



Hitachi TagmaStore®
Adaptable Modular Storage and
Workgroup Modular Storage
HP® OpenVMS™ Host Installation Guide

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- *Hitachi TagmaStore Universal Storage Platform and Network Storage Controller HP® OpenVMS™ Configuration Guide (MK-94RD239)*

Preface

This configuration guide describes and provides instructions for configuring the devices on the Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage systems for operation with the HP® OpenVMS™ operating system. This document is intended for system administrators and Hitachi Data Systems representatives. If you have questions or concerns, please contact the Hitachi Data Systems Support Center.

This configuration guide assumes that the user:

- Has a background in data processing and understands direct-access storage device subsystems and their basic functions,
- Is familiar with the Hitachi TagmaStore Adaptable Modular Storage or Workgroup Modular Storage system,
- Is familiar with the SRM commands for their AlphaServer model, and
- Is familiar with the `wwidmgr` command and the OpenVMS™ operating system.

For more information about the HP® OpenVMS™ operating system, consult the HP® online help and/or user documentation or contact HP® technical support.

Notes:

- 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 Workgroup Modular Storage Model WMS100 User and Reference Guide* (MK-95DF738) for more information about the Adaptable Modular Storage and Workgroup Modular Storage systems.
- The use of Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage series products and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Microcode Level

This document revision applies to Adaptable Modular Storage and Workgroup Modular Storage microcode versions 1.0 and higher.

Convention for Storage Capacity Values

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

- 1 KB (kilobyte) = 1,000 bytes
- 1 MB (megabyte) = 1,000² bytes
- 1 GB (gigabyte) = 1,000³ bytes
- 1 TB (terabyte) = 1,000⁴ bytes

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

- 1 KB (kilobyte) = 1,024 bytes
- 1 MB (megabyte) = 1,024² bytes
- 1 GB (gigabyte) = 1,024³ bytes
- 1 TB (terabyte) = 1,024⁴ bytes

Referenced Documents

- *Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage: Storage Navigator - Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
- *Hitachi TagmaStore Adaptable Modular Storage and Workgroup 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)
- *Hitachi TagmaStore Adaptable Modular Storage Model AMS500 User and Reference Guide* (MK-95DF714)
- *Hitachi TagmaStore Adaptable Modular Storage Model AMS200 User and Reference Guide* (MK-95DF713)
- *Hitachi TagmaStore Adaptable Modular Storage 1000 User and Reference Guide* (MK-95DF780)
- *Hitachi TagmaStore Workgroup Modular Storage 100 User and Reference Guide* (MK-95DF738)
- *Hitachi TagmaStore Hitachi Dynamic Link Manager User's Guide for Windows® Systems* (MK-92DLM129)

Comments

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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 HP® OpenVMS™ Configuration Guide for Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage solutions (hereinafter referred to as AMS/WMS).

This guide describes the requirements and procedures for connecting AMS/WMS systems to an HP OpenVMS system. It also describes how to configure the new AMS/WMS disk devices for operation with the HP OpenVMS operating system (OS). The Hitachi Data Systems representative performs the initial physical installation of the AMS/WMS system. The user then configures new AMS/WMS devices with assistance as needed from the Hitachi Data Systems representative.

Configuration of the AMS/WMS disk devices for HP OpenVMS operations includes:

- Configuring the AMS or WMS for use with OpenVMS (see section 2.1)
- Verifying device recognition at the AlphaServer console (see section 3.1)
- Setup of boot devices if desired (see section 3.2)
- Verifying device recognition by OpenVMS (see section 3.3)
- Initialize and mount the devices (see section 3.4)
- Setting and verifying the auto-mount parameters (see section 3.5)

Note on the term “SCSI disk”: The AMS/WMS logical devices are defined to the host as SCSI disk devices, whether the interface is SCSI or fibre-channel.

1.1 Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage Systems

The Hitachi AMS/WMS systems are high-performance storage arrays, with added features for increasing data accessibility and enabling continuous user data access.

- The AMS systems offer a mix of both fibre-channel and lower cost Serial ATA (SATA) drives.
- The WMS systems can be configured with SATA drives only for low-cost near-line storage applications, which could be used for purposes such as archiving data for regulatory compliance.

The AMS/WMS architecture empowers users to scale the system to meet a wide range of capacity and performance requirements. In addition, the AMS/WMS provides connectivity to most open systems through a standard fibre-channel interface.

For more information about the AMS/WMS systems, contact Hitachi Data Systems or refer to the following documents:

- AMS Documents
 - *Hitachi TagmaStore Adaptable Modular Storage 200 User and Reference Guide* (MK-95DF713)
 - *Hitachi TagmaStore Adaptable Modular Storage 500 User and Reference Guide* (MK-95DF714)
 - *Hitachi TagmaStore Adaptable Modular Storage 1000 User and Reference Guide* (MK-95DF780)
- WMS Document
 - *Hitachi TagmaStore Workgroup Modular Storage 100 User and Reference Guide* (MK-95DF738)

Chapter 2 Preparing for New Device Configuration

This chapter provides the following information:

- Configuration requirements (section 2.1)
- Installing the AMS/WMS system (section 2.2)
- Preparing to connect the AMS/WMS (section 2.3)
- Configuring the host bus adapters (HBAs) (section 2.3.5)
- Connecting the AMS/WMS to the OpenVMS™ system (section 2.4)

2.1 Configuration Requirements

The following are requirements for undertaking an AMS/WMS HP OpenVMS configuration

- **Hitachi AMS/WMS system**

The Storage Navigator software is required to configure fibre-channel (FC) ports.

Note: The availability of AMS/WMS features and functions depends on the level of microcode installed on the AMS/WMS system.

- **HP® OpenVMS™ operating system.** Important: Please contact HP to make sure the most current OS patches are installed.

- **Fibre-channel HBAs**

Be sure to install all utilities, tools, and drivers that come with the HBAs:

- The AMS/WMS system supports a shortwave, non-OFC (open fibre control) optical fibre-channel interface and multimode optical cables with LC connectors. Do not connect any OFC-type fibre-channel interface to the AMS/WMS system.
- The AMS system supports speeds of 4 Gbps, 2 Gbps, and 1 Gbps.
- The WMS system supports speeds of 2 Gbps and 1 Gbps. It can support a maximum speed of 4 Gbps by adding the WMS/AMS 4GB 2 Port I/O Module. For more information, contact Hitachi Data Systems.

2.2 Installing an Adaptable Modular System/Workgroup Modular Storage System

The AMS/WMS system comes with all the hardware and cabling required for installation. Installation of the AMS/WMS system involves the following activities.

■ Hardware Installation

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

- Assembling all hardware and cabling.
- Upgrading to the latest microcode level.
- Creating RAID groups and LUNs and formatting LUNs using the Storage Navigator AMS/WMS 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 HBAs and cabling.

■ AMS/WMS FC Ports

The fibre topology parameters for each AMS/WMS fibre-channel port depend on the type of device to which the AMS/WMS port is connected. Determine the topology parameters supported by the device, and set your topology accordingly.

Use the Storage Navigator AMS/WMS software to configure the AMS/WMS 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 the Adaptable Modular System/Workgroup Modular Storage System

Before connecting an AMS/WMS system, perform the following tasks:

- Set the host-specific parameters for the AMS/WMS fibre-channel port(s) (see section 2.3.1)
- Ascertain the fibre topology (see section 2.3.2)
- Ascertain port addresses (see section 2.3.3)
- Verify HBA installation (see section 2.3.4).
- Configure the host bus adapters (see section 2.3.5)

2.3.1 Setting Host-Specific Parameters for AMS/WMS Ports

The AMS/WMS ports must be configured for the connected operating system. Use the Storage Navigator AMS/WMS software to configure the AMS/WMS 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)

2.3.2 Ascertaining the Fibre Topology

You configure the AMS/WMS FC ports to define the fibre topology parameters and port addresses. The AMS/WMS systems support up to 512 LUNs. You will select the appropriate settings for each AMS/WMS 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.

Note: If you plan to connect different types of servers to the AMS/WMS via the same fabric switch, you must use **zoning** on the switch, the Hitachi Volume Security (LUN Management) feature on the AMS/WMS, or a combination of both.

2.3.3 Ascertaining Port Addresses

In fabric environments, the port addresses are assigned automatically by fabric switch port number and are not controlled by the AMS/WMS port settings. In FC arbitrated-loop (FCAL) environments, the 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 2.1).

Table 2.1 shows the available AMS/WMS 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 HBA translates the AL-PA value assigned to the AMS/WMS port to a SCSI TID.

Note on loop ID conflict: Windows 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.

Table 2.1 Available AL-PA Values

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

2.3.4 Verifying Host Bus Adapter Installation

Before the AMS/WMS is connected to the HP OpenVMS system, verify the HBA installation. To ensure that the host fibre configuration is correct, you will verify recognition of the FCA and the FCA driver.

1. At the P00>> prompt, type `init` (on some AlphaServer models, type `set mode diag` instead).
2. Type `wwidmgr -show adapter` to display the HBA's topology settings.
3. If necessary, type `wwidmgr -set adapter` to change the topology to fabric mode.
4. Type the `init` command again to return to console to its default mode.

Figure 2.1 shows this procedure on an AlphaServer 4000. In this example, the `set mode diag` command is used rather than the `init` command.

```
P00>>>set mode diag
Console is in diagnostic mode
P00>>>
P00>>>wwidmgr -show adapter
polling kgpsa0 (KGPSA-C) slot 2, bus 0 PCI, hose 1
kgpsaa0.0.0.2.1   PGA0      WWN 2000-0000-c92f-2953
polling kgpsa1 (KGPSA-C) slot 3, bus 0 PCI, hose 0
kgpsab0.0.0.3.0   PGB0      WWN 2000-0000-c92a-1db5
item  adapter      WWN                               Cur. Topo  Next Topo
[ 0] kgpsab0.0.0.3.0 2000-0000-c92a-1db5             FABRIC     FABRIC
[ 1] kgpsaa0.0.0.2.1 2000-0000-c92f-2953             LOOP       LOOP
[9999] All of the above.
P00>>>wwidmgr -set adapter -item 1 -topo fabric
P00>>>wwidmgr -show adapter
item  adapter      WWN                               Cur. Topo  Next Topo
[ 0] kgpsab0.0.0.3.0 2000-0000-c92a-1db5             FABRIC     FABRIC
[ 1] kgpsaa0.0.0.2.1 2000-0000-c92f-2953             LOOP       FABRIC
[9999] All of the above.
P00>>>init
ÛÛÛ P00>>>^X
```

Figure 2.1 Verifying HBAs are Set to Fabric Mode

The system is resetting at this point. After the reset, verify that the HBA topology changed.

```
P00>>>
P00>>>set mode diag
Console is in diagnostic mode
P00>>>wwidmgr -show adapter
polling kgpsa0 (KGPSA-C) slot 2, bus 0 PCI, hose 1
kgpsaa0.0.0.2.1   PGA0      WWN
polling kgpsa1 (KGPSA-C) slot 3, bus 0 PCI, hose 0
kgpsab0.0.0.3.0   PGB0      WWN 2000-0000-c92a-1db5
item  adapter      WWN                               Cur. Topo  Next Topo
[ 0] kgpsab0.0.0.3.0 2000-0000-c92a-1db5             FABRIC     FABRIC
[ 1] kgpsaa0.0.0.2.1 2000-0000-c92f-2953             FABRIC     FABRIC
[9999] All of the above.
```

Figure 2.2 Verifying Adapter Topology has been Changed

Although the default settings for the host HBA are adequate for most applications, there are some settings that can be configured by the user. Refer to the HBA documentation and to the HP manual “Guidelines for OpenVMS Cluster Configurations” for more information about these settings.

OpenVMS™ must use host LUN 0. Therefore, be sure that host LUN 0 is assigned to each port that OpenVMS will be using. The HP AlphaServer console assigns a UDID to each device that it sees. This UDID is equal to the LDEV number for an AMS or WMS LUN, except for LUN 0. In this case, the UDID equals -1. While this does not cause any problems, it requires special care in its use at boot time (see section 3.2).

Figure 2.3 shows an example of the `wwidmgr -show wwid` command. This example assumes that LDEVs have been assigned to ports 1A and 2A on the TagmaStore with the LUN assignments shown in Table 2.2.

Table 2.2 LUN Assignments Used in Example

| Host LUN on Ports 1A and 2A | LDEV Number |
|-----------------------------|-------------|
| 0 | 00:30 |
| 1 | 00:01 |
| 2 | 00:02 |
| 3 | 00:03 |
| 4 | 00:1F |
| 5 | 00:00 |

Notice that host LUN 0 (LDEV 00:30) has disappeared because it is being used by OpenVMS. LDEV 00:00 (host LUN 5) has a UDID of -1. The other LUNs all have UDIDs equal to their LDEV numbers (in decimal). For example, an LDEV number of 00:1F appears to the AlphaServer as UDID 31.

Note: Due to the way the AlphaServer console computes UDIDs, two disks from two different AMS or WMS controllers that have the same LDEV numbers are seen as the same disk by the AlphaServer console because they have the same UDID. To avoid this problem, be sure that any multiple storage devices connected to the same AlphaServer host do not have disks with duplicate LDEV numbers.

```
P00>>>wwidmgr -show wwid
[0] UDID: 1 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0001 (ev:none)
[1] UDID: 2 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0002 (ev:none)
[2] UDID: 3 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0003 (ev:none)
[3] UDID:31 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-001f (ev:none)
[4] UDID:-1 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0000 (ev:none)
[5] UDID: 1 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0001 (ev:none)
[6] UDID: 2 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0002 (ev:none)
[7] UDID: 3 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0003 (ev:none)
[8] UDID:31 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-001f (ev:none)
[9] UDID:-1 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0000 (ev:none)
```

Figure 2.3 Example of Using `wwidmgr -show wwid` Command

2.3.5 Configuring the Host Bus Adapters

After verifying the HBA installation, configure the HBA(s) connected to the AMS/WMS. HBAs have many configuration options. For information about configuring the HBA, refer to the documentation that came with it.

2.4 Connecting to an OpenVMS™ System

After you configure the AMS/WMS ports and HBA(s), connect the AMS/WMS system to the OpenVMS™ system. The AMS/WMS systems come with all the hardware and cabling required for connection to the host systems. Some of these steps are performed by the Hitachi Data Systems representative, while others are performed by the user.

To connect the AMS/WMS system to the host system:

1. **Verify system installation.** The Hitachi Data Systems representative verifies that the status of the ports and LDEVs is normal. The Hitachi Data Systems representative should also check the fibre device parameters to make sure that all AMS/WMS LDEVs are unique for each host system.
2. **Shut down and power off the host system.** The user should perform this activity. You must shut down and power off the host system before connecting the AMS or WMS:
 - a) Shut down the OpenVMS™ system.
 - b) When shutdown is complete, power off the OpenVMS™ display.
 - c) Power off all peripheral devices except for the AMS or WMS system. Power off the host system.

You are now ready to connect the AMS or WMS.

3. **Connect the AMS or WMS to the host system.** The Hitachi Data Systems representative installs the fibre cables between the AMS or WMS and the host system.

Note: The Hitachi Data Systems representative must use the AMS/WMS 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 and boot up the host system.** The user should perform this activity. To power on the host system after connecting the AMS or WMS:
 - a) Power on the OpenVMS™ display.
 - b) Power on all peripheral devices. The AMS or WMS should already be on. The fibre-channel ports should already be configured (see section 2.3.5). If not, the host system may need to be restarted to recognize the new devices.
 - c) Confirm the ready status of all peripheral devices, including the AMS or WMS system.
 - d) Power on the OpenVMS™ system.

Chapter 3 Configuring the New Devices

After AMS/WMS installation and connection are complete, the devices on the AMS or WMS system can be configured for use. Configuration of the AMS/WMS devices is performed by the user, and requires both access to the HP® AlphaServer console and system access to the OpenVMS® system. The activities involved in device configuration are:

- Verifying new device recognition at the HP® AlphaServer console (section 3.1)
- Setting up of boot devices if desired (section 3.2)
- Verifying new device recognition by OpenVMS™ (section 3.3)
- Initializing and mounting the new devices (section 3.4)
- Setting and verifying the auto-mount parameters (section 3.5)

3.1 Verifying New Device Recognition at the HP® AlphaServer Console

After connecting the AMS or WMS system to the OpenVMS™ system, verify that the HP AlphaServer console recognizes the new devices. The devices must be installed and formatted and the fibre-channel ports configured before the host system is powered on. If they are not, the user must shut down and restart the system to allow the system to recognize the new devices.

To verify that the HP AlphaServer console recognizes the new devices on the AMS or WMS system:

1. Enter the `init` command at the console prompt (usually `P00>>>`). On some models of the HP AlphaServer it may be necessary to enter the command `set mode diag` instead.
2. Enter the `wwidmgr -show wwid` command to verify that the AMS or WMS devices are present.
3. Enter the `init` command to reset the console.
4. Figure 3.1 shows an example.

```
P00>>>set mode diag
Console is in diagnostic mode
P00>>>wwidmgr -show wwid
[0] UDID: 1 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0001 (ev:none)
[1] UDID: 2 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0002 (ev:none)
[2] UDID: 3 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0003 (ev:none)
[3] UDID:31 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-001f (ev:none)
[4] UDID:-1 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0000 (ev:none)
[5] UDID: 1 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0001 (ev:none)
[6] UDID: 2 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0002 (ev:none)
[7] UDID: 3 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0003 (ev:none)
[8] UDID:31 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-001f (ev:none)
[9] UDID:-1 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0000 (ev:none)
P00>>>init
```

Figure 3.1 Example of Verifying New Devices

3.2 Setting Up Boot Devices

For the OpenVMS system to use AMS or WMS devices at boot time, the user makes them visible to the OpenVMS system using either the `wwidmgr -quickset` or `wwidmgr -set` command. Up to four devices can be made visible to OpenVMS at boot time.

The following procedure describes how to use the `wwidmgr -quickset` and `wwidmgr -show reachability` command.

1. The `wwidmgr -quickset -item` command is used to set up host LUN 5 (the AMS or WMS LDEV 00:00) because its UDID is -1.
2. The `wwidmgr -quickset -udid` command is used to set up the other three LUNs because they all have UDIDs that are not equal to -1. The maximum of four LUNs has been set up - host LUNs 1, 2, 3, and 4.
3. The `wwidmgr -show reachability` command is used to verify that all four LUNs can be seen at boot time. Lastly the `init` command is entered to reset the AlphaServer console.

```

P00>>>wwidmgr -show wwid
[0] UDID: 1 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0001 (ev:none)
[1] UDID: 2 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0002 (ev:none)
[2] UDID: 3 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0003 (ev:none)
[3] UDID:31 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-001f (ev:none)
[4] UDID:-1 WWID:01000010:5006-0e80-0042-8311-0000-0121-0000-0000 (ev:none)
[5] UDID: 1 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0001 (ev:none)
[6] UDID: 2 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0002 (ev:none)
[7] UDID: 3 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0003 (ev:none)
[8] UDID:31 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-001f (ev:none)
[9] UDID:-1 WWID:01000010:5006-0e80-0042-8313-0000-0121-0000-0000 (ev:none)
P00>>>wwidmgr -quickset -item 4
Disk assignment and reachability after next initialization:
5006-0e80-0042-8311-0000-0121-0000-0000
      via adapter:          via fc nport:      connected:
dga10765.1001.0.2.1      kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
P00>>>wwidmgr -quickset -udid 1
Disk assignment and reachability after next initialization:
5006-0e80-0042-8311-0000-0121-0
      via adapter:          via fc nport:      connected:
dga10765.1001.0.2.1      kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0001
      via adapter:          via fc nport:      connected:
dga1.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
P00>>>wwidmgr -quickset -udid 2
Disk assignment and reachability after next initialization:
5006-0e80-0042-8311-0000-0121-0000-0000
      via adapter:          via fc nport:      connected:
dga10765.1001.0.2.1      kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0001
      via adapter:          via fc nport:      connected:
dga1.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0002
      via adapter:          via fc nport:      connected:
dga2.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
P00>>>wwidmgr -quickset -udid 3
Disk assignment and reachability after next initialization:
5006-0e80-0042-8311-0000-0121-0000-0000
      via adapter:          via fc nport:      connected:
dga10765.1001.0.2.1      kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0001
      via adapter:          via fc nport:      connected:
dga1.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0002
      via adapter:          via fc nport:      connected:
dga2.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0003
      via adapter:          via fc nport:      connected:
dga3.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
P00>>>wwidmgr -show reachability
Disk assignment and reachability after next initialization:
5006-0e80-0042-8311-0000-0121-0000-0000
      via adapter:          via fc nport:      connected:
dga10765.1001.0.2.1      kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0001
      via adapter:          via fc nport:      connected:
dga1.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0002
      via adapter:          via fc nport:      connected:
dga2.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
5006-0e80-0042-8311-0000-0121-0000-0003
      via adapter:          via fc nport:      connected:
dga3.1001.0.2.1          kgpsaa0.0.0.2.1      5006-0e80-0042-8311      Yes
P00>>> init

```

After the AlphaServer console is reset, you can use the `show dev` command to view the AMS or WMS boot devices. The commands `set bootdef_dev` and `set boot_osflags` can be used to set the AMS or WMS device as the default boot device. This lets the user enter simply `boot` at the command prompt rather than `boot dgd1.1001.0.1.0 -flags 0,0`.

Figure 3.2 shows an example of this.

```
P00>>>show dev
dgd1.1001.0.1.0          $1$DGA1          HITACHI DF600F
dgd18964.1001.0.1.0     $1$DGA18964     HITACHI DF600F
dgd2.1001.0.1.0        $1$DGA2          HITACHI DF600F
dgd3.1001.0.1.0        $1$DGA3          HITACHI DF600F
dka0.0.0.1.1           DKA0             COMPAQ BF01863644 3B05
dka100.1.0.1.1         DKA100           COMPAQ BD009635C3 B012
dka200.2.0.1.1         DKA200           COMPAQ BF01864663 3B07
dka300.3.0.1.1         DKA300           COMPAQ BF01864663 3B07
dqa0.0.0.15.0          DQA0             HL-DT-ST CD-ROM GCR-8480 2.11
dva0.0.0.1000.0        DVA0
eia0.0.0.2004.1        EIA0             00-08-02-55-FF-80
eib0.0.0.2005.1        EIB0             00-08-02-55-FF-81
pga0.0.0.2.1           PGA0             WWN 1000-0000-c93d-402d
pgb0.0.0.4.1           PGB0             WWN 1000-0000-c922-52bd
pgc0.0.0.5.1           PGC0             WWN 1000-0000-c93d-27d9
pgd0.0.0.1.0           PGD0             WWN 1000-0000-c928-688b
pge0.0.0.4.0           PGE0             WWN 1000-0000-c92c-21e9
pka0.7.0.1.1           PKA0             SCSI Bus ID 7
P00>>>
P00>>>set bootdef_dev dgd1.1001.0.1.0
P00>>>set boot_osflags 0,0
P00>>>show bootdef_dev
bootdef_dev          dgd1.1001.0.1.0
P00>>>show boot_osflags
boot_osflags         0,0
P00>>>
```

Figure 3.2 Example of Setting an AMS or WMS Device as the Default Boot Device

Note: Device names follow the syntax `1dgaYYYY`, where `YYYY` is the UDID assigned by the AlphaServer console. For LDEV 00:00 however, OpenVMS assigned a 5-digit number because the LDEV had a UDID of -1.

3.3 Verifying New Device Recognition by OpenVMS

After OpenVMS boots, verify the correct recognition of the AMS or WMS devices. Use the `show device` command to verify that OpenVMS can see the AMS or WMS devices. The AMS/WMS devices have names in the form `1dgaYYYY` where `YYYY` is the UDID of the AMS or WMS device or a 5-digit number assigned by the AlphaServer console if the UDID is -1.

Note: This is not the host LUN (H-LUN) number seen by the fibre-channel HBA. The host LUN number might be different than the LDEV number. This means that a user can change the location of an AMS/WMS device by assigning it to a different HBA or by giving it a different host LUN number. The OpenVMS device name will not change because it is based on the LDEV number, which does not change. The `show dev/mul` command can be used to see AMS or WMS devices that have multiple paths from the host.

Figure 3.3 shows the use of the `show dev` and `show dev/mul` commands.

```

$ show dev dga
Device      Device      Error   Volume      Free      Trans Mnt
Name        Status      Count   Label        Blocks   Count  Cnt
$1$DGA0:   (ES402) Online    0        OVMS731A    18978021  396   1
$1$DGA1:   (ES402) Mounted  2
$1$DGA2:   (ES402) Online    0
$1$DGA3:   (ES402) Online    0
$1$DGA31:  (ES402) Online    0

$ show dev/mul
Device      Device      Error   Volume      Current
Name        Status      Count   Paths      path
$1$DGA0:   (ES402) Online    0  2/ 2  PGB0.5006-0E80-0042-8313
$1$DGA1:   (ES402) Mounted  2  2/ 2  PGB0.5006-0E80-0042-8313
$1$DGA2:   (ES402) Online    0  2/ 2  PGB0.5006-0E80-0042-8313
$1$DGA3:   (ES402) Online    0  2/ 2  PGB0.5006-0E80-0042-8313
$1$DGA31:  (ES402) Online    0  2/ 2  PGB0.5006-0E80-0042-8313
Device      Device      Error   Volume      Current
Name        Status      Count   Paths      path
$1$GGA30:   Online      0  2/ 2  PGB0.5006-0E80-0042-8313

```

Figure 3.3 Example of Using `show dev` and `show.dev/mul` Commands

3.4 Initializing and Mounting New Devices

After the AMS/WMS are recognized by OpenVMS, they must be mounted and initialized so they can be used for I/O operations. Use the **initialize** command to write an OpenVMS volume label to the AMS or WMS device and then use the **mount** command to enable the OpenVMS operating system to perform I/O to it.

Figure 3.4 shows an example of using these two commands.

```
$ initialize $1$dga0
_Label: vol0
$
$ mount $1$dga0
_Label: vol0
_Log name: logvol0
%MOUNT-I-MOUNTED, VOL0 mounted on _$1$DGA0: (ES402)
$ show dev dga
Device          Device          Error   Volume      Free      Trans Mnt
Name            Status          Count   Label        Blocks   Count  Cnt
$1$DGA0:      (ES402) Mounted alloc    1    VOL0        20975073    1    1
$1$DGA1:      (ES402) Mounted          2    OVMS731A   18978021   396    1
$1$DGA2:      (ES402) Online           0
$1$DGA3:      (ES402) Online           0
$1$DGA31:     (ES402) Online           0
$
```

Figure 3.4 Example of Using initialize and mount Commands

The label and log name are chosen by the user. These commands can also be entered as single line commands, as shown in Figure 3.5.

```
$initialize $1$dga0 vol0
$mount $1$dga0 vol0 logvol0
```

Figure 3.5 Example of Entering Commands as Single Line Commands

3.5 Setting and Verifying the Auto-mount Parameters

The user can automatically mount the AMS or WMS devices after each reboot of the OpenVMS operating system. This task can be automated by adding the necessary mount commands to the SYSTARTUP_VMS.COM file. Refer to the *HP® OpenVMS™ System Manager's Manual* for instructions about how to modify this file.

Chapter 4 Troubleshooting

4.1 Troubleshooting

The AMS/WMS provides continuous data availability. For troubleshooting information for the AMS/WMS system, refer to the following documents:

- *Hitachi TagmaStore Adaptable Modular Storage 200 User and Reference Guide, MK-95DF713*
- *Hitachi TagmaStore Adaptable Modular Storage 500 User and Reference Guide, MK-95DF714*
- *Hitachi TagmaStore Adaptable Modular Storage 1000 User and Reference Guide, MK-95DF780*
- *Hitachi TagmaStore Workgroup Modular Storage 100 User and Reference Guide, MK-95DF738*

Table 4.1 lists potential error conditions during AMS/WMS OpenVMS configuration and provides instructions for resolving each condition. If you are unable to resolve an error condition, contact your Hitachi Data Systems representative or Value-added Reseller (VAR) for help, or call the Hitachi Data Systems Support Center for assistance.

Table 4.1 Error Conditions and Recommended Actions

| Error Condition | Recommended Action |
|---|--|
| The logical devices are not recognized by the system. | Make sure that the READY indicator lights on the AMS or WMS system are ON. Make sure that the fibre cables are correctly installed and firmly connected. Shutdown the OpenVMS system and verify that the devices can be seen by the HP® AlphaServer console. |
| The file system is not mounted after rebooting. | Make sure that the SYSTARTUP_VMS.COM file contains the mount commands. |
| The AMS or WMS red alarm light is on. | Please contact the Hitachi Data Systems Support Center. |
| System hangs or devices are declared and then system hangs. | Ensure that the latest patches are applied to the OpenVMS operating system. |

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).

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
San Diego, California, USA
1-800-446-0744
- 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 Online Device Installation

OpenVMS lets users dynamically add or remove devices from a running system. The following procedure summarizes this procedure.

1. Start the SYSMAN utility:

```
RUN SYS$SYSTEM:SYSMAN
```

2. Enter the following commands:

```
SYSMAN> IO SCSI_PATH_VERIFY
```

```
SYSMAN> IO AUTOCONFIGURE
```

Figure A.1 shows the addition of LUN 26 to an existing configuration that already included LUNs 1 through 25 and LUN 200. In this example, LUN 26 is added as device \$1\$dga26 between LUNs 25 and 200. OpenVMS creates device names of the form \$1\$dgaYYYY - where YYYY is the UDID of the AMS or WMS device assigned by the AlphaServer console. This number is not the same as the host LUN number seen by the fibre-channel HBA (the LUN on the AMS or WMS). In this example, the host LUN number (LUN) of \$1\$dga26 is 30. This same procedure can be used to reconfigure the system after devices have been removed or replaced.

```
$
$ show dev/mul
```

| Device Name | Device Status | Error Count | Paths | Current path |
|--------------|----------------|-------------|-------|--------------------------|
| \$1\$DGA1: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA2: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA3: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA4: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA5: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA6: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA7: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA8: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA9: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA10: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA11: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA12: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA13: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA14: | (ES401) Online | 0 | 3/ 3 | PGC0.5006-0E80-0042-79B0 |
| \$1\$DGA15: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA16: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA17: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA18: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA19: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA20: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA21: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA22: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA23: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA24: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA25: | (ES401) Online | 0 | 3/ 3 | PGB0.5006-0E80-0042-79B0 |
| \$1\$DGA200: | (ES401) Online | 0 | 2/ 2 | PGB0.5006-0E80-0042-79B0 |

```

Device          Device          Error          Current
Name            Status          Count Paths        path
$1$GGA0:       Online         0   3/ 3   PGB0.5006-0E80-0042-79B0
$ run sys$system:sysman
SYSMAN> io scsi_path verify
SYSMAN> io autoconfigure
SYSMAN> exit
$ show dev/mul

Device          Device          Error          Current
Name            Status          Count Paths        path
$1$DGA1:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA2:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA3:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA4:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA5:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA6:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA7:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA8:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA9:       (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA10:      (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA11:      (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA12:      (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA13:      (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA14:      (ES401) Online     0   3/ 3   PGC0.5006-0E80-0042-79B0
$1$DGA15:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA16:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA17:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA18:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA19:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA20:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA21:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA22:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA23:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA24:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA25:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA26:      (ES401) Online     0   3/ 3   PGB0.5006-0E80-0042-79B0
$1$DGA200:     (ES401) Online     0   2/ 2   PGB0.5006-0E80-0042-79B0
Device          Device          Error          Current
Name            Status          Count Paths        path
$1$GGA0:       Online         0   3/ 3   PGB0.5006-0E80-0042-79B0
$

```

Figure A.1 Example of an addition of LUN 26 to an existing configuration

Appendix B Using OpenVMS™ Alternate Pathing

The OpenVMS™ operating system automatically configures all the alternate paths to a device. Only one of these paths can be active at one time.

The command `show dev/full dev-name` can be used to view all of the available paths to a device. The user can manually change paths by issuing the `set dev dev-name /path=path-name /switch` command. The example below shows the use of these commands.

```
$ show dev /full $1$dga3
Disk $1$DGA3: (ES402), device type HITACHI DF600F, is online, file-oriented device,
shareable, available to cluster, device has multiple I/O paths, error logging is enabled.
  Error count          0  Operations completed          0
  Owner process        ""  Owner UIC                [SYSTEM]
  Owner process ID     00000000  Dev Prot          S:RWPL,O:RWPL,G:R,W
  Reference count      0  Default buffer size    512
  WWID 02000010:
  Allocation class     1
  I/O paths to device  2
  Path PGB0.5006-0E80-0042-8313 (ES402), primary path, current path.
  Error count          0  Operations completed          0
  Path PGC0.5006-0E80-0042-8311 (ES402).
  Error count          0  Operations completed          0

$ set dev $1$dga3 /path=pgc0.5006-0e80-0042-8311/switch

$ show dev /full $1$dga3
Disk $1$DGA3: (ES402), device type HITACHI DF600F, is online, file-oriented device,
shareable, available to cluster, device has multiple I/O paths, error logging is enabled.
  Error count          0  Operations completed          1
  Owner process        ""  Owner UIC                [SYSTEM]
  Owner process ID     00000000  Dev Prot          S:RWPL,O:RWPL,G:R,W
  Reference count      0  Default buffer size    512
  WWID 02000010:
  Allocation class     1
  I/O paths to device  2
  Path PGB0.5006-0E80-0042-8313 (ES402), primary path.
  Error count          0  Operations completed          1
  Path PGC0.5006-0E80-0042-8311 (ES402), current path.
  Error count          0  Operations completed          0

$
```

OpenVMS supports various SAN configurations. For information about supported configurations, contact your local HDS representative.

Appendix C Using OpenVMS Clustering

Configuring an OpenVMS cluster with the AMS or WMS involves the following steps:

1. Installing and connecting the AMS or WMS to the OpenVMS hosts to be used in the cluster (see Chapter 2). For information about the types of cluster configurations OpenVMS supports, refer to the *HP® Guidelines for Creating OpenVMS™ Cluster Configurations* manual.
2. Verifying new device recognition at the HP AlphaServer console (see section 3.1).
3. Setting up boot devices (see section 3.2). At least one device must be the OpenVMS cluster system disk. For a 2-node cluster, a second disk must act as the quorum disk. Other OpenVMS cluster disks can be created if desired. For more information, refer to the *HP® OpenVMS™ Cluster Systems* manual for details.
4. Install the first cluster member on the AMS or WMS device.
5. Boot the first cluster member.
6. If this is a 2-node cluster, install the quorum disk.
7. Install the second cluster member.
8. Install other cluster members if desired.

Steps 4 through 8 are described in the *HP® OpenVMS™ Cluster Systems* manual. If you are building a 2-node cluster, exercise care when adding the quorum disk. The quorum disk requires a file called QUORUM.DAT to be present for its operation. One way to install this file on the disk is to use the following procedure:

1. Install the first cluster member without a quorum disk (i.e., answer 'no' to the prompt asking whether this cluster will contain a quorum disk).
2. After the first member boots, install the quorum disk using the procedure described in the *HP® OpenVMS™ Cluster Systems* manual.
3. Add the second member. When the prompt appears asking if the cluster contains a quorum disk, answer yes.
4. Boot the second member. When the second member runs its GENDATA process, the QUORUM.DAT file will be added to the quorum disk as required.
5. After the second member boots, reboot the first member to verify that it can also use the quorum disk.

Acronyms and Abbreviations

| | |
|-------|------------------------------------|
| AL | arbitrated loop |
| AL-PA | arbitrated loop physical address |
| AMS | Adaptable Modular Storage |
| CLI | Command Line Interface |
| CVS | custom volume size |
| FC | fibre channel |
| FX | Hitachi Cross-OS File Exchange |
| GUI | graphical user interface |
| HBA | host bus adapter |
| HDD | hard disk drive |
| HDS | Hitachi Data Systems |
| I/O | input/output |
| LDEV | logical device |
| LU | logical unit |
| LUN | logical unit number, logical unit |
| OFC | open fibre control |
| OS | operating system |
| PC | personal computer system |
| PCI | power control interface |
| SATA | Serial ATA |
| SCSI | small computer system interface |
| SIM | service information message |
| SNMP | simple network management protocol |
| TID | target ID |
| TOV | timeout value |
| VLL | Virtual LVI/LUN |
| WMS | Workgroup Modular Storage |

