:

- Setting and recognizing the LUs (see section 3.1),
- Verifying new device recognition (see section 3.2),
- Partitioning and labeling the disk (see section 3.3), and
- Creating and mounting the file system (see section 3.4).

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

The HRX devices are not SCSI disk devices. 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 (no file system, no mount operation).

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

WARNING: The multiplatform devices are *not* write-protected for UNIX®/PC server access. Do not execute any write operation by the fibre-channel adapters 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 9900 V HRX devices for operation with Sun® Solaris™ includes:

■ Setting and recognizing the LUs (see section 3.1),

■ Verifying new device recognition (see section 3.2), and

■ Partitioning and labeling the disk (see section 3.3).

Table 1.1   9900 V 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 Cylinders	# of Heads	# of Sectors per Track	Capacity MB *(Note 4)*
OPEN-3	SCSI disk	HITACHI	OPEN-3	4806720	512	3338	15	96	2347
OPEN-9	SCSI disk	HITACHI	OPEN-9	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	HITACHI	OPEN-E	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	HITACHI	OPEN-L	71192160	512	49439	15	96	34761
OPEN-3*n	SCSI disk	HITACHI	OPEN-3*n	4806720*n	512	3338*n	15	96	2347*n
OPEN-9*n	SCSI disk	HITACHI	OPEN-9*n	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	HITACHI	OPEN-E*n	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	HITACHI	OPEN-L*n	71192160*n	512	49439*n	15	96	34761*n
OPEN-3 VLL	SCSI disk	HITACHI	OPEN-3-CVS	*Note 5*	512	*Note 6*	15	96	*Note 7*
OPEN-9 VLL	SCSI disk	HITACHI	OPEN-9-CVS	*Note 5*	512	*Note 6*	15	96	*Note 7*
OPEN-E VLL	SCSI disk	HITACHI	OPEN-E-CVS	*Note 5*	512	*Note 6*	15	96	*Note 7*
OPEN-3*n VLL	SCSI disk	HITACHI	OPEN-3*n-CVS	*Note 5*	512	*Note 6*	15	96	*Note 7*
OPEN-9*n VLL	SCSI disk	HITACHI	OPEN-9*n-CVS	*Note 5*	512	*Note 6*	15	96	*Note 7*
OPEN-E*n VLL	SCSI disk	HITACHI	OPEN-E*n-CVS	*Note 5*	512	*Note 6*	15	96	*Note 7*

Table 1.1   9900 V Device Specifications (continued)

Device Type (Note 1)	Category (Note 2)	Vendor Name	Product Name (Note 3)	# of Blocks (512-byte blk)	Sector Size (bytes)	# of Cylinders	# of Heads	# of Sectors per Track	Capacity MB (Note 4)
3390-3A	HRX otm/mto	HITACHI	3390-3A	5820300	512	3345	15	116	2844
3390-3B	HRXmto	HITACHI	3390-3B	5816820	512	3343	15	116	2842
3390-3C	HRXotm	HITACHI	OP-C-3390-3C	5820300	512	3345	15	116	2844
HRX OPEN-3	HRXoto	HITACHI	OPEN-3	4806720	512	3338	15	96	2347
3390-3A VLL	HRX otm/mto	HITACHI	3390-3A-CVS	*Note 5*	512	*Note 6*	15	116	*Note 7*
3390-3B VLL	HRXmto	HITACHI	3390-3B-CVS	*Note 5*	512	*Note 6*	15	116	*Note 7*
3390-3C VLL	HRXotm	HITACHI	OP-C-3390-3C-CVS	*Note 5*	512	*Note 6*	15	116	*Note 7*
HRX OPEN-3 VLL	HRXoto	HITACHI	OPEN-3-CVS	*Note 5*	512	*Note 6*	15	96	*Note 7*

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

Note 2: The category of a device (SCSI disk or raw) determines its volume usage. Table 1.2 shows the volume usage for SCSI disk devices and raw devices. The SCSI disk devices (OPEN-*x*, VLL, LUSE, VLL LUSE) are usually formatted with partitions and file systems for Solaris™ operations. The multiplatform devices (e.g., 3390-3A/B/C) must be installed as raw devices and can only be accessed using HRX. Do not create a file system on any device used for HRX operations. *Note:* The 9900 V 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 9900 V command device (used for Hitachi Command Control Interface operations) is distinguished by **-CM** on the product name (e.g., OPEN-3-CM, OPEN-3-CVS-CM). The product name for OPEN-*x* VLL devices is OPEN-*x* **CVS** (CVS = custom volume size).

Note 4: The device capacity can sometimes be changed by the BIOS or host adapter board. Also, different capacities may be due to variations such as 1 MB = 1000^2 or 1024^2 bytes.

Note 5: The number of blocks for a VLL 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 with capacity = 37 MB:
# of blocks = (53 cylinders–see Note 6) $\times$ (15 heads) $\times$ (96 sectors per track) = 76320

Note 6: The number of data cylinders for a VLL volume is calculated as follows ($\uparrow$...$\uparrow$ means that the value should be rounded up to the next integer):

- The number of data cylinders for an OPEN-*x* VLL volume =
  # of cylinders = $\uparrow$ (capacity (MB) specified by user) $\times$ 1024/720 $\uparrow$
  Example: For an OPEN-3 VLL volume with capacity = 37 MB:
  # 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 =
  # of cylinders = $\uparrow$ (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
  # 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 =
  # of cylinders = (number of cylinders specified by user) + 9

- The number of data cylinders for a 3390-3B VLL volume =
  # of cylinders = (number of cylinders specified by user) + 7

Note 7: The size of an OPEN-*x* VLL volume is specified by capacity in MB, not by number of cylinders. The user specifies the volume size using the 9900 V Virtual LVI/LUN software.

- Note that OPEN-L cannot be used for VLL volumes.

Chapter 2   Preparing for New Device Configuration

2.1   Configuration Requirements

The requirements for Lightning 9900™ V Series Sun® Solaris™ configuration are:

- **Hitachi Lightning 9900™ V Series subsystem**, all-open or multiplatform configuration.
  - The 9900 V 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 9900 V features and devices depends on the level of microcode installed on the 9900 V subsystem.

- **Sun® system**: Sun® SPARCstation series, Sun® SPARCserver series, Sun® SPARCcenter series, or Sun® Ultra series.

- **Sun® Solaris™ OS**, version 2.6, 7, or 8. **Root** login access to the Sun® system is required.

  Important: Please contact Sun® to make sure that the most current OS patches are installed on the Sun® system(s).

  Note: For the latest information on Solaris™ 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 9900 V 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 9900 V subsystem.
  - For information on supported FC 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 5.3).

2.2 Installing the 9900 V Subsystem

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

1. **Hardware installation**. The Hitachi Data Systems representative performs hardware installation as specified in the 9900 V maintenance manual. Follow all precautions and procedures in the 9900 V 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 any OFC-type connector to the 9900 V subsystem. Do not connect/disconnect fibre-channel cabling that is being actively used for I/O. This can cause the Solaris™ system to hang. Always confirm that the devices on the fibre cable are offline before connecting or disconnecting the fibre cable.

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

   Note: The Hitachi Data Systems representative must use the 9900 V 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 fibre-channel ports. For instructions on installing the LUN Manager Remote Console software, please refer to the *Hitachi Lightning 9900™ V Series Remote Console – Storage Navigator User's Guide* (MK-92RD101) and the *Hitachi Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD105).

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

2.3 Preparing to Connect the 9900 V Subsystem

Before the 9900 V subsystem is connected to your Solaris™ system, you must perform the following tasks:

- Set the host mode for the 9900 V fibre-channel port(s) (see section 2.3.1),
- Configure the 9900 V fibre-channel ports (see section 2.3.2),
- Verify the host fibre-channel adapters (see section 2.4),
- Configure the host fibre-channel adapters (see section 2.5), and
- Set the disk and device parameters (see section 2.6).

You will use the LUN Manager Remote Console software to set the host modes for and configure the 9900 V fibre ports. For instructions on using the LUN Manager software, please refer to the *Hitachi Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD105).

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

After completing these steps, you will shut down the Solaris™ system, connect the 9900 V subsystem, and then restart the Solaris™ system (see section 2.7).

2.3.1 Setting the Host Mode for the 9900 V Ports

The 9900 V 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 (see Figure 2.1). The required host mode setting for 9900 V Solaris™ operations is **09**.
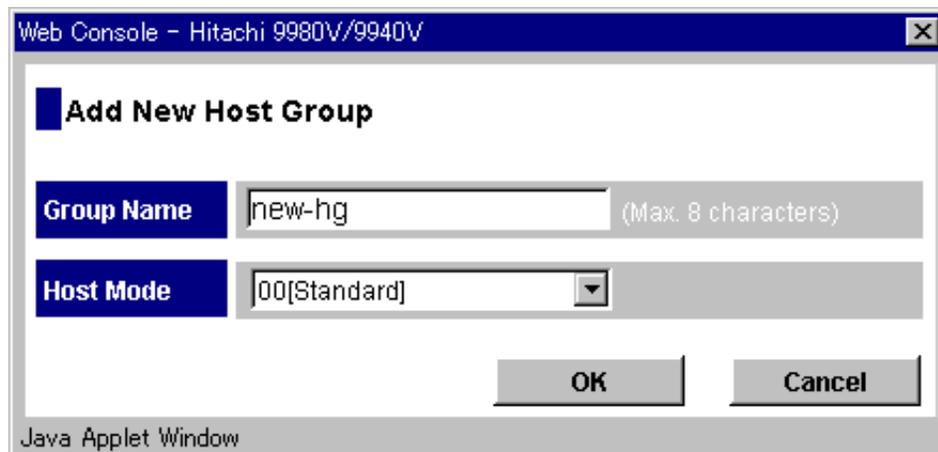
Figure 2.1   Setting the Host Mode

2.3.2   Configuring the 9900 V Fibre-Channel Ports

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

Note: The 9900 V subsystem supports up to 256 LUs per fibre-channel port.

Fibre topology. Figure 2.2 shows the LUN Manager panel used to define the port parameters, and Table 2.1explains the settings on this panel. You will select the appropriate settings for each 9900 V 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 9900 V port is also important. *Note:* If you plan to connect different types of servers to the 9900 V 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 9900 V 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 9900 V 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 9900 V port to a SCSI TID. See Appendix B for a description of the AL-PA-to-TID translation.

Note on loop ID conflict: The Solaris™ 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 Appendix B for the TID-to-AL-PA mapping).

Table 2.1   Fibre Parameter Settings for the 9900 V

Fabric	Connection	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 detailed information about port topology configurations supported by each host bus adapter/switch combination. Not all types of switches support F-port connection.
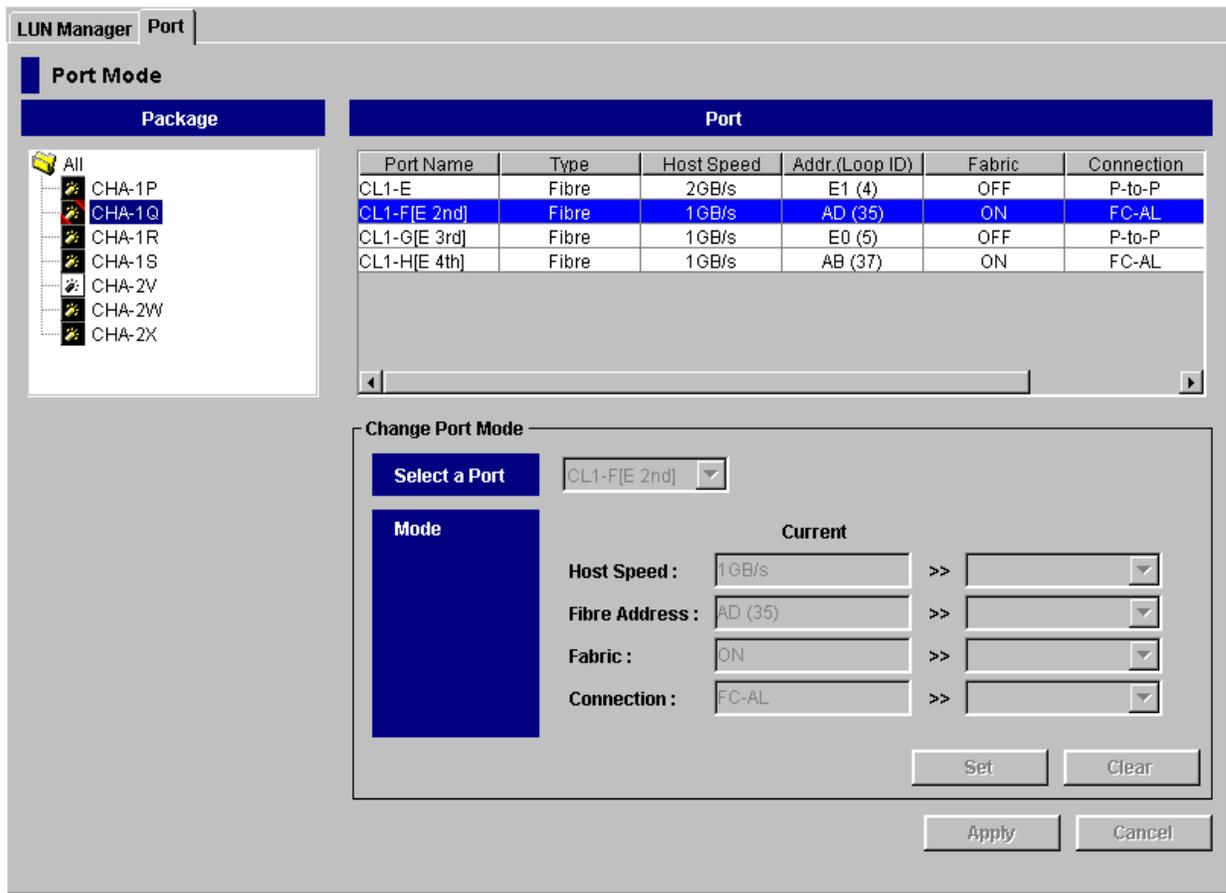
Figure 2.2   Setting the Fibre-Channel Port Parameters

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	

2.4   Verifying the Host Fibre-Channel Adapter Installation

Before configuring the FC adapter(s), you must verify proper FC adapter installation. To ensure that the host FC adapter configuration is correct, you will verify recognition of the FCA and the FCA driver.

To verify the fibre-channel host configuration:

1. Log in to the Sun® system as **root**, and make sure that all existing devices are powered on and properly connected to the Sun® system.

2. Display the host configuration using the **dmesg** command (see Figure 2.3). The fibre information (underlined in the following example) includes the recognition of the **fibre channel adapter**, **SCSI bus characteristics**, **world wide name**, and **FCA driver**. Make sure that the host recognizes these four classes. If this information is not displayed or if error messages are displayed, the host environment may not be configured properly.

```
# dmesg

Nov  9 23:14
ems, Inc.
mem = 65536K (0x4000000)
avail mem = 60129280
Ethernet address = 8:0:20:92:32:48
root nexus = Sun Ultra 1 SBus (UltraSPARC 167MHz)
sbus0 at root: UPA 0x1f 0x0 ...
espdma0 at sbus0: SBus0 slot 0xe offset 0x8400000
esp0:   esp-options=0x46
esp0 at espdma0: SBus0 slot 0xe offset 0x8800000 Onboard device sparc9 ipl 4
sd0 at esp0: target 0 lun 0
sd0 is /sbus@1f,0/espdma@e,8400000/esp@e,8800000/sd@0,0
        <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
sd6 at esp0: target 6 lun 0
sd6 is /sbus@1f,0/espdma@e,8400000/esp@e,8800000/sd@6,0
fca0: JNI Fibre Channel Adapter (1062 MB/sec), model FC          ← Verify that
fca0:   SBus 1: IRQ 4: FCODE Version 11.0.9 [1a6384]: SCSI ID 125: AL_PA 01 ← these items
fca0:   Fibre Channel WWN: 100000e0690000d5                      ← are listed.
fca0:   FCA Driver Version 2.2.HIT.03, Oct 09, 1999 Solaris 2.5, 2.6 ←
fca0:   All Rights Reserved.
fca0:   < Total IOPB space used: 1125824 bytes >
fca0:   < Total DMA space used: 565277 bytes >
root on /sbus@1f,0/espdma@e,8400000/esp@e,8800000/sd@0,0:a fstype ufs
zs0 at sbus0: SBus0 slot 0xf offset 0x1100000 Onboard device sparc9 ipl 12
zs0 is /sbus@1f,0/zs@f,1100000
zs1 at sbus0: SBus0 slot 0xf offset 0x1000000 Onboard device sparc9 ipl 12
zs1 is /sbus@1f,0/zs@f,1000000
keyboard is </sbus@1f,0/zs@f,1000000> major <29> minor <2>
mouse is </sbus@1f,0/zs@f,1000000:b> major <29> minor <3>
stdin is </sbus@1f,0/zs@f,1000000> major <29> minor <2>
 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
```

Figure 2.3   Displaying the Fibre Device Information (Jaycor FC-1063)

2.5   Configuring the Host Fibre-Channel Adapter(s)

After verifying the HBA installation, you are ready to configure the fibre-channel adapter(s) connected to the 9900 V. The host bus adapters (HBAs) have many configuration options. This section provides minimum requirements for configuring FC adapters for operation with the 9900 V subsystem. The following sample instructions apply to Jaycor and JNI™ FC adapters. For instructions on configuring other adapters, please refer to the user documentation for the adapter.

2.5.1   Sample Instructions for Jaycor FC Adapters

2.5.1.1   Setting the FCA* File

To configure the Jaycor FC-1063, FC64-1063, and FCI-1063 FCAs, set the fca*.conf file (in /kernel/drv/ directory), and add and/or confirm the following descriptions in the configuration file:
timeout_reset_enable = 1
link_recovery_delay = 500
failover = 180;
(s*ee important note below for binding information)*

Note: The setting for link_recovery_delay is an industry standard. It is included here as information only.

When using VERITAS® Volume Manager (VxVM) Dynamic Multi Pathing (DMP), set the following values:
Recovery_attempts = 5
Failover = 60

When you use driver 2.5.8.HIT07.01 or later, add and/or confirm the value of the driver parameter:
watchdog_reset_count = 1;
watchdog_reset_wakeups = 24;(for 2.5.8.HIT.07.01 or later)

When you use driver 2.5 with Solaris™ version 8, change the following parameter values:
ip_disable = 1;
(s*ee important note below for binding information)*
fca_verbose = 1;

Configure these parameters as follows:

- For 32-bit SBus adapters, configure the **/kernel/drv/fca.conf** file.

- For 64-bit SBus adapters, configure the **/kernel/drv/fca-pci.conf** file.

Important Note: If you are performing WWN Persistent Binding, after the target is bound to the specified WWN, the target will then also be statically bound to only that port in the fabric due to the Def_port_binding statement. This setup will not allow you to move a device to a new port (e.g., due to a bad port on a switch), without requiring a reboot of the server. A system reboot can be necessary because of incorrect configuration.

If you are using persistent binding of any form, the static binding should match the persistent binding type. If you require static WWNN or WWPN binding, change the following definitions:

def_wwpn_binding = "*xxxxxxxxxxxxxxxx*";
Static Port binding---------------def_port_binding = "$*xxxxxx*";
def_wwnn_binding = "*xxxxxxxxxxxxxxx*";

def_wwpn_binding = "*xxxxxxxxxxxxxxx*";
Static WWNN binding----------def_wwnn_binding = "$*xxxxxxxxxxxxxxx*";
def_port_binding = "*xxxxxx*";

def_wwnn_binding ="*xxxxxxxxxxxxxxx*";
Static WWPN binding----------def_wwpn_binding = "$*xxxxxxxxxxxxxxx*";
def_port_binding = "*xxxxxx*";

2.5.1.2   Editing the /kernel/drv/fca-pci.conf file

To edit the /kernel/drv/fca-pci.conf file:

1. Log in as **root**.

2. Make a backup of fca-pci.conf: **cp /kernel/drv/fca-pci.conf /kernel/drv/fca-pci.bk**

3. Edit the fca-pci.conf file: **vi /kernel/drv/fca-pci.conf**

4. Enter: **timeout_reset_enable = 1;** (see Figure 2.4).

5. Enter: **recovery_attempts = 5;** (see Figure 2.5)

6. Enter: **failover = 180;** (see Figure 2.6)

7. Enter: **ip_disable = 1;** (This parameter is only for driver v2.5.) (see Figure 2.7)

8. Enter the appropriate binding parameters for your configuration: (s*ee important note above for binding information)* (see Figure 2.8)*)*

9. Enter the appropriate binding parameters for your configuration (see Figure 2.8) (s*ee important note above for binding information)*

10. Enter (see Figure 2.9) (s*ee important note above for binding information)*

11. Enter: **fca_verbose = 1;** (see Figure 2.10)

12. Add and/or confirm the value of the driver parameter: **(for 2.5.8.HIT.07.01 or later)**
    watchdog_reset_count = 1;
    watchdog_reset_wakeups = 24;(see Figure 2.11**)**

13. Save your changes, and exit the text editor.

14. Shut down and reboot to establish the I/O TOV setting.

```
# Configuration flag timeout_reset_enable
# Type: boolean; default: 0
# When a command times out to a target, the driver can attempt to clear the problem in
# two ways:
#   1. (timeout_reset_enable = 1) Reset the target.
#   2. (timeout_reset_enable = 0) Send an abort exchange (ABTS_LS) request to the target.
timeout_reset_enable = 1;
```

Figure 2.4   Example of set timeout_reset_enable = 1

```
# Configuration variable recovery_attempts
# Type: integer; count; default: 5
# Defines the number of times login_recovery is attempted before failed
recovery_attempts = 5;
```

Figure 2.5   Example of set recovery_attempts = 5

```
# Configuration variable failover
# Type: integer; seconds; default: 180
# Defines the number of seconds after link failure before
# failing all pending commands on targets.
failover = 180;
```

Figure 2.6   Example of failover = 180

```
# Configuration flag ip_disable
# Type: boolean; defalt; 0 (false)
# if false (0), then the IP side of the driver is enabled
# if true (1), the the IP side of the driver is completely disabled
ip_disable = 1;
```

Figure 2.7   Example of ip_disable=1

```
# Configuration flag def_wwXn_binding where X is either n for node or p for port.
# Type: string; default: "$xxxxxxxxxxxxxxxx" (means WWXN is "static don't care")
# Sets the 16 digit hexidecimal default wwXn binding for every target/lun instance which
# does not explicitly define one.
#      - A "$" preceding the string indicates static binding enabled
#      - A "x" in place of a digit indicates "don't care" for that digit
# *See technote for details on wwn bindings
def_wwpn_binding  = "xxxxxxxxxxxxxxxx";
def_wwnn_binding  = "xxxxxxxxxxxxxxxx";
```

Figure 2.8   Example of def_wwn_binding, def_wwpn_binding and def_wwnn_binding

```
# Configuration flag def_port_binding
# Type: string; default: "xxxxxx" (means PORT is "non-static don't care")
# Sets the 6 digit hexidecimal default port binding for every target/lun instance which
# does not explicitly define one.
#      - A "$" preceding the string indicates static binding enabled
#      - A "x" in place of a digit indicates "don't care" for that digit
# *See technote for details on port bindings
def_port_binding = "$xxxxxx";
```

Figure 2.9   Example of def_port_binding

```
# Configuration flag fca_verbose
# Type: boolean; default: 1
# Determines how many messages are displayed directly to the console.
#      - A "0" will quiet the driver messages to the console, but still print them to the
#        system message log.
#       (NOTE: a "boot -v" will override this setting and make the driver verbose again)
#      - A "1" will make the driver print all messages to the console and to the system
#        message log.
fca_verbose = 1;
```

Figure 2.10   Example of fca_verbose=1

```
Configuration variable watchdog_reset_count
# Type: integer, count; default: 5
# This count is the maximum number of Tachyon resets allowed in the period occup
ied by
# watchdog_reset_wakeups before the link is failed over.  If failed, The link wi
ll remain in the
# failed state until 2*failover seconds.
watchdog_reset_count = 1;
#watchdog_reset_count = 5;


# Configuration variable watchdog_reset_wakeups
# Type: integer, count; default: 10
# This count is the maximum number of hang watchdog wakeups during which Tachyon
 resets
# are counted. If this count is exceeded without link failover, then the Tachyon
 reset counter
# is set back to zero and Tachyon resets are counted for the next watchdog_reset
_wakeups period.
watchdog_reset_wakeups = 24;
#watchdog_reset_wakeups = 10;
```

Figure 2.11   Example of watchdog_reset_count=1 and watchdog_reset_wakeups=10

2.5.1.3 Connecting to Fibre Switch

Perform the following steps to enable fibre switch connection:

1. Edit the /kernel/drv/fca.conf file as follows: **fca_nport = 1**.

2. The Jaycor port adapter should be connected to a fibre switch F-Port. The 9900 V fibre channel port should connect to a fibre switch FL-Port.

3. Use the Zoning function when attempting to connect multiple types of servers to the 9900 V via the same fibre switch.

2.5.1.4 Connecting to FC-AL

If there are multiple workstations/servers on same loop and two or more of the host's ports have the same AL_PA , change the AL_PA using the following procedure:

For FCI-1063 (see Figure 2.12):

1. Backup the fca-pci.conf file: cp /kernel/drv/fca-pci.conf /kernel/drv/fca-pci.bk

2. Edit the fca-pci.conf file

3. Set scsi-initiator-id = 0xZZ; (0xZZ:0-7d hex)

4. Save your changes and exit the text editor

5. Shut down and reboot.

For FC-1063, FC64-1063:

1. For Openboot mode, enter init 0.

2. To disable autoboot, enter the following command at the **ok** prompt
   setenv auto-boot? False

3. Set the **fcode-debug?** attribute to **true**. To view the OpenBoot environment variables, enter **printenv**. If the value of **fcode-debug?** is false, enter **setenv fcode-debug? true**

4. Enter the following command to show a list of all SCSI devices: **probe-scsi-all**

5. Select the device for which you want to change the SCSI-ID, and issue the following command (note there must be a space after the first "):
   " /sbus@1f,0/fca@1,0" select-dev

6. If this fails, reset the system using the reset command, and issue the **select-dev** command again.

7. To reconfigure the workstation to autoboot, enter: **setenv auto-boot? true**

8. Reset the system by entering the **reset** command.

Note: A storage device or loopback plug must be attached to the adapter. Enter the Openboot command to change the SCSI-ID, and enter **y** and the new SCSI ID (see Figure 2.13): **set-scsi-id**

```
## fca-pci.conf - JNI FCA-PCI DRIVER (Solaris SCSI HBA) CONFIGURATION FILE

# Configuration variable scsi-initiator-id
# Type: integer, 0-125; default: none (must be explicitly set for PCI driver)
# Defines the adapters SCSI ID (and hence FC AL_PA) on the loop
scsi-initiator-id = 0x7d;
```

Figure 2.12   Example of /kernel/drv/fca-pci.conf

```
Sure you want to change it? (y/n)  ...Enter `y'
Se ok set-scsi-id
SCSI Initiator ID set = 7D
t SCSI Initiator ID, 1 to 125(7d), enter 2 hex digits: xx  ...Enter new ID
SCSI ID set to xx
ok
```

Figure 2.13   Example of SCSI ID Change

2.5.2 Sample Instructions for JNI™ 1-Gb Emerald™-Based FC Adapters

The following requirements apply when connecting the 9900 V to a JNI™ Emerald™-based FC host bus adapter:

- The Solaris™ version must be version 8. *Note:* This functionality is currently supported for Solaris™ 8 only. Please contact your Hitachi Data Systems representative for the latest information on platform/version support.

- The JNI™ adapter must be model FCE-6410/1063, or compatible.

- The driver version must be 4.0.2 or later.

- The EZ Fibre™ configuration utility must be installed. Please refer to the latest user documentation about compatibility with driver versions.

- The Solaris™ OS patches for EZ Fibre™ must be installed: the 108434-01/108435-01 patches for Solaris™ version 8. *Note:* The required OS patches are listed in the EZ Fibre™ readme.txt file. Please refer to the the latest user documentation.

WARNING: Make sure that LUN 0 is defined and the LUNs are defined consecutively for each target ID. If LUN 0 is not defined and/or the LUNs are not defined consecutively, EZ Fibre will not recognize the rest of the LUs on that target ID.

2.5.2.1 Verifying the FC Emerald™- Based Adapter and Utility

Before the 9900 V is connected to the Solaris™ system, you must verify installation of the fibre-channel Emerald-based™ adapter (FCE), FCE driver, and EZ Fibre™ configuration utility. To ensure that the host configuration is correct, you will verify recognition of the FCE and the FCE driver.

To verify the fibre-channel adapter and driver:

1. Log in to the Sun® system as **root**, and make sure that all existing devices are powered on and properly connected to the Sun® system.

2. Display the host configuration using the **dmesg** command (see Figure 2.14).

3. The fibre information (underlined in Figure 2.14) includes the recognition of the **fibre channel adapter**, **SCSI bus characteristics**, **world wide name**, and **JNIC driver**. Make sure that the host recognizes these four classes. If this information is not displayed, or if error messages are displayed, the host environment may not be configured properly.

Verify installation of the EZ Fibre™ configuration utility by running the EZ Fibre™ configuration utility: enter **./ezf** or **/opt/jni/ezfibre/standalone/ezf**. The EZ Fibre™ GUI should open. For instructions on using the EZ Fibre™ utility, please refer to the user documentation for the adapter and utility.

```
# dmesg

Sep 23 15:35:51 E3500-2 unix: NOTICE: Firmware supports Dynamic Reconfiguration of I/O board types 1, 4.
ems, Inc.
Sep 23 15:35:51 E3500-2 unix: sysctrl0 is /central@1f,0/fhc@0,f8800000/clock-board@0,900000
avail mem = 60129280
Sep 23 15:35:51 E3500-2 unix: sysctrl0: Key switch is in the secure position
Sep 23 15:35:51 E3500-2 unix: environ0 is /fhc@e,f8800000/environment@0,400000
Sep 23 15:35:51 E3500-2 unix: environ2 is /fhc@6,f8800000/environment@0,400000
Sep 23 15:35:51 E3500-2 unix: environ3 is /fhc@a,f8800000/environment@0,400000
Sep 23 15:35:51 E3500-2 unix: environ4 is /fhc@12,f8800000/environment@0,400000
Sep 23 15:35:51 E3500-2 unix: simmstat0 is /fhc@e,f8800000/simm-status@0,600000
Sep 23 15:35:51 E3500-2 unix: sram0 is /fhc@e,f8800000/sram@0,200000
• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •
Sep 23 15:44:04 E3500-2 unix: jnic6: Hba: fce  Model: FCE-1063  Type: scsi
Sep 23 15:44:04 E3500-2 unix: jnic6: FCode: Version 2.14 [5a8e]  XCode: 2000b[9053]
Sep 23 15:44:04 E3500-2 unix: jnic6: Slot: 0  IRQ: 3  Mode: 64  Channel: 0
Sep 23 15:44:04 E3500-2 unix: jnic6: WWNN: 100000e069a18b80  WWPN: 200000e069a18b80
Sep 23 15:44:05 E3500-2 unix: jnic6: Forced Context Switching enabled
Sep 23 15:44:05 E3500-2 unix: jnic6: Configured as Private Loop port
Sep 23 15:44:05 E3500-2 unix: jnic6: LIP detected (ff)
Sep 23 15:44:05 E3500-2 unix: jnic6: JNIC v4.0.4 (01081000)
Sep 23 15:44:05 E3500-2 unix: jnic6: Copyright(c) 1995-2001 JNI Corp, All Rights Reserved.
Sep 23 15:44:06 E3500-2 unix: jnic6: Link Up
Sep 23 15:44:07 E3500-2 unix: jnic6: Port 0000e0 (WWN 500060e802f01605:500060e802f01605) available.
root on /sbus@1f,0/espdma@e,8400000/esp@e,8800000/sd@0,0:a fstype ufs
zs0 at sbus0: SBus0 slot 0xf offset 0x1100000 Onboard device sparc9 ipl 12
zs0 is /sbus@1f,0/zs@f,1100000
zs1 at sbus0: SBus0 slot 0xf offset 0x1000000 Onboard device sparc9 ipl 12
zs1 is /sbus@1f,0/zs@f,1000000
keyboard is </sbus@1f,0/zs@f,1000000> major <29> minor <2>
mouse is </sbus@1f,0/zs@f,1000000:b> major <29> minor <3>
stdin is </sbus@1f,0/zs@f,1000000> major <29> minor <2>
 • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •
```

Figure 2.14   Displaying the Fibre Device Information (Jaycor FCE-6410 shown)

2.5.2.2   Configuring the JNI FC Emerald™-Based Adapter

After connecting the 9900 V subsystem and rebooting the Sun® system, you are ready to configure the JNI™ FC adapter(s) connected to the 9900 V. Use the EZ Fibre™ utility to configure the adapter.

To configure the JNI™ Emerald™-based FC adapter:

1. Log in as **root**.

2. Make a backup of **jnic.conf**: **cp /kernel/drv/jnic.conf /kernel/drv/jnic.conf.bk**

3. Make a backup of **sd.conf**: **cp /kernel/drv/sd.conf /kernel/drv/sd.conf.bk**

4. Add and set/confirm the driver parameter: **FcEnableContextSwitch = 1;(for 4.0.4 or later)**

5. Run the EZ Fibre™ configuration utility.

6. Select the **Adapter Parameters** tab.

7. Set the driver parameter: **Failover Delay (sec) = 180;**

8. Set the driver parameter: **Reset on Timeout = Disabled;**

9. Set the driver parameter (see Figure 2.15): **Topology Type = Private Loop;**

10. Select the **Commit Change** button, and save your changes. In addition, you should set the LUN-Level Zoning if possible (see step 11).

11. OS is rebooted automatically. After OS is invoked, run EZ Fibre™ utility.

12. Select the **LUN-Level Zoning** tab.

13. Bind the necessary target LUNs binding by specifying Mapped item (see Figure 2.16).

14. Select the **Commit Change** button, and save your changes.

15. OS is rebooted automatically. *Note:* While the OS is loading, a message including "Reboot required" is printed on console or /var/adm/messages file. Reboot OS manually again by following the directions. It is due to the inconsistency between HBA and topology setting.

16. Confirm that your Sun® server is connected to the 9900 V subsystem.
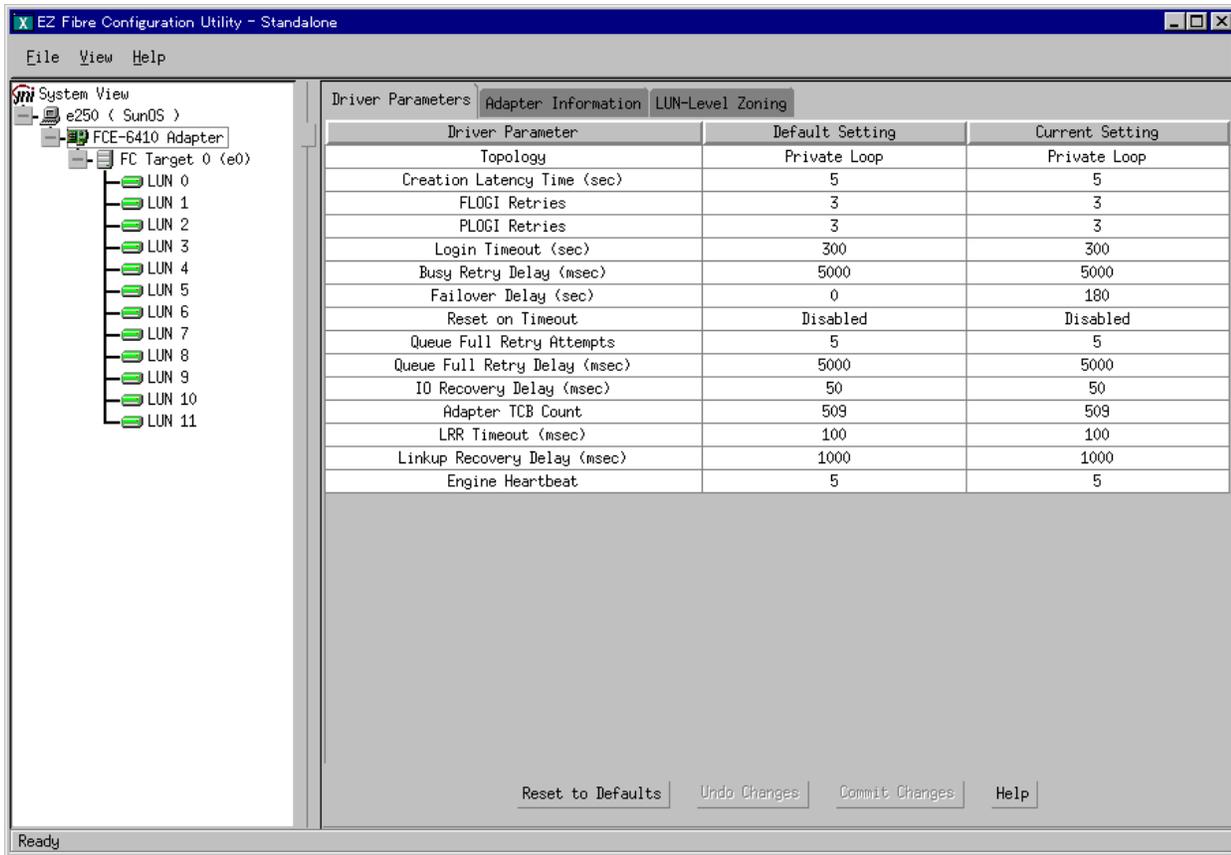
Figure 2.15   Example of JNI™ Driver Parameters
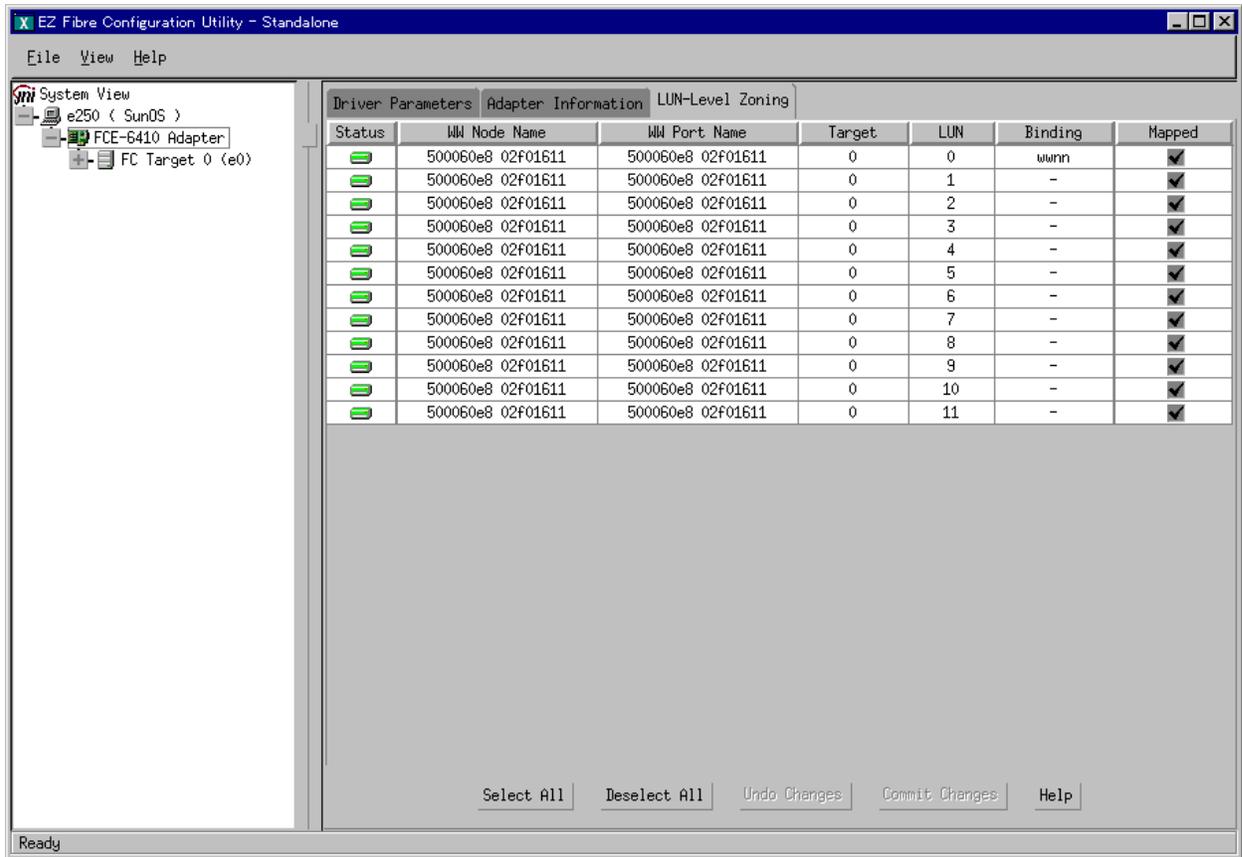
Figure 2.16   Example of JNI™ LUN-Level Zoning

2.5.2.3 Connecting to Fabric Switch

To configure a JNI™ Emerald™-based FCA connected to the 9900 V via fabric switch:

1. Log in as **root**.

2. Make a backup of **jnic.conf**: **cp /kernel/drv/jnic.conf /kernel/drv/jnic.conf.bk**

3. Make a backup of **sd.conf**: **cp /kernel/drv/sd.conf /kernel/drv/sd.conf.bk**

4. Add and Set the driver parameter: **FcEnableContextSwitch = 1;(for 4.0.4 or later)**

5. Run the EZ Fibre™ configuration utility.

6. Select the **Adapter Parameters** tab.

7. Set the driver parameter: **Failover Delay (sec) = 180;**

8. Set the driver parameter: **Reset on Timeout = Disabled;**

9. Set the driver parameter (see Figure 2.17): **Topology Type = Fabric;**

10. Select the **Commit Change** button, and save your changes. In addition, you should set the LUN-Level Zoning if possible (see step 11).

11. OS is rebooted automatically. After OS is invoked, run EZ Fibre™ utility.

12. Select the **LUN-Level Zoning** tab.

13. Bind the necessary target LUNs binding by specifying Mapped item.

14. Select the **Commit Change** button, and save your changes.

15. OS is rebooted automatically. *Note:* While the OS is loading, a message including "Reboot required" is printed on console or /var/adm/messages file. Reboot OS manually again by following the directions. It is due to the inconsistency between HBA and topology setting.

16. Confirm that your Sun® server is connected to 9900 V subsystem.

EZ Fibre Configuration Utility – Standalone

File View Help

System View
  e450-1 (SunOS)
    FCE-6410 Adapter
      FC Target 0 (0)

Driver Parameters | Adapter Information | LUN-Level Zoning

Driver Parameter	Default Setting	Current Setting
Topology	Private Loop	Fabric
Creation Latency Time (sec)	5	5
FLOGI Retries	3	3
PLOGI Retries	3	3
Login Timeout (sec)	300	300
Busy Retry Delay (msec)	5000	5000
Failover Delay (sec)	0	180
Reset on Timeout	Disabled	Disabled
Queue Full Retry Attempts	5	5
Queue Full Retry Delay (msec)	5000	5000
IO Recovery Delay (msec)	50	50
Adapter TCB Count	509	509
LRR Timeout (msec)	100	100
Linkup Recovery Delay (msec)	1000	1000
Engine Heartbeat	5	5

Reset to Defaults   Undo Changes   Commit Changes   Help

Ready
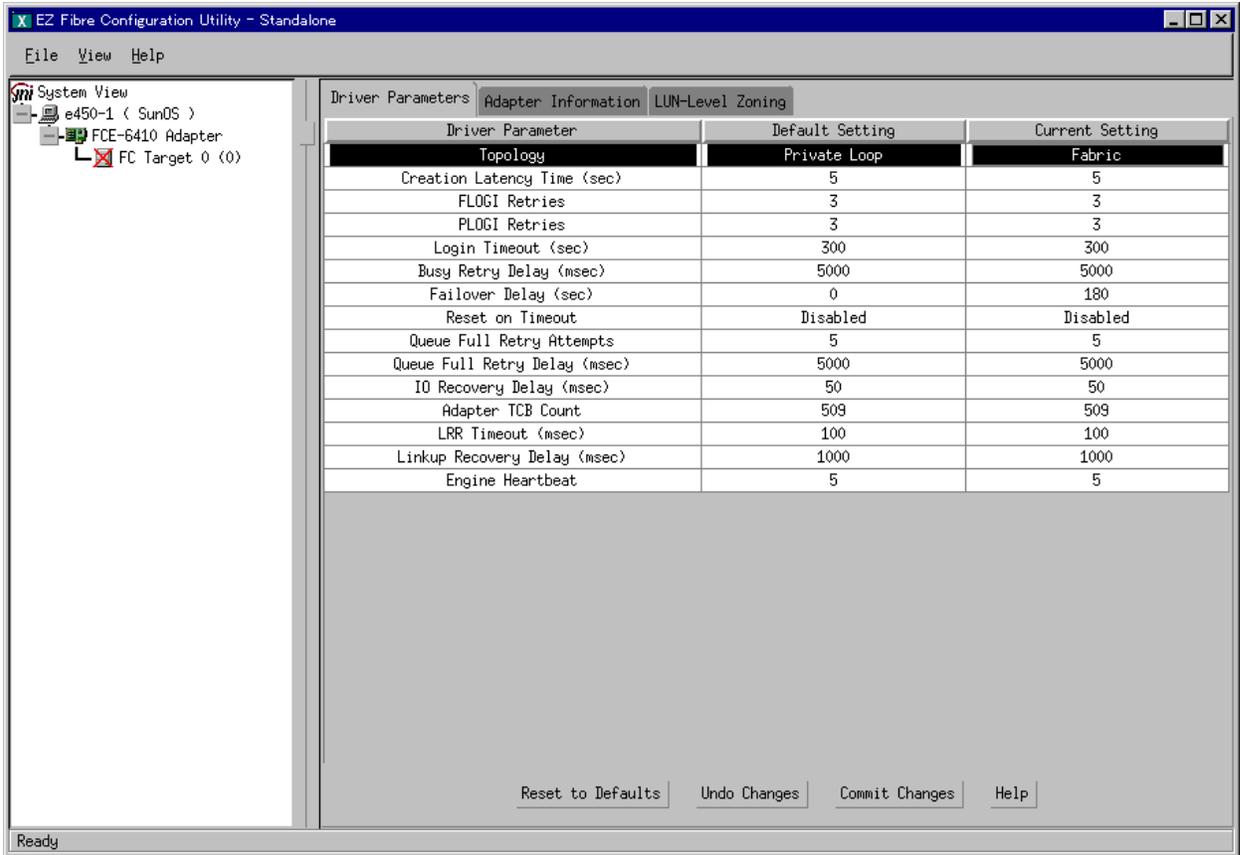
Figure 2.17   Example of JNI™ Driver Parameters for Fabric Switch

2.5.2.4 Example of jnic.conf File and Parameter Information

The EZ Fibre™ utility updates the necessary information in the **jnic.conf** and **sd.conf** files. Figure 2.18 shows an example of the **jnic.conf** file. For further information on setting parameter information, please refer to EZ Fibre™ utility online help. *Note:* It is possible to modify the **jnic.conf** file manually by referring to the configuration guide for the Emerald HBA driver. To manually modify the **jnic.conf** file, it is necessary to get WWN information, target ID information, the number of Host Bus Adapters for the jnic, and the number of 9900 V LUNs, in advance. Information in Figure 2.18 that is in bold and underlined is required.

```
##
## JNI Corporation jnic driver (Solaris SCSI) configuration file.
##
## jnic.conf
##


#
# Configuration flags: FcLoopEnabled, FcFabricEnabled, FcPortCfgEnable
# Type: boolean
# Default: FcLoopEnabled   = 1 (true)
#          FcFabricEnabled = 0 (false)
#          FcPortCfgEnable = 0 (false)
#
# These flags are used to configure hba port topology.  Since the JNI hba
# ports must be programmed for operation as L_Port or N_Port, these flags,
# in conjunction with the current hba port setting(s), will determine if
# hba port reconfiguration is necessary.  If hba reconfiguration is necessary,
# and the FcPortCfgEnable flag is set, the change will take effect on the
# subsequent adapter reboot.  If hba reconfiguration is necessary and the
# FcPortCfgEnable flag is not set, the driver/adapter will enter non-
# participating mode.
#
# The hba port will be set up or reconfigured as specified in the following
# table:
#
#     conf flag      hba config
#   Loop  Fabric  Loop  Fabric  FcPortCfgEn  Action
#   ------------  ------------  -----------  --------------------------------
#   0     0       (don't care)     X         Non-participating Mode
#   1     0       Y     -          X         L_Port Mode (private loop)
#   1     0       -     Y          1         Program hba port (Reboot required)
#   1     0       -     Y          0         Non-participating Mode
#   0     1       Y     -          1         Program hba port (Reboot required)
#   0     1       Y     -          0         Non-participating Mode
#   0     1       -     Y          X         N_Port Mode  (fabric)
#   1     1       Y     -          X         NL_Port Mode (public loop)
#   1     1       -     Y          X         N_Port Mode  (fabric)
#
#FcLoopEnabled   = 1;
#FcFabricEnabled = 0;
#FcPortCfgEnable = 0;


#
# Configuration flag: FcLinkUpRecoveryTime
# Type: integer
# Default: 1000 (ms)
#
```

Figure 2.18   Example of jnic.conf File (continues on the following pages)

```
#
# Sets the time (in ms) after the link is up before port discovery begins.
#
#FcLinkUpRecoveryTime = 1000;
#
# Configuration flag: BusyRetryDelay
# Type: integer
# Default: 100 (ms)
#
# Sets the time (in ms) after a command is busied before it is retried.
#
#BusyRetryDelay = 100;


#
# Configuration flag: FailoverDelay
# Type: integer
# Default: 0 (s)
#
# Sets the time (in s) after a command is failed before the target is failed
# to the upper layer scsi driver.  A zero value represents no failover.
#
#FailoverDelay = 0;


#
# Configuration flag: TimeoutResetEnable
# Type: boolean
# Default: 0 (false)
#
# Flag for enabling resets for timed-out commands.
#
#TimeoutResetEnable = 0;


#
# Configuration flag: QfullRetryCount
# Type: integer
# Default: 5
#
# Number of times an I/O is retried due to a QFULL condition.
#
#QfullRetryCount = 5;


#
# Configuration flag: QfullRetryDelay
# Type: integer
# Default: 100 (ms)
#
# Delay (msec) between retry and receipt of QFULL condition.
#
#QfullRetryDelay = 100;


#
# Configuration flag: IoRecoveryDelay
# Type: integer
# Default: 50 (ms)
#
# Delay (msec) between target online and IO recovery.
#
#IoRecoveryDelay = 50;
```

Figure 2.18   Example of jnic.conf File (continued)

```
#
# Configuration flag: def_hba_binding
# Type: string
# Default: "jnic*"
#
#  "jnic*"  (means all target/lun instances will be initialized by all
#             jnic instances)
#
#  "null" (means no target/lun instance will be initialized by any
#          jnic instance UNLESS the targetX_hba or targetX_lunY_hba binding
#          parameters are explicitly defined)
#
# Sets the default HBA binding for every target/lun instance which does not
# explicitly define one.
#       - A "*" following an hba name indicates all instances of that hba driver
# *See technote for details on hba bindings
#
#def_hba_binding  = "jnic*";


#
# Configuration flag: def_wwnn_binding
# Type: string
# Default: "$xxxxxxxxxxxxxxxx" (means WWNN is "static don't care")
#
# Sets the 16 digit hexadecimal default wwnn binding for every target/lun
# instance which does not explicitly define one.
#       - A "$" preceding the string indicates static binding enabled
#       - A "x" in place of a digit indicates "don't care" for that digit
#
#
#def_wwnn_binding  = "$xxxxxxxxxxxxxxxx";



#
# Configuration flag: def_wwpn_binding
# Type: string
# Default: "$xxxxxxxxxxxxxxxx" (means WWPN is "static don't care")
#
# Sets the 16 digit hexadecimal default wwpn binding for every target/lun
# instance which does not explicitly define one.
#       - A "$" preceding the string indicates static binding enabled
#       - A "x" in place of a digit indicates "don't care" for that digit
#
#def_wwpn_binding  = "$xxxxxxxxxxxxxxxx";



#
# Configuration flag: def_port_binding
# Type: string
# Default: "xxxxxx" (means PORT is "non-static don't care")
#
# Sets the 6 digit hexadecimal default port binding for every target/lun
# instance which does not explicitly define one.
#       - A "$" preceding the string indicates static binding enabled
#       - A "x" in place of a digit indicates "don't care" for that digit
# *See technote for details on port bindings
#
#def_port_binding = "xxxxxx";
```

Figure 2.18   Example of jnic.conf File (continued)

```
#
# Configuration flags for target to FC device mapping:
#     targetX_hba,
#     targetX_lunY_hba,
#     targetX_wwnn,
#     targetX_wwpn,
#     targetX_port,
#
# Type: string
# Default:
#
# Example usage:
#
# target0_hba     = "jnic0";
# target0_lun0_hba = "jnic0";
# target0_wwnn    = "xxxxxxxxxxxxxxxx";
# target0_wwpn    = "xxxxxxxxxxxxxxxx";
# target0_port    = "xxxxxx";



#
# Configuration flags for target and lun level throttling:
#     target_throttle  <default = 256>,    - Default throttle for all targets
#     lun_throttle     <default = 64>,     - Default throttle for all luns
#     targetX_throttle <default = 256>,    - Specific throttle for targetX
#     targetX_lun_throttle  <default = 64> - Default throttle for all targetX luns
#     targetX_lunY_throttle <default = 64> - Specific throttle for targetX lun
#
# Type: integer
# Default:
#
# Example usage:
#
# target_throttle  = 256;
# lun_throttle  = 64;
# target0_throttle = 256;
# target0_lun_throttle  = 64;
# target0_lun1_throttle = 64;


jnic0-target0_wwnn="500060e802f01612";
jnic0-target0_lun0_hba="jnic0";                    ← This information is updated.
jnic0-target0_lun1_hba="jnic0";                    ←
jnic0-target0_lun2_hba="jnic0";                    ←
jnic0-target0_lun3_hba="jnic0";                    ←
jnic0-target0_lun4_hba="jnic0";                    ←
jnic0-target0_lun5_hba="jnic0";                    ←
jnic0-target0_lun6_hba="jnic0";                    ←
jnic0-target0_lun7_hba="jnic0";                    ←
jnic0-target0_lun8_hba="jnic0";                    ←
jnic0-target0_lun9_hba="jnic0";                    ←
jnic0-target0_lun10_hba="jnic0";                   ←
jnic0-target0_lun11_hba="jnic0";                   ←
jnic0-target0_lun12_hba="jnic0";                   ←
jnic0-target0_lun13_hba="jnic0";                   ←
jnic0-target0_lun14_hba="jnic0";                   ←
jnic0-target0_lun15_hba="jnic0";                   ←
```

Figure 2.18   Example of jnic.conf File (continued)

```
def_hba_binding="null";                          ← This information is updated.
jnic0-def_hba_binding="null";                    ←
jnic0-FcLoopEnabled=0;                           ←
jnic0-FcFabricEnabled=1;                         ←
jnic0-FcPortCfgEnable=1;                         ←
jnic0-JniCreationDelay=5;                        ←
jnic0-FlogiRetryCount=3;                         ←
jnic0-PlogiRetryCount=3;                         ←
jnic0-LoginTimeout=300;                          ←
jnic0-BusyRetryDelay=5000;                       ←
jnic0-FailoverDelay=180;                         ←
jnic0-TimeoutResetEnable=0;                      ←
jnic0-QfullRetryCount=5;                         ←
jnic0-QfullRetryDelay=5000;                      ←
jnic0-IoRecoveryDelay=50;                        ←
jnic0-FcEmldEngTcbCount=509;                     ←
jnic0-FcLrrTimeout=100;                          ←
jnic0-FcLinkUpRecoveryTime=1000;                 ←
jnic0-FcEngHeartbeat=5;                          ←
```

Figure 2.18   Example of jnic.conf File (continued)

2.5.3   Sample Instructions for JNI™ 2-Gb Emerald™-Based FC Adapters

The following requirements apply when connecting the 9900 V to a JNI™ 2-Gb Emerald™-based FC host bus adapter:

- The JNI™ adapter must be a JNI 2-Gb Emerald-compatible model such as FCE-6460/1473.

- The driver version must be 5.0.1 or later.

- The EZ Fibre™ configuration utility must be installed. Please refer to the latest user documentation about compatibility with driver version.

- The Solaris™ OS patches for EZ Fibre™ must be installed: the 108434-01/108435-01 patches for Solaris™ version 8. *Note:* The required OS patches are listed in the EZ Fibre™ readme.txt file. Please refer to the latest user documentation.

WARNING: Make sure that LUN 0 is defined and the LUNs are defined consecutively for each target ID. If LUN 0 is not defined and/or the LUNs are not defined consecutively, EZ Fibre will not recognize the rest of the LUs on that target ID.

2.5.3.1   Verifying the FC 2-Gb Emerald™- Based Adapter and Utility

Before the 9900 V is connected to the Solaris™ system, you must verify installation of the fibre-channel Emerald-based™ adapter (FCE), FCE driver, and EZ Fibre™ configuration utility. To ensure that the host configuration is correct, you will verify recognition of the FCE and the FCE driver.

To verify the fibre-channel adapter and driver:

1. Log in to the Sun® system as **root**, and make sure that all existing devices are powered on and properly connected to the Sun® system.

2. Display the host configuration using the **dmesg** command (Figure 2.19).

3. The fibre information (underlined in Figure 2.19) includes the recognition of the **fibre channel adapter**, **SCSI bus characteristics**, **world wide name**, and **JNIC146x driver**. Make sure that the host recognizes these four classes. If this information is not displayed, or if error messages are displayed, the host environment may not be configured properly.

4. Verify installation of the EZ Fibre™ configuration utility by running the EZ Fibre™ configuration utility. Enter **./ezf** or **/opt/jni/ezfibre/standalone/ezf**.The EZ Fibre™ GUI should open. For instructions on using the EZ Fibre™ utility, please refer to the user documentation for the adapter and utility.

```
# dmesg

Sep 23 15:49

Sep 23 15:35:51 E3500-2 unix: NOTICE: Firmware supports Dynamic Reconfiguration of I/O
board types 1, 4.
Sep 23 15:35:51 E3500-2 unix: sysctrl0 is /central@1f,0/fhc@0,f8800000/clock-board@0,900000
Sep 23 15:35:51 E3500-2 unix: sysctrl0: Key switch is in the secure position
Sep 23 15:35:51 E3500-2 unix: environ0 is /fhc@e,f8800000/environment@0,400000

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Sep 23 15:44:18 E3500-2 unix: jnic146x2: Hba: fcr  Model: FCE-1473-N  Type: scsi
Sep 23 15:44:18 E3500-2 unix: jnic146x2: FCode: Version 3.6.2 [104d]  XCode: 2100b [106a]
Sep 23 15:44:18 E3500-2 unix: jnic146x2: WWNN: 100000017300329b  WWPN: 200000017300329b
Sep 23 15:44:19 E3500-2 unix: jnic146x2: Auto-negotiating link speed
Sep 23 15:44:19 E3500-2 unix: jnic146x2: Configured as Fabric port
Sep 23 15:44:19 E3500-2 unix: jnic146x2: JNIC v5.0.1 (01082001)
Sep 23 15:44:19 E3500-2 unix: jnic146x2: Copyright(c) 1995-2001 JNI Corp, All Rights
Reserved.
Sep 23 15:44:21 E3500-2 unix: jnic146x2: Link Up
Sep 23 15:44:22 E3500-2 unix: jnic146x2: Port 0117c7 (WWN
500060e802f01615:500060e802f01615) online.
Sep 23 15:44:22 E3500-2 unix: jnic146x2: Target (WWN 500060e802f01615:500060e802f01615)
online.
Sep 23 15:44:24 E3500-2 unix: jnic146x2 at sbus5: SBus5 slot 0x0 offset 0x400000 and slot
0x0 offset 0x404000 and slot 0x0 offset 0x405000 and slot 0x0 offset 0x0 SBus level 3
sparc9 ipl 5
Sep 23 15:44:24 E3500-2 unix: jnic146x2 is /sbus@b,0/fcr@0,400000
Sep 23 15:45:38 E3500-2 cssd: starting cs00.sh (pid#250)
Sep 23 15:45:38 E3500-2 cssd: starting ccv.sh (pid#251)
Sep 23 15:45:38 E3500-2 cssd: starting kkcv.sh (pid#252)
Sep 23 15:45:39 E3500-2 unix: pseudo-device: vol0
Sep 23 15:45:39 E3500-2 unix: vol0 is /pseudo/vol@0
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
```

Figure 2.19   Displaying the Fibre Device Information (Jaycor FCE-1473 shown)

2.5.3.2 Configuring the JNI FC Emerald™- Based Adapter

After connecting the 9900 V subsystem and rebooting the Sun® system, you are ready to configure the JNI™ FC adapter(s) connected to the 9900 V. Use the EZ Fibre™ utility to configure the adapter.

To configure the JNI™ Emerald™-based FC adapter:

1. Log in as **root**.

2. Make a backup of **jnic146x.conf**: **cp /kernel/drv/jnic146x.conf /kernel/drv/jnic146x.conf.bk**

3. Make a backup of **sd.conf**: **cp /kernel/drv/sd.conf /kernel/drv/sd.conf.bk**

4. Run the EZ Fibre™ configuration utility.

5. Select the **Adapter Parameters** tab.

6. Set the driver parameter: **Target Failed Reporting Delay (sec) = 120;**

7. Set the driver parameter: **Target Reset on I/O Timeout = Disabled;**

8. Set the driver parameter (see Figure 2.20): **Topology Type = Private Loop;**

9. Select the **Commit Change** button, and save your changes. In addition, you should set the LUN-Level Zoning if possible (see step 11).

10. OS is rebooted automatically. After OS is invoked, run EZ Fibre™ utility.

11. Select the **LUN-Level Zoning** tab.

12. Bind the necessary target LUNs binding by specifying Mapped item (see Figure 2.21).

13. Select the **Commit Change** button, and save your changes.

14. OS is rebooted automatically. *Note:* While the OS is loading, a message including "Reboot required" is printed on console or /var/adm/messages file. Reboot OS manually again by following the directions. It is due to the inconsistency between HBA and topology setting.

15. Confirm that your Sun® server is connected to 9900 V subsystem.
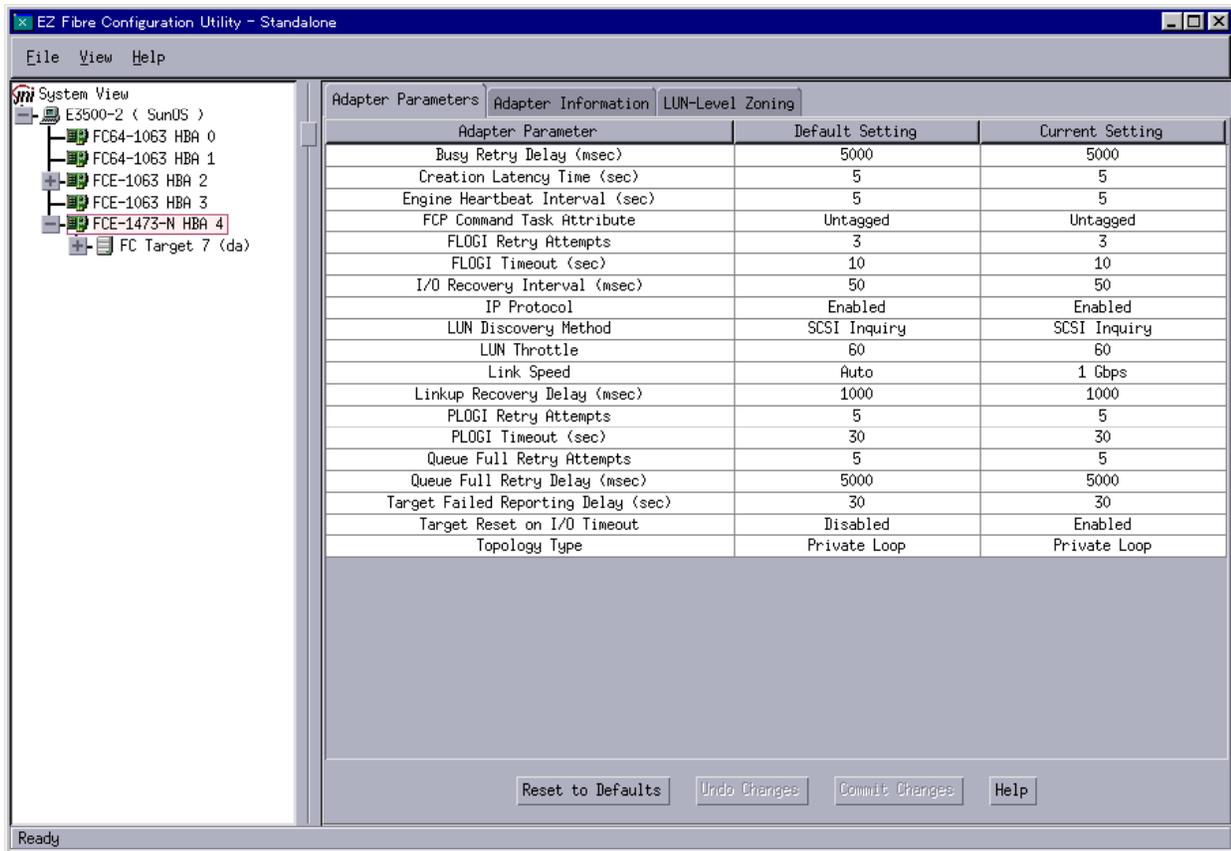
Figure 2.20   Example of JNI™ Driver Parameters
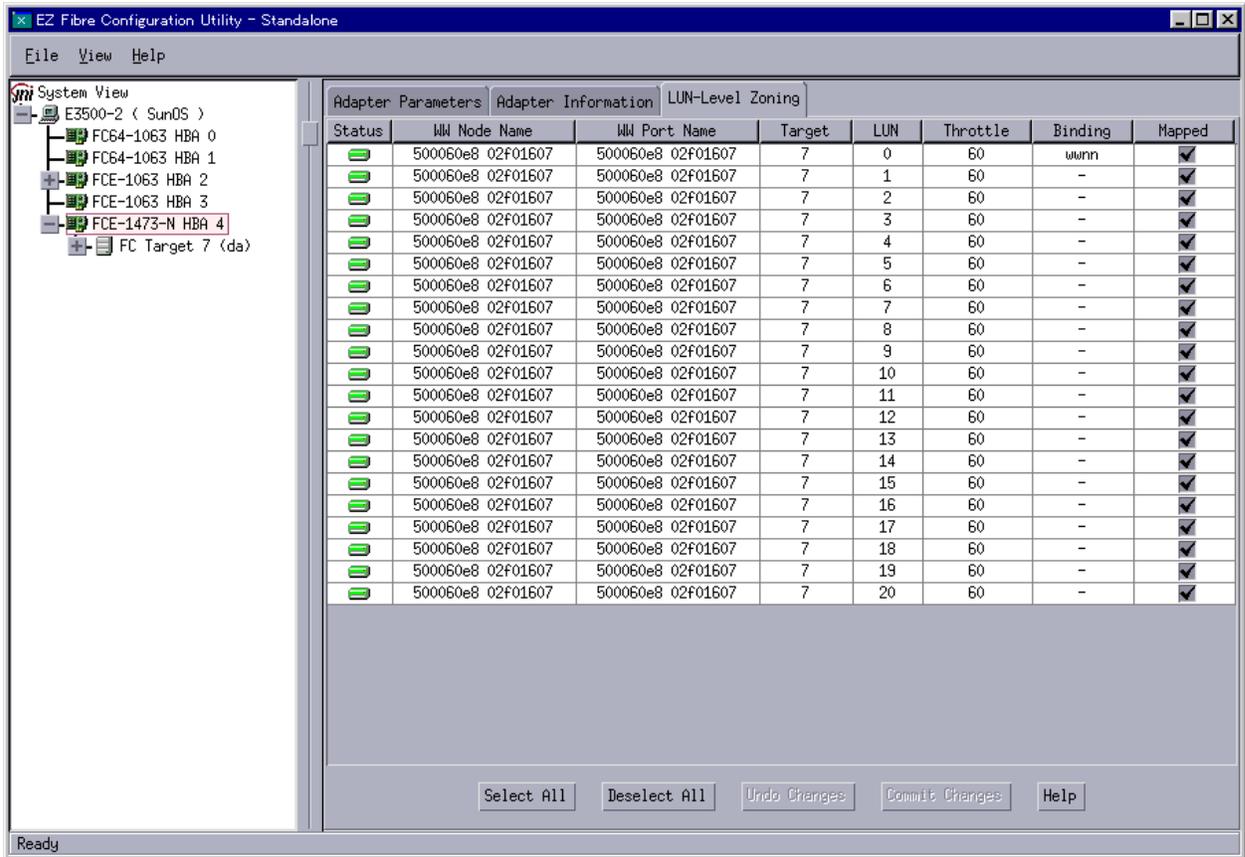
Figure 2.21   Example of JNI™ LUN-Level Zoning

2.5.3.3 Connecting to Fabric Switch

To configure a JNI™ Emerald™-based FCA connected to the 9900 V via fabric switch:

1. Log in as root.

2. Make a backup of jnic146x.conf: cp /kernel/drv/jnic146x.conf /kernel/drv/jnic146x.conf.bk

3. Make a backup of sd.conf: cp /kernel/drv/sd.conf /kernel/drv/sd.conf.bk

4. Run the EZ Fibre™ configuration utility.

5. Select the Adapter Parameters tab.

6. Set the driver parameter: Target Failed Reporting Delay (sec) = 120;

7. Set the driver parameter: Target Reset on I/O Timeout = Disabled;

8. Set the driver parameter (see Figure 2.22): Topology Type = Fabric;

9. Select the Commit Change button, and save your changes. In addition, you should set the LUN-Level Zoning if possible (see step 11).

10. OS is rebooted automatically. After OS is invoked, run EZ Fibre™ utility.

11. Select the LUN-Level Zoning tab.

12. Bind the necessary target LUNs binding by specifying Mapped item.

13. Select the Commit Change button, and save your changes.

14. OS is rebooted automatically. Note: While the OS is loading, a message including "Reboot required" is printed on console or /var/adm/messages file. Reboot OS manually again by following the directions. It is due to the inconsistency between HBA and topology setting.

15. Confirm that your Sun® server is connected to 9900 V subsystem.

EZ Fibre Configuration Utility - Standalone

File   View   Help

System View
E3500-2 (SunOS)
    FC64-1063 HBA 0
    FC64-1063 HBA 1
    FCE-1063 HBA 2
    FCE-1063 HBA 3
    FCE-1473-N HBA 4
        FC Target 0 (0)

Adapter Parameters | Adapter Information | LUN-Level Zoning

Adapter Parameter	Default Setting	Current Setting
Busy Retry Delay (msec)	5000	5000
Creation Latency Time (sec)	5	5
Engine Heartbeat Interval (sec)	5	5
FCP Command Task Attribute	Untagged	Untagged
FLOGI Retry Attempts	3	3
FLOGI Timeout (sec)	10	10
I/O Recovery Interval (msec)	50	50
IP Protocol	Enabled	Enabled
LUN Discovery Method	SCSI Inquiry	SCSI Inquiry
LUN Throttle	60	60
Link Speed	Auto	Auto
Linkup Recovery Delay (msec)	1000	1000
PLOGI Retry Attempts	5	5
PLOGI Timeout (sec)	30	30
Queue Full Retry Attempts	5	5
Queue Full Retry Delay (msec)	5000	5000
Target Failed Reporting Delay (sec)	30	60
Target Reset on I/O Timeout	Disabled	Disabled
Topology Type	Private Loop	Fabric

Reset to Defaults   Undo Changes   Commit Changes   Help

Ready

Figure 2.22   Example of JNI™ Driver Parameters for Fabric Switch

2.5.3.4 Example of jnic146x.conf File and Parameter Information

The EZ Fibre™ utility updates the necessary information in the **jnic146x.conf** and **sd.conf** files. Figure 2.23 shows an example of the **jnic146x.conf** file. For further information on setting parameter information, please refer to the online help for the EZ Fibre™ utility.

Note: It is possible to modify the **jnic146x.conf** file manually by referring to the configuration guide for Emerald HBA driver. To manually modify the **jnic146x.conf** file, it is necessary to get the following information in advance: WWN information, target ID information, the number of LUNs, 9900 V Fibre Channel adapter information, and for the jnic146x, the number of Host Bus Adapters. The information in that is in bold and is underlined is required.

```
##
## JNI Corporation jnic146x driver (Solaris SCSI) configuration file.
##
## jnic146x.conf
##
## Date last modified: March 23, 2001
##
## For additional information, refer to the "readme.txt" file provided with the
## jnic146x driver installation package.

#
# Configuration parameters: FcLoopEnabled, FcFabricEnabled
# Type: boolean
# Default: FcLoopEnabled   = 1
#          FcFabricEnabled = 0
#
# These parameters are used to configure the HBA port topology. The HBA port
# will be set up as specified in the following table:
#
#   FcLoopEnabled  FcFabricEnabled   Topology
#   -------------  ---------------   -------------------------
#        0               0           Auto-topology detect
#        0               1           N_Port mode (fabric)
#        1               0           L_Port mode (private loop)
#        1               1           NL_Port Mode (public loop)
#
#FcLoopEnabled   = 1;
#FcFabricEnabled = 0;


#
# Configuration parameter: FcEngHeartbeatInterval
# Type: integer
# Default: 5 (sec)
#
# When the JNI adapter/driver detects that the Fibre Channel link is up (and
# there is no I/O activity), it will send a "test frame" (or heartbeat) to
# itself to verify link integrity.  The test frame is sent at the interval
# specified by this parameter.  If the test frame does not complete, it is
# assumed that there is a link problem.  In this situation, the driver
# initiates error recovery to re-establish a good link.  A value of "0"
# disables the heartbeat.
```

Figure 2.23   Example of a jnic146x.conf File (continues on the following pages)

```
#
#FcEngHeartbeatInterval = 5;


#
# Configuration parameter: FcLinkUpRecoveryTime
# Type: integer
# Default: 1000 (msec)
#
# Delay (msec) after the link is up before port discovery begins, allowing
# the link to stabilize and protecting against a possible I/O surge. This timer
# is reset every time the link comes up. The default value is adequate for most
# configurations.
#
#FcLinkUpRecoveryTime = 1000;


#
# Configuration parameter: BusyRetryDelay
# Type: integer
# Default: 5000 (msec)
#
# Delay (msec) before retrying after receipt of an I/O with a "SCSI Busy"
# status from a target. The number of retries is based on the Solaris retry
# count associated with the I/O.
#
#BusyRetryDelay = 5000;


#
# Configuration parameter: FailoverDelay
# Type: integer
# Default: 30 (sec)
#
# Delay (seconds) before failing all I/O for an offline target. If the delay
# timer expires, all I/O for the failed target is returned to the application.
# A zero value disables failover.
#
#FailoverDelay = 30;


#
# Configuration parameter: TimeoutResetEnable
# Type: boolean
# Default: 0 (false)
#
# Boolean parameter for enabling SCSI target resets for timed out I/O. When
# the timer expires (usually 60 seconds, as specified by the upper layers),
# the driver issues a target reset to attempt to clear the device (which might
# be either too busy to respond or stuck).
#
#TimeoutResetEnable = 0;


#
# Configuration parameter: QfullRetryCount
# Type: integer
# Default: 5
#
# Number of times an I/O is retried due to receipt of a "SCSI Queue Full" status
# from a target. The delay between retries is based on the QfullRetryDelay
# parameter.
#
#QfullRetryCount = 5;
```

Figure 2.23   Example of a jnic146x.conf File (continued)

```
#
# Configuration parameter: QfullRetryDelay
# Type: integer
# Default: 5000 (msec)
#
# Delay (msec) before retrying after receipt of an I/O with a "SCSI Queue Full"
# status from a target. The number of retries is based on the QfullRetryCount
# parameter.
#
#QfullRetryDelay = 5000;


#
# Configuration parameter: LunRecoveryInterval
# Type: integer
# Default: 50 (msec)
#
# Sets the LUN I/O recovery interval (in msec) after the driver reconnects to
# a disk. It is a global parameter affecting all targets, and determines how
# long the driver waits after a port is discovered until sending I/O to that
# port. Some devices might require more time to flush I/O that was in progress
# prior to a link going down; if this is the case, increase the value of this
# parameter.
#
#LunRecoveryInterval = 50;


#
# Configuration parameter: FcLinkSpeed
# Type: integer
# Default: 1 (force 1 Gbit/sec)
#
# Specifies the desired Fibre Channel link speed as follows:
#   0 - default to SEEPROM setting
#   1 - force 1 Gbit/sec
#   2 - force 2 Gbit/sec
#   3 - auto negotiate link speed
#
#FcLinkSpeed = 1;


#
# Configuration parameter: JniCreationDelay
# Type: integer
# Default: 5 (sec)
#
# Delay (seconds) after driver creation to allow the network to stabilize,
# discover ports, and build the driver's database.  Increase this value
# if targets are being discovered too late in the boot process.
#
#JniCreationDelay = 5;


#
# Configuration parameter: FlogiRetryCount
# Type: integer
# Default: 3
#
# Total number of Fabric Login (FLOGI) attempts before giving up logging in to
# a switch. Failure prevents participation on a Fabric topology.
#
#FlogiRetryCount = 3;
```

Figure 2.23   Example of a jnic146x.conf File (continued)

```
#
# Configuration parameter: FcFlogiTimeout
# Type: integer
# Default: 10
#
# Specifies the amount of time (in seconds) that the driver waits for a Fabric
# Login (FLOGI) accept. The value should be increased only if the switch to
# which the HBA is connected requires more time to respond to a FLOGI. The
# number of retries is configured with the FlogiRetryCount parameter.
#
#FcFlogiTimeout = 10;


#
# Configuration parameter: PlogiRetryCount
# Type: integer
# Default: 5
#
# Total number of Port Login (PLOGI) attempts before giving up logging in to
# a SCSI target.
#
#PlogiRetryCount = 5;


#
# Configuration parameter: PlogiControlSeconds
# Type: integer
# Default: 30
#
# Defines the number of seconds that the driver waits for a successful
# port login (PLOGI) attempt. The maximum number of attempts is defined by
# the PlogiRetryCount parameter. Some devices might take longer to respond
# to PLOGIs; if this is the case, increase the value of this parameter.
#
#PlogiControlSeconds = 30;


#
# Configuration parameter: FcEmldEngTcbCount
# Type: integer
# Default: 1789
#
# Total number of concurrent exchanges (also called transfer control blocks)
# allowed by the adapter. To optimize performance, set this parameter to match
# the memory capacity of the hardware.
#
#FcEmldEngTcbCount = 1789;


#
# Binding Parameters:
#
# Configuration parameter: def_hba_binding
# Type: string
# Default: "jnic146x*"
#
# Sets the default HBA binding for every target/LUN instance which does not
# explicitly define one.  A "*" following an HBA name indicates all instances
# of that HBA driver
#
#  "jnic146x*" - means all target/LUN instances will be initialized by all
#                jnic146x instances
#
#  "null" - means no target/LUN instance will be initialized by any jnic146x
#           instance UNLESS the targetX_hba or targetX_lunY_hba binding
#           parameters are explicitly defined
```

Figure 2.23   Example of a jnic146x.conf File (continued)

```
#
#def_hba_binding = "jnic146x*";


#
# Configuration parameter: def_wwnn_binding
# Type: string
# Default: "$xxxxxxxxxxxxxxxx" (means WWNN is "static don't care")
#
# Sets the 16-digit hexadecimal default WWNN binding for every target/LUN
# instance which does not explicitly define one.
#      - A "$" preceding the string indicates static binding by WWNN enabled
#      - A "x" in place of a digit indicates "don't care" for that digit
#
#def_wwnn_binding = "$xxxxxxxxxxxxxxxx";


#
# Configuration parameter: def_wwpn_binding
# Type: string
# Default: "$xxxxxxxxxxxxxxxx" (means WWPN is "static don't care")
#
# Sets the 16-digit hexadecimal default WWPN binding for every target/LUN
# instance which does not explicitly define one.
#      - A "$" preceding the string indicates static binding by WWPN enabled
#      - A "x" in place of a digit indicates "don't care" for that digit
#
#def_wwpn_binding = "$xxxxxxxxxxxxxxxx";


#
# Configuration parameter: def_port_binding
# Type: string
# Default: "xxxxxx" (means PORT is "non-static don't care")
#
# Sets the 6-digit hexadecimal default port binding for every target/LUN
# instance which does not explicitly define one.
#      - A "$" preceding the string indicates static binding by port ID enabled
#      - A "x" in place of a digit indicates "don't care" for that digit
#
#def_port_binding = "xxxxxx";


#
# Configuration parameters for target to FC device mapping:
#
#    targetX_hba,
#    targetX_lunY_hba,
#    targetX_wwnn,
#    targetX_wwpn,
#    targetX_port,
#
# Type: string
# Default:
#
# Example usage: Replace the 'x' characters with actual WWNN, WWPN, or port ID.
#
# target0_hba      = "jnic146x0";
# target0_lun0_hba = "jnic146x0";
# target0_wwnn     = "xxxxxxxxxxxxxxxx";
# target0_wwpn     = "xxxxxxxxxxxxxxxx";
# target0_port     = "xxxxxx";


#
# Configuration parameters for target and LUN level throttling:
#
```

Figure 2.23   Example of a jnic146x.conf File (continued)

```
#    target_throttle  <default = 256>,    - Default throttle for all targets
#    lun_throttle      <default = 64>,     - Default throttle for all LUNs
#    targetX_throttle <default = 256>,     - Specific throttle for targetX
#    targetX_lun_throttle  <default = 64> - Default throttle for all targetX LUNs
#    targetX_lunY_throttle <default = 64> - Specific throttle for each targetX LUN
#
# Type: integer
# Default:
#
# Example usage:
#
# target_throttle = 256;
# lun_throttle = 64;
# target0_throttle = 256;
# target0_lun_throttle = 64;
# target0_lun1_throttle = 64;

jnic146x2-target9_wwnn="$500060e802f01607";              ← This information is updated.
jnic146x2-target9_lun0_hba="jnic146x2";
jnic146x2-target9_lun0_throttle=60;
jnic146x2-target9_lun1_hba="jnic146x2";
jnic146x2-target9_lun1_throttle=60;
jnic146x2-target9_lun2_hba="jnic146x2";
jnic146x2-target9_lun2_throttle=60;
jnic146x2-target9_lun3_hba="jnic146x2";
jnic146x2-target9_lun3_throttle=60;
jnic146x2-target9_lun4_hba="jnic146x2";
jnic146x2-target9_lun4_throttle=60;
jnic146x2-target9_lun5_hba="jnic146x2";
jnic146x2-target9_lun5_throttle=60;
jnic146x2-target9_lun6_hba="jnic146x2";
jnic146x2-target9_lun6_throttle=60;
jnic146x2-target9_lun7_hba="jnic146x2";                  ← This information is updated.
jnic146x2-target9_lun7_throttle=60;
jnic146x2-target9_lun8_hba="jnic146x2";
jnic146x2-target9_lun8_throttle=60;
def_hba_binding="null";
jnic146x2-def_hba_binding="null";
jnic146x2-FcLoopEnabled=1;
jnic146x2-FcFabricEnabled=0;
jnic146x2-FcLinkSpeed=3;
jnic146x2-JniCreationDelay=5;
jnic146x2-FlogiRetryCount=3;
jnic146x2-PlogiRetryCount=5;
jnic146x2-PlogiControlSeconds=30;
jnic146x2-BusyRetryDelay=5000;
jnic146x2-FailoverDelay=120;
jnic146x2-TimeoutResetEnable=0;
jnic146x2-QfullRetryCount=5;
jnic146x2-QfullRetryDelay=5000;
jnic146x2-LunRecoveryInterval=50;
jnic146x2-LunThrottle=60;
jnic146x2-LunDiscoveryMethod=0;
jnic146x2-CmdTaskAttr=1;
jnic146x2-FcIpEnable=1;
jnic146x2-FcFlogiTimeout=10;
jnic146x2-FcLinkUpRecoveryTime=1000;
jnic146x2-FcEngHeartbeatInterval=5;
```

Figure 2.23   Example of a jnic146x.conf File (continued)

2.6   Setting the Disk and Device Parameters

The queue depth parameter (**max_throttle**) for the 9900 V devices must be set according to either Option 1 or Option 2 as specified in Table 2.3.

Table 2.3   Max Throttle (Queue Depth) Requirements for the 9900 V Devices

Queue Depth Option	Requirements
Option 1	Queue_depth ≤ 256 or default. ***WARNING:*** The number of issued commands must be controlled completely. You must adjust the number of issued commands from Solaris™ system to 256 or less, because queuing capacity of 9900 V subsystem is 256 per port. Otherwise memory allocate failed messages may occur on the Solaris™ system, and all read/write I/O may stop (Solaris™ system may hang).
Option 2	Number of LUs × queue_depth ≤ 256 and queue_depth ≤ 32

Note: You can adjust the queue depth for the 9900 V devices later as needed (within the specified range) to optimize the I/O performance of the 9900 V devices.

The required I/O time-out value (TOV) for 9900 V devices is 60 seconds (default TOV=60). If the I/O TOV has been changed from the default, you must change it back to 60 seconds by editing the **sd_io_time** or **ssd_io_time** parameter in the **/etc/system** file.

In addition to queue depth and I/O TOV, you should also verify all other required settings for your operational environment (e.g., FC fibre support). You must also make sure that the device parameters are the same for all 9900 V devices. *Note:* For fibre-channel, the settings in the system file are effective for the whole system, not for just the adapter board.

To set the I/O TOV and queue depth for the 9900 V devices:

1. Make a backup of the **/etc/system** file: **cp /etc/system /etc/system.old**

2. Edit the **/etc/system** file.

3. To set the TOV, add the following to the **/etc/system** file (see Figure 2.24):

   – **set sd:sd_io_time=0x3c**

   – for Sun generic HBA: **set ssd:ssd_io_time=0x3c**

4. To set the queue depth, add the following to the **/etc/system** file (see Figure 2.25):

   – **set sd:sd_max_throttle = x**   (for **x** refer to Table 2.3)

   – for Sun generic HBA: **set ssd:ssd_max_throttle = x**   (for **x** refer to Table 2.3)

5. Save your changes, and exit the text editor.

6. Shutdown and reboot to apply the I/O TOV setting.

```
*ident    "@(#)system    1.15    92/11/14 SMI" /* SVR4 1.5 */
*
* SYSTEM SPECIFICATION FILE
*
:
*       To set a variable named 'debug' in the module named 'test_module'
*
*                   set test_module:debug = 0x13
                    set sd:sd_io_time = 0x3c              ← Add this line to /etc/system
                    set ssd:ssd_io_time = 0x3c            ← Add this line to /etc/system
                                                         (for SUN generic Host Bus Adapter)
```

Figure 2.24   Setting the I/O TOV

```
:
*     To set a variable named 'debug' in the module named 'test_module'
*
*              set test_module:debug = 0x13

set sd:sd_max_throttle = 8                               ← Add this line to /etc/system
set ssd:ssd_max_throttle = 8                             ← Add this line to /etc/system
                                                         (for SUN generic Host Bus Adapter)
```

Figure 2.25   Setting the Max Throttle (Queue Depth)

2.7 Connecting the 9900 V Subsystem to the Sun® System

After you have configured the 9900 V fibre ports and host fibre-channel adapter(s), you are ready to connect the 9900 V subsystem to the Sun® system. The 9900 V subsystem comes with all the hardware and cabling required for connection to the host system(s). Connection of the 9900 V subsystem involves the following activities:

1. **Verify subsystem installation**. The Hitachi Data Systems representative verifies that the status of the fibre-channel adapters and LDEVs is NORMAL.

2. **Shut down the Sun® system**. The Sun® system must be powered OFF before the 9900 V is connected. The user should perform this activity.

   a) Shut down the Sun® system.

   a) When shutdown is complete, power off the Sun® display.

   b) Power off all peripheral devices except for the 9900 V subsystem.

   c) Power off the host system. You are now ready to connect the 9900 V subsystem.

3. **Connect the 9900 V to the Sun® system**. The Hitachi Data Systems representative installs the fibre-channel cables between the 9900 V and the Sun® system.

   Note: The Hitachi Data Systems representative must use the 9900 V 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 Sun® system**. The user should perform this activity. To power on the Sun® system after connecting the 9900 V:

   a) Power on the Sun® system display.

   b) Power on all peripheral devices. The 9900 V should already be on, the fibre-channel ports should already be configured, and the driver configuration file and system configuration file should already be edited. If the fibre ports are configured or configuration files edited after the Sun® system is powered on, the system must be restarted in order to recognize the new devices.

   c) Confirm the ready status of all peripheral devices, including the 9900 V.

   d) Power on the Sun® system.

5. **Boot the Sun® system**. When the **OK** prompt appears, boot the system using the **boot -r** command. The **-r** option tells the system to rebuild the devices. Using **boot** by itself will not build the devices on the newly installed 9900 V.

Chapter 3   Configuring the 9900 V Devices

After installation and connection of the Lightning 9900™ V Series subsystem are complete, the devices on the 9900 V subsystem are ready to be configured for use. Configuration of the 9900 V devices is performed by the user and requires root access to the Sun® system.

The activities involved in new device configuration are:

- Setting and recognizing the LUs (see section 3.1),

- Verifying new device recognition (see section 3.2),

- Partitioning and labeling the new devices (see section 3.3), and

- Creating and mounting the file system (see section 3.4).

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

Failover and SNMP: Chapter 4 provides information on failover and SNMP configuration for the 9900 V subsystem.

Troubleshooting: Chapter 5 and Appendix A provide troubleshooting information.

Fibre port addressing: Appendix B provides the fibre port addressing (AL-PA to SCSI TID mapping) for Solaris™ systems.

Online device installation: Appendix C provides instructions for online 9900 V device installation.

Boot disk: Appendix D provides instructions for configuring the Solaris™ boot disk on the 9900 V subsystem.

VERITAS® VxVM DMP: Appendix E provides information for VERITAS® VxVM DMP operations.

3.1 Setting and Recognizing the LUs

Once the 9900 V is installed and connected, you must set and recognize the new LUs by adding the 9900 V logical devices to the **sd.conf** file (/kernel/drv/sd.conf). The **sd.conf** file includes the SCSI TID and LUN for all LDEVs connected to the Sun® system. After editing the **sd.conf** file, you will halt the system and reboot.

To set and recognize LUs:

1. Log in as root, and make a backup copy of the **/kernel/drv/sd.conf file**:
   cp -ip /kernel/drv/sd.conf /kernel/drv/sd.conf.standard

2. Edit the **/kernel/drv/sd.conf file** as shown in Figure 3.1. Make sure to make an entry (SCSI TID and LUN) for each new device being added to the Sun® system.

   Note: If the LUs have already been added to the **sd.conf** file, please verify each new LU.

3. Exit the vi editor by entering the command: **ESC + :wq**

4. Halt the Sun® system (**halt**), and then reboot the Sun® system (**boot -r**).

5. Log in to the system as root, and verify that the system recognizes the 9900 V (Figure 3.2): **dmesg | more**

6. Verify that the vendor name, product name, and number of blocks match the values shown in Figure 3.2.

```
# cp -ip /kernel/drv/sd.conf /kernel/drv/sd/conf/standard        ← Make backup of file.
#
# vi /kernel/drv/sd.conf                                         ← Edit the file (vi shown).
#ident  "@(#)sd.conf    1.8     93/05/03 SMI"
name="sd" class="scsi"
        target=0 lun=0;

name="sd" class="scsi"
        target=1 lun=0;

name="sd" class="scsi"
        target=2 lun=0;

name="sd" class="scsi"                                           ← Add this information for
        target=2 lun=1;                                          ← all new target IDs
                                                                   and LUNs. (*See note.)
name="sd" class="scsi"
        target=3 lun=0;

name="sd" class="scsi"
        target=4 lun=0;
#
# halt                                                           ← Enter halt.
Jan 11 10:10:09 sunss20 halt:halted by root
Jan 11 10:10:09 sunss20 syslogd:going down on signal 15
Syncing file systems... done
Halted

Program terminated
Type help for more information
OK

volume management starting.
The system is ready.

host console login: root                                        ← Log in as root.
Password:                                                       ← Password is not displayed.
Oct 11 15:28:13 host login: ROOT LOGIN /dev/console
Last login:Tue Oct 11 15:25:12 on console
Sun Microsystems inc.  SunOS 5.5      Generic September 1993
#
#
#
```

Note: The SCSI class type name is used because the SCSI driver is used for fibre channel.

Figure 3.1   Setting and Recognizing LUs

```
# dmesg | more
  :
sbus0 at root: UPA 0x1f 0x0 ...
fas0:rev 2.2 FEPS chip

SUNW,fas0 at sbus0: SBus0 slot 0xe offset 0x8800000 and slot 0xe offset 0x8810000 Onboard
device sparc9 ipl 4
SUNW,fas0 is /sbus@1f,0/SUNW,fas@e,8800000
sd0 at SUNW,fas0: target 0 lun 0
sd0 is /sbus@1f,0/SUNW,fas@e,8800000/sd@0,0
     <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
sd6 at SUNW,fas0: target 6 lun 0
sd6 is /sbus@1f,0/SUNW,fas@e,8800000/sd@6,0
WARNING: fca0: fmle: sc1: 000e0000  sc2: 00000000
fca0: JNI Fibre Channel Adapter (1062 MB/sec), model FC
fca0:SBus 1 / IRQ 4 / FCODE Version 10 [20148b] / SCSI ID 125 / AL_PA 0x1
fca0:Fibre Channel WWN: 100000e0690002b7
fca0:FCA Driver Version 2.1+, June 24, 1998 Solaris 2.5, 2.6
fca0:All Rights Reserved.
fca0:< Total IOPB space used: 1100624 bytes >
fca0:< Total DMA space used: 532644 bytes >
fca0: <HITACHI :OPEN-3         :5235> target 2 (alpa 0xe4) lun 0 online
sd192 at fca: target 2 lun 0
                          ↖ LUN = 0
                ↖ target ID = 2
sd192 is /sbus@1f,0/fca@1,0/sd@2,0

WARNING: /sbus@1f,0/fca@1,0/sd@2,0 (sd192)
        corrupt label - wrong magic number                        ← Not yet labeled.
        Vendor 'HITACHI', product 'OPEN-3', 4806720 512 byte blocks
              ↖ Vendor name              ↖ Number of blocks
                                   ↖ Product name
fca0: <HITACHI :OPEN-3         :5235> target 2 (alpa 0xdc) lun 2 online
sd193 at fca: target 2 lun 1       (LUN=1, target ID=2)
sd193 is /sbus@1f,0/fca@1,0/sd@2,1
WARNING: /sbus@1f,0/fca@1,0/sd@2,1 (sd193)
        corrupt label - wrong magic number
        Vendor 'HITACHI', product 'OPEN-3', 4806720 512 byte blocks
fca0: <HITACHI :OPEN-9         :5235> target 6 (alpa 0xdc) lun 0 online
sd.. at fca: target  lun 0   (LUN=0, target ID=6)
sd.. is /sbus@1f,0/fca@1,0/sd@4,0
WARNING: /sbus@1f,0/fca@1,0/sd@4,0 (sd..)
        corrupt label - wrong magic number                        ← Not yet labeled.
        Vendor 'HITACHI', product 'OPEN-9', 14423040 512 byte blocks
sd.. at fca: target 6 lun 0                                       ← Verify target ID.
        corrupt label - wrong magic number                        ← Not yet labeled.
        Vendor 'HITACHI', product 'OPEN-9', 14423040 512 byte blocks
sd.. is /sbus@1f,0/fca@1,0/sd@5,0
WARNING: /sbus@1f,0/fca@1,0/sd@5,0 (sd..)
        corrupt label - wrong magic number                        ← Not yet labeled.
        Vendor 'HITACHI', product '3390-3B', 5822040 512 byte blocks
sd.. is /sbus@1f,0/fca@1,0/sd@6,0
WARNING: /sbus@1f,0/fca@1,0/sd@6,0 (sd..)
        corrupt label - wrong magic number                        ← Not yet labeled.
        Vendor 'HITACHI', product '3390-3A', 5825520 512 byte blocks
sd.. is /sbus@1f,0/fca@1,0/sd@8,0
```

Note: If the HRX volumes (e.g., 3390-3A/B/C) are customized, their block number may be lower than the number displayed in this example.

Figure 3.2   Fibre Device Recognition

3.2   Verifying Recognition of New Devices

After system start-up, log in as root and verify that the Sun® system recognizes the 9900 V using the **dmesg | more** command. Verify that the displayed vendor names, product names, and number of blocks match the values displayed in Figure 3.3. If the results are different than the intended system configuration, SVP path definition or fibre cabling might be wrong.

Note: When the Sun® system accesses the multiplatform devices, the message "Request sense couldn't get sense data" may be displayed. Please disregard this message.

```
# dmesg | more
  :
sbus0 at root: UPA 0x1f 0x0 ...
fas0: rev 2.2 FEPS chip

SUNW,fas0 at sbus0: SBus0 slot 0xe offset 0x8800000 and slot 0xe offset 0x8810000 Onboard device
sparc9 ipl 4
SUNW,fas0 is /sbus@1f,0/SUNW,fas@e,8800000
sd0 at SUNW,fas0: target 0 lun 0
sd0 is /sbus@1f,0/SUNW,fas@e,8800000/sd@0,0
      <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
sd6 at SUNW,fas0: target 6 lun 0
sd6 is /sbus@1f,0/SUNW,fas@e,8800000/sd@6,0
WARNING: fca0: fmle: sc1: 000e0000   sc2: 00000000
fca0: JNI Fibre Channel Adapter (1062 MB/sec), model FC
fca0: SBus 1 / IRQ 4 / FCODE Version 10 [20148b] / SCSI ID 125 / AL_PA 0x1
fca0: Fibre Channel WWN: 100000e0690002b7
fca0: FCA Driver Version 2.1+, June 24, 1998 Solaris 2.5, 2.6
fca0: All Rights Reserved.
fca0: < Total IOPB space used: 1100624 bytes >
fca0: < Total DMA space used: 532644 bytes >
fca0: <HITACHI :OPEN-3        :5235> target 2 (alpa 0xe4) lun 0 online
sd192 at fca: target 2 lun 0
                    ↖        ↖ LUN = 0
                      target ID = 2
sd192 is /sbus@1f,0/fca@1,0/sd@2,0
WARNING: /sbus@1f,0/fca@1,0/sd@2,0 (sd192)
      corrupt label – wrong magic number                          ← Not yet labeled.
      Vendor 'HITACHI', product 'OPEN-3',   4806720 512 byte blocks
             ↖ Vendor name    ↖ Product name   ↖ Number of blocks
fca0: <HITACHI :OPEN-3        :5235> target 2 (alpa 0xdc) lun 1 online
sd193 at fca: target 2 lun 1       (LUN=1, target ID=2)
sd193 is /sbus@1f,0/fca@1,0/sd@2,1
WARNING: /sbus@1f,0/fca@1,0/sd@2,1 (sd193)
      corrupt label – wrong magic number
      Vendor 'HITACHI', product 'OPEN-3', 4806720 512 byte blocks
```

Figure 3.3   Verifying New Devices

This example shows two new disks on fca@1: target ID is 2, LUNs are 0 and 1, vendor name is "HITACHI", product name is "OPEN-3", and number of blocks is 4806720. LUNs 0 and 1 are assigned as device names sd192 and sd193, respectively. Details for other disks:

    vendor name "HITACHI", product name "OPEN-9" and 14423040 512-byte blocks.
    vendor name "HITACHI", product name "3390-3B" and 5822040 512-byte blocks.
    vendor name "HITACHI", product name "3390-3A" and 5825520 512-byte blocks.

3.3 Partitioning and Labeling the New Devices

After the new devices have been recognized by the Sun® system, you can begin partitioning and labeling the devices. All new devices must be partitioned and labeled using the Sun® **format** utility (see *WARNING* below), including all SCSI disk devices and HRX devices. Each SCSI disk device (e.g., OPEN-*x*) can have more than one partition. Each HRX device (e.g., 3390-3A) must have one partition of fixed size. The disk partitioning and labeling procedure involves the following tasks: defining and setting the disk type, setting the partition(s), labeling the disk, and verifying the disk label.

A good way to partition and label the disks is to partition and label all devices of one type (e.g., OPEN-3), then all devices of the next type (e.g., OPEN-9), and so on until you have partitioned and labeled all new devices. You will enter this information into the Sun® system during the disk partitioning and labeling procedure.

WARNING: Be extremely careful when using the Sun® **format** utility. Do not use any **format** commands not described in this document. The Sun® **format** utility is designed for Sun® disks. Some **format** commands are not compatible with the 9900 V and can overwrite the data on the disk. The 9900 V will not respond to the **format** command (9900 V disks are formatted using the SVP), and will not report any defect data in response to the **defect** command.

To partition and label the devices/disks on the newly installed 9900 V:

1. Enter **format** at the root prompt to start the **format** utility (see Figure 3.4).

    a) Verify that all new devices are displayed. If not, exit the **format** utility (**quit** or **Ctrl-d**), and then make sure that the SCSI/fibre-to-LDEV paths were defined for all devices and that all new devices were added to the driver configuration file). See Chapter 5 for troubleshooting information.

    b) Write down the character-type device file names (e.g., c1t2d0) for all of the new 9900 V devices. You will need this information later to create the file systems.

2. When you are asked to specify the disk, enter the number (from the list) for the device to be partitioned and labeled. Remember the device type of this device (e.g., OPEN-3).

3. When you are asked if you want to label the disk, enter **n** for "no".

4. After the format menu is displayed, enter **type** to display the disk types. The disk types are listed in Table 1.1 (vendor name + product name, e.g., HITACHI OPEN-3).

5. If the disk type for the selected device is already defined, enter the number for that disk type, and go to step (8). *Note:* Do not use HITACHI-OPEN-*x*-0315, HITACHI-3390-3A/B-0315. These disk types are created automatically by the Sun® system and cannot be used for the 9900 V devices.

6. If the disk type for the selected device is not already defined, enter the number for **other** to define a new disk type.

7. Enter the disk type parameters for the selected device using the data provided above. Make sure to enter the parameters exactly as shown in Figure 3.5.

8. When you are asked if you want to label the disk, enter **n** for "no".

9. After the format menu is displayed, enter **partition** to display the partition menu.

10. Enter the desired partition number, and then enter the partition parameters as shown in Figure 3.6. Refer to Table 3.1 – Table 3.6 for partition parameters.

11. Enter **print** at the **partition>** prompt to display the current partition table.

12. Repeat steps (10) and (11) as needed to set the desired partitions for the selected device. *Note:* This step does not apply to the multiplatform devices (e.g., 3390-3A/B/C), because these devices can only have one partition of fixed size.

13. When you are finished setting the partitions for the selected device, enter **label** at the **partition>** prompt, and then enter **y** to label the device (see Figure 3.7).

    Note: The Sun® system displays the following warnings when an HRX device (e.g., 3390-3A/B/C) is labeled. You can ignore these warnings.

    ```
    Warning: error warning VTOC.
    Warning: no backup labels.
    Label failed.
    ```

14. Enter **quit** to exit the **partition** utility and return to the **format** utility.

15. At the **format>** prompt, enter **disk** to display the available disks. Make sure that the disk you just labeled is displayed with the proper disk type name and parameters.

16. Repeat steps (2) through (15) for each new device to be partitioned and labeled. Once a 9900 V disk type is defined (e.g., HITACHI OPEN-3), you can label all devices of that same type without having to enter the parameters (i.e., skipping steps (6) and (7)). For this reason, you may want to label the devices by type, for example, labeling all OPEN-3 devices, then all OPEN-9 devices, and so on until all new devices have been partitioned and labeled.

17. When you are finished partitioning and labeling the disks and verifying the disk labels, exit the **format** utility (**quit** or **Ctrl-d**).

```
# format        ← Start format utility.
Searching for disks...done

c1t2d0: configured with capacity of 2.29GB   (OPEN-3)  ← These devices are not yet labeled.
c1t2d1: configured with capacity of 2.29GB   (OPEN-3)  ←
c2t4d0: configured with capacity of 6.88GB   (OPEN-9)  ←
c2t5d0: configured with capacity of 2.77GB   (3390-3B) ←
c2t6d0: configured with capacity of 2.78GB   (3390-3A) ←
    ↖ These character-type device file names are used later to create the file systems.


AVAILABLE DISK SELECTIONS:

        0. c0t1d0 <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>            ← Already labeled.
           /iommu@f,e0000000/sbus@f,e0001000/espdma@f,400000/esp@f,800000/sd@1,0
        1. c0t3d0 <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>            ←Already labeled.
           /iommu@f,e0000000/sbus@f,e0001000/espdma@f,400000/esp@f,800000/sd@3,0
        2. c1t2d0 <HITACHI-OPEN-3-52-34                            ← Not yet labeled:
                              ↖ Product version
            -↖ LUN          ↖ Product ID
                    ↖Vendor ID
          -↖ Target Id
          ↖ Logical Controller ID
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@2,0   OPEN-3, TID=2, LUN=0
        3. c1t2d1 <HITACHI-OPEN-3-52-34                            ← Not yet labeled:
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@2,1   OPEN-3, TID=2, LUN=1
        4. c1t4d0 <HITACHI-OPEN-9-52-34                            ← Not yet labeled:
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@4,0   OPEN-9, TID=4, LUN=0
        5. c1t5d0 <HITACHI-3390-3B-52-34                           ←Not yet labeled:
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@5,0   3390-3B, TID=5, LUN=0
        6. c1t6d0 <HITACHI-3390-3A-52-34                           ← Not yet labeled:
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@6,0   3390-3A, TID=6, LUN=0
Specify disk (enter its number): 2                                ← Select device.
selecting c1t2d0
[disk formatted]
Disk not labeled.  Label it now ? n                               ← Enter "n" for no.
:
#
```

Figure 3.4   Verifying New Devices for Disk Partitioning

```
FORMAT MENU:
        disk      - select a disk
        type      - select (define) a disk type
        partition - select (define) a partition table
        current   - describe the current disk
        format    - format and analyze the disk
        repair    - repair a defective sector
        label     - write label to the disk
        analyze   - surface analysis
        defect    - defect list management
        backup    - search for backup labels
        verify    - read and display labels
        save      - save new disk/partition definitions
        inquiry   - show vendor, product and revision
        volume    - set 8-character volume name
        quit

# format> type                                          ← Enter type.
:

AVAILABLE DRIVE TYPES
        0. Auto configure
            :
        14. SUN2.1G
        15. HITACHI-OPEN-3-0315                 ← Do not select this disk type.
        16. other
Specify disk type (enter its number):16         ← Enter number for "other" to define.
Enter number of data cylinders:3336             ← Enter value from Table 3.1 (*Note 1)
Enter number of alternate cylinders[2]:2        ← Enter value from Table 3.1
Enter number of physical cylinders[3338]:          (press Enter for default)
Enter number of heads:15                        ← Enter value from Table 3.2–Table 3.6
Enter number of physical heads[defaults]:          (press Enter for default)
Enter number of data sectors/track:96           ← Enter value from Table 3.2–Table 3.6
Enter number of physical sectors/track[defaults]:  (press Enter for default)
Enter rpm of drive [3600]:10000                 ← Enter value from Table 3.1 (*Note 2)
Enter format time[defaults]:                       (press Enter for default)
Enter cylinder skew[defaults]:                     (press Enter for default)
Enter track skew[defaults]:                        (press Enter for default)
Enter track per zone[defaults]:                    (press Enter for default)
Enter alternate tracks[defaults]:                  (press Enter for default)
Enter alternate sectors[defaults]:                 (press Enter for default)
Enter cache control[defaults]:                     (press Enter for default)
Enter prefetch threshold[defaults]:                (press Enter for default)
Enter minimum prefetch[defaults]:                  (press Enter for default)
Enter maximum prefetch[defaults]:                  (press Enter for default)
Enter disk type name(remember quotes):"HITACHI OPEN-3"  ← Enter name from Table 1.1
selecting c1t2d0
[disk formatted]
No defined partition tables.
Disk not labeled.  Label it now ? n             ← Enter "n" for no.
format>
```

Note 1: The cylinder number of the 3390-3B is 3346, and the 9900 V returns '3346 cylinder' to the Mode Sense command, and '5822040 blocks' (Maximum LBA 5822039) to Read capacity command. When 3390-3B is not labeled yet, Solaris™ displays 3344 data cylinders and 2 alternate cylinders. When 3390-3B is labeled by the Solaris™ format type subcommand, use 3340 for data cylinder and 2 for alternate cylinder. This is similar to the 3390-3B VLL.

Note 2: The 9900 V reports the RPM of the physical disk drive in response to the type subcommand parameter.

Figure 3.5   Defining and Setting the Disk Type

```
format> disk

AVAILABLE DISK SELECTIONS
        0. c0t1d0 <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>
           /iommu@f,e0000000/sbus@f,e0001000/espdma@f,400000/esp@f,800000/sd@1,0
        1. c0t3d0 <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>
           /iommu@f,e0000000/sbus@f,e0001000/espdma@f,400000/esp@f,800000/sd@3,0
        2. c1t2d0 <HITACHI OPEN-3 cyl 3336 alt 2 hd 15 sec 96> ...already labeled
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@0,10000/sd@2,0
        3. c1t2d1 <HITACHI-OPEN-3-52-34 .....>               ...not yet labeled
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@0,10000/sd@2,1
        4. c1t4d0 <HITACHI-OPEN-9-52-34 .....>               ...not yet labeled
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@4,0
        5. c1t5d0 <HITACHI-3390-3B-52-34 ....>               ...not yet labeled
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@5,0
        6. c1t6d0 <HITACHI-3390-3A-52-34 ....>               ...not yet labeled
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@6,0

Specify disk (enter its number): 3


FORMAT MENU:
        disk      - select a disk
        type      - select (define) a disk type
        partition - select (define) a partition table
        current   - describe the current disk
        format    - format and analyze the disk
        repair    - repair a defective sector
        label     - write label to the disk
        analyze   - surface analysis
        defect    - defect list management
        backup    - search for backup labels
        verify    - read and display labels
        save      - save new disk/partition definitions
        inquiry   - show vendor, product and revision
        volume    - set 8-character volume name
        quit
format> type                                              ← Enter type.

AVAILABLE DRIVE TYPES
        0.Auto configure
          :
        13. SUN1.3G
        14. SUN2.1G
        15. HITACHI-OPEN-3-52-34
        16. HITACHI OPEN-3
        17. other
Specify disk type (enter its number):16                   ← Enter the number for
:                                                            the desired drive type.
selecting c0t2d0
[disk formatted]
No defined partition tables.
Disk not labeled.  Label it now ? n                       ← Enter n for no.
format>
```

Figure 3.6   Setting the Partition(s) (continues on the next page)

```
FORMAT MENU:
        disk      - select a disk
        type      - select (define) a disk type
        partition - select (define) a partition table
        current   - describe the current disk
        format    - format and analyze the disk
        repair    - repair a defective sector
        label     - write label to the disk
        analyze   - surface analysis
        defect    - defect list management
        backup    - search for backup labels
        verify    - read and display labels
        save      - save new disk/partition definitions
        inquiry   - show vendor, product and revision
        volname   - set 8-character volume name
        <cmd>     - execute <cmd>, then return
        quit
format> partition                                        ← Display partition menu.


PARTITION MENU
        0       - change '0' partition
        1       - change '1' partition
        2       - change '2' partition
        3       - change '3' partition
        4       - change '4' partition
        5       - change '5' partition
        6       - change '6' partition
        7       - change '7' partition
        select - select a predefined table
        modify - modify a predefined partition table
        name   - name the current table
        print  - display the current table
        label  - write partition map and label to the disk
        quit
partition> 0                                             ← Select partition number.
Part     Tag      Flag     Cylinders     Size     Blocks
  0  unassigned    wm        0 -          0       (0/0/0)

Enter partition id tag [root]:                           ← Press enter for default.
Enter partition permission flags [wm]:                   ← Press enter for default.
Enter new starting cyl [0]:                              ← Press enter for default.
Enter partition size [0b, 0c, 0.00mb]:3336c              ← Enter size (Table 3.1).
partition> print                                         ← Display partition table.
:                                                              (*See note.)
Current partition table (unnamed)
Part        Tag     Flag     Cylinders      Size              Blocks
  0        root      wm       0 -            0       (0/0/0)        0
  1        swap      wm       0 -            0       (0/0/0)        0
  2      backup      wu       0 - 3335    2.29 GB    (3336/0/0)  4803840
  3  unassigned      wu       0 -            0       (0/0/0)        0
  4  unassigned      wm       0 -            0       (0/0/0)        0
  5  unassigned      wm       0 -            0       (0/0/0)        0
  6         usr      wm     336 - 3335     204 GB    (2970/0/0)  4276800
  7  unassigned      wm       0 -            0       (0/0/0)        0
```

Note: In Solaris™ version 2.6, make sure that partitions 1 and 6 are set to a partition size of 0.

Figure 3.6   Setting the Partition(s) (continued)

```
PARTITION MENU
        0      - change '0' partition
        1      - change '1' partition
        2      - change '2' partition
        3      - change '3' partition
        4      - change '4' partition
        5      - change '5' partition
        6      - change '6' partition
        7      - change '7' partition
        select - select a predefined table
        modify - modify a predefined partition table
        name   - name the current table
        print  - display the current table
        label  - write partition map and label to the disk
        quit
partition> label                                          ← Label the disk.
Ready to label disk, continue? Y                          ← Enter Y for yes.
   * (see note at bottom)
partition> quit                                           ← Return to format.
format> disk                                              ← Display disks.


AVAILABLE DISK SELECTIONS
        0. c0t1d0 <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>
           /iommu@f,e0000000/sbus@f,e0001000/espdma@f,400000/esp@f,800000/sd@1,0
        1. c0t3d0 <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>
           /iommu@f,e0000000/sbus@f,e0001000/espdma@f,400000/esp@f,800000/sd@3,0
        2. c1t2d0 <HITACHI OPEN-3 cyl 3336 alt 2 hd 15 sec 96>   ← Verify disk label.
                                                            ↖ Track size.
                                                  ↖  Number of heads.
                                          ↖  Number of alternate cylinders.
                                ↖  Number of data cylinders.
                   ↖  Disk type name.
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@0,10000/sd@2,0
        3. c1t2d1 <HITACHI-OPEN-3-0315 ..................... >    ← Not yet labeled.
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@0,10000/sd@2,1
        4. c1t4d0 <HITACHI-OPEN-9-0315 ..................... >    ← Not yet labeled.
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@4,0
        5. c1t5d0 <HITACHI-3390-3B-0315 ................... >     ← Not yet labeled.
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@5,0
        6. c1t6d0 <HITACHI-3390-3A-0315 ................... >     ← Not yet labeled.
           /iommu@f,e0000000/sbus@f,e0001000/....,isp@1,10000/sd@6,0

Specify disk (enter its number): 3              ← Enter number for next disk to label,
                                                   or press Ctrl-d to quit.
```

Note: The Sun® Solaris™ system displays the following warnings when an HRX device (e.g., 3390-3A) is labeled. You can ignore these warnings: **Warning: error warning VTOC. Warning: no backup labels. Label failed.**

Figure 3.7   Labeling the Disk and Verifying the Disk Label

Table 3.1   9900 V Device Geometry Parameters

Device Type	# of Data Cylinders	# of Alternate Cylinders	RPM	Partition Size (sample)
OPEN-3	3336	2	10,000	3336c
OPEN-9	10014	2	10,000	10014c
OPEN-E	19757	2	10,000	19757c
OPEN-L	19013	2	10,000	19013c
OPEN-3*n	N1*	2	10,000	N4*
OPEN-9*n	N5*	2	10,000	N8*
OPEN-E*n	N30*	2	10,000	N33*
OPEN-*x* VLL	See Table 1.1	2	10,000	See Table 1.1
OPEN-3*n VLL	N22*	2	10,000	N25*
OPEN-9*n VLL	N22*	2	10,000	N25*
OPEN-E*n VLL	N22*	2	10,000	N25*
OPEN-L*n	N34	2	10,000	N37
3390-3A	3346	2	10,000	3346c
3390-3B	3340	2	10,000	3340c
3390-3C	3346	2	10,000	3346c
HRX OPEN-3	3336	2	10,000	3336c
3390-3A VLL	See Table 1.1	2	10,000	See Table 1.1
3390-3B VLL	See Table 1.1	2	10,000	See Table 1.1
3390-3C VLL	See Table 1.1	2	10,000	See Table 1.1
HRX OPEN-3 VLL	See Table 1.1	2	10,000	See Table 1.1

Note: For the values indicated by Nxx (e.g., N15, N22), please refer to Table 3.2–Table 3.6.

Table 3.2   Geometry Parameters for OPEN-3*n LUSE Devices

n	Data Cylinders-N1 Partition Size-N4	Heads-N2	Blocks/Track-N3	Usable Blocks (N1+2)*N2*N3	Provided Blocks =3338*15*96*n	Diff.
2	6674	15	96	9613440	9613440	0
3	10012	15	96	14420160	14420160	0
4	13350	15	96	19226880	19226880	0
5	16688	15	96	24033600	24033600	0
6	20026	15	96	28840320	28840320	0
7	23364	15	96	33647040	33647040	0
8	26702	15	96	38453760	38453760	0
9	30040	15	96	43260480	43260480	0
10	16688	30	96	48067200	48067200	0
11	20026	33	80	52873920	52873920	0
12	20026	30	96	57680640	57680640	0
13	20026	39	80	62487360	62487360	0
14	23364	30	96	67294080	67294080	0
15	16688	45	96	72100800	72100800	0
16	26702	30	96	76907520	76907520	0
17	30040	34	80	81714240	81714240	0
18	30040	30	96	86520960	86520960	0
19	30040	38	80	91327680	91327680	0
20	16688	60	96	96134400	96134400	0
21	23364	45	96	100941120	100941120	0
22	30040	55	64	105747840	105747840	0
23	30040	46	80	110554560	110554560	0
24	20026	60	96	115361280	115361280	0
25	16688	45	160	120168000	120168000	0
26	20026	39	160	124974720	124974720	0
27	30040	45	96	129781440	129781440	0
28	23364	60	96	134588160	134588160	0
29	30040	58	80	139394880	139394880	0
30	16688	45	192	144201600	144201600	0
31	30040	62	80	149008320	149008320	0
32	26702	60	96	153815040	153815040	0
33	30040	55	96	158621760	158621760	0
34	30040	64	85	163428480	163428480	0
35	30040	56	100	168235200	168235200	0
36	30040	60	96	173041920	173041920	0

N1,N2,N3: Use value in Table 3.1.

N4: Use same value as N1. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (e.g. enter 6674c for OPEN-3*2).

Table 3.3   Geometry Parameters for OPEN-9*n LUSE Devices

n	Data Cylinders-N5 Partition Size-N8	Heads-N6	Blocks/Track-N7	Usable Blocks (N5+2)*N6*N7	Provided Blocks =10016*15*96*n	Diff.
2	20030	15	96	28846080	28846080	0
3	30046	15	96	43269120	43269120	0
4	30046	20	96	57692160	57692160	0
5	30046	25	96	72115200	72115200	0
6	30046	30	96	86538240	86538240	0
7	30046	35	96	100961280	100961280	0
8	30046	40	96	115384320	115384320	0
9	30046	45	96	129807360	129807360	0
10	30046	50	96	144230400	144230400	0
11	30046	55	96	158653440	158653440	0
12	30046	60	96	173076480	173076480	0
13	30046	52	120	187499520	187499520	0
14	30046	56	120	201922560	201922560	0
15	30046	60	120	216345600	216345600	0
16	30046	64	120	230768640	230768640	0
17	30046	34	240	245191680	245191680	0
18	30046	36	240	259614720	259614720	0
19	30046	38	240	274037760	274037760	0
20	30046	40	240	288460800	288460800	0
21	30046	42	240	302883840	302883840	0
22	30046	44	240	317306880	317306880	0
23	30046	46	240	331729920	331729920	0
24	30046	48	240	346152960	346152960	0
25	30046	50	240	360576000	360576000	0
26	30046	52	240	374999040	374999040	0
27	30046	54	240	389422080	389422080	0
28	30046	56	240	403845120	403845120	0
29	30046	58	240	418268160	418268160	0
30	30046	60	240	432691200	432691200	0
31	30046	62	240	447114240	447114240	0
32	30046	64	240	461537280	461537280	0
33	30985	64	240	475960320	475960320	0
34	31924	64	240	490383360	490383360	0
35	31298	63	256	504806400	504806400	0
36	31689	64	256	519225344	519229440	4096

N5,N6,N7: Use value in Table 3.1, Table 3.2.

N8: Use same value as N5. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (e.g. enter 20030c for OPEN-9*2).

Table 3.4   Geometry Parameters for OPEN-E*n LUSE Devices

n	Data Cylinders-N30 Partition Size-N33	Heads-N31	Blocks/Track-N32	Usable Blocks (N30+2)*N31*N32	Provided Blocks =9966*15*96*n	Diff.
2	19757	30	96	56905920	56905920	0
3	19757	45	96	85358880	85358880	0
4	19757	60	96	113811840	113811840	0
5	19757	30	240	142264800	142264800	0
6	19757	45	192	170717760	170717760	0
7	19757	60	168	199170720	199170720	0
8	19757	60	192	227623680	227623680	0
9	19757	60	216	256076640	256076640	0
10	19757	60	240	284529600	284529600	0
11	27166	60	192	312975360	312982560	7200
12	29636	60	192	341429760	341435520	5760
13	32106	60	192	369884160	369888480	4320
14	27660	60	240	398332800	398341440	8640
15	29636	60	240	426787200	426794400	7200
16	31612	60	240	455241600	455247360	5760
17	31612	60	255	483694200	483700320	6120
18	31257	64	256	512147456	512153280	5824

N30,N31,N32 : Use value in Table 3.1.

N33 : Use same value as N30. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (e.g. enter 19757c for OPEN-E*2).

Note: Data cylinders must be less than or equal to 32767, heads must be less than or equal to 64, blocks per track must be less than or equal to 256 when these values are specified as parameters of Solaris™ format type subcommand. The whole data blocks of OPEN-E*2~OPEN-E*10 can be used by above parameters. About OPEN-E*11~OPEN-E*18, some blocks must become unusable.

Table 3.5   Geometry Parameters for OPEN-L*n LUSE Devices

n	Data Cylinders-N34 Partition Size-N37	Heads-N35	Blocks/Track-N36	Usable Blocks (N34+2)*N35*N36	Provided Blocks =9966*15*96*n	Diff.
2	19013	64	117	142384320	142384320	0
3	30422	36	195	213576480	213576480	0
4	30422	45	208	284768640	284768640	0
5	30422	60	195	355960800	355960800	0
6	30422	60	234	427152960	427152960	0
7	30897	63	256	498339072	498345120	6048

N34,N35,N36 : Use value in Table 3.1.

N37 : Use same value as N34. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (e.g. enter 19013c for OPEN-L*2).

Note: Data cylinders must be less than or equal to 32767, heads must be less than or equal to 64, blocks per track must be less than or equal to 256 when these values are specified as parameters of Solaris format type subcommand. The whole data blocks of OPEN-L*2~OPEN-L*6 can be used by above parameters. About OPEN-L*7, some blocks must become unusable.

Table 3.6   Geometry Parameters for OPEN-*x**n VLL-LUSE Devices (Example)

#	Data Cylinders-N22 Partition Size-N25	Heads-N23	Blocks/Track-N24	Usable Blocks (N22+2)*N23*N24	Provided Blocks-N21	Diff.
1	98	15	96	144000	35MB×2 volumes ⌈35×1024/720⌉×2=100 100×15×96=144000	0
2	2590	15	96	3732480	50MB×36 volumes ⌈50×1024/720⌉×36=2592 2592×15×96=3732480	0
3	284	15	96	411840	100MB×2 volumes ⌈100×1024/720⌉×2=286 286×15×96=411840	0
4	5694	15	96	8202240	500MB×8 volumes ⌈500×1024/720⌉×8=5696 5696×15×96=8202240	0
5	22758	30	96	65548800	2000MB×2 volumes ⌈2000×1024/720⌉×16=45520 45520×15×96=65548800	0
6	27455	40	188	206476640	2800MB×36 volumes ⌈2800×1024/720⌉×36=143388 143388×15×96=206478720	2080

N21 # of blocks of LUSE composed by VLL volumes are calculated by :
N21 = N20 × (# of heads) × (# of sectors per track).

N22: N20 – 2, Use total cylinder - 2.

N23,N24: Use value in Table 3.1, Table 3.2.

N25: Use same value as N22.

3.4   Creating and Mounting the File Systems

After you have partitioned and labeled all new disks, you can create and mount the file systems for the SCSI disk devices (e.g., OPEN-*x*). Creating and mounting the file systems for the new SCSI disk devices involves:

- Creating the file systems (see section 3.4.1),

- Creating and verifying the mount directories (see section 3.4.2),

- Mounting and verifying the file systems (see section 3.4.3),

- Setting the auto-mount parameters (optional) (see section 3.4.4).

Note: Do not create file systems or mount directories for the HRX devices (e.g., 3390-3A). These devices are accessed as raw devices and do not require any further configuration after being partitioned and labeled.

3.4.1   Creating the File Systems

To create the file systems for the newly installed SCSI disk devices:

1. Create the file system using the **newfs -C <maxcontig>** command (see Figure 3.8).

   a) Use 6 or one of the following multiples of 6 as the **maxcontig** value for all 9900 V SCSI disk devices: 12, 18, 24, or 30. If 6 is used, Solaris™ will access 48 kB as a unit (6×8 kB), which matches the track size of the 9900 V OPEN-3 and OPEN-9 devices. These **maxcontig** values (6, 12, 18, 24, 30) optimize the 9900 V's I/O performance by keeping the I/O data range on one track. The **maxcontig** value that you choose depends on your applications, and you can always change the **maxcontig** parameter to a different value at any time.

   b) Use the character-type device file as the argument (e.g., **/dev/rdsk/c1t2d0s0**).

2. When the confirmation appears, verify that the device file name is correct. If so, enter **y** for yes. If not, enter **n** for no, and then repeat step (1) using the correct device file name.

3. Repeat steps (1) and (2) for each new SCSI disk device on the 9900 V subsystem. Make sure to use the same **maxcontig** value for all 9900 V devices.

```
# newfs –C 6 /dev/rdsk/c1t2d0s0                                  ← Create file system.
newfs:construct a new file system /dev/rdsk/c1t2d0s0:(y/n) y      ← Verify correct device.
/dev/rdsk/c1t2d0s0: 4803840 sectors in 3336 cylinders of 15 tracks, 96 sectors
    2345.6MB in 209 cyl groups (16 c/g, 11.25MB/g, 5440 i/g)
super-block backups (for fsck -F ufs -o b=#) at:
 32, 23168, 46304, 69440, 92576, 115712, 138848, 161984, 185120, 208256,
   :
4747616, 4770752, 4792352,
# newfs –C 6 /dev/rdsk/c1t2d1s0                                  ← Create file system on
                                                                   next disk using same
                                                                   maxcontig value.
```

Figure 3.8   Creating the File Systems

3.4.2 Creating and Verifying the Mount Directories

After you have created the file systems, you can create and verify the mount directories for the new SCSI disk devices. Each logical partition requires a unique mount directory, and the mount directory name should identify the logical volume and the partition.

To create the mount directories for the newly installed SCSI disk devices:

1. Go to the root directory (Figure 3.9).

2. Create the mount directory using the **mkdir** command. Choose a name for the mount directory which identifies both the logical volume and the partition. For example, to create a mount directory named 9900 V_LU00, enter: **mkdir /9900 V_LU00**

   Note: If you need to delete a mount directory, use **rmdir** (e.g., **rmdir /9900 V_LU00**).

3. Verify the new mount directory using the **ls -x** command.

4. Repeat steps (2) and (3) for each logical partition on each new SCSI disk device.

```
# cd                                              ← Go to the root directory.
# pwd                                             ← Display current directory.
/
# mkdir /9900 V_LU00                              ← Create new mount directory.
# ls -x                                           ← Verify new mount directory.
9900 V_LU00  bin    dev     device   etc      export correctly
floppy       home   hstsboof kadb    kernel   lib
#
```

Figure 3.9   Creating and Verifying a Mount Directory

3.4.3 Mounting and Verifying the File Systems

After you have created the mount directories, you can mount and verify the file systems for the new SCSI disk devices. The file system for each logical partition should be mounted and verified to ensure that all new logical units are fully operational.

To mount and verify the file systems for the newly installed 9900 V devices (see Figure 3.10).

1. Mount the file system using the **mount** command. Make sure to use the correct block-type device file name and mount directory for the device/partition. For example, to mount the file /dev/dsk/c1t2d0s0 with the mount directory /9900 V_LU00 enter: **mount /dev/dsk/c1t2d0s0 /9900 V_LU00**

   If you need to unmount a file system, use **umount** command (e.g., **umount /9900 V_LU00**).

   Note: If you have already set the auto-mount parameters (see section 3.4.4), you do not need to specify the block-type device file, only the mount directory.

2. Repeat step (1) for each partition of each newly installed SCSI disk device.

3. Display the mounted devices using the **df -k** command, and verify that all new SCSI disk devices are displayed correctly. OPEN-*x* devices will display as OPEN-3, OPEN-9, OPEN-E, or OPEN-L devices.

4. As a final verification, perform some basic UNIX® operations (e.g., file creation, copying, and deletion) on each logical unit to make sure that the new file systems are fully operational.

```
# mount /dev/dsk/c1t2d0s0 /9900 V_LU00                              ← Mount file system.
               ↖ Block-type device file name
# mount /dev/dsk/c1t2d1s0 /9900 V_LU01                              ← Mount next file
system.
                            ↖ Mount directory name
# mount /dev/dsk/c1t2d2s0 /9900 V_LU02                              ← Mount next file system.
 :
 :
#
# df -k                                                             ← Display file systems.
File system       Kbytes      used     avail   capacity   Mounted on
/dev/dsk/c0t3d0s0   28775     27706         0     100%     /
/dev/dsk/c0t3d0s6  269191    234897      7384      97%     /usr
/proc                   0         0         0       0%     /proc
fd                      0         0         0       0%     /dev/fd
/dev/dsk/c0t3d0s4s  57567     29515     22302      57%     /var
swap               142204        20    142184       0%     /tmp
/dev/dsk/c0t3d0s7  462119    206000    209909      50%     /export/home
/dev/dsk/c0t3d0s5   47975     42059      1126      97%     /opt
/dev/dsk/c1t2d0s0 2256436         9   2030787       0%     /9900 V_LU00     ← Verify file
systems.
/dev/dsk/c1t2d1s0 2256436         9   2030787       0%     /9900 V_LU01     ← OPEN-3
device
/dev/dsk/c1t2d2s0 6774358         9   6548709       0%     /9900 V_LU02     ← OPEN-9
device
:
# mount /dev/dsk/c1t2d0s0 /9900 V_LU00                       ← Mount file system.
# cd /9900 V_LU00                                            ← Go to mount directory.
# cp /bin/vi /9900 V_LU00/vi.back1                           ← Copy a file.
# ls -l                                                      ← Verify the file copy.
drwxr-xr-t   2 root     root        8192 Mar 15 11:35  lost+found
-rwxr-xr-x   1 root     sys      2617344 Mar 15 11:41  vi.back1
# cp vi.back1 vi.back2                                       ← Copy file again.
# ls -l                                                      ← Verify file copy again.
drwxr-xr-t   2 root     root        8192 Mar 15 11:35  lost+found
-rwxr-xr-x   1 root     sys      2617344 Mar 15 11:41  vi.back1
-rwxr-xr-t   1 root     sys      2617344 Mar 15 11:52  vi.back2
# rm vi.back1                                                 ← Remove test files.
# rm vi.back2                                                 ←
```

Figure 3.10   Mounting and Verifying the File System

3.4.4   Setting and Verifying the Auto-Mount Parameters

You can add any or all of the new SCSI disk devices to the **/etc/vfstab** file to specify the auto-mount parameters for each device. Once a device is added to this file, you can mount the device without having to specify its block-type device file name (e.g., mount /9900 V_LU00), since the **/etc/vfstab** file associates the device with its mount directory.

To set the auto-mount parameters for the desired devices (see Figure 3.11).

1. Make a backup copy of the **/etc/vfstab** file: **cp /etc/vfstab /etc/vfstab.standard**

2. Edit the **/etc/vfstab** file to add one line for each device to be auto-mounted. Table 3.7 shows the auto-mount parameters. If you make a mistake while editing, exit the **vi** editor without saving the file, and then begin editing again.

3. Reboot the Sun® system after you are finished editing the **/etc/vfstab** file.

4. Display the mounted devices using the **df -k** command, and verify that the desired devices were auto-mounted.

```
# cp –ip /etc/vfstab /etc/vfstab.standard    ← Make backup before editing.
# vi /etc/vfstab                                      ← Edit the file.
#device           device             mount       FS     fsck  mount   mount
#to mount         to fsck            point       type   pass  at boot options
  ①                 ②                 ③          ④       ⑤     ⑥       ⑦   ← See
                                                                              Table 3.7.
/proc             –                  /proc       procfs  –     no      –
fd                –                  /dev/fd     fd      –     no      –
swap              –                  /tmp        tmpfs   –     yes     –
/dev/dsk/c0t3d0s0 /dev/rdsk/c0t3d0s0 /           ufs     1     no      –
/dev/dsk/c0t3d0s6 /dev/rdsk/c0t3d0s6 /usr        ufs     2     no      –
/dev/dsk/c0t3d0s7 /dev/rdsk/c0t3d0s7 /export     ufs     3     yes     –
/dev/dsk/c0t3d0s5 /dev/rdsk/c0t3d0s5 /opt        ufs     4     yes     –
/dev/dsk/c0t3d0s1 –                  –           swapfs  –     no      –
/dev/dsk/c1t2d0s0 /dev/rdsk/c1t2d0s0 /9900 V_LU00 ufs    5     yes     –     ← Add
one line
/dev/dsk/c1t2d1s0 /dev/rdsk/c1t2d1s0 /9900 V_LU01 ufs    5     yes     –       for
each LUN.
```

Figure 3.11   Setting the Auto-Mount Parameters

Table 3.7   Auto-Mount Parameters

Parameter #	Name	Enter:
①	Device to mount	Block-type device file name
②	Device to fsck	Character-type device file name
③	Mount point	Mount directory name
④	FS type	File system type (e.g., ufs)
⑤	Fsck pass	Order for performing file system checks
⑥	Mount at boot	Yes = auto-mounted at boot/mountall No = not auto-mounted at boot/mountall
⑦	Mount options	Desired mount options: - no options (typical) -ro read-only access (e.g., for 3390-3B devices)

Chapter 4   Failover and SNMP Configuration

The Lightning 9900™ V Series 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 Sun® Solaris™ environment, the 9900 V subsystem supports the following products and functions (please contact Hitachi Data Systems for the latest information):

■   VERITAS® Cluster Server™ and Sun™ Cluster for host/application failover (section 4.1).

■   Hitachi Dynamic Link Manager (HDLM) and VERITAS® Volume Manager™ for path failover and logical volume management (see section 4.2).

The 9900 V disk 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 9900 V SVP and the SNMP manager on the host. The SNMP agent on the SVP 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   Host Failover

The 9900 V subsystem supports the VERITAS® Cluster Server™ and Sun™ Cluster host failover products for the Sun® Solaris™ operating system. The user must make sure to configure the host failover software and any other high-availability (HA) software as needed to recognize and operate with the newly attached 9900 V devices.

Note: You must set HOST MODE=09 before installing SUN CLUSTER, or the Quorum Device will not be assigned to the 9900 V subsystem.

Note: When Sun Cluster 3.0 is used, you must set **HOST MODE=09** and **System Option Mode 185=ON**. When **MODE 185=ON** is set, a unique disk ID is assigned for each LUN. When **MODE 185=OFF** is set, the same disk ID is assigned for all LUNs.

For assistance with VERITAS® Cluster Server™ operations, please refer to the VERITAS® user documentation, or contact VERITAS® technical support. For assistance with Sun™ Cluster operations, please refer to the Sun™ Cluster user documentation, or contact Sun® technical support. For assistance with specific configuration issues related to the 9900 V subsystem, please contact your Hitachi Data Systems representative.

4.2   Path Failover

The 9900 V subsystem supports the Hitachi Dynamic Link Manager (HDLM) and VERITAS® Volume Manager™ path failover products for the Sun® Solaris™ operating system. The user must make sure to configure the path failover software and any other products as needed to recognize and operate with the newly attached 9900 V devices.

For assistance with Hitachi Dynamic Link Manager for Solaris™ systems, please refer to the *Hitachi Freedom Storage™ Hitachi Dynamic Link Manager User's Guide for Solaris™* (MK-92DLM114), or contact your Hitachi Data Systems representative. For assistance with VERITAS® Volume Manager™ operations, please refer to the VERITAS® user documentation, or contact VERITAS® technical support.

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 9900 V subsystem utilizes SNMP to transfer status and management commands to the SNMP Manager on the UNIX®/PC server host via the 9900 V 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 9900 V SVP notifies the SNMP manager on the UNIX®/PC server. Notification of 9900 V error conditions is made in real time, providing the UNIX®/PC server user with the same level of monitoring and support available to the mainframe user. The SIM reporting via SNMP enables the user to monitor the 9900 V subsystem from the UNIX®/PC server host.

When a SIM occurs, the 9900 V 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 Sun® Solaris™ server host. For assistance with SNMP manager configuration on the Sun® Solaris™ server host, please refer to the user documentation, or contact the vendor's technical support.
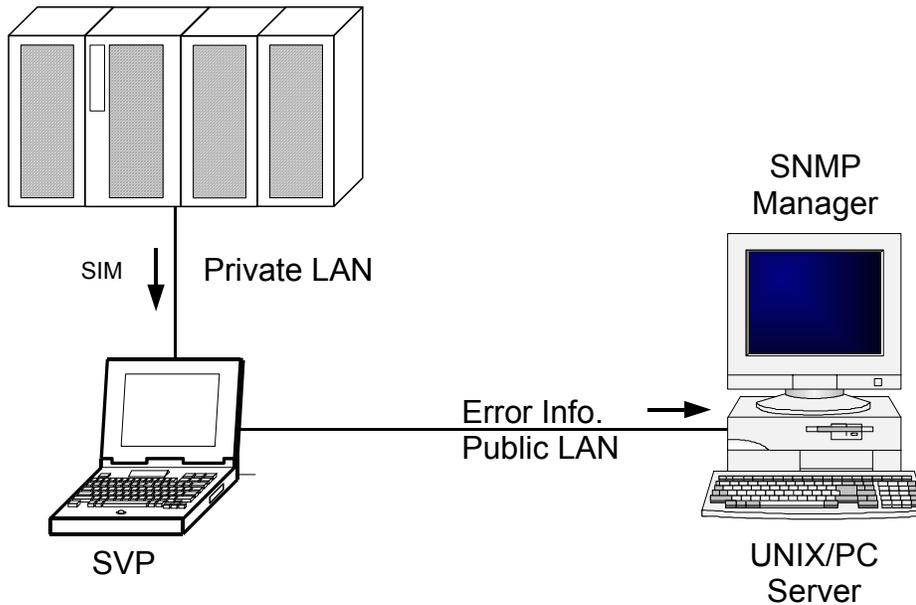

Figure 4.1   9900 V SNMP Environment

Chapter 5   Troubleshooting

5.1   Troubleshooting

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

One method of troubleshooting for Solaris™ operations involves the "verbose" mode for the HBA configuration file. See section 5.2 for information on verbose mode troubleshooting.

Table 5.1 lists potential error conditions during 9900 V Sun® Solaris™ configuration and provides instructions for resolving each condition. If you are unable to resolve an error condition, please contact your Hitachi Data Systems representative for help, 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 9900 V subsystem are ON. Make sure that the fibre cables are correctly installed and firmly connected. Run **dmesg** to recheck the fibre buses for new devices. Verify the contents of **/kernel/drv/sd.conf** file. Make sure that LUSE devices are not intermixed with normal LUs or with multiplatform devices on the same port.
File system cannot be created (**newfs** command)	Check that character-type device file is specified for **newfs** command. Verify that logical unit is correctly labeled by UNIX® **format** command.
The file system is not mounted after rebooting.	Make sure that the system was restarted properly. Make sure that the file system attributes are correct. Verify that **/etc/vfstab** is correctly edited.
Pinned track.	Reset ECC/LRC pinned track error status using the Solaris™ **analyze** command as described in Appendix A.
The Sun® system does not reboot properly after hard shutdown.	If the Sun® system is powered off without executing the shutdown process, wait three minutes before restarting the Sun® system. This allows the 9900 V's internal time-out process to purge all queued commands so that the 9900 V is available (not busy) during system startup. If the Sun® system is restarted too soon, the 9900 V will continue trying to process the queued commands, and the Sun® system will not reboot successfully.
The 9900 V performed a self reboot because the subsystem was busy or it logged a panic message.	Reboot the Sun® system.
The 9900 V responds Not Ready, or the 9900 V has displayed Not Ready and timed itself out.	Please contact the Hitachi Data Systems Support Center.
The system detects a parity error.	Make sure that the HBA has been installed properly. Reboot the Sun® system.

5.2   Verbose Mode

One method of troubleshooting involves the "verbose" mode for the HBA configuration file. The following paragraphs are examples of error messages that may occur. A possible debugging method is to select the device and turn on verbose mode, then attempt the boot process again. Verbose error messages will provide information which will help isolate the problem. Use the steps in Figure 5.1 to turn on the verbose flag. Figure 5.2 contains examples of error messages.

```
ok  " /sbus/fca" select-dev
ok    true to fca-verbose
ok    boot fcadisk
```

Figure 5.1   Turning on Verbose Flag

```
Error message:
Cannot Assemble drivers for /sbus@1f,0/fcaw@1,0/sd@0,0:a
Cannot Mount root on  /sbus@1f,0/fcaw@1,0/sd@0,0:a
Problem:
The process of copying the OS to the fibre channels was not complete, or the drive
specified on the boot command is not the same as the one the OS was constructed on.
```

```
Error message:
Can't open boot device
Problem:
The wwn specifed with the set-bootn0-wwn does not correspond to the wwn of the device.
Could also be a cable problem – the adapter cannot initialize.
```

```
Error message:
The file just loaded does not appear to be bootable
Problem:
The bootblk was not installed on the target.
```

```
Error message:
mount: /dev/dsk/c0t0d0s0 – not of this fs type
Problem:
At this point the process hangs. This happens if the /etc/vfstab
File has not been updated on the fibrechannel boot drive to reflect the new target.
```

```
Error message:
Get PortID request rejected by nameserver
Problem:
The wwn of the target is not correct. Select the adapter and perform set-bootn0-wwn. If
this is correct, check the switch to see that target is properly connected.
```

```
Error message:
Can't read disk label
Problem:
The selected target is not a Solaris filesystem.
```

Figure 5.2   Examples of Error Messages (continues on the next page)

```
Error message:
Nport init failed –
Problem:
Card is connected to an arbitrated loop device, but wants to initialize as an NPORT. The
bootn0-wwn property has probably been set to a valid WWN.
```

```
Error message:
Panic dump not saved
Problem:
After the system is successfully booted to Solaris from the fibrechannel and a panic occurs
the panic does not get saved to the swap device.
This can be the result not properly defined the swap partition.
Use the format command to view the slices on the fibre channel drive.
Take the partition option, then the print option.
The swap partition should look something like this:
     1      swap    wm     68-459 298.36MB      (402/0/0)      611040
Sizes and cylinders will probably be different on your system. Make sure that the flag is
wm and that the sizes are defined (not 0). Then use the label option from partition to
write the label to the drive. After this the panic should be saved to the swap partition.
If the partition needs to be changed chose the partition option, and enter 1 to select
slice 1.
```

```
Error message:
Can't open /packages
Problem:
The bootblk was not properly installed
```

Figure 5.2   Examples of Error Messages (continued)

5.3   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 on the host system(s). Please note the reference codes and severity levels of the recent 9900 V SIMs.

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
  San Diego, California, USA
  1-800-348-4357
  1-619-537-3000

- 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   Pinned Track Recovery

To recover a pinned track on a 9900 V device, use the **analyze** command in the format utility to write dummy data to the pinned track as shown in Figure A.1. This procedure is used for Sun® Solaris™ 2.6 and may not be valid for other versions of the Solaris™ OS. Make sure that you check the device number in the SCSI path configuration and not the 9900 V LDEV ID.

WARNING: Data written on a pinned track or data on the partition containing the pinned track will be overwritten by the dummy data write process. The pinned track data or partition data should be restored using a backup file.

To recover a pinned track:

1. Log in to the Solaris™ system as root.

2. Write dummy data to the pinned track using the **analyze** command (**analyze** is a subcommand of the **format** command).

3. Isolate LDEV number of the LDEV containing the pinned track by SVP.

4. Get the SCSI port number (1A~2H), SCSI target ID and LUN on the Solaris™ system for the LDEV having the pinned track.

5. Log in to the Solaris™ system as root, and execute the **format** command.

6. Determine device number cxtxdx by port number and target ID and LUN and the board installed into the Sun® system to which the 9900 V port is connected.

7. The whole track range must be specified by starting LBA and ending LBA.

8. One track has 96 blocks for OPEN-*x*, OPEN-*x**n (LUSE), and OPEN-*x* .

9. The pinned track will not be correctly reset if the whole track range is not specified.

10. Data written on the pinned track must be recovered by backup file because the **analyze** command writes dummy data on the pinned track.

11. The files or directories written with dummy data cannot be determined because of the structure of the UNIX® file system. All files and directories on the partition containing the pinned track must be recovered from the backup file.

```
host console login: root                                          ← Log in as root.
password: hitachi                                                 ← Enter your password.
# format                                                          ← Enter format.
Searching for disks...done
AVAILABLE DISK SELECTIONS:
   :
Specify disk (enter its number):1                                 ← Enter the pinned track
selecting  cxtxdx                                                    disk number.
[disk formatted]

FORMAT MENU:
   :
format> analyze                                                   ← Enter analyze.
   :
analyze> setup                                                    ← Enter setup.
Analyze entire disk[yes]? N                                       ← Enter N for no.
Enter starting block number[0, 0/0/0]: starting LBA of the pinned track
Enter ending block number[5806479, 3336/14/115]: ending LBA of the track
Loop continuously[no] no                                          ← Enter no.
Enter number of passes[2]                                         ← Press enter for default.
Repair defective blocks[yes]                                      ← Press enter for default.
Stop after first error[no]                                        ← Press enter for default.
Use random bit patterns[no]                                       ← Press enter for default.
Enter number of blocks per transfer[126, 0/1/10]: 1              ← Enter 1.
Verify media after formatting [yes]? no                           ← Enter no.
Enable extended messages[no]? yes                                 ← Enter yes.
estore defect list[yes]?                                          ← Press enter for default.
Restore disk label[yes]?                                          ← Press enter for default.

analyze> write                                                    ← Enter write.
Ready to analyze (will corrupt data). This takes a long time,
but is interruptable with CTRL-C. Continue? y                     ← Enter y for yes.

     PASS 0 - pattern = c6dec6de
    cylinder number/head number/block counts

Total of 0 defective blocks repaired.
analyze> quit                                                     ← Exit the analyze utility.
```

Figure A.1   Recovering a Pinned Track

Appendix B Fibre Port Addressing

In a FC-AL (fibre channel arbitrated loop) configuration, the host communicates with the devices comprising the loop with 8 bit AL-PA (arbitrated loop physical address, also called the port address). The number of available port addresses is 126. (There are 127 port addresses, but address 00H is reserved for fibre connection.)

Devices communicate with hosts using individual port addresses. However, hosts map SCSI protocol to fibre channel devices. The hosts access the device's LUs using the device files /dev/dsk/c*t*d* and /dev/rdsk/c*t*d*. SCSI and fibre channel devices are accessed the same way; however, the device files for SCSI and fibre channel devices are configured differently. Table B.1 lists the AL-PA and the corresponding SCSI address.

Table B.1   Fibre Port Addressing (continues on next page)

AL-PA	T value	AL-PA	T value	AL-PA	T value	AL-PA	T value
EF	0	CD	16	B2	32	98	48
E8	1	CC	17	B1	33	97	49
E4	2	CB	18	AE	34	90	50
E2	3	CA	19	AD	35	8F	51
E1	4	C9	20	AC	36	88	52
E0	5	C7	21	AB	37	84	53
DC	6	C6	22	AA	38	82	54
DA	7	C5	23	A9	39	81	55
D9	8	C3	24	A7	40	80	56
D6	9	BC	25	A6	41	7C	57
D5	10	BA	26	A5	42	7A	58
D4	11	B9	27	A3	43	79	59
D3	12	B6	28	9F	44	76	60
D2	13	B5	29	9E	45	75	61
D1	14	B4	30	9D	46	74	62
CE	15	B3	31	9B	47	73	63

Table B.1   Fibre Port Addressing (continued)

AL-PA	T value	AL-PA	T value	AL-PA	T value	AL-PA	T value
72	64	55	80	3A	96	23	112
71	65	54	81	39	97	23	113
6E	66	53	82	36	98	1F	114
6D	67	52	83	35	99	1E	115
6C	68	51	84	34	100	1D	116
6B	69	4E	85	33	101	1B	117
6A	70	4D	86	32	102	18	118
69	71	4C	87	31	103	17	119
67	72	4B	88	2E	104	10	120
66	73	4A	89	2D	105	0F	121
65	74	49	90	2C	106	08	122
63	75	47	91	2B	107	04	123
5C	76	46	92	2A	108	02	124
5A	77	45	93	29	109	01	125
59	78	43	94	27	110		
56	79	3C	95	26	111		

Appendix C Online Device Installation

This appendix provides instructions for online installation of new devices. After initial installation and configuration of the Lightning 9900™ V Series subsystem, additional devices can be installed or de-installed online without having to restart the Solaris™ system. After online installation, the device parameters for new volumes must be changed to match the LUs defined under the same fibre-channel port (see section 3.2). This procedure should be performed by the system administrator (i.e., super-user).

Note: For additional instructions regarding online installation and deinstallation of LUs, please refer to the *9900 V Maintenance Manual* or the *Hitachi Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD105).

When the TOV for 9900 V volumes needs to be changed, you must edit the **/etc/system** file and reboot to make the file change effective. Please use normal disruptive installation procedure for this case. Solaris™ must be booted once by the **boot -r** command with the TIDs and LUNs for new volumes defined in **/kernel/drv/sd.conf** file for non-disruptive volume installation. It is one way to prepare future online volume installation that whole TIDs and LUNs, i.e. TID=0~15 and LUN=0~7 are defined in the Solaris™ **kernel/drv/sd.conf** file and the system is once booted with **boot -r** command. In case of fibre channel, you should define LUN=0~119 in /kernel/drv/sd.conf file for the path (TID) which you will install additional LUNs.

Note: With the JNI™ Emerald™-based FC host bus adapter, online installation is not available.

1. The Solaris™ system must be booted once by **boot -r** command with the TIDs and LUNs for new volumes defined in **/kernel/drv/sd.conf** file for non-disruptive volume installation. If not, the Solaris™ system must be rebooted to recognize new volumes.

2. Check existing SCSI TIDs.

3. Hitachi Lightning 9900™ V Series setup:

    a) Ensure the latest microcode is loaded. Non-disruptive version up requires alternate path.

    b) Install CHF and LDEV, and connect fibre cable if necessary.

    c) Execute online LU installation from the SVP or using the Remote Console – Storage Navigator software.

    d) Verify 9900 V SCSI path configuration.

4. Execute the following commands (as super-user) to recognize the new devices.
    # /usr/sbin/drvconfig
    # /usr/sbin/devlinks
    # /usr/sbin/disks
    # /usr/ucb/ucblinks

5. After online installation, the device parameters (e.g., TOV, queue depth) for the new volumes must be changed to match the LUs defined under the same fibre-channel port.

6. Configure the new devices (partition, label, file system, auto-mount) as described in Chapter 3.

Appendix D Configuring the Boot Disk on the 9900 V

D.1 Introduction

The Solaris™ boot disk can be configured on the Hitachi Lightning 9900™ V Series if the following conditions are met:

- Host bus adapter must be JNI™ 64-bit S-Bus FC Adapter.

- FCODE (firmware) version of HBA must be 13.3.5 for Solaris™ 2.6/7 and 13.3.7 for Solaris™ 8.

- FCA driver version must be 2.2.1.HIT.06.01 for Solaris™ 2.6/7 and 2.5.8.HIT.07 for Solaris™ 8.

- Fibre-channel topology must be FC-AL. The EPL mode of FC switching hub is not available. Connecting to Fabric Switch is not available.

- Open Boot version must be 3.1 or later.

Install the JNI™ adapter card and the fibre channel disk drive on a Sparc® workstation running the desired OS. Install the JNI™ software, and verify that the OS sees the fibre channel drives. Identify the controller and target for the installation of the Solaris™ OS. The target ID must be in the range 0-9.

Note: The Solaris™ system sometimes changes the adapter and controller instance number during a boot –r. If the target for the root file system is set to c2t0d0s0 in **/etc/vfstab**, but the reconfiguration boot changes the controller number to c3, the boot will fail. Before installing Solaris™ on the fibre-channel driver, start with a clean system. Make sure the adapter is the first instance (fca0 or fcaw0). This may require a **boot -ar** to initialize the **/etc/path_to_inst** file.

Note the worldwide name (wwn) of the target. The wwn is printed by the driver during the attach phase. It can be seen in the console window, or by viewing the /var/adm/messages file. You may use the target to world wide name binding feature for the driver to set the wwn in the /kernel/drv/sd.conf file. This is strongly recommended if the topology includes a switch or hub where configuration is subject to change. See the technotes accompanying the Solaris™ device driver for details.

Note: When the subsystem is set up as boot disk for the Solaris™ system, it is necessary to stop I/O operation for hosts connected to the subsystem. It is recommended that Solaris™ boot be performed during low host load periods.

D.2 Partition Check

To configure the Solaris™ boot disk on the 9900 V, use the **format** command to verify that the target will accommodate the Sun® OS partitions. Verify that the sizes of the partitions on the target chosen for the Solaris™ installation are large enough to copy the current OS partitions. Use the **format** command to examine the partitions of the system drives where the current OS resides (see Figure D.1).

```
# format
        (choose disk 0)
    format> partition
    partition> print
        (sample output:)
          Current partition table (original):
          Total disk cylinders available: 2733 + 2 (reserved cylinders)

          Part      Tag   Flag    Cylinders       Size            Blocks
          0         root   wm      0 -  133      99.45MB    (134/0/0)   203680
          1         swap   wu    134 -  241      80.16MB    (108/0/0)   164160
          2       backup   wm      0 - 2732       1.98GB    (2733/0/0) 4154160
          3   unassigned   wm      0               0        (0/0/0)          0
          4   unassigned   wm      0               0        (0/0/0)          0
          5   unassigned   wm      0               0        (0/0/0)          0
          6          usr   wm    242 -  761     385.94MB    (520/0/0)   790400
          7         home   wm    762 - 2732       1.43GB    (1971/0/0) 2995920

  quit partition, and choose the fibre channel disk on which you wish to install the OS.

    partition> quit
    format> disk
          AVAILABLE SELECTIONS ---
          specify disk:
          (Enter number of disk)
          1 (example)
    format> partition
    partition> print

          Repartition the drive (if necessary).
    partition> modify

          (exit format)
```

Figure D.1   OS System Drive Partitions

D.3   File System Creation

Creating file systems on the required partitions. In this example the OS is being copied to target 3 of the fibre channel drives on controller 1. To use a different target, change t3 to t(target id). To use a different controller, change c1 to c(controller number). Both the root partition (slice 0) and the /usr partition (slice 6) must be created. Other partitions (/export/home, /var, /opt) should also be created to mirror the current layout. Use the **newfs** command to create the filesystems (see Figure D.2).

```
# newfs      /dev/rdsk/c1t3d0s0
# newfs      /dev/rdsk/c1t3d0s6
# newfs      /dev/rdsk/c1t3d0s7
```

Figure D.2   Creating a New File System

D.4   Boot Block Installation

Install a bootblk on the root partition of the fibre channel drive. Use the **uname -a** command to determine the architecture of the workstation. This will determine the directory in /usr/platform where the bootblk will be found. The example below (see Figure D.3) gives sun4u as the architecture and subdirectory for /usr/platform. Then install a bootblk on the fibre channel target with the **installboot** command (see Figures D.3 and D.4).

```
# uname -a
(RESPONSE:)
SunOS patriot 5.6 Generic sun4u Sparc SUNW,Ultra -1
```

Figure D.3   Installing a Boot Block

```
# /usr/sbin/installboot  /usr/platform/sun4u/lib/fs/ufs/bootblk  /dev/rdsk/c1t3d0s0
```

Figure D.4   Installing a Boot Block

D.5   Required Files Directories Copy

Use the **ufsdump** and **ufsrestore** command to copy the required files and directories from the current system to the fibre channel target. First mount the root directory of the fibre channel target. The example below (see Figure D.5) will create the required directory structure on the new target and copy the files. In this example the current OS is located on /dev/dsk/c0t0d0.

Note: There must be a space before and after '0f', '-' and 'rf'.

```
# mount    /dev/dsk/c1t3d0s0    /mnt
# ufsdump  0f  -  /dev/dsk/c0t0d0s0 | ( cd /mnt; ufsrestore  rf   -)
```

Figure D.5   Creating the Directory Structure for Root Directory

When the command completes, the target (c1t3d0s0) will have the complete image of the root partition. In the **/mnt/etc** directory, update the **vfstab** file to indicate the fibre channel target to be mounted during boot (see Figure D.6). Modify all partitions which will be located on the fibre channel target.

```
# cd /mnt/etc
# vi vfstab

Before Modification:
#device          device          mount          FS    fsck    mount      mount
#to mount        to fsck         point           type  pass   at boot     options
#
/dev/dsk/c0t0d0s1   -                          -      swap  -     no   -
/dev/dsk/c0t0d0s0   /dev/rdsk/c0t0d0s0   /        ufs   1     no   -
/dev/dsk/c0t0d0s6   /dev/rdsk/c0t0d0s6   /usr     ufs   1     no   -
swap                -                          /tmp  tmpfs  -    yes  -

After Modification:
#device          device          mount          FS    fsck    mount      mount
#to mount        to fsck         point           type  pass   at boot     options
#
/dev/dsk/c1t3d0s1   -                          -      swap  -     no   -
/dev/dsk/c1t3d0s0   /dev/rdsk/c1t3d0s0   /        ufs   1     no   -
/dev/dsk/c1t3d0s6   /dev/rdsk/c1t3d0s6   /usr     ufs   1     no   -
swap                -                          /tmp  tmpfs  -    yes  -
```

Figure D.6   Updating the vfstab File

Unmount the root partition, and repeat the procedure for the **/usr** partition in the current root directory (see Figure D.7). *Note:* There must be a space before and after '0f', '-' and 'rf'. Repeat the procedure for any other partitions to be mounted from the fibre channel target.

```
# umount /mnt

# mount /dev/dsk/c1t3d0s6 /mnt
# ufsdump  0f  -  /dev/dsk/c0t0d0s6 | ( cd /mnt; ufsrestore  rf  -)
# umount /mnt
```

Figure D.7   Creating the Directory Structure for /usr Partition

D.6   OpenBoot Modification

Halt the system to get to the OpenBoot environment. Create an OpenBoot alias to boot from the fibre-channel drive. Issue the **printenv** command to see the default boot device in the environment variables.

```
# halt             # halt the system #
ok                    # now in the OpenBoot environment #
Ok  printenv
(RESPONSE:)
(You can see the following line.)
          boot-device   disk       disk
```

Issue the **devalias** command to see the device associated with the alias for the default boot device.

```
Ok  devalias                # get a list of aliases #
(RESPONSE:)
          disk     /sbus/SUNW,fas@e,8800000/sd@0,0
```

Issue the **show-devs** command to see the device name for the fibre channel drive.

```
Ok   show-devs              # get a list of devices #
(RESPONSE:)
                 /sbus@1f,0/SUNW,fas@e,8800000/sd
                 /sbus@1f,0/fca@1,0/sd
```

Create a similar alias or the fibre channel drive with the **nvalias** command.

```
Ok  nvalias    fcadisk   /sbus@1f,0/fca@1/sd@3,0
```

Save the alias with the **nvstore** command. Power cycle the workstation so that the alias is saved.

```
Ok   nvstore                   # save changes to nvram #
```

Now boot from the fibre channel drive using the alias.

```
Ok   boot fcadisk -r              # boot from fibrechannel #
(RESPONSE:)
          The normal boot process begins.
```

If you want to set the fibre channel drive as the permanent boot drive, type the following command to check the default value.

```
Ok   printenv
(RESPONSE:)
(You can see the following line.)
          boot-device    disk      disk
```

After checking the default value, type the following command to change the boot-device from the default scsi drive to the fibre channel drive.

```
Ok   setenv  boot-device  fcadisk
```

Appendix E   Reference Information for VERITAS® VxVM DMP

E.1   Restrictions

- When two or more 9900 V subsystems are connected to one Sun® server with VxVM DMP via HUB or Switch per each path, do not do a micro-program exchange at the same time on multiple 9900 Vs.

- When you use VxVM DMP, set queue_depth = 8.

- When you use VxVM DMP, set failover/failover delay parameter to 60 (seconds), though the drivers of each host bus adapter have different parameters.

- VxVM DMP has the possibility to recognize device incorrectly.

    – You can register only disks that are added correctly using vxinstall command.

    – For other disks, the following command is executed per each disk. For example, when c6t100d10s2 is registered as disk10 within rootdg:
    # /etc/vx/bin/vxdisksetup –i c6t100d10
    # vxdg –g rootdg adddisksetup –i c6t100d10
    disk10=c6t100d10s2

E.2   Jaycor Driver Configuration Setting

When you use Dynamic Multi Pathing (DMP) of VERITAS® Volume Manager (VxVM) with Jaycor adapters, set the following configurations (see section 2.5.1.1):
    Recovery_attempts = 5;
    Failover = 60;

These parameters are configured in the file **/kernel/drv/fca-pci.conf** for PCI adapters and file **/kernel/drv/fcaw.conf** for 64-bit SBus adapters.

Acronyms and Abbreviations

AL   arbitrated loop
AL-PA   arbitrated loop-physical address

DMP   Dynamic Multi Pathing

ESCON®   Enterprise System Connection (IBM trademark for optical channels)
ExSA™   Extended Serial Adapter™

FC   fibre-channel
FCA   fibre-channel adapter
FCP   fibre-channel protocol

Gb   gigabit
GB   gigabyte
Gbps   gigabits per second

HRX   Hitachi RapidXchange

I/O   input/output
IBM   International Business Machines Corporation

kB   kilobytes

LDEV   logical device
LU   logical unit
LUN   logical unit number, logical unit
LUSE   LU Size Expansion
LVI   Logical Volume Image
LVM   Logical Volume Manager

MB   megabytes

PA   physical address
PC   personal computer system
PCI   peripheral component interconnect

RAID   redundant array of independent disks

SCSI   small computer system interface
SIM   service information message
SNMP   simple network management protocol
SVP   service processor

TID   target ID

WWN   worldwide name

VLL   Virtual LVI/LUN
VxVM   VERITAS® Volume Manager