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Hitachi TagmaStore®
Adaptable Modular Storage and
Workgroup Modular Storage

Sun™ Solaris™ Host Installation Guide

MK-95DF733-03

Trademarks

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Document Revision Level

Revision	Date	Description
MK-95DF733-00	June 2005	Initial Release
MK-95DF733-01	August 2005	Revision 1, supersedes and replaces MK-95DF733-00
MK-95DF733-02	October 2005	Revision 2, supersedes and replaces MK-95DF733-01
MK-95DF733-03	April 2006	Revision 3, supersedes and replaces MK-95DF733-02

Source Document(s) for this Revision

- *Hitachi TagmaStore*® Adaptable Modular Storage™ *Sun*™ *Solaris*™ *Configuration Guide* (HDS review of this document)

Changes in this Revision

- Updated the document to include *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780) and *Hitachi TagmaStore Workgroup Modular Storage Model WMS100 User and Reference Guide* (MK-95DF738).

Preface

This document describes and provides instructions for configuring the devices on the Hitachi Adaptable Modular Storage Series system for operation with the Sun Solaris operating system.

This document assumes the following:

- The user has a background in data processing and understands RAID storage subsystems and their basic functions.
- The user is familiar with the Hitachi Adaptable Modular Storage or Workgroup Modular Storage system.
- The user is familiar with the Sun Solaris operating system and the Sun SPARCstation™, SPARCserver™, SPARCcenter™, and/or Ultra Series™ systems.
- The user is familiar with the UNIX® file system, system commands, and utilities.

Notes:

- ***Note:*** The terms "Adaptable Modular Storage™" and "Workgroup Modular Storage" refer to the entire Hitachi Adaptable and Workgroup Modular Storage system family, unless otherwise noted. Refer to the *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780), *Hitachi TagmaStore Adaptable Modular Storage™ Model AMS500 User's Guide* (MK-95DF714), *Hitachi TagmaStore Adaptable Modular Storage™ Model AMS200 User's Guide* (MK-95DF713), or *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780) for more information about the Adaptable Modular Storage™ and Workgroup Modular Storage systems.
- For more information about the Sun Solaris operating system, consult your Sun Solaris online help and/or user documentation or contact Sun technical support.

Software Version

This document revision applies to the Hitachi TagmaStore Adaptable Modular Storage microcode versions 1.0 and higher.

Convention for Storage Capacity Values

Storage capacity values for hard disk drives (HDDs) are calculated based on the following values:

1 KB = 1,000 bytes
1 MB = $1,000^2$ bytes
1 GB = $1,000^3$ bytes
1 TB = $1,000^4$ bytes

Storage capacity values for logical units (LUs) are calculated based on the following values:

1 KB = 1,024 bytes
1 MB = $1,024^2$ bytes
1 GB = $1,024^3$ bytes
1 TB = $1,024^4$ bytes
1 block = 512 bytes

Referenced Documents

- **Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage Series:**
  - *Storage Navigator - Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
  - *Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
- **Hitachi TagmaStore Adaptable Modular Storage Series:**
  - *Storage Navigator Web User's Guide* (MK-95DF719)
  - *Model AMS500 User and Reference Guide* (MK-95DF714)
  - *Model AMS200 User and Reference Guide* (MK-95DF713)
  - *Model AMS1000 User and Reference Guide* (MK 95DF780)
- **Hitachi TagmaStore Workgroup Modular Storage Series:**
  - *Model WMS100 User and Reference Guide* (MK 95DF738)
- **Hitachi TagmaStore Hitachi Dynamic Link Manager:**
  - *User's Guide for Sun Solaris Systems* (MK-92DLM114)

Comments

Please send us your comments on this document. Make sure to include the document title, number, and revision. Please refer to specific section(s) and paragraph(s) whenever possible.

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Thank you! (All comments become the property of Hitachi Data Systems Corporation.)

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Chapter 1 Introduction

Welcome to the Sun™ Solaris™ Host Installation Guide for Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage.

This guide describes the requirements and procedures for connecting Adaptable Modular Storage and Workgroup Modular Storage systems to a Sun Solaris system. It also describes how to configure the new Adaptable Modular Storage disk devices for operation with the Sun Solaris operating system. The Hitachi Data Systems representative performs the initial physical installation of the Adaptable Modular Storage system. The user then configures the new Adaptable Modular Storage devices with assistance as needed from the Hitachi Data Systems representative.

Configuration of the Adaptable Modular Storage disk devices for Solaris operations includes:

- Setting the disk and device parameters (section 2.5)
- Setting and recognizing the LUs (section 2.6)
- Configuring the host fibre-channel adapters (section 2.7)
- Creating and mounting the file systems (section 3.1)

Note on the term "SCSI disk": The Adaptable Modular Storage logical devices are defined to the host as SCSI disk devices, whether the interface is SCSI or fibre-channel.

1.1 Adaptable Modular Storage System

The Hitachi Adaptable Modular Storage Series system is a high-performance, medium-capacity storage system, with added features for increasing data accessibility and enabling continuous user data access. The architecture of the Adaptable Modular Storage enables the user to scale the system to meet a wide range of capacity and performance requirements. The Adaptable Modular Storage system provides connectivity to most open systems through a standard fibre-channel interface.

For more information about the Adaptable Modular Storage system, refer to the *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780), *Hitachi TagmaStore Adaptable Modular Storage Model AMS500 User's Guide* (MK-95DF714), the *Hitachi TagmaStore Adaptable Modular Storage Model AMS200 User's Guide* (MK-95DF713), *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780)or contact your Hitachi Data Systems account team.

Chapter 2 Preparing for New Device Configuration

This chapter covers the following topics:

- Configuration requirements (section 2.1)
- Installing an Adaptable Modular Storage system (section 2.2)
- Preparing to connect Adaptable Modular Storage (section 2.3)
- Connecting the Adaptable Modular Storage to a Sun system (section 2.4)
- Setting the disk and device parameters (section 2.5)
- Setting and recognizing the LUs (section 2.6)
- Configuring the host fibre-channel adapters (section 2.7)
- Using QLogic and Sun HBAs (section 2.8)
- Rebooting the Sun system (section 2.9)

2.1 Configuration Requirements

The requirements for undertaking an Adaptable Modular Storage Sun Solaris configuration are:

- **Hitachi Adaptable Modular Storage system**

  The Storage Navigator Adaptable Modular Storage software is required to configure the fibre-channel (FC) ports on the Adaptable Modular Storage system.

  Note: The availability of Adaptable Modular Storage features and functions depends on the level of microcode installed on the Adaptable Modular Storage system.

- **Sun system**

  Sun SPARCstation™ series, Sun SPARCserver series, Sun SPARCcenter series, or Sun Ultra Series™. Please contact your Hitachi Data Systems account team for the latest information on supported hardware.

- **Sun Solaris operating system, version 2.6, 7, 8, or 9**

  Root login access to the Sun system is required.

  Important: Contact Sun to make sure that the most current operating system patches are installed on the Sun system(s). For more information about supported Solaris versions, contact Hitachi Data Systems.

- **Fibre-channel adapters**

  Be sure to install all utilities, tools, and drivers that come with the adapter(s).

  – The Adaptable Modular Storage system supports full-speed (1 and 2 Gbps), shortwave, non-OFC (open fibre control) optical fibre-channel interface and multimode optical cables with SC and/or LC connectors. Do not connect any OFC-type fibre-channel interface to the Adaptable Modular Storage system.

  Note: It is recommended that users read all vendor release notes and vendor installation guides before setting up HBA configuration files.

- **High-availability (HA) software (optional)**

  The Adaptable Modular Storage currently supports the following software products. Please contact your Hitachi Data Systems account team for the latest information on supported software products.

  – VERITAS® Cluster Server™ and Sun Cluster for host/application failover

  – Hitachi Dynamic Link Manager and VERITAS Volume Manager™ for path failover and logical volume management

2.2 Installing an Adaptable Modular Storage System

The Adaptable Modular Storage system comes with all the hardware and cabling required for installation. Installation of the Adaptable Modular Storage system involves the following activities:

- **Hardware installation**

  A Hitachi Data Systems representative performs hardware installation as specified in the Adaptable Modular Storage Maintenance Manual. Follow all precautions and procedures in the Adaptable Modular Storage maintenance manual. Check all specifications to ensure proper installation and configuration. Hardware installation includes:

  - Assembling all hardware and cabling
  - Installing the latest microcode level
  - Creating RAID groups and LUNs and formatting LUNs using the Storage Navigator Adaptable Modular Storage software. For information and instructions on using Storage Manager, refer to the following documents:
    - *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
    - *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
    - *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)
  - Installing the fibre-channel adapters and cabling

- **Adaptable Modular Storage FC Port**

  The fibre topology parameters for each Adaptable Modular Storage fibre-channel port depend on the type of device to which the Adaptable Modular Storage port is connected. Determine the topology parameters supported by the device, and set your topology accordingly (see section 2.3).

  You use the Storage Navigator Adaptable Modular Storage software to configure the Adaptable Modular Storage fibre ports. For instructions on using Storage Navigator, refer to the following documents:

  - *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
  - *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
  - *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)

2.3 Preparing to Connect Adaptable Modular Storage

Before connecting an Adaptable Modular Storage system, perform the following tasks:

- Set the host-specific parameters for the Adaptable Modular Storage fibre-channel port(s) (see section 2.3.1)
- Verify host bus adapter installation (see section 2.3.2)

You use the Storage Navigator Adaptable Modular Storage software to configure the Adaptable Modular Storage ports (see Figure 2.1). Some key configuration selections you can make include:

- **Topology (Connection):** Loop or Point-to-Point
- **Port Option:** Optional settings on the port that describe how the host accesses the port. Multiple options can be selected: reset/LIP mode (signal), reset/LIP mode (process), reset/ALL LIP port mode, reset target (reset bus device) mode, etc.
- **Host mode:** Standard, Open VMS, Wolfpack, TRESPASS, etc. Select the host mode for the connected platform to enable the host to "see" all LUNs on the port.
- **Extended Host Mode (Host Mode2):** Optional settings on the port that describe how the host accesses the port. Multiple options can be selected: VxVM DMP mode, Sun connection mode, report inquiry page 83H, UA (06/2A00) suppress mode, etc.

For instructions on using Storage Navigator, refer to the following documents. For more information on Solaris settings, see Table 2.1 and Table 2.2.

- *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
- *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
- *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)

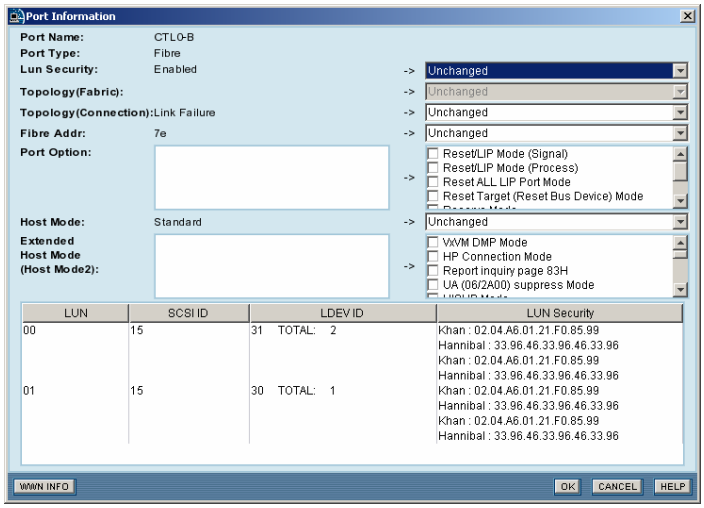

Figure 2.1 Example of Port Information

Table 2.1 Solaris Settings (Basic)

Parameter	Setting	Comments
System		
System startup attribute	Depends on system configuration	*See Note 1.*
Data share mode	Depends on system configuration	Recommend ON in all cases; *see Note 2.*
Data striping size	64 kbytes	Default
Cache mode	ALL OFF	Default
Operation if a processor failure occurs	Reset a fault	Default
Drive detach mode enable	Disabled	Default
Turbo LU warning	Disabled	Default
Report status (normal/warning)	Enabled	Default
RS232C Error Information Outflow Mode	OFF	Default
Host Interface		
Command Queuing Mode	ON	Default
ROM micro program version	—	N/A
RAM micro program version	—	N/A
Write & verify executing mode	ON	Default
LU mapping mode	User defined	*See Note 3.*
Host Port		
Host connection mode	—	N/A
Host connection mode1	Standard	Default; *see Note 4.*
Host connection mode2	ALL OFF	Default; *see Note 4.*
LIP reset mode	Target authentication	Default
Reset/LIP mode (process)	Reset within the port	Default
Reset/LIP mode (signal)	Reset within the port	Default
Target reset (bus device reset) mode	Reset within the port	Default
Logical unit reset mode	Reset within the port	Default
Third party process logout mode	Reset within the port	Default
Reserve mode	Within a CTL	Default; *see Note 5.*
Network		
DHCP	OFF	Default
IP address	User defined	—
Subnet mask	User defined	—
Default gateway	User defined	—

Parameter	Setting	Comments
Name		
Vendor ID	HITACHI	Default
Product ID	DF600F	Default
Serial number	—	Default
Controller identifier	Disabled	Default
Controller id	DF600-00	*See Note 6.*

Note 1: Hot-Standby mode is used only when one of the two Controllers is desired to be active.

Note 2: Data Share mode is used to prevent performance deterioration caused by LU ownership switching. This occurs when a host computer issues commands frequently to a Controller that does not own the target LU (often due to a path or host failure in failover mode). Data Share mode is recommended where LU ownership switching may occur.

Note 3: This is needed for defining which LUs will be accessible through a port.

Note 4: Please see Table 2.2.

Note 5: When **Data Share** mode is set, the Adaptable Modular Storage operates in the **Within a System** mode even when the **Within a CTL** mode is set.

Note 6: Make the controller ID's of the CTL-00 and CTL-01 of the Adaptable Modular Storage identical. When two or more Adaptable Modular Storage units are connected to the same host, the Controller IDs of each Adaptable Modular Storage must be unique per Adaptable Modular Storage system.

Table 2.2 Solaris Parameter Settings (Advanced)

		Path Failover		Clusters		HDS Solutions	
Parameter	Options	VxVM-DMP	HDLM	VCS	SCS	ShadowImage In-system replication Adaptable Modular Storage	TrueCopy remote replication Adaptable Modular Storage
HCM *See Note 1*	Standard	X*	X			—	—
	Trespass	X				—	—
HCM *See Note 2*	Sun Cluster Mode				X *See Note 3.*		
Product ID		DF400[2]/DF600F			DF600FSUN	—	—
Controller Identifier		ENABLED					
		DF600-00					

Important: It is recommended that VxVM DMP v3.2p2+pp or later be used. This will allow you to set the Adaptable Modular Storage Product ID as a DF600 using the Standard setting.

Note 1: Prior to VxVM DMP 3.2 p2+pp or later, VERITAS did not use ASL and DDLs. If you are using the Adaptable Modular Storage in such an environment, set inQuiry Reporting (Product ID) for the Adaptable Modular Storage as a DF500.

Note 2: Set product ID to DF600F when using VxVM DMP 3.2 p2+pp or later with ASL (see Techfile ID 252140 on the VERITAS support website).

Note 3: Sun Cluster 3.0 I/O path switch function is not supported but ASL is required for the VxVM environment.

For host and software specific settings, the Hitachi Data Systems engineer should refer to the appropriate Adaptable Modular Storage maintenance documentation.

2.3.1 Setting the Host-Specific Parameters for the Adaptable Modular Storage Ports

The Adaptable Modular Storage ports must be configured for the connected operating system. Use the Storage Navigator Adaptable Modular Storage software to configure the Adaptable Modular Storage fibre ports. For instructions on using Storage Navigator, refer to the following documents:

- *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
- *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
- *Hitachi TagmaStore™ Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)

2.3.1.1 Fibre Topology

You configure the Adaptable Modular Storage FC ports to define the fibre topology parameters and port addresses (see Table 2.3). The Adaptable Modular Storage system supports up to 512 LUs. You will select the appropriate settings for each Adaptable Modular Storage 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 to one of the following:

- Loop – For use in a direct connection environment without using a fabric switch, or as a connection to a fabric switch with the intent of setting up a public or private loop.
- Direct – For use in a SAN environment where the customer is connecting the Adaptable Modular Storage to a fabric switch with the intent of setting-up an N_Port or an F_Port environment.

Note: If you plan to connect different types of servers to the Adaptable Modular Storage via the same fabric switch, use Hitachi LUN Manager™ Host Storage Domain (HSD) on the Adaptable Modular Storage.

2.3.1.2 Port Address

In fabric environments, port addresses are assigned automatically by fabric switch port number and are not controlled by the Adaptable Modular Storage port settings. In FC arbitrated-loop (FCAL) environments, port addresses are set by entering an AL-PA (arbitrated-loop physical address, or loop ID, or port address). The host communicates with the devices comprising the loop with 8-bit AL-PA (see Table 2.3).

Table 2.3 shows the available AL-PA values and the corresponding SCSI TID address. The number of available port addresses is 126. (There are 127 port addresses, but address 00H is reserved for fibre connection.) The 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 Adaptable Modular Storage port to a SCSI TID.

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 2.3 Fibre Port Addressing

AL-PA	TID	AL-PA	TID	AL-PA	TID	AL-PA	TID	AL-PA	TID	AL-PA	TID	AL-PA	TID	AL-PA	TID
EF	0	CD	16	B2	32	98	48	72	64	55	80	3A	96	23	112
E8	1	CC	17	B1	33	97	49	71	65	54	81	39	97	23	113
E4	2	CB	18	AE	34	90	50	6E	66	53	82	36	98	1F	114
E2	3	CA	19	AD	35	8F	51	6D	67	52	83	35	99	1E	115
E1	4	C9	20	AC	36	88	52	6C	68	51	84	34	100	1D	116
E0	5	C7	21	AB	37	84	53	6B	69	4E	85	33	101	1B	117
DC	6	C6	22	AA	38	82	54	6A	70	4D	86	32	102	18	118
DA	7	C5	23	A9	39	81	55	69	71	4C	87	31	103	17	119
D9	8	C3	24	A7	40	80	56	67	72	4B	88	2E	104	10	120
D6	9	BC	25	A6	41	7C	57	66	73	4A	89	2D	105	0F	121
D5	10	BA	26	A5	42	7A	58	65	74	49	90	2C	106	08	122
D4	11	B9	27	A3	43	79	59	63	75	47	91	2B	107	04	123
D3	12	B6	28	9F	44	76	60	5C	76	46	92	2A	108	02	124
D2	13	B5	29	9E	45	75	61	5A	77	45	93	29	109	01	125
D1	14	B4	30	9D	46	74	62	59	78	43	94	27	110		
CE	15	B3	31	9B	47	73	63	56	79	3C	95	26	111		

2.3.2 Verifying the Host Fibre-Channel Adapter Installation

Before the Adaptable Modular Storage system is connected to the Sun system, verify the FC adapter installation. To ensure that the host fibre 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. Use the **/usr/platform/[platform:sun4u]/sbin/prtdiag** command to display the host configuration (see example in 2.2).
3. Be sure that the host recognizes the following four classes of fibre information (underlined in the following example): **fibre channel adapter**, **SCSI bus characteristics**, **world wide name**, and **FCA driver**. If this information is not displayed or if error messages are displayed, the host environment may not be configured properly.

   Note: For information on the HBA-specific text displayed on screen, refer to the MAN pages and/or user documentation for the HBA.

```
# /usr/platform/sun4u/sbin/prtdiag -v



Brd  Type  MHz   Slot  Name                              Model
---  ----  ----  ----  --------------------------------  ---------------------
 0   PCI    33     0   SUNW,qfe-pci108e,1001             SUNW,pci-qfe
 0   PCI    33     1   network-SUNW,hme
 0   PCI    33     1   SUNW,qfe-pci108e,1001             SUNW,pci-qfe
 0   PCI    33     2   SUNW,qfe-pci108e,1001             SUNW,pci-qfe
 0   PCI    33     3   scsi-glm/disk (block)             Symbios,53C875
 0   PCI    33     3   scsi-glm/disk (block)             Symbios,53C875
 0   PCI    33     3   SUNW,qfe-pci108e,1001             SUNW,pci-qfe
 0   PCI    33     5   fibre-channel-pci1242,4642

# pkginfo -l  JNIfcaw        ← For FC64-1063 (64-bit Sbus)
              JNIfca         ← For FC32-1063 (32-bit Sbus)
              JNIfcaPCI      ← For FCI-1063 (32/64-bit PCI)
              JNIC           ← For FCE-6410 (64-bit PCI)
              JNIC146x <- For FCE-1473
              LPFC <- For Emulex LP8000/LP9000 cards
              LPFS <- For Emulex LP8000S/LP9000S cards

:
 :
 :
fca0: JNI Fibre Channel Adapter (1062 MB/sec), model FC                  ← Verify that
SBus 1: IRQ 4: FCODE Version 11.0.9 [1a6384]: SCSI ID fca0: 125: AL_PA 01  ← these items
Fibre Channel WWN: fca0: 100000e0690000d5                                 ← are listed
FCA Driver Ver. 2.2.HIT.03, Oct 09, 1999 Solaris fca0: 2.5, 2.6        <- or equivalents
```

Figure 2.2 Displaying the Fibre Device Information (JNI FC-1063 shown)

2.4 Connecting the Adaptable Modular Storage System to a Sun System

The Adaptable Modular Storage system comes with all the hardware and cabling required for connection to the host system(s). Connection of the Adaptable Modular Storage system involves the following steps. Some of these steps are performed by the Hitachi Data Systems representative, while other steps are performed by the user.

Note: The Hitachi Data Systems representative must use the Adaptable Modular Storage 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.

1. **Verify system installation**. A Hitachi Data Systems representative verifies that the status of the fibre/SCSI adapters and LUNs is normal.
2. **Connect the Adaptable Modular Storage to the Sun system**. Install the fibre-channel cables between the Adaptable Modular Storage system and the Sun system.

After connecting the Adaptable Modular Storage system to the Solaris host, perform the following tasks before rebooting the host:

- Modify /etc/system with appropriate time-out and max throttle values (see section 2.5),
- Modify /kernel/drv.sd.conf so LUs can be recognized (see section 2.6), and
- Configure the host fibre-channel adapters (see section 2.7).

3. **Power on the Sun system.** The user or Hitachi Data Systems representative powers on the Sun system after connecting the Adaptable Modular Storage system:
   a) Power on the Sun system display.
   b) Power on all peripheral devices. The Adaptable Modular Storage system should already be on and the fibre-channel ports should already be configured. If the Adaptable Modular Storage fibre ports are configured after the Sun system is powered on, the system must be restarted to recognize the new devices.
   c) Confirm the ready status of all devices.
   d) Power on the Sun system.

2.5 Setting the Disk and Device Parameters

Once the Adaptable Modular Storage is installed and connected, you must set the queue depth parameter (**sd_max_throttle**) and I/O time-out value (**sd_io_time**) for the Adaptable Modular Storage devices. The required I/O time-out value (TOV) for Adaptable Modular Storage devices is 60 seconds (0x3C), which is also the default TOV value. 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** parameter in the **/etc/system** file.

To set the I/O TOV and queue depth for the Adaptable Modular Storage devices:

1. Make a backup of /etc/system: **cp /etc/system /etc/system.bak**
2. Edit /etc/system
3. Add the following to /etc/system: **set sd:sd_io_time=0x3c**
4. Add the following to /etc/system: **set sd:sd_max_throttle = x** (for ***x*****,** refer to Figure 2.3)

   Note: The sd_max_throttle setting is determined by dividing 512 by the total number of LUNs configured to a port. For example, if the user has configured a total of 67 LUNs to port -0A- on a 9570, the sd_max_throttle setting will be:

   512 /67 = 7.6 (always round down to the next **EVEN** integer).

   In this case the customer would set the sd_max_throttle to (**6**). This number should not exceed **32**, or, if using VxVM DMP, this number should not exceed **8**.
5. Save your changes and exit the text editor. You will reboot the system later to apply the above 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  ← For setting I/O TOV, add this line to /etc/system

            set sd:sd_max_throttle = 8       ← For setting max throttle,
                                                add this line to /etc/system
```

Figure 2.3 Setting I/O TOV and Max Throttle (Queue Depth)

2.6 Setting and Recognizing the LUs

You must set and recognize the new LUs by adding the Adaptable Modular Storage logical devices to the **sd.conf** file (/kernel/drv/sd.conf). The **sd.conf** file includes the SCSI TID and LUN for all LUs connected to the Sun system.

To set and recognize the new 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.bak
2. Edit the **/kernel/drv/sd.conf file** as shown in Figure 2.4. 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, verify each new LU.

   Note: The setup in the **sd.conf** file is different for some adapters (for example, Emulex LP8000). Refer to the MAN pages or user documentation for the adapter.
3. Exit the vi editor and save your changes. You will reboot the system later to apply the new settings.

```
# 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;
#
#
```

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

Figure 2.4 Setting and Recognizing LUs

2.7 Configuring the Host Fibre-Channel Adapters

After setting the disk and device parameters and setting and recognizing the LUs, configure the host fibre-channel (FC) adapter(s) (HBAs) connected to the Adaptable Modular Storage.

HBAs have many configuration options. Be sure to read the MAN pages and user documentation for the adapter.

This section provides minimum requirements for configuring FC adapters for operation with the Adaptable Modular Storage system. The following sample instructions apply to JNI™, JNI Emerald™-based, and Emulex FC adapters.

2.7.1 Sample Instructions for JNI FC Adapters

Edit the **fca*.conf** file to configure the FC adapters.

For 32-bit SBus adapters, configure the **/kernel/drv/fca.conf** file.
For 64-bit SBus adapters, configure the **/kernel/drv/fcaw.conf** file.
For PCI adapters, configure the **/kernel/drv/fca-pci.conf** file.

To configure an HBA by editing the **fca*.conf** file (fca-pci.conf is shown in this example):

1. Log in as **root**.
2. Make a backup of fca-pci.conf: **cp /kernel/drv/fca-pci.conf /kernel/drv/fca-pci.bak**
3. Edit the fca-pci.conf file: **vi /kernel/drv/fca-pci.conf**
4. Enter: **timeout_reset_enable = 1;** (see Figure 2.5)
5. Enter: **link_recovery_delay = 500;** (see Figure 2.6)
6. Enter: **recovery_attempts = 5;** (see Figure 2.7)
7. When using VERITAS VxVM, enter: **scsi_probe_delay = 5000;**
   (minimum value = 5000, can be set higher as needed)
8. Enter: **failover = 180;** (see Figure 2.8)

   When using VERITAS VxVM Dynamic Multi Pathing (DMP), enter: **failover = 60;**
9. Enter: **ip_disable = 1;** (This parameter is only for driver v2.5.) (see Figure 2.9)
10. Enter: **def_wwpn_binding = "xxxxxxxxxxxxxxxx";** (see Figure 2.10)

    Enter: **def_wwnn_binding = "xxxxxxxxxxxxxxxx";** (see Figure 2.10)

    Note: Before driver v2.5, enter: def_wwn_binding = "xxxxxxxxxxxxxxxx";

    Note: If binding is being performed, use $xxxxxxxxxxxxxxxx for the wwpn setting.
11. Enter: **def_port_binding = "$xxxxxx";** (see Figure 2.11)
12. Enter: **fca_verbose = 1;** (see Figure 2.12)
13. When connecting to Arbitrated Loop (AL), enter: **fca_nport = 0;**
    When connecting to fibre switch, enter: **fca_nport = 1;**

14. 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 as follows:

    For FCI-1064, set **scsi-initiator-id = 0xZZ;** (0xZZ:0-7d hex) (see Figure 2.13)

    For FC-1063, FC64-1063:

    a) For Openboot mode, enter init 0.

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

    c) 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

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

    e) 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**

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

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

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

    Note: There must be a storage device or loopback plug attached to the adapter. Enter the Openboot command to change the SCSI-ID, and enter **y** and the new SCSI ID (see Figure 2.14): **set-scsi-id**

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

```
# 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 2.5 Example of set timeout_reset_enable = 1

```
# Configuration flag link_recovery_delay
# Type: unsigned int; default: 100
# Set delay between link up state and login recovery.
# This delay helps ensure link stability before recovery of communications to ports.
# The delay is in milliseconds with a 10 millisecond resolution.
link_recovery_delay = 500;
```

Figure 2.6 Example of set link_recovery_delay = 500

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

Figure 2.7 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 2.8 Example of failover = 180

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

Figure 2.9 Example of ip_disable=1

```
# Configuration flag def_wwXn_binding where X is either n for node or p for port.
# Type: string; default: "$xxxxxxxxxxxxxxxx" (means WWXN is "static don't care")
# Sets the 16 digit hexadecimal default wwXn binding for every target/lun instance which
# does not explicitly define one.
#      - A "$" 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 2.10 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 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 2.11 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 2.12 Example of fca_verbose=1

```
## 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 2.13 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 2.14 Example of SCSI ID Change

2.7.2 Sample Instructions for JNI Emerald -based FC Adapters

Edit the **jnic.conf** file to configure the JNI Emerald -based FC adapters.

The following requirements apply when connecting the Adaptable Modular Storage 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.
- The JNI adapter must be model FCE-6410 or FCE2-6410.
- The driver version must be 4.0.2 or later.

To configure a JNI Emerald -based HBA by editing the **/kernel/drv/jnic.conf** file:

1. Log in as **root**.
2. Make a backup of jnic.conf: **cp /kernel/drv/jnic.conf /kernel/drv/jnic.conf.bak**
3. Make a backup of sd.conf: **cp /kernel/drv/sd.conf /kernel/drv/sd.conf.bak**
4. Edit the jnic.conf file: **vi /kernel/drv/jnic.conf**
5. Set the driver parameters: Topology = Private Loop, or Topology = Fabric;
   Failover Delay (sec) = 180
   Reset on Timeout = Disabled
6. Enter or edit the following settings (one line for each LUN mapped on each target/path) where:

   Name=sd class=scsi target= (*x*) lun= (*y*)

   Example:

   ```
   name=sd   class=scsi  target=1  lun=0
   name=sd   class=scsi  target=1  lun=1
   name=sd   class=scsi  target=1  lun=2
   name=sd   class=scsi  target=1  lun=3

   name="sd"   class="scsi"  target=2  lun=0
   name="sd"   class="scsi"  target=2  lun=1
   name="sd"   class="scsi"  target=2  lun=2
   name="sd"   class="scsi"  target=2  lun=3
   ```

   Note: For 4 LUNs (0 through 3) mapped on 2 separate paths on the Adaptable Modular Storage.

7. Bind the necessary target LUNs.
8. Save your changes and exit the text editor.

2.7.3 Emulex LP8000S/LP9000S lpfs package: /kernel/drv/lpfs.conf

To configure an FC-AL setup with direct connect or connected through a hub:

- Edit the /kernel/drv/lpfs.conf file as follows:

  topology=4
  automap=1

  Topology Settings for Emulex:

  0 = Arbitrated Loop, then Point-to-Point

  2 = Point-to-Point only

  4 = Arbitrated Loop Only

  6 = Point-to-Point, then Arbitrated Loop

  Default setting: **4**

  Automap Settings for Emulex:

  0 = only devices with persistent bindings are recognized

  1 = Maps by WWNN

  2 = Maps by WWPN

  3 = Maps by D_ID

  Default setting: **1**

  All other settings should be left at their default settings specified in the lpfs.conf file.

2.7.4 Emulex LP8000/LP9000: lpfc package: /kernel/drv/lpfc.conf

To configure an FC-AL setup with direct connect or connected through a hub:

- Edit the /kernel/drv/lpfc.conf file as follows:

  topology=4;
  automap=1;

  All other settings should be left at their default settings specified in the lpfc.conf file.

2.7.5 Emulex LP8000S/LP9000S: lpfs: /kernel/drv/lpfs.conf

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/lpfs.conf file as follows:

   topology=2
   automap=0

2. Add the following settings:

   fcp-bind-WWPN="(wwpn):lpfs(Z)t(X)";

There should be one entry per path with a different target and wwpn.

Note: (*X*) is the target you desire on this path (one per path), (wwpn) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator (DAMP/Resource Manager), and Z is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (*X*) are the same targets entered in the /kernel/drv/sd.con file in the previous steps.

Example:

fcp-bind-WWPN =”50002000AE001142:lpfc0t1”;
fcp-bind-WWPN =”50002000AE001144:lpfc1t2”;

All other settings should be left at their default settings specified in the lpfs.conf file.

2.7.6 Emulex LP8000/LP9000: lpfc package: /kernel/drv/lpfc.conf

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/lpfc.conf file as follows:

   topology=2
   automap=0

2. Add the following settings:

   fcp-bind-WWPN="(wwpn):lpfs(Z)t(X)";

There should be one entry per path with a different target and wwpn.

Note: (*X*) is the target you desire on this path (one per path), (wwpn) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator (DAMP/Resource Manager), and (Z) is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (X) are the same targets entered in the /kernel/drv/sd.con file in the previous steps.

Example:

fcp-bind-WWPN =”50002000AE001142:lpfc0t1”;
fcp-bind-WWPN =”50002000AE001144:lpfc1t2”;

All other settings should be left at their default settings specified in the lpfs.conf file.

2.7.7 JNI FC-1063 (32bit sbus HBA): JNIfca package: /kernel/drv/fca.conf

To configure an FC-AL setup with direct connect or connected through a hub:

- Edit the /kernel/drv/fca.conf file as follows:

  fca_nport = 0
  public_loop = 0
  failover = 60
  def_wwpn_binding =”xxxxxxxxxxxxxxxx”
  def_wwnn_binding =”xxxxxxxxxxxxxxxx”
  def_hba_binding = ”fcaw*”
  def_port_binding = ”$xxxxxx”

  All other settings should be left at their default settings specified in the fcaw.conf file.

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/fca.conf file as follows:

   fca_nport = 1
   public_loop = 0
   failover = 60
   def_wwpn_binding = "$xxxxxxxxxxxxxxxx"
   def_wwnn_binding = "xxxxxxxxxxxxxxxx"
   def_hba_binding = "Non-jni*"
   def_port_binding = "xxxxxx"

2. Add the following settings:

   target(X)_wwpn = "(wwpn)"

   Note: There should be one entry per path with a different target and wwpn.

   target(X)_lun(Y)_hba="fcaw(Z)"

   Note: There should be one entry for each LUN on this path, designated by target (*X*) from step 1.

Note: *X* is the target you desire on this path (one per path), and (wwpn) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator Adaptable Modular Storage. *Y* is the Host LUN number as mapped in Storage Navigator Adaptable Modular Storage, and *Z* is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (X) and (Y) are the same targets and LUNs entered in the /kernel/drv/sd.con file in the steps above.

Example:

target1_wwpn = "50002000AE001142"
target1_lun0_hba = "fcaw0"
target1_lun1_hba = "fcaw0"
target1_lun2_hba = "fcaw0"
target1_lun3_hba = "fcaw0"

target2_wwpn="50002000AE001144"
target2_lun0_hba="fcaw1"
target2_lun1_hba="fcaw1"
target2_lun2_hba="fcaw1"
target2_lun3_hba="fcaw1"

All other settings should be left at their default settings specified in the fcaw.conf file.

2.7.8 JNI FC64-1063: JNIfcaw package: /kernel/drv/fcaw.conf

To configure an FC-AL setup with Direct Connect or connected through a hub:

- Edit /kernel/drv/fcaw.conf file as follows:

  ```
  fca_nport = 0
  public_loop = 0
  failover = 60
  def_wwpn_binding = ”xxxxxxxxxxxxxxxx”
  def_wwnn_binding = ”xxxxxxxxxxxxxxxx”
  def_hba_binding = ”fcaw*”
  def_port_binding = ”$xxxxxx”
  ```

All other settings should be left at their default settings specified in the fcaw.conf file.

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/fcaw.conf file as follows:

   ```
   fca_nport=1
   public_loop=0
   failover=60
   def_wwpn_binding=”$xxxxxxxxxxxxxxxx”
   def_wwnn_binding=”xxxxxxxxxxxxxxxx”
   def_hba_binding=”Non-jni*”
   def_port_binding=”xxxxxx”
   ```

2. Add the following settings:

   target(*X*)_wwpn=”(wwpn)” #

   Note: There should be one entry per path with a different target and wwpn.

   target(*X*)_lun(*Y*)_hba=”fcaw(*Z*)” #

   Note: There should be one entry for each LUN on this path, designated by target (X) from step 1.

Note: (*X*) is the target you desire on this path (one per path), and (wwpn) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator Adaptable Modular Storage. (*Y*) is the Host LUN number as mapped in Storage Navigator Adaptable Modular Storage, and (*Z*) is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (X) and (Y) are the same targets and LUNs entered in the /kernel/drv/sd.con file in the previous steps.

Example:

target1_wwpn=”50002000AE001142”

target1_lun0_hba=”fcaw0”
target1_lun1_hba=”fcaw0”
target1_lun2_hba=”fcaw0”
target1_lun3_hba=”fcaw0”

target2_wwpn=”50002000AE001144”;

target2_lun0_hba=”fcaw1”
target2_lun1_hba=”fcaw1”
target2_lun2_hba=”fcaw1”
target2_lun3_hba=”fcaw1”

All other settings should be left at their default settings specified in the fcaw.conf file.

2.7.9 JNI FCI-1063: JNIfcaPCI package: /kernel/drv/fca-pci.conf

To configure an FC-AL setup with direct connect or connected through a hub:

- Edit /kernel/drv/fca-pci.conf file as follows:

  fca_nport = 0
  public_loop = 0
  failover = 60
  def_wwpn_binding = ”xxxxxxxxxxxxxxxx”
  def_wwnn_binding = ”xxxxxxxxxxxxxxxx”
  def_hba_binding = ”fca-pci*”
  def_port_binding = ”$xxxxxx”

All other settings should be left at their default settings specified in the fcaw.conf file.

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/fca-pci.conf file as follows:

   fca_nport = 1
   public_loop = 0
   failover = 60
   def_wwpn_binding = "$xxxxxxxxxxxxxxxx"
   def_wwnn_binding= "xxxxxxxxxxxxxxxx"
   def_hba_binding = "Non-jni*"
   def_port_binding = "xxxxxx"

2. Add the following settings:

   target(X)_wwpn="(wwpn)";

   Note: There should be one entry per path with a different target and wwpn.

   target(*X*)_lun(*Y*)_hba="fcaw(*Z*)";

   Note: There should be one entry for each LUN on this path, designated by target (*X*) from step 1.

Note: (*X*) is the target you desire on this path (one per path), (wwpn) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator Adaptable Modular Storage. (*Y*) is the Host LUN number as mapped in Resource manager Adaptable Modular Storage, and (*Z*) is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (X) and (Y) are the same targets and LUNs entered in the /kernel/drv/sd.con file in the steps above.

Example:

target1_wwpn="50002000AE001142"

target1_lun0_hba="fcaw0"
target1_lun1_hba="fcaw0"
target1_lun2_hba="fcaw0"
target1_lun3_hba="fcaw0"

Example:

target2_wwpn="50002000AE001144"

target2_lun0_hba="fcaw1"
target2_lun1_hba="fcaw1"
target2_lun2_hba="fcaw1"
target2_lun3_hba="fcaw1"

All other settings should be left at their default settings specified in the fcaw.conf file.

2.7.10 JNI FCE-6410: JNIC package: /kernel/drv/jnic.conf

To configure an FC-AL setup with direct connect or connected through a hub:

- Edit the /kernel/drv/jnic.conf file as follows:

  FcLoopEnabled = 1
  FcFabricEnabled = 0
  FcPortCfgEnable = 1

Note: Since this is for private loop, you will need to set this first, reboot (#reboot -- -r), and set to 0.

failover=60

Note: For more than one HBA, set failover to 0.

def_wwpn_binding = ”xxxxxxxxxxxxxxxx”
def_wwnn_binding = ”xxxxxxxxxxxxxxxx”
def_hba_binding = ”jnic*”
def_port_binding = ”$xxxxxx”

All other settings should be left at their default settings specified in the fcaw.conf file.

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/jnic.conf file as follows:

   FcLoopEnabled = 0
   FcFabricEnabled = 1
   FcPortCfgEnable = 1

   Note: This is for private loop, so you will need to set this first, reboot (#reboot -- -r), and set to 0.

   Failover = 60

   Note: This is for private loop, so you will need to set this first, reboot (#reboot -- -r), and set to 0.

   def_wwpn_binding = ”$xxxxxxxxxxxxxxxx”
   def_wwnn_binding = ”xxxxxxxxxxxxxxxx”
   def_hba_binding = ”Non-jni*”
   def_port_binding = ”xxxxxx”

2. Add the following settings:

   target(*X*)_wwpn=”(wwpn)”

   Note: There should be one entry per path with a different target and wwpn.

   target(*X*)_lun(*Y*)_hba=”jnic(Z)”

   Note: There should be one entry for each LUN on this path, designated by target (X) from step 1.

Note: (*X*) is the target you desire on this path (one per path), (wwpn) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator Adaptable Modular Storage. (*Y*) is the Host LUN number as mapped in Storage Navigator Adaptable Modular Storage, and (*Z*) is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (X) and (Y) are the same targets and LUNs entered in the /kernel/drv/sd.con file in the steps above.

Example:

target1_wwpn="50002000AE001142"

target1_lun0_hba="jnic0"
target1_lun1_hba=" jnic0"
target1_lun2_hba=" jnic0"
target1_lun3_hba=" jnic0"

Example:

target2_wwpn="50002000AE001144"
target2_lun0_hba=" jnic1"
target2_lun1_hba=" jnic1"
target2_lun1_hba=" jnic1"

target2_lun1_hba=" jnic1"
target2_lun1_hba=" jnic1"
target2_lun2_hba="jnic1"
target2_lun3_hba="jnic1";

All other settings should be left at their default settings specified in the jnic.conf file.

2.7.11 Emulex LP8000S/LP9000S: lpfs package: /kernel/drv/lpfs.conf

To configure an FC-AL setup with direct connect or connected through a hub:

- Edit /kernel/drv/lpfs.conf file as follows:

  Topology = 4
  automap = 1

All other settings should be left at their default settings specified in the lpfs.conf file.

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/lpfs.conf file as follows:

   topology = 2
   automap = 0

2. Add the following settings:

   fcp-bind-WWPN="(wwpn):lpfs(Z)t(X)";

   Note: There should be one entry per path with a different target and wwpn.

Note: (*X*) is the target you desire on this path (one per path), (wwpn) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator Adaptable Modular Storage, and (*Z*) is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (*X*) are the same targets entered in the /kernel/drv/sd.con file in the steps above.

Example:

fcp-bind-WWPN =”50002000AE001142:lpfs0t1”;

fcp-bind-WWPN =”50002000AE001144:lpfs1t2”;

All other settings should be left at their default settings specified in the lpfs.conf file.

2.7.12 Emulex LP8000/LP9000: lpfc package: /kernel/drv/lpfc.conf

To configure an FC-AL setup with direct connect or connected through a hub:

- Edit /kernel/drv/lpfc.conf file as follows:

  Topology = 4
  automap = 1

All other settings should be left at their default settings specified in the lpfc.conf file.

To configure a point-to-point setup connected through a switch:

1. Edit /kernel/drv/lpfc.conf file as follows:

   Topology = 2
   Automap = 0

2. Add the following settings:

   fcp-bind-WWPN="(wwpn):lpfs(Z)t(X)";

   Note: There should be one entry per path with a different target and wwpn.

Note: (*X*) is the target you desire on this path (one per path), (*wwpn*) is the World Wide Port Name as read from the System Parameter:Fibre Channel display in Storage Navigator Adaptable Modular Storage, and (*Z*) is the HBA instance number, incrementing by consecutive numbers, starting from 0 and continuing, one for each path/target.

Note: Where (*X*) are the same targets entered in the /kernel/drv/sd.con file in the steps above.

Example:

fcp-bind-WWPN =”50002000AE001142:lpfc0t1”

fcp-bind-WWPN =”50002000AE001144:lpfc1t2”;

All other settings should be left at their default settings specified in the lpfs.conf file.

2.8 Using QLogic and Sun HBAs

For QLogic and Sun HBAs, accept all default settings. The exception is setting up sd.conf with the applicable number of LUNs.

2.9 Rebooting the Sun System

After setting the disk and device parameters, setting and recognizing the LUs, and configuring the HBAs, reboot the Sun System.

To reboot the Sun System, enter the following at the command prompt: **reboot -- -r**
The **-r** option tells the system to rebuild the devices. Using **reboot** by itself will not build the devices on the newly installed Adaptable Modular Storage system.

After rebooting, configure the new LUs as described in Chapter 3.

Chapter 3 Configuring the New Devices

After Adaptable Modular Storage installation and connection procedures have been performed, the new Adaptable Modular Storage devices are ready to be configured for use.

Configuration of the Adaptable Modular Storage devices is performed by the user and requires root access to the Sun system. The activity involved in device configuration is:

- Creating and mounting the file systems (section 3.1)

3.1 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. Creating and mounting the file systems for the new SCSI disk devices involves:

- Creating the file systems (section 3.1.1)
- Creating and verifying the mount directories (section 3.1.2)
- Mounting and verifying the file systems (section 3.1.3)
- Setting the auto-mount parameters (optional) (section 3.1.4)

Note: Do not create file systems or mount directories for the raw devices. Raw devices do not require any further configuration after being partitioned and labeled.

3.1.1 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 3.1).
   a) Use 6 or one of the following multiples of 6 as the **maxcontig** value for all Adaptable Modular Storage 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 Adaptable Modular Storage devices. These **maxcontig** values (6, 12, 18, 24, 30) optimize the Adaptable Modular Storage'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 (for example, **/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 repeat step 1 using the correct device file name.
3. Repeat steps 1 and 2 for each new SCSI disk device on the Adaptable Modular Storage system. Use the same **maxcontig** value for all Adaptable Modular Storage 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 3.1 Creating the File Systems

3.1.2 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 (see Figure 3.2).
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 9500_LU00, enter: **mkdir /9500_LU00**

   Note: If you need to delete a mount directory, use **rmdir** (for example, **rmdir /9500_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 /9500_LU00                                      ← Create new mount directory.
# ls -x                                                 ← Verify new mount directory.
9500_LU00  bin    dev      device    etc      export correctly
floppy     home   hstsboof kadb      kernel   lib
#
```

Figure 3.2 Creating and Verifying a Mount Directory

3.1.3 Mounting and Verifying the File Systems

After you create the mount directories, 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 Adaptable Modular Storage devices (see Figure 3.3).

1. Use the **mount** command to mount the file system. 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 /9500_LU00 enter:

   mount /dev/dsk/c1t2d0s0 /9500_LU00

   If you need to unmount a file system, use **umount** command (for example: **umount /9500_LU00**).

   Note: If you have already set the auto-mount parameters (see section 3.1.4), 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.

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

```
# mount /dev/dsk/c1t2d0s0 /9500_LU00                          ← Mount file system.
                ↖ Block-type device file name
# mount /dev/dsk/c1t2d1s0 /9500_LU01                          ← Mount next file system.
                          ↖ Mount directory name
# mount /dev/dsk/c1t2d2s0 /9500_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%     /9500_LU00 ← Verify file systems.
/dev/dsk/c1t2d1s0  2256436        9  2030787      0%     /9500_LU01
/dev/dsk/c1t2d2s0  6774358        9  6548709      0%     /9500_LU02
:
# mount /dev/dsk/c1t2d0s0 /9500_LU00                          ← Mount file system.
# cd /9500_LU00                                               ← Go to mount directory.
# cp /bin/vi /9500_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 3.3 Mounting and Verifying the File System

3.1.4 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 (for example, mount /9500_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 3.4).

1. Make a backup copy of the **/etc/vfstab** file: **cp /etc/vfstab /etc/vfstab.bak**
2. Edit the **/etc/vfstab** file to add one line for each device to be auto-mounted. Table 3.1 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 when you finish 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
 ←                  ↑                    →           ↓       °     ±        ″   ← Table 3.1.
/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  /9500_LU00  ufs     5     yes      -   ← Add one line
/dev/dsk/c1t2d1s0  /dev/rdsk/c1t2d1s0  /9500_LU01  ufs     5     yes      -     for each LUN.
```

Figure 3.4 Setting the Auto-Mount Parameters

Table 3.1 Auto-Mount Parameters

Parameter #	Name	Enter:
←	Device to mount	Block-type device file name
↑	Device to fsck	Character-type device file name
→	Mount point	Mount directory name
↓	FS type	File system type (for example, ufs)
°	Fsck pass	Order for performing file system checks
±	Mount at boot	Yes = auto-mounted at boot/mountall No = not auto-mounted at boot/mountall
″	Mount options	Desired mount options: - no options (typical) -ro read-only access

Chapter 4 Troubleshooting

4.1 Troubleshooting

For troubleshooting information about Adaptable Modular Storage system refer to the *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780), *Hitachi TagmaStore Adaptable Modular Storage Model AMS500 User's Guide* (MK-95DF714), the *Hitachi TagmaStore Adaptable Modular Storage Model AMS200 User's Guide* (MK-95DF713), *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780)or contact your Hitachi Data Systems account team.

Table 4.1 lists potential error conditions during Adaptable Modular Storage Sun Solaris configuration and provides instructions for resolving each condition. If you are unable to resolve an error condition, contact your Hitachi Data Systems representative or VAR for help, or call the Hitachi Data Systems Support Center for assistance.

Table 4.1 Troubleshooting

Error Condition	Recommended Action
The logical devices are not recognized by the system.	Make sure that the READY indicator lights on the Adaptable Modular Storage system are ON. Make sure that the fibre cables are correctly installed and firmly connected. Recheck the fibre buses for new devices (using **diag** command, see section 2.6). Verify the contents of **/kernel/drv/sd.conf** file.
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.
The Adaptable Modular Storage red alarm light is on.	Please contact the Hitachi Data Systems Support Center.
System hangs, or devices are declared and then system hangs.	Make sure that the target IDs are set 0 through 6 and 8 through 15, and target ID 7 has been reserved for the SCSI controller card.
File system/superblock error	Run fsck.
Wrong magic number.	Label the disk using the **format** utility.

4.2 Calling the Hitachi Data Systems Support Center

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including the circumstances surrounding the error or failure and the exact content of any error messages displayed on the host system(s).

Run the getconfig script and send its resulting output file to Hitachi Data Systems when placing a support request call. Instructions are provided in Appendix E.

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 Adaptable Modular Storage Disk Type Configuration

This appendix provides instructions for determining the parameter values used when formatting a device on a Sun host (data cylinders, heads, sectors per track). The Solaris OS has a maximum value of **32767** for the number of data cylinders in a device.

Use the following formula to calculate the number of data cylinders for a device:

data_cylinders = [lun_capacity / (heads × sectors_per_track)] – 2

where,

lun_capacity = capacity that you entered when you set the LU
heads = (16, 32, 48, 64) depending on lun_capacity. (See Table B.1).
sectors_per_track = 96

Table A.1 Determining the Number of Heads

Case #	If the LUN size is (in blocks):	Use a 'Heads' value of:
1	LU ≤ 50,330,112	16
2	50,330,113 ≤ LU ≤ 100,660,224	32
3	100,660,225 ≤ LU ≤ 150,990,336	48
4	150,990,337 ≤ LU ≤ 201,320,448	64

Example 1:

A device with lun_capacity = 68,068,452 is in the "Case #2" category:

data_cylinders = [LUN capacity / (heads * sectors_per_track)] – 2
22155 = [68,068,452 / (32 × 96)] – 2

Note: Use the integer value without the remainder. Do not round up to the next integer.

Example 2:

A device with lun_capacity = 34,034,226 is in the "Case 1" category:

data_cylinders = [lun_capacity / (heads * sectors_per_track)] – 2
22155 = [34,034,226 / (16 × 96)] – 2

Appendix B Online Device Installation

This appendix provides instructions for online installation of new devices. After initial installation and configuration of the Adaptable Modular Storage system, 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. This procedure should be performed by the system administrator (i.e., super-user).

When the TOV for Adaptable Modular Storage volumes needs to be changed, you must edit the **/etc/system** file and reboot to make the file change effective. Please use the 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: Online installation is not available with the Sun X6729A FC adapter and JNI Emerald -based FC host bus adapter.

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. Adaptable Modular Storage setup:
   a) Ensure the latest microcode is loaded. Non-disruptive version up requires alternate path.
   b) Install CHF and LUN, and connect fibre cable if necessary.
   c) Execute online LU installation from the Storage Navigator software, or Remote Console PC.
   d) Verify Adaptable Modular Storage 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 (for example, 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 C Configuring the Boot Disk on the Adaptable Modular Storage

C.1 Introduction

The Adaptable Modular Storage can be set up as the boot disk instead of the built-in SCSI disk, if the following conditions are satisfied:

- HBA (host bus adapter) must be a 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 Adaptable Modular Storage array on a Sun server/ 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 system is set up as boot disk for the Solaris system, it is necessary to stop I/O operation for hosts connected to the system. It is recommended that Solaris boot be performed during low host load periods.

C.2 Partition Check

To configure the Adaptable Modular Storage as the Solaris boot disk, 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 C.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 C.1 Operating System Drive Partitions

C.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 C.2).

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

Figure C.2 Creating a New File System

C.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 C.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 Figure C.4).

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

Figure C.3 Installing a Boot Block

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

Figure C.4 Installing a Boot Block

C.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 C.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 C.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. 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 C.6 Updating the vfstab File

Unmount the root partition, and repeat the procedure for the **/usr** partition in the current root directory (see Figure C.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 C.7 Creating the Directory Structure for /usr Partition

C.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 D Running the getconfig Script

For troubleshooting purposes, you may need to run the getconfig script and send the results to Hitachi Data Systems Technical Support.

To do this, complete the following steps:

1. Load a CD in the CD-ROM drive of your Solaris host.
2. Copy the getconfig104.tar.Z file to /tmp
3. type command: # uncompress /tmp/getconfig104.tar.Z
4. type command: # tar xvf /tmp/getconfig104.tar
5. Follow directions in the README file.

Appendix E Acronyms and Abbreviations

AL	arbitrated loop
AL-PA	arbitrated loop-physical address
CLI	command line interface
DMP	Dynamic Multi Pathing
FC	fibre-channel
FCA	fibre-channel adapter
FC-AL	fibre-channel arbitrated loop
FCP	fibre-channel protocol
Gb	gigabit
GB	gigabyte
GUI	graphical user interface
HBA	host bus adapter
I/O	input/output
LU	logical unit
LUN	logical unit number, logical unit
MB	megabyte
OFC	open fibre control
OS	operating system
PC	personal computer system
PCI	peripheral component interconnect
RAID	redundant array of independent disks
SCSI	small computer system interface
TID	target ID
TOV	time-out value
WWN	worldwide name
VAR	value added reseller
VxVM	VERITAS Volume Manager