64-Bit PCI-To-Fibre Channel Host Bus Adapter

User Guide

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About This Guide

This guide is designed to be used as step-by-step instructions for installation and as a reference for operation, troubleshooting, and future upgrades.

Text Conventions

This document uses the following conventions to distinguish elements of text:

Keys	Keys appear in boldface. A plus sign (+) between two keys indicates that they should be pressed simultaneously.
USER INPUT	User input appears in a different typeface and in uppercase.
FILENAMES	File names appear in uppercase italics.
Menu Options, Command Names, Dialog Box Names	These elements appear in initial capital letters.
COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These elements appear in uppercase.
Type	When you are instructed to *type* information, type the information **without** pressing the **Enter** key.
Enter	When you are instructed to *enter* information, type the information and then press the **Enter** key.

Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings.

> ⚠ **WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.

> △ **CAUTION:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

> **IMPORTANT:** Text set off in this manner presents clarifying information or specific instructions.

> **NOTE:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

Symbols on Equipment

These icons may be located on equipment in areas where hazardous conditions may exist.

> ⚠ ⚡ Any surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.
> **WARNING:** To reduce the risk of injury from electrical shock hazards, do not open this enclosure.

> ⚠ ⊘ Any RJ-45 receptacle marked with these symbols indicates a Network Interface Connection.
> **WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.

Power Supplies or Systems marked with these symbols indicate the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the system.

Getting Help

If you have a problem and have exhausted the information in this guide, you can get further information and other help in the following locations.

Compaq Technical Support

You are entitled to free hardware technical telephone support for your product for as long you own the product. A technical support specialist will help you diagnose the problem or guide you to the next step in the warranty process.

In North America, call the Compaq Technical Phone Support Center at 1-800-OK-COMPAQ[1]. This service is available 24 hours a day, 7 days a week.

Outside North America, call the nearest Compaq Technical Support Phone Center. Telephone numbers for world wide Technical Support Centers are listed on the Compaq website. Access the Compaq website at http://www.compaq.com.

Be sure to have the following information available before you call Compaq:

■ Technical support registration number (if applicable)

■ Product serial number (s)

■ Product model name(s) and numbers(s)

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[1] For continuous quality improvement, calls may be recorded or monitored.

- Applicable error messages

- Add-on boards or hardware

- Third-party hardware or software

- Operating system type and revision level

- Detailed, specific questions

Compaq Website

The Compaq website has information on this product as well as the latest drivers and Flash ROM images. You can access the Compaq website at http://www.compaq.com.

Compaq Authorized Reseller

For the name of your nearest Compaq Authorized Reseller:

- In the United States, call 1-800-345-1518.

- In Canada, call 1-800-263-5868.

- Elsewhere, see the Compaq website for locations and telephone numbers.

Chapter **1**

Introduction

Overview

This is a brief introduction to the 64-bit PCI-to-Fibre Channel Host Bus Adapter (HBA) and includes:

- Specifications for major functional characteristics

- The standards with which the HBA complies

- The agency approvals granted to the HBA

These three topics are preceded by a brief product description.

Product Description

The HBA has the following characteristics:

- Single-slot PCI bus expansion board that interfaces a PCI bus to a fibre channel device (see Figure 1-1 and Table 1-1).

- Embedded optical short-wave laser, single-mode fibre channel interface.

- Supports 32-bit and 64-bit PCI transfers as a bus master during Direct Memory Access (DMA) transfers and 16-bit transfers as a slave during Processor Input/Output (PIO) operations.

■ Designed using a single custom Application Specific Integrated Circuit (ASIC). The custom ASIC implements a very high performance, multi-class, multi-protocol fibre channel host adapter with a 64-bit PCI bus connection in a single chip.

■ Supports a full-duplex fibre channel connection at full-link bandwidth providing a total throughput of greater than 2 Gbits/sec.

■ Controlled by a 233 MHz, 32-bit Intel StrongARM RISC processor.
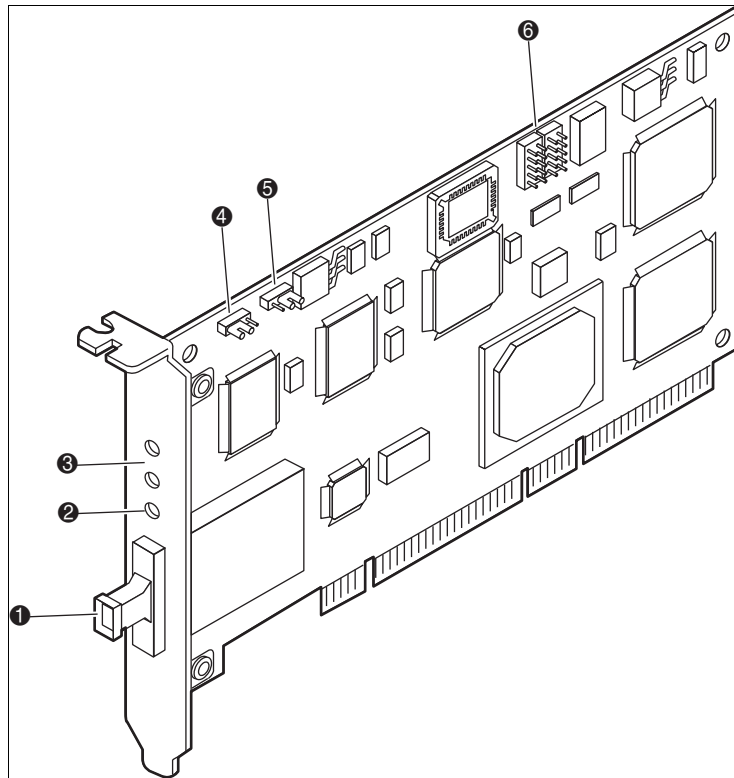
Figure 1-1. 64-Bit PCI-to-fibre channel host bus adapter

Table 1-1
64-Bit PCI-to-Fibre Channel Host Bus Adapter

Figure Legend	Description
❶	Fibre channel connector
❷	LED Indicates the Embedded Optical Receive port is receiving light.
❸	POST LEDs indicators **Note:** see Tables 2-1 and 4-1 for detailed descriptions
❹	Jx1 jumper (see Table 1-2)
❺	Jx2 jumper (see Table 1-2)
❻	Not used

Jumper Settings

Two jumper blocks (JX1 and JX2) are used to control the HBA's Device ID. The default device ID setting for the HBA is F800. The jumper settings defined in table 1-2 must be maintained for proper HBA operation.

Table 1-2
HBA Jumper Settings

Jumper	Pins	Description	Device ID	Comments
JX1	1-2	JX2 disabled	F800	Default
JX2	2-3		F800	Default

Performance Specifications

The HBA is a high-performance I/O solution for applications such as client/server configurations, database I/O environments, multimedia applications, and imaging technologies. Each of these requires high-level throughput with low-latency characteristics.

The HBA is both ANSI Fibre Channel and PCI Local Bus Compliant and supports:

■ Full PCI bus speed data transfers of 133 MBytes/sec

■ Point-to-point arbitrated-loop, and switch fabric FC connections

■ Storage protocol

■ Fibre channel class 1, 2, 3

■ Direct interface to fibre optical cables through an embedded SC type short-wave multi-mode connection

Collectively, these characteristics create a high-performance fibre channel HBA.

Standards

The HBA conforms to the following standards:

■ ANSI Fibre Channel FC-PH, Revision 4.3

■ ANSI Fibre Channel FC-AL, Revision 4.5

■ PCI Local Bus, Revision 2.0/2.1

■ Fibre Channel Class 1, 2, 3

Agency Approvals

The HBA has the following agency approvals:

■ UL Recognized to UL1950

■ CUR Recognized to CSA22.2, No. 950

■ TUV Certified to EN60950

■ FCC Rules, Part 15, Class B

■ DOC Rules, Class B

■ EMC Directive 89/336EEC (CE Mark)

   ❑ EN55022, CISPR22/93, Class B

   ❑ EN50082-1

Chapter **2**

Installation

Installation Overview

This chapter provides step-by-step instructions for installing the 64-Bit PCI-to-Fibre Channel Host Bus Adapter (HBA) including:

■ Verification of hardware, software, and document requirements

■ Recording reference numbers

■ Installing the HBA and connecting media

This chapter also provides information on installation guidelines and supported configurations for the operating systems.

> **IMPORTANT:** The HBA contains static-sensitive components. Comply with Electrostatic Discharge (ESD) procedures.

Hardware Requirements

The system hardware requirements for installing the HBA include:

■ One open 32- or 64-bit PCI bus slot with a 5.0 VDC signaling interface

■ Maximum PCI bus clock rate of 33 MHz

Software and Documentation Requirements

The following documentation and software kit is supplied with the HBA.

- User Guide:Part Number 173941-001 (AA-RKPDA-TE)

- Release Notes: Part Number 173940-001 (AA-RKPEA-TE)

- Software Replication License: Part Number AV-R9RUA-TE

- Diskette 1: This diskette contains the following files for Windows NT 4.0 systems.

  - ❑ Firmware Download Utility

  - ❑ Firmware

  - ❑ Readme Files: *README FIRST*, *FIRMWARE README*, *DOWNLOAD README*, *RELEASE NOTES*, and *USER GUIDE*

- Diskette 2: This diskette contains the following files for Windows NT 4.0 systems.

  - ❑ Driver

  - ❑ *OEMSETUP.INF*

  - ❑ *TXTSETUP.OEM*

  - ❑ *LPSCSI*

  - ❑ *LPUTILNT.EXE*

  - ❑ Readme Files: *README FIRST* and *LPUTILNT README*

- Diskette 3: This diskette contains the following files for Alpha platforms running Tru64Unix or OpenVMS operating systems.

  - ❑ Firmware Download Utility

  - ❑ Firmware

  - ❑ Readme Files: *README FIRST*, *FIRMWARE README*, *DOWNLOAD README*, *RELEASE NOTES*, and *USER GUIDE*

Recording Reference Numbers

Each HBA ships with a unique address identifier that is stored in flash memory. Fibre channel industry standards issue two unique identifiers: WorldWide Port Name (WWPN) and Node Name (NN), each of which is derived from the HBA's IEEE address. Combined, the WWPN and NN create the WorldWide Name (WWN) which is an 8-byte field that uniquely identifies an HBA on a FC circuit.

Recording the Address and Serial Number

The WWN address and serial number are clearly marked on the HBA. Record the addresses on the lines below for future reference.

IEEE address: _____

Serial number: _____

Installing the HBA into a Computer

Following is the procedure for installing the HBA into a computer.

> ⚠ **WARNING:** Be sure to observe the ESD precautions for this procedure.

1. Make sure the computer is powered down and the AC power cord is disconnected.

2. Remove the screws on the computer cover, and then remove the cover.

3. Remove the blank panel from an empty 32- or 64-bit PCI bus slot.

4. Insert the HBA into the empty PCI bus slot; press firmly until it is seated securely.

5. Secure the HBA mounting bracket to the computer panel with the panel screws.

6. Replace the computer cover and secure it using the previously removed screws.

Verifying the Installation

To verify the HBA is properly installed and is operating:

1. Connect the computer AC power cord and then turn the computer on.

2. At power up, observe the POST LED indicators on the HBA. The position of the Post LED indicators is defined in Figure 1-1 and Table 1-1 of this manual. The green LED indicates power functions and the yellow LED signifies port activity. The Yellow LED blinks at all times during normal operation. Table 2-1 lists normal LED indications.

Table 2-1
POST LED Indicators

Green LED	Yellow LED	State
Off	Flashing (irregular)	POST processing in progress
On	Slow blink (1 Hz)	Normal (inactive)
On	Flashing (irregular)	Normal (active)
On	Fast blink (4 Hz)	Normal (busy)
Slow blink	Off	Normal (link down or not yet started)

Configuration Guidelines for Operating Systems

- Windows NT: The accompanying software for loading the Windows NT driver also contains the default registry parameter settings that are loaded as part of the driver installation. The default topology setting is for FCAL, Topology = 0. Consult the following sources for any restriction and for information on supported configurations specific to your operating system and topology.

  - Release Notes

  - ACS Platform Kit for your storage subsystem

  - Compaq Computer Corporation Website

    http://www.compaq.com/products/storageworks/adapters.html

    Drill down through Services and Support to Adapter Support.

■ Tru64Unix and Open VMS: Refer to your Operating System
  Installation manual and consult the following sources for any restriction
  and for information on supported configurations specific to your
  operating system and topology:

  ❑ Release Notes

  ❑ ACS Platform Kit for your storage subsystem

  ❑ Compaq Computer Corporation Website

    http://www.compaq.com/products/storageworks/adapters.html

    Drill down through Services and Support to Adapter Support.

Chapter **3**

Device Driver Installation

Introduction

This chapter contains step-by-step instructions for installing the Windows NT SCSI Miniport driver. This chapter also contains information on the Tru64Unix and OpenVMS drivers.

System managers must be familiar with the operating system under which the PCI-to-Fibre Channel Host Bus Adapter (HBA) is to operate. System managers must also have access to standard system documentation.

> **NOTE:** This chapter describes the steps for installing the Windows NT device driver and for accessing fibre channel storage devices. For other configuration changes, see Chapter 6, "Windows NT Registry Information."

Windows NT 4.0 System Requirements

Ensure that your system meets these minimum requirements:

■ Installed HBA

■ Windows NT SCSI device driver and registry parameter file from Diskette 2 of the software kit provided with the HBA

■ Windows NT 4.0 Server with Service Pack 4 or greater

Installing the Windows NT SCSI Device Driver

This section contains the steps for installing the Windows NT SCSI device driver on a Windows NT server.

The software kit that is included with the HBA contains the latest version of he HBA's files at the time of shipment. Software files are updated periodically and can be obtained from the Compaq website:

http://www.compaq.com/products/storageworks/adapters.html

Drill down through Services and Support to Adapter Support.

> **IMPORTANT:** The ideal device driver installation includes the possession of a valid operating system backup.

Following are the steps for installing the Windows NT SCSI device driver and registry parameters for the first time.

From the Windows NT desktop:

1. Click on Start, select Settings, and then Control Panel.

2. Double click on the SCSI Adapters icon.

3. Select the Drivers tab

4. Click Add.

5. Click Have Disk.

6. Type in the path to the Windows NT SCSI device driver and then click OK.

7. Select the fibre channel SCSI driver and then click OK.

8. Click Install and continue to install the driver.

9. Reboot the computer to restart Windows NT.

Verifying the Device Driver Installation

Verify the driver installation from the Windows NT desktop:

1. Click Start, select Settings, and then Control Panel.

2. Double click the SCSI Adapters icon.

3. Select the Drivers tab.

   Verify that the Emulex SCSI mini-port driver is present and started.

4. Select the Default tab.

   Verify that the HBA is present.

5. Click the + symbol to expand the adapter list.

   Verify that the connected storage device is listed.

Removing the Device Driver

To remove the device driver from the Windows NT desktop:

1. Click Start, select Settings, and then Control Panel.

2. Double click the SCSI Adapters icon.

3. Select the Drivers tab.

4. Click Remove.

5. Select Yes to confirm.

6. Click OK.

7. Reboot the computer to restart Windows NT.

Tru64Unix Driver and Console Software

The HBA driver is built into the Tru64Unix operating systems and supported by Console software. For the supported versions of Tru64Unix operating systems and Console software, consult the HBA Release Notes included in this documentation package. Release notes are updated periodically and can be obtained from the Compaq website:

http://www.compaq.com/products/storageworks/adapters.html

Drill down through Services and Support to Adapter Support.

See the documentation specific to your platform for detailed information on installing the appropriate operating system and Console software.

-SHOW ADAPTER / -SET ADAPTER Commands

V5.6 SRM console and higher revisions have the capability of setting an HBA to run in arbitrated loop mode or in fabric (switch) mode. If an HBA in loop mode is connected to a switch, the results are unpredictable. The same is true for an HBA in fabric mode that is connected to a loop. By default, the console assumes a fabric topology. The SET ADAPTER command stores the selected topology into the NVRAM storage on the HBA. If the HBA is moved from one AlphaServer to another, this setting stays with the HBA. The V5.6 or greater supports the FCAL (loop) topology. A setting of loop is a valid setting in V5.6, however, that setting prompts the console driver not to run.

Refer to the WWIDGR manual at the following location for detailed information on the –SHOW ADAPTER and –SET ADAPTER commands:

http://ftp.digital.com/pub/DEC/Alpha/firmware/v5.6/doc/wwidmgr.pdf

> **NOTE:** In order for the –SHOW ADAPTER and –SET ADAPTER commands to be accepted by the system, the console must first be set to diagnostic mode (set mode diag).

-SHOW ADAPTER Command

The HBA configuration can be displayed with the command (see Figures 3-1 and 3-2):

WWIDMGR-SHOW ADAPTER

```
P00>>>wwidmgr-show adapter

Item                              adapter           WWN                  Cur. Topo   Next Topo
kgpsaa0.0.0.4.6 – Nvram read failed
[0]                               kgpsaa0.0.0.4.6   1000-0000-c921-0c22  fabric      unavail
kgpsab0.0.0.8.6 – Nvram read failed
[1]                               kgpsab0.0.0.8.6   1000-0000-c921-027a  loop        unavail
[9999] All of the above.
```

Figure 3-1. –SHOW ADAPTER with an unformatted NVRAM

In Figure 3-1, note the warning message "Nvram Read Failed." This indicates that the NVRAM on the HBA has not been initialized and formatted. This is expected and can be corrected by issuing a –SET ADAPTER command as described in the next section.

```
LP00>>>wwidmgr-show adapter

Item           adapter           WWN                  Cur. Topo   Next Topo
 [0]           kgpsaa0.0.0.4.6   1000-0000-c921-05ab  fabric      fabric
 [1]           kgpsab0.0.0.8.6   1000-0000-c921-0ce0  fabric      fabric
[9999] All of the above.
```

Figure 3-2. –SHOW ADAPTER display

Figure 3-2 shows a display from WWIDMGR-SHOW ADAPTER where there are two HBAs in the system. See the following for a detailed look at a line item:

[0]   kgpsaa0.0.0.4.6   1000-0000-c921-05ab   fabric   fabric

■ [0] – Item Number. The bracketed value is used as a parameter to the *–item* qualifier in the WWIDMGR-SET ADAPTER command. You can select which HBA to configure by its item number. An item number of 9999 selects all HBAs.

■ Kgpsaa0.0.0.4.6 – Adapter Mnemonic. Error messages and displays use this identifier.

■ 1000-0000-c920-05ab – WWN of the HBA. This value is used to identify the HBA to other nodes on the fibre channel link.

■ Fabric – Current Topology. This value is either fabric or loop. It indicates the mode in which the HBA is operating currently, during this WWIDMGR session. The current mode in which the HBA is running is not altered during a WWIDMGR session.

■ Fabric – Next Topology. This value can be fabric, loop, or unavail. It indicates the topology setting that is in the HBA's NVRAM. An unavail setting indicates the NVRAM is not formatted, a condition corrected by a –SET ADAPTER command. A setting of fabric or loop indicates how the HBA is configured the next time the system is initialized.

■ –SET ADAPTER – A WWIDMGR-SET ADAPTER command is used to format the HBA NVRAM and to configure an HBA to run on a loop or a fabric. The command format is:

wwidmgr-set adapter -item<itemno> -topo<fabric|loop>

where *itemno* is the bracketed value from the –SHOW ADAPTER command. In Figure 3-3, you can change all HBA's from fabric to loop by specifying an *itemno* value of 9999. The *init* is shown at the end to emphasize that the setting in the running HBA is not changed until the next initialization.

```
LP00>>>wwidmgr-show ada

Item              adapter                  WWN                     Cur. Topo      Next Topo
 [0]              kgpsaa0.0.0.8.1          1000-0000-c920-05ab     fabric         fabric
 [1]              kgpsab0.0.0.10.1         1000-0000-c921-0ce0     fabric         fabric
[9999] All of the above
LP00>>>wwidmgr-set adapter –item 9999 –topo loop
LP00>>>wwidmgr-show ada

Item              adapter                  WWN                     Cur. Topo      Next Topo
[0]               kgpsaa0.0.0.8.1          1000-0000-c920-05ab     fabric         loop
[1]               kgpsab0.0.0.10.1         1000-0000-c921-0ce0     fabric         loop
[9999] All of the above.
LP00>>>init
```

Figure 3-3. –SET ADAPTER example

OpenVMS Driver and Console Software

The HBA driver is built into the OpenVMS operating system, TIMA Kit, and supported by Console software. For the supported versions of OpenVMS operating systems, TIMA Kit and Console software, see the HBA Release Notes included in this documentation package. Release notes are updated periodically and can be obtained from the Compaq website:

http://www.compaq.com/products/storageworks/adapters.html

Drill down through Services and Support to Adapter Support.

See the documentation specific to your platform for detailed information on installing the appropriate operating system and Console software.

Chapter **4**

Troubleshooting

Introduction

The Power-On Self Test (POST), valid for Windows NT, Tru64Unix, and OpenVMS operating systems and the Windows NT System Event Logger (Viewer) are troubleshooting utilities for the 64-Bit PCI-To-Fibre Channel Host Bus Adapter (HBA). This chapter explains the use of these utilities in the event of an HBA problem.

POST Conditions and Results

Table 4-1 lists the HBA LED states with descriptions of each. . The position of the Post LED indicators is defined in Figure 1-1 and Table 1-1 of this manual.

If the LEDs indicate a failure during POST:

 1. Make sure that the HBA is seated firmly in the PCI slot.

 2. Verify that the fibre cable connection to the HBA is secure.

Table 4-1
HBA POST LED States

Green LED	Yellow LED	Description
Off	Off	Wake-up failure (inoperable HBA)
Off	On	POST failure (inoperable HBA)
Off	Slow blink (1 Hz)	Wake-up failure
Off	Fast blink (4 Hz)	Failure in POST
Off	Flashing (irregular)	POST processing in progress
On	Off	Failure while functioning
On	On	Failure while functioning
On	Slow blink (1 Hz)	Normal (inactive)
On	Flashing (irregular)	Normal (active)
On	Fast blink (4 Hz)	Normal (busy)
Slow blink	Off	Normal (link down or not yet started)
Slow blink	Slow blink (1 Hz)	Off-line for download
Slow blink	Fast blink (4 Hz)	Restricted off-line mode (waiting for restart)

The Windows NT Event Viewer

The Windows NT SCSI driver verifies the condition of the HBA POST. If there is a failure or a suspected failure, an error log entry is issued to the Windows NT System Event Logger (Viewer).

Following is the procedure for viewing the Windows NT error log.

From the Main menu:

1. Double click or select the Administrative Tools program group.

2. Double click or select the Event Viewer. The display shows a list of discrete events specifying the source name LP8NDS35 (NT SCSI driver).

3. Double click any event with the source name LP8NDS35.

4. Change the data view from Bytes (default) to Words.

5. Examine the entry at offset 0x10: if the low byte = En, match the low byte with the error found in Table 4-2, Windows NT SCSI Port Error Log. Tables 4-3 and 4-4 list CmdStat values and Parameter error values.

Windows NT Miniport Event Log Codes

The Windows NT Miniport driver can log events/errors in the Windows NT event log. Serious errors will always be logged. Informational events will only be logged if the registry parameter LogError=1 is used.

All Miniport logged events are issued with an Event ID of 11 (INTERNAL ADAPTER ERROR) but do not necessarily indicate an HBA error occurred. Byte offset 0x10 of the event is the driver event code. Byte offsets 0x11 to 0x13 contain event specific information.

Table 4-2
Windows NT SCSI Port Error Log

0x10 Offset	Explanation	0x11 to 0x13 Further Information
0xD0	SNS_REQ (XMIT_SEQ failed)	0x11 = cmdstat, 12 = parm err
0xD1	SNS_RSP (RCV_SEQ failed)	0x11 = cmdstat, 12 = parm err
0xD3	RCV_ELS_REQ failed	0x11 = cmdstat, 12 = parm err
0xD4	XMT_ELS_REQ failed	0x11 = cmdstat, 12 = parm err
0xD5	Too many targets found (160+)	0x11 to 13 = D_DID that didn't fit
0xD6	SNS request time-out	0x11 to 13 no additional information
0xD7	Mailbox interrupt time-out	0x11 = mailbox word 0
0xD8	TPRLO requested when busy	0x11 = local req. state, 12 = discstate, 13 = mailbox word 0
0xD9	Link down time-out occurred	0x11 = local req. state, 12 = discstate, 13 = mailbox word 0

Table 4-2
Windows NT SCSI Port Error Log *continued*

0x10 Offset	Explanation	0x11 to 0x13 Further Information
0xDA	Hard link down time-out occurred	0x11 = local req. state, 12 = discstate, 13 = mailbox word 0
0xE0	Node purged from configuration	0x11 to 0x13 = D_ID of node purged
0xE1	Error interrupt occurred	Status register bytes 1-3 in event 11-13. E1 error indicates an HBA hardware failure, return HBA for repair.
0xE2	Mailbox cmd time-out	0x11 = command
0xE3	Mailbox rsp err	0x11 = command, 12-13 = mbxstatus
0xE4	HBA not ready after init	Status register bytes 1-3 in event 11-13
0xE5	Requested loop but link = PT-PT	
0xE6	Mailbox int. but cmd not complete	0x11 = MB cmd, 12-13 = mbxstatus
0xE7	SRB already queued to ring	
0xE8	RESTART failed	
0xE9	PORT BYPASS (LPB) received	
0xEB	Unknown IOCB cmd rsp	0x11 = 15:8 = cmd field
0xEC	Uncached extension alloc. Error	
0xED	Link down @ boot time (30 sec)	
0xEF	Too many interrupts at initial boot	
0xF0	Rcv ELS request (possible logout)	0x11 = ELS type, 12-13 = X_ID
0xF1	LinkUp error; LP8 down, driver up	0x11 = parameter field, 12 = IOCB cmd
0xF2	LinkUp w/ illegal or corrupt RPI	0x11 = parameter field, 12 = IOCB cmd

Table 4-2
Windows NT SCSI Port Error Log *continued*

0x10 Offset	Explanation	0x11 to 0x13 Further Information
0xF3	DeQueue ring->iotcmd.head	0x11 = caller ID
0xF4	HBA reset	0x11 = coded reason for reset:
		Bit 0 = IOCB requeue; bit 1 = readla retry
		Bit 2 = initlink retry; bit 3 = rstbus retry
		Bit 4 = mailbox time-out
0xF5	PCP_IXXX_CR IOCB rsp err	0x11 = cmdstat, 12 = parm err, 13 = ALPA
0xF6	PCP_IXXX_CR IOCB rsp err	0x11 = cmdstat, 12 = parm err, 13 = ALPA
0xF7	Ring hd !=0 && pendingsrb!=NULL	
0xF8	Invalid FCP_RSP	0x11 = pcpcntrl, 12 = scsisat, 13 = len
0xF9	Two consec. time-outs, issue LIP	
0xFA	START_IO error	0x11 = errtype, 12 = srbstat, 13 = linkup
0xFB	ELS_REQ_CR IOCB rsp err	0x11 = cmdstat, 12 = parm err, 13 = ALPA
0xFC	ELS_REQ_CR IOCB rsp err	0x11 = cmdstat, 12 = parm err, 13 = ALPA
0xFE	FLOGI failed	0x11 = cmdstat, 12 = parm err
0xFF	SNS_PLOGI failed	0x11 = cmdstat, 12 = parm err

Table 4-3
CmdStat Values

0x11 Offset	Explanation	Further Information
0x1	IOSTAT_FCP_RSP_ERR	
0x2	IOSTAT_REMOTE_STOP	Remote sent an ABTS
0x3	IOSTAT_LOCAL_REJECT	Parameter field contains additional info
0x4	IOSTAT_NPORT_RJT	
0x5	IOSTAT_FABRIC_RJT	
0x6	IOSTAT_NPORT_BSY	
0x7	IOSTAT_FBRIC_BSY	
0x8	IOSTAT_INTERMED_RSP	
0x9	IOSTAT_LS_RJT	
0xA	IOSTAT_BA_RJT	

Table 4-4
Parameter Error Values (valid only when CmdStat=0x3)

0x12 Offset	Explanation
0x00	IOERR_SUCCESS
0x01	IOERR_MISSING_CONTINUE
0x02	IOERR_SEQUENCE_TIMEOUT
0x03	IOERR_INTERNAL_ERROR
0x04	IOERR_INVALID_RPI
0x05	IOERR_NO_XRI
0x06	IOERR_ILLEGAL_COMMAND
0x07	IOERR_XCHG_DROPPED
0x08	IOERR_ILLEGAL_FIELD

Table 4-4
Parameter Error Values (valid only when CmdStat=0x3) *continued*

0x12 Offset	Explanation
0x09	IOERR_BAC_CONTINUE
0x0A	IOERR_TOO_MANY_BUFFERS
0x0B	IOERR_RCV_BUFFER_WAITING
0x0C	IOERR_NO_CONNECTION
0x0D	IOERR_TX_DMA_FAILED
0x0E	IOERR_RX_DMA_FAILED
0x0F	IOERR_ILLEGAL_FRAME
0x10	IOERR_EXTRA_DATA
0x11	IOERR_NO_RESOURCES
0x12	IOERR_RESERVED
0x13	IOERR_ILLEGAL_LENGTH
0x14	IOERR_UNSUPPORTED_FEATURE
0x15	IOERR_ABORT_IN_PROGRESS
0x16	IOERR_ABORT_REQUESTED
0x17	IOERR_RECEIVE_BUFFER_TIMEOUT
0x18	IOERR_LOOP_OPEN_FAILURE
0x19	IOERR_RING_RESET
0x1A	IOERR_LINK_DOWN
0x1B	IOERR_CORRUPTED_DATA
0x1C	IOERR_CORRUPTED_RPI
0x1D	IOERR_OUT_OF_ORDER
0x1E	IOERR_OUT_OF_ORDER_ACK
0x1F	IOERR_DUPLICATE_FRAME
0x20	IOERR_INVALID_ACK
0x21	IOERR_BAD_40BIT_ADDRESS

Table 4-4
Parameter Error Values (valid only when CmdStat=0x3) *continued*

0x12 Offset	Explanation
0x22	IOERR_RESERVED
0x23	IOERR_RESERVED
0x24	IOERR_RESERVED
0x25	IOERR_ABORT_MULTI_REQUESTED
0x26	IOERR_RESERVED
0x27	IOERR_RESERVED
0x28	IOERR_LINK_BUFFER_SHORTAGE
0x29	IOERR_RCV_XRIBUF_WAITING

Windows NT SCSI Address Mapping

The driver emulates six SCSI buses per HBA to map all 126 possible AL_PA to Target IDs.

The first bus is a dummy bus used to delay the Windows NT initial inquiry scan until after discovery completes. The 31 target IDs per bus (Windows NT requires the initiator to consume one of the IDs, we use #31) are then mapped to either ascending or descending SEL_IDs (based on the ScanDown registry parameter).

> **NOTE:** The first bus will be utilized if the parameter MapBus0=1 is used.

Fabric Device Mapping

In a fabric (switched) environment, devices are initially created based on the order that they are returned from the Simple Name Server (SNS). Once created (at boot), the devices continue to be tracked based on:

–WWPN: HardAddress=0;MapNodeName=0
–NodeName: HardAddress=0;MapNodeName=1
–D_ID: HardAddress=1; (MapNodeName=don't care)

Private Loop Device Mapping

In a private loop environment (FCAL, no switch), devices are initially created based on a fixed address ordering. Once created (at boot), the devices continue to be tracked based on:

−WWPN:	HardAddress=0;MapNodeName=0
−NodeName:	HardAddress=0;MapNodeName=1
−D_ID:	HardAddress=1; (MapNodeName=don't care)

This section identifies the initial fixed mapping between the Windows NT bus/target/lun and a fibre channel native address (AL_PA/SEL_ID). There are two potential mappings based on a registry parameter [ScanDown=0 (driver default); use *, ScanDown=1;].

The index into Table 4-5 can be derived by:

```
#define TARGETS_PER_BUS 32

i = (Srb->PathId > 0) ? Srb->PathId-1 : 0; //Bus 0 = dummy bus nodeInx = ((I *
(TARGETS_PER_BUS-1)) + Srb->TargetId;
```

Table 4-5
Current Private Loop Device Mapping

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
1***	0	0-7	0x01	0x7D	0xEF	0x00
	1	0-7	0x02	0x7C	0xE8	0x01
	2	0-7	0x04	0x7B	0xE4	0x02
	3	0-7	0x08	0x7A	0xE2	0x03
	4	0-7	0x0F	0x79	0xE1	0x04
	5	0-7	0x10	0x78	0xE0	0x05
	6	0-7	0x17	0x77	0xDC	0x06

* Use this translation if registry ScanDown = 0 (default)

** Use this translation if registry ScanDown = 1

*** If MapBus0=1;, then device addressing starts with Bus #0, not #1

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
	7	0-7	0x18	0x76	0xDA	0x07
	8	0-7	0x1B	0x75	0xD9	0x08
	9	0-7	0x1D	0x74	0xD6	0x09
	10	0-7	0x1E	0x73	0xD5	0x0A
	11	0-7	0x1F	0x72	0xD4	0x0B
	12	0-7	0x23	0x71	0xD3	0x0C
	13	0-7	0x25	0x70	0xD2	0x0D
	14	0-7	0x26	0x6F	0xD1	0x0E
	15	0-7	0x27	0x6E	0xCE	0x0F
	16	0-7	0x29	0x6D	0xCD	0x10
	17	0-7	0x2A	0x6C	0xCC	0x11
	18	0-7	0x2B	0x6B	0xCB	0x12
	19	0-7	0x2C	0x6A	0xCA	0x13
	20	0-7	0x2D	0x69	0xC9	0x14
	21	0-7	0x2E	0x68	0xC7	0x15
	22	0-7	0x31	0x67	0xC6	0x16
	23	0-7	0x32	0x66	0xC5	0x17
	24	0-7	0x33	0x65	0xC3	0x18
	25	0-7	0x34	0x64	0xBC	0x19
	26	0-7	0x35	0x63	0xBA	0x1A

*   Use this translation if registry ScanDown = 0 (default)

**   Use this translation if registry ScanDown = 1

***   If MapBus0=1;, then device addressing starts with Bus #0, not #1

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
	27	0-7	0x36	0x62	0xB9	0x1B
	28	0-7	0x37	0x61	0xB6	0x1C
	29	0-7	0x3A	0x60	0xB5	0x1D
	30	0-7	0x3C	0x5F	0xB4	0x1E
	31	0-7	None	None	None	None
2***	0	0-7	0x43	0x5E	0xB3	0x1F
	1	0-7	0x45	0x5D	0xB2	0x20
	2	0-7	0x46	0x5C	0xB1	0x21
	3	0-7	0x47	0x5B	0xAE	0x22
	4	0-7	0x49	0x5A	0xAD	0x23
	5	0-7	0x4A	0x59	0xAC	0x24
	6	0-7	0x4B	0x58	0xAB	0x25
	7	0-7	0x4C	0x57	0xAA	0x26
	8	0-7	0x4D	0x56	0xA9	0x27
	9	0-7	0x4E	0x55	0xA7	0x28
	10	0-7	0x51	0x54	0xA6	0x29
	11	0-7	0x52	0x53	0xA5	0x2A
	12	0-7	0x53	0x52	0xA3	0x2B
	13	0-7	0x54	0x51	0x9F	0x2C
	14	0-7	0x55	0x50	0x9E	0x2D

* Use this translation if registry ScanDown = 0 (default)

** Use this translation if registry ScanDown = 1

*** If MapBus0=1;, then device addressing starts with Bus #0, not #1

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
	15	0-7	0x56	0x4F	0x9D	0x2E
	16	0-7	0x59	0x4E	0x9B	0x2F
	17	0-7	0x5A	0x4D	0x98	0x30
	18	0-7	0x5C	0x4C	0x97	0x31
	19	0-7	0x63	0x4B	0x90	0x32
	20	0-7	0x65	0x4A	0x8F	0x33
	21	0-7	0x66	0x49	0x88	0x34
	22	0-7	0x67	0x48	0x84	0x35
	23	0-7	0x69	0x47	0x82	0x36
	24	0-7	0x6A	0x46	0x81	0x37
	25	0-7	0x6B	0x45	0x80	0x38
	26	0-7	0x6C	0x44	0x7C	0x39
	27	0-7	0x6D	0x43	0x7A	0x3A
	28	0-7	0x6E	0x42	0x79	0x3B
	29	0-7	0x71	0x41	0x76	0x3C
	30	0-7	0x72	0x40	0x75	0x3D
	31	0-7	None	None	None	None

* Use this translation if registry ScanDown = 0 (default)

** Use this translation if registry ScanDown = 1

*** If MapBus0=1;, then device addressing starts with Bus #0, not #1

continued

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
3***	0	0-7	0x73	0x3F	0x74	0x3E
	1	0-7	0x74	0x3E	0x73	0x3F
	2	0-7	0x75	0x3D	0x72	0x40
	3	0-7	0x76	0x3C	0x71	0x41
	4	0-7	0x79	0x3B	0x6E	0x42
	5	0-7	0x7A	0x3A	0x6D	0x43
	6	0-7	0x7C	0x39	0x6C	0x44
	7	0-7	0x80	0x38	0x6B	0x45
	8	0-7	0x81	0x37	0x6A	0x46
	9	0-7	0x82	0x36	0x69	0x47
	10	0-7	0x84	0x35	0x67	0x48
	11	0-7	0x88	0x34	0x66	0x49
	12	0-7	0x8F	0x33	0x65	0x4A
	13	0-7	0x90	0x32	0x63	0x4B
	14	0-7	0x97	0x31	0x5C	0x4C
	15	0-7	0x98	0x30	0x5A	0x4D
	16	0-7	0x9B	0x2F	0x59	0x4E
	17	0-7	0x9D	0x2E	0x56	0x4F
	18	0-7	0x9E	0x2D	0x55	0x50
	19	0-7	0x9F	0x2C	0x54	0x51

* Use this translation if registry ScanDown = 0 (default)

** Use this translation if registry ScanDown = 1

*** If MapBus0=1;, then device addressing starts with Bus #0, not #1

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
	20	0-7	0xA3	0x2B	0x53	0x52
	21	0-7	0xA5	0x2A	0x52	0x53
	22	0-7	0xA6	0x29	0x51	0x54
	23	0-7	0xA7	0x28	0x4E	0x55
	24	0-7	0xA9	0x27	0x4D	0x56
	25	0-7	0xAA	0x26	0x4C	0x57
	26	0-7	0xAB	0x25	0x4B	0x58
	27	0-7	0xAC	0x24	0x4A	0x59
	28	0-7	0xAD	0x23	0x49	0x5A
	29	0-7	0xAE	0x22	0x47	0x5B
	30	0-7	0xB1	0x21	0x46	0x5C
	31	0-7	None	None	None	None
4***	0	0-7	0xB2	0x20	0x45	0x5D
	1	0-7	0xB3	0x1F	0x43	0x5E
	2	0-7	0xB4	0x1E	0x3C	0x5F
	3	0-7	0xB5	0x1D	0x3A	0x60
	4	0-7	0xB6	0x1C	0x39	0x61
	5	0-7	0xB9	0x1B	0x36	0x62

*   Use this translation if registry ScanDown = 0 (default)

**   Use this translation if registry ScanDown = 1

***   If MapBus0=1;, then device addressing starts with Bus #0, not #1

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
	6	0-7	0xBA	0x1A	0x35	0x63
	7	0-7	0xBC	0x19	0x34	0x64
	8	0-7	0xC3	0x18	0x33	0x65
	9	0-7	0xC5	0x17	0x32	0x66
	10	0-7	0xC6	0x16	0x31	0x67
	11	0-7	0xC7	0x15	0x2E	0x68
	12	0-7	0xC9	0x14	0x2D	0x69
	13	0-7	0xCA	0x13	0x2C	0x6A
	14	0-7	0xCB	0x12	0x2B	0x6B
	15	0-7	0xCC	0x11	0x2A	0x6C
	16	0-7	0xCD	0x10	0x29	0x6D
	17	0-7	0xCE	0x0F	0x27	0x6E
	18	0-7	0xD1	0x0E	0x26	0x6F
	19	0-7	0xD2	0x0D	0x25	0x70
	20	0-7	0xD3	0x0C	0x23	0x71
	21	0-7	0xD4	0x0B	0x1F	0x72
	22	0-7	0xD5	0x0A	0x1E	0x73
	23	0-7	0xD6	0x09	0x1D	0x74
	24	0-7	0xD9	0x08	0x1B	0x75
	25	0-7	0xDA	0x07	0x18	0x76

* Use this translation if registry ScanDown = 0 (default)

** Use this translation if registry ScanDown = 1

*** If MapBus0=1;, then device addressing starts with Bus #0, not #1

continued

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
	26	0-7	0xDC	0x06	0x17	0x77
	27	0-7	0xE0	0x05	0x10	0x78
	28	0-7	0xE1	0x04	0x0F	0x79
	29	0-7	0xE2	0x03	0x08	0x7A
	30	0-7	0xE4	0x02	0x04	0x7B
	31	0-7	None	None	None	None
5***	0	0-7	0xE8	0x01	0x02	0x7C
	1	0-7	0xEF	0x00	0x01	0x7D
	2	0-7	None	None	None	None
	3	0-7	None	None	None	None
	4	0-7	None	None	None	None
	5	0-7	None	None	None	None
	6	0-7	None	None	None	None
	7	0-7	None	None	None	None
	8	0-7	None	None	None	None
	9	0-7	None	None	None	None
	10	0-7	None	None	None	None
	11	0-7	None	None	None	None
	12	0-7	None	None	None	None

* Use this translation if registry ScanDown = 0 (default)

** Use this translation if registry ScanDown = 1

*** If MapBus0=1;, then device addressing starts with Bus #0, not #1

Table 4-5
Current Private Loop Device Mapping *continued*

Bus # 0	Target# 0-31	Lun# 0-7	*AL_PA None	*SEL_ID None	**AL_PA None	**SEL_ID None
	13	0-7	None	None	None	None
	14	0-7	None	None	None	None
	15	0-7	None	None	None	None
	16	0-7	None	None	None	None
	17	0-7	None	None	None	None
	18	0-7	None	None	None	None
	19	0-7	None	None	None	None
	20	0-7	None	None	None	None
	21	0-7	None	None	None	None
	22	0-7	None	None	None	None
	23	0-7	None	None	None	None
	24	0-7	None	None	None	None
	25	0-7	None	None	None	None
	26	0-7	None	None	None	None
	27	0-7	None	None	None	None
	28	0-7	None	None	None	None
	29	0-7	None	None	None	None
	30	0-7	None	None	None	None
	31	0-7	None	None	None	None

* Use this translation if registry ScanDown = 0 (default)

** Use this translation if registry ScanDown = 1

*** If MapBus0=1;, then device addressing starts with Bus #0, not #1

Chapter **5**

Firmware and Diagnostic Utility

Introduction

This chapter contains installation and user instructions for the diagnostic and firmware download utility. This utility is a DOS-based program used exclusively in standalone environments.

> **NOTE:** The diagnostic and firmware download utility is used to upgrade firmware on both versions of the 64-Bit PCI-to-Fibre Channel Host Bus Adapters (HBAs).

The Diagnostic and Firmware Download Utility

The supplied software kit contains the Alpha and the i386 system diagnostic and firmware download utility, for their respective hosts. The diagnostic utility for each host is stored in the host specific directory. For Alpha systems the utility is *ALPHDNLD.EXE* and for i386 systems the utility is *I386DNLD.EXE*. The common HBA firmware is located in the root directory.

Functionally, the utility program performs:

■ Discovery and preliminary testing of the HBA in the system.

■ Functional testing and operational checks on the HBA.

■ The use of input and output files to automate the execution of the diagnostic utility program.

■ Updating HBA firmware.

> **NOTE:** The diagnostic utility does not operate in the DOS shell under Windows.

i386 System Installation

You must load the software and start the diagnostic utility from the DOS command line. You can execute *I386DNLD.EXE* directly from the supplied software kit or you can load onto your hard drive and execute it from there.

To install the *I386DNLD.EXE* onto the hard drive:

1. Insert the supplied diskette into your system's diskette drive.

2. Make a directory and copy the files onto your hard drive, as follows:

   C:\md dir_name
   C:\copy A:\i386*.*c:\dir_name
   C:\cd dir_name

Where:

Dir_name is the directory where the diagnostic software is stored.

Starting *I386DNLD.EXE* in an i386 System

To start the *I386DNLD.EXE* program without any options, type:

From the system disk:

   C:*I386DNLD.EXE*

From the diskette:

   A:/i*386DNLD.EXE*

The options for *I386DNLD.EXE* are listed in Table 5-1. The syntax for using options is:

C:\ *I386DNLD.EXE* {I = infilename} {o = outfilename}

Following is a sample command:

C:\ *I386DNLD.EXE* o = pciha001

Where *pciha001* is the output filename.

Table 5-1
***I386DNLD.EXE* Command Options**

Option	Description
Infilename	Script input file that is read and executed by the program.
Outfilename	Creates a file of keystrokes that is stored for later use (for example, as an input file).

NOTE: All message lines except user input begin with a # symbol to indicate a comment line. User entered data appears on a line by itself, not preceded by a #.

Starting Alpha Systems with Alpha BIOS

Following is the procedure for starting *ALPHDNLD.EXE* on systems running Alpha BIOS:

1. If the system default is NT, at startup, press the **F2** key for setup. When the Alpha BIOS screen comes up, go to Step 3.

2. If the system default is SRM, type ARC at the SRM console. When the Alpha BIOS initialization screen comes up, press the **F2** key for setup, go to Step 3.

3. Select Run Maintenance Program from the Utilities menu. The run Maintenance Program window comes up.

4. Insert the diskette into your computer's diskette drive.

5. Type: A:/ *ALPHDNLD.EXE* and press the **Enter** key.

Go to the "Start-up for Alpha/i386 System" section.

Start-Up for Alpha/i386 Systems

The diagnostic program performs preliminary analysis of the HBA before displaying its Main menu. If no HBA is found, the program exits. Error messages are displayed on failure conditions.

During startup, the diagnostic and firmware download utility program:

1. Looks for installed PCI HBAs.

2. Executes preliminary testing on all installed HBAs. Tests include:

    a. SLIM memory test.

    b. BIU register test.

    c. BIU configuration registers test.

3. Reports pass or fail status messages.

4. Resets the HBAs.

5. Checks Power-On Self Test (POST) status of HBAs.

6. Reports revision levels of diagnostic and functional firmware.

7. Displays the resources of each HBA.

The following is a sample output of the diagnostic and firmware download utility Start-Up Procedure.

WELCOME TO HOST DIAGNOSTIC UTILITY Revision x.x

Host Adapters found in the system: 1

PRELIMINARY TESTING of Host Adapter 1

    Host Adapter 1: PASS 0xA: SLIM Memory Tests

WELCOME TO HOST DIAGNOSTIC UTILITY Revision x.x

    Host Adapter 1: Pass 0xA: BIU Registers Tests

    Host Adapter 1: Pass 0xA: BIU Configuration Registers Tests

Adapter 1 PASSED PRELIMINARY TESTS

WELCOME TO HOST DIAGNOSTIC UTILITY Revision x.x

Resetting Host Adapter: 1

Host Adapter 1: Post Done.

Host Adapter 1 is READY. Functional Firmware Loaded.

Diagnostic Firmware Version x.x

Functional Firmware Version x.x

HIT RETURN or ENTER key to continue

<return>

HOST ADAPTER 1 Resources Info

Pci_bus_num = 0   Pci_dev_num = 0xA0

Slim_base_adr = 0x000D0000   Reg_mem_base_adr = 0x000D1000

Reg_io_base_adr = 0x0000FC00   IRQ = 0xB

NOTE: Enter 0 in 'option:' prompt to display previous menu

NOTE: All values entered are hexadecimal

LP8DUTIL Main Menu Revision x.x

WELCOME TO HOST DIAGNOSTIC UTILITY Revision x.x

1 - Test Host Adapters

2 - Modify Test Options

3 - Restart Host Adapters

4 - Input /Output

5 - Maintenance

6 - Show Host Adapters Info

7 - Quit

Option:

Diagnostics Main Menu

After the diagnostic and firmware download utility goes through its start-up procedure, the Main menu displays and handles user requests. If the program detects two or more HBAs in the system, you are prompted to select which HBA(s) is to be tested.

The function of each option on the Main menu is listed in Table 5-2.

Table 5-2
***I386DNLD.EXE* Main Menu Options**

Menu Selection	Description
Test Host Adapters	Runs host-based internal and external loopback tests.
Modify Test Options	Enables you to disable or enable up to seven different tests, depending upon the cards installed (BIU-1 or BIU-2). Specify number of retries and actions to take if error occurs.
Restart Host Adapters	Resets the HBA.
Input/Output	Opens or closes input and output files.
Maintenance	Updates firmware or non-volatile parameters in FLASH ROM. Display program images stored in memory.
Show Host Adapters Info	Displays configuration and status data used by Tech Support.
Quit	Exits *I386DNLD.EXE*.

NOTE: Enter 0 at the Option prompt to display the previous menu. All values are in hexadecimal.

The menu options and descriptions are described in the following sections.

Test Host Bus Adapters

Select this option to run host-based internal and external loopback tests on the HBAs. Internal BIU PCI loopback and other loopback tests are run automatically. External loopback tests are disabled by default: 0 = No, 1 = Yes. The default is 0.

Choose 0 (No) if you do not have an external loopback connector.

> **NOTE:** Testing the HBA while it is connected to an arbitrated loop is not recommended.

Modify Test Options

Select Test and specify the number of passes on one or more of these tests: PCI loopback, Internal loopback, External Loopback, or all three.

Choose the number of passes (default is 0x50; 0=infinity), and the action to take upon encountering errors (0 = stop, 1 = repeat, 2 = ignore). 0 is the default.

Restart Host Bus Adapters

Select this option to reset the HBA. When a restart HBA occurs, the HBA will perform POST testing and will reload functional firmware.

Input/Output

Select this option to open or close input and output files. The contents of the Input file are interpreted and executed by the program. The output file contains a log of all messages. Note that nesting of input files is not supported.

Maintenance

Select this option to update firmware or non-volatile parameters in the flash ROM. This option also displays program images (load list) stored in the HBA's memory. You must reboot the HBA for the new firmware to take effect.

Show Host Bus Adapter Info

Select this option to display HBA data in these areas:

■ BIU PCI Configuration Parameters

■ Host Bus Adapter Info and Status

■ Adapter Revisions

■ Display Configuration Data

■ Service Parameters

■ Status/Counters Info

■ Link Status

■ Link Attention

Quit

Select this option to exit the program. A warning message indicates if any errors were encountered during the session.

The Diagnostic and Firmware Loader Utility

On Enterprise Alpha Servers that are not equipped with a diskette drive or Alpha Server 8x00 series machines running under OpenVMS, the Console CD contains the LP8ldr.exe file. To start LP8ldr.exe program from a Console CD under the Alpha Server 8x00 series ARC emulator, issue the following commands.

1. Set console serial.

2. Set arc_enable on.

3. Set Console_mode advanced.

4. Perform a system initialization.

5. Run iso9660:[utility]lp8ldr.exe –d dkd400 –p 2

    Where –d = CD-ROM Device (at the SRM prompt type "show dev" to display the value for your systems CD-ROM)

    -p = the PCI bus number where the HBAs are located. If you choose to download the firmware, all HBAs on the PCI bus specified by the –P parameter will be programmed with the version of firmware contained in the LP8ldr.exe file.

For AS8200 systems with HBAs installed on multiple PCI busses, it is necessary to run the LP8ldr Utility once for each PCI bus that has an HBA to be upgraded. Therefore if your system has two HBAs the utility will be run twice. The –P parameter must be set to the new PCI bus number each time the utility is run.

The LP8ldr.exe file contains the HBA's firmware download utility and the latest version of the firmware at the time the Console CD was released. You will be prompted by the program to either download the firmware or skip the process. If you choose to download the firmware, all HBAs will be programmed with the version of firmware contained in the LP8ldr.exe file. For information on the latest version of the Console CD and firmware go to the Compaq website:

http://www.compaq.com/products/storageworks/adapters.html

Drill down through Services and Support to Adapter Support.

Chapter **6**

Using LPUTILNT Utility/NT

Introduction

The 64-Bit PCI-To-Fibre Channel Host Bus Adapter (HBA) utility
(*LPUTILNT.EXE*) is an executable file located in the platform specific
directory of the supplied software kit. Run the utility from the CD or copy and
run it from your local hard drive.

> **NOTE:** The LPUTILNT Utility/NT requires that the SCSI Miniport driver be installed and
> connected to at least one drive before it can operate properly or the registry parameter
> Simulate Device=1 be set.

The LPUTILNT Utility/NT is a Windows NT-based Graphical User Interface
(GUI) that lets you:

- View HBA parameters

- Perform HBA firmware maintenance

- Download PCI configuration files (CFL)

- Modify driver parameters in the Windows NT registry

These parameters have been set by the Original Equipment Manufacturer
(OEM) setup file provided in the software kit. The fibre channel setup file, run
as part of the platform kit configuration, will also modify them. The resulting
parameter setting has been modified to provide the optimal setting for the
supported configurations.

Viewing HBA Parameters

To view HBA parameters:

1. Double click on the *LPUTILNT.EXE* to start the diagnostic utility.

   The following Main menu screen appears (Figure 6-1).
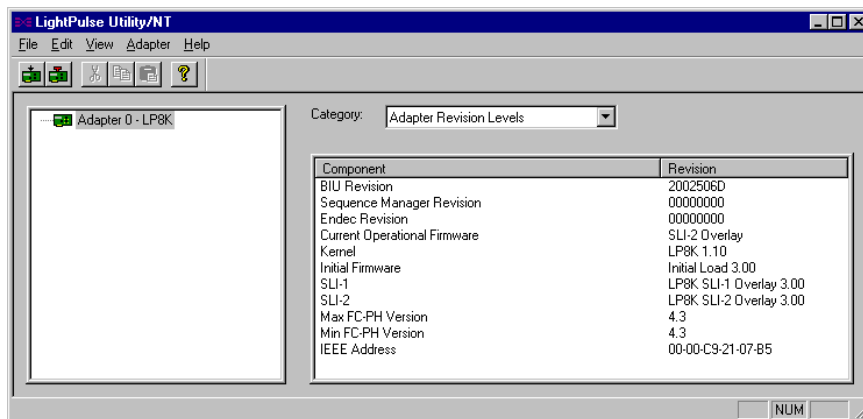
Figure 6-1. Main menu screen

2. Select an HBA.

3. On the menu bar, click on an HBA or pull down the category list.

4. Select an option to view HBA parameters.

There are eight options available, each displaying a different group of HBA parameters:

■ Adapter Revision Levels –View information about the chipset and firmware revision levels of the selected HBA.

■ Firmware Maintenance –View detailed information about the firmware in the flash ROM of the selected HBA. You can also:

  ❑ Upgrade HBA firmware

  ❑ Manage existing firmware

  ❑ Enable or disable the HBA's Boot BIOS

- Loop Map – View a list of the members of the selected HBA's loop map.

- PCI Registers – View the values of the PCI configuration registers for the selected HBA.

- Configuration Data – View information about the data in each of the configuration regions in the flash ROM of the selected HBA. You can also download PCI configuration data files.

- Drive Parameters – View information about device driver parameters that are maintained in the Windows/NT registry.

- Link Statistics – View statistics about the arbitrated loop of the selected HBA.

- Status and Counters – View status and counters for bytes, frames, sequences, exchanges, etc.

Performing HBA Firmware Maintenance

From the LPUTILNT Utility/NT Main menu screen:

1. Select the desired HBA.

2. Expand the category list and select Firmware Maintenance.

This display provides detailed information about the firmware in the flash ROM of the selected HBA. The radio buttons determine how the following data is displayed (see Figure 6-2):

- Flash ROM List – Shows all firmware images in the selected HBA's flash ROM.

- Flash ROM Map – Displays these same images, along with unused flash ROM storage space.

- RAM Map – Displays the firmware images currently loaded in the selected HBA's SRAM.
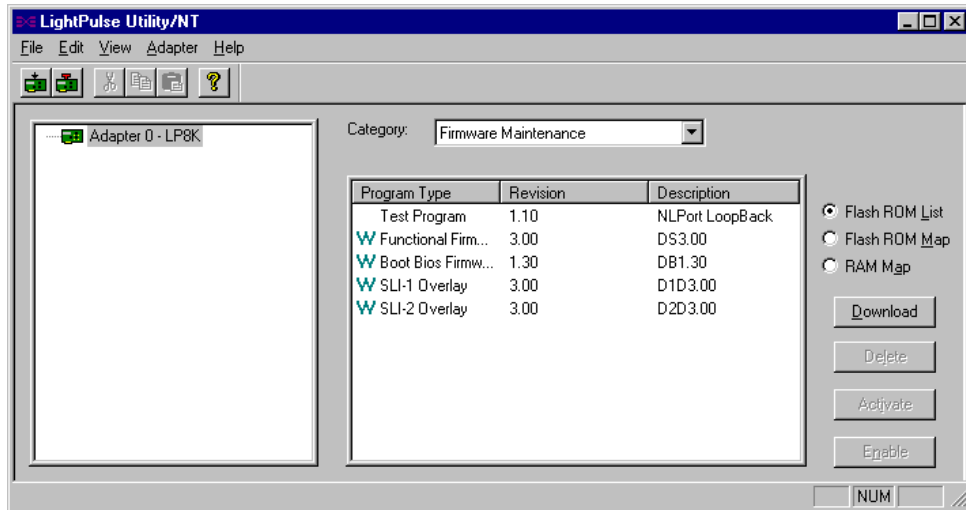
Figure 6-2. Firmware maintenance screen

Firmware images that are referenced in the HBA's wake-up parameters are denoted with a W in the leftmost column of the display (see Figure 6-2).

From the Firmware Maintenance screen, you can:

■ Upgrade HBA firmware

■ Delete or activate existing firmware

■ Enable or disable the HBA's Boot BIOS

Upgrading HBA Firmware

To upgrade HBA firmware:

1. Obtain a copy of the desired upgrade file.

2. Double click on *LPUTILNT.EXE* to start the diagnostic utility.

3. Select the desired HBA.

4. Expand the category list and select Firmware Maintenance.

5. Click on Download.

6. Locate the new upgrade file.

7. Click on Open.

> **NOTE:** The new software is transferred to the HBA.

8. Expand the category list and select Adapter Revision Levels.

9. Verify that the new firmware revision is shown.

Deleting or Activating Firmware Image

Deleting a firmware image might be necessary in order to provide storage for a subsequent download. When two images of the same type, but different revision exist in the HBA's flash ROM, you can select which image is active. Only one image can be active at a time. A W in the list precedes the active image.

From the LPUTILNT Utility/NT Main menu screen:

1. Select the desired HBA.

2. Expand the category list and select Firmware Maintenance.

3. Select a firmware image.

4. Click on Delete to remove the image file or click on Activate to activate the image file.

Enabling or Disabling Boot BIOS

Boot BIOS is used to designate a fibre channel drive as the boot drive. To enable a fibre channel drive as the boot drive, first enable Boot BIOS using this procedure and then see Chapter 7 for directions on how to use Boot BIOS.

From the LighPulse Utility/NT Main menu screen:

1. Select the desired HBA.

2. Expand the category list and select Firmware Maintenance (see Figure 6-2).

3. Select the Boot BIOS firmware image.

   NOTE: If Boot BIOS Firmware is not listed, you will need to upgrade your HBA's firmware.

4. Click on the **Enable** button.

   The **Enable** button toggles to disable when Boot BIOS is enabled.

Downloading PCI Configuration Files

The Configuration Data screen provides information about the data in each of the configuration regions in the flash ROM of the selected HBA. You can select a region in the drop-down region list to display data for that region. Regions five, six and seven let you download PCI configuration data files to the selected region.

Modifying Driver Parameters in the Windows NT Registry

This screen provides information about device driver parameters that are maintained in the Windows/NT registry and allows those values to be modified. All available device driver parameters are listed in the data display, along with the current, minimum, maximum, and default values. Parameters that have their value specified in the system registry are denoted with either a G or an L in the left-most column of the screen. The G indicates that the value is set in the global registry entry, which applies to all HBAs that do not have a local registry entry. The L indicates that the value is set in a registry entry specific to the selected HBA, which overrides the value settings in the global entry.

Modifying the Driver Parameters

From the LPUTILNT Utility/NT Main menu screen:

1. Select the desired HBA.

2. Expand the category list and select Driver Parameters.1.

3. Double click on a Parameter Name.

4. Enter the desired value in the New Value field.

5. Select the Permanent or Global checkbox:

   ❑ Select Permanent to cause the new value to be written to the system registry. If Permanent is not selected, the parameter reverts to its default value when the driver is reset.

   ❑ Select Global to change the global registry entry. Otherwise, the change is made to the HBA-specific registry entry.

Current parameters that can be set are listed in Table 6-1. Table 6-2 lists the AL_PA addresses.

Table 6-1
Drive Parameters

Parameter	Description
AbortStatus = 0xn	Values from 0x00 – 0xFF. Controls NT SRB error status for general Abort conditions. Default = SRB_STATUS_BUS_RESET (0x0E) which will not cause the current NT class driver to throttle down I/O performance after four of these errors have been received (on a per-LUN basis)
ALTOV = n	Values are in milliseconds from 1 to 15. Default = 15.
ARBTOV = n	Values are milliseconds form 500 to 10000. Default = 1000. Represents FC_AL arbitration time-out prior to LIP.
Class = n	Values from 0-2. Default = 2. Controls which Fibre Channel Class will be used: 0 = Class 1, 1 = Class 2, 2 = Class 3.
EDTOV = n	Values are in milliseconds form 500 to 10000. Default = 1000. Represents error detect time-out value prior to LIP.
EnableDPC = n	Values 0 or 1. Default = 0. 0 = process I/O completion at interrupt level, 1 = process at DPC level.
FrameSizeMSB = n	Values from 1-8. Default = 8. Controls the upper byte of the receive FrameSize if issued in PLOGI. This lets the FrameSize to be constrained on 256 byte increments from 256 (1) – 2048 (8).
HardALPA = 0xn	Values from 0x01 – 0xEF. Default = 0x01 lets the HBA use a hard assigned loop address. NOTE: Only valid ALPAs can be used (see Table 6-2).
LinkTimeOut = n	Values are in seconds from 1 – 500. Default = 60. Controls the time-out at which link no longer BUSY's requests but issues SELECTION_TIMEOUT error status.
LogErrors = n	Values 0 or 1. Default = 0. 0 = don't log general HBA/drive errors. 1 = use Event Log to general errors.

Table 6-1
Drive Parameters *continued*

Parameter	Description
NodeTimeOut = n	Values are in seconds from 1–255. Default = 10. Controls the time-out at which a formerly logged-in node will issue SELECTION_TIMEOUT error status to an I/O request.
QueueDepth = n	Values from 1–64 (decimal). Default = 64. Requests per LUN/Target (see Queue Target parameter).
QueueTarget = n	Vaules 0 or 1 (decimal). Default = 0. 0 = QueueDepth applies on a per LUN basis: 1 = QueueDepth applies on a Target basis.
RATOV = n	Values are in seconds from 2 to 120. Default = 2. This value is the ELS request time-out.
ReadCheck = n	Values 0 or 1. Default = 1. 0 = do not enable byte counting for read operations. 1 = enable byte counting. If bytes counted are less than requested transfer count, issue underrun.
ResetFF = n	Values 0 or 1. Default = 1. 0 = ResetBus translates to LIP (F7). 1 = ResetBus translates to LIP (FF). Used for WolfPack to force reservations to be freed when ResetBus issued. Only meaningful for FC_AL topology and Seagate native FC hard drives.
ResetTPRLO = n	Values 0 or 1. Default = 1. 0 = RestBus translates to LIP ( ). 1 = ResetBus translates to ThirdPartyProcessLogout + LIP ( ). Used for WolfPack to force reservations to be freed when ResetBus is issued.
RetryInterval = n	Values are in seconds from 2-255. Default = 45. Used for time-out interval if RetryIoTimeOut = 1. Must be shorter than Class driver TimeOutInterval.
RetryIoTimeOut = n	Vaules 0 or 1. Default = 1. 1 = lets an HBA to time-out I/O prior to port driver's time-out which causes a LIP/Link Reset.

Table 6-1
Drive Parameters *continued*

Parameter	Description
RTTOV = n	Values are in milliseconds from 100 to 511. Default = 256. Represents time-out between phases of Off-line to On-line protocol.
ScanDown = n	Values 0 or 1. Default = 0. 0 = Lowest AL_PA = Lowest physical disk (ascending AL_PA order). 1 = Highest AL_PA = Lowest Physical Disk (ascending SEL_ID order).
SilFlags = n	Values from 0-2. Default = 0. Controls which driver interface to use. 0 = automode; attempt SLI-2 first. If that fails, uses SLI-1. 1 = always use SLI-1. 2 = always use SLI-2.
SimulateDevice = n	Values 0 or 1. Default = 0. 0 = do not create a "dummy" disk device. 1 = create a dummy disk to force the driver to load even if no disk devices are present at boot time.
SnsALL = n	Values 0 or 1. Default = 1. Controls which N_Ports are queried from the NameServer. 0 = SCSI FCP only. 1 = All N_Ports.
Topology = n	Values 0 or 1. Default = 0. 0 = FC_AL (loop), 1 = PT-PT Fabric. When set to 1, FLOGI, SCR/RSCN and NameServer queries are employed.
TrafficCop = n	Values 0 or 1. Default = 0. 1 = enable FC-AL loop master to run unfair and break potential arbitration problems by sending frames to itself. 0 = run fair all the time.

Table 6-2
AI_PA Addresses

0x01	0x02	0x04	0x08	0x0F	0x10	0x17	0x18	0x1B
0x1D	0x1E	0x1F	0x23	0x25	0x26	0x27	0x29	0x2A
0x2B	0x2C	0x2D	0x2E	0x31	0x32	0x33	0x34	0x35
0x36	0x39	0x3A	0x3C	0x43	0x45	0x46	0x47	0x49
0x4A	0x4b	0x4C	0x4D	0x4D	0x51	0x52	0x53	0x54
0x55	0x56	0x59	0x5A	0x5C	0x63	0x65	0x66	0x67
0x69	0x6A	0x6B	0x6C	0x6D	0x6E	0x71	0x72	0x73
0x74	0x75	0x75	0x79	0x7A	0x7C	0x80	0x81	0x82
0x84	0x88	0x8F	0x90	0x97	0x98	0x9B	0x9D	0x9E
0x9F	0xA3	0xA5	0xA6	0xA7	0xA9	0xAA	0xAB	0xAC
0xAD	0xAE	0xB1	0xB2	0xB3	0xB4	0xB5	0xB6	0xB9
0xBA	0xBC	0xC3	0xC5	0xC6	0xC7	0xC9	0xCA	0xCB
0xCC	0xCD	0xCE	0xD1	0xD2	0xD3	0xD4	0xD5	0xD5
0xD9	0xDA	0xDC	0xE0	0xE1	0xE2	0xE4	0xE8	0xEF

Chapter **7**

Boot BIOS

Introduction

Boot BIOS is a set of x86 instructions in the 64-Bit PCI-To-Fibre Channel
Host Bus Adapter (HBA) flash ROM that lets you designate a fibre channel
hard drive as the boot drive. Boot BIOS works with the existing system BIOS
on Intel Pentium class PCI system boards.

> **NOTE:** The examples in this chapter use the Windows NT 4.0 operating system.

Boot BIOS does the following:

■ Supports up to eight fibre channel HBAs per computer

■ Detects up to 99 devices per HBA

■ Displays a maximum of 16 devices during the boot process

System Requirements

■ Intel Pentium Class computer, with system BIOS copyright 1995 or later

■ MS-DOS 6.0 or higher

■ Windows NT 4.0 installation media

■ Installed HBA

- Connected fibre channel RA8000 or ESA12000

- Media containing the SCSI Miniport driver

- *I386DNLD.EXE* diagnostic utility, version 8.5 or higher

RA8000 or ESA12000 Boot Setup

This set up is the same for all x86 systems.

1. Follow the instructions in the *Microsoft Windows NT i386 RA8000/ES12000 Solutions Software Kit* version 8.5.

2. Refer to the *Compaq StorageWorks HSG80 Array Controller ACS version 8.5 Configuration and CLI Reference Guide* to run the DILX utility.

3. Running this utility in standard mode on the boot drive removes any old file information that might be on the drive.

4. Sample of DILX utility:

   HSG >run dilx

Disk In-line Exerciser

It is recommended that DILX only be run when there is no host activity present on the HBA.

Do you want to continue (y/n) [n] ?y

The Auto-Configure Option

The Auto-Configure option does the following:

- Automatically tests all of the drive units configured (selection of specific drive units not permitted)

- Performs a very thorough test with writes enabled

- Only provides run time and performance summary options

- Is only recommended for initial installations

Do you wish to perform an Auto-Configure (y/n) [n] ?

Use all defaults and run in read only mode (y/n) [y] ?n
Enter execution time limit in minutes (1:65535) [10] ?
Include performance statistics in performance summary (y/n) [n] ?
Display hard/soft errors (y/n) [n] ?
Enter IO queue depth (1:8) [4] ?
***Available tests are:

1. Basic function

2. User defined

Use the basic function test 99.9% of the time. The user defined test is for special
problems only.
Enter test number (1:2) [1] ?2

In the user defined test, you may define up to 20 commands.
They will be executed in the order entered.
The commands will be repeated until the execution time limit expires.

⚠ **CAUTION:** If you define write commands, user data will be destroyed.

Enter command number 1 (read, write, quit) [] ?write.
Enter data pattern number 0 = ALL, 19 = USER_DEFINED, (0:19) [0] ?
Enter starting lbn for this command ?0
Enter the IO size in 512 byte blocks for this command (1:64 [] ?64
Enter command number 2 (read, write, quit) [] ?quit.
Drive unit numbers available for testing on this HBA include:
0.
Enter unit number to be tested ?0.
Unit 0 will be write enabled.
Do you wish to add this unit (y/n) [n] ?y.
Unit 0 successfully allocated for testing.
Maximum number of units are now configured.
DILX testing started at : 20:06:34.
Test will run for 10 minutes.
Type ^G to get a current performance summary.
Type ^C to terminate the DILX test prematurely.
Type ^Y to terminate the DILX prematurely.

DILX terminated prematurely by user request
DILX aborting, abort code 8
HSG BOT3(9600) >

Defining a Fibre Channel Drive as the Boot Drive

The following is a summary of the procedures necessary to define a fibre channel hard drive as the boot drive in Windows NT 4.0.

1. Enable Boot BIOS.

2. Create an MS- DOS boot diskette.

3. Designate a fibre channel boot drive.

4. Enable HBA Boot BIOS on a fibre channel hard drive.

5. Install Windows NT 4.0 operating system.

Enabling Boot BIOS

1. Boot your computer in MS-DOS.

2. Insert Diskette #2 Firmware and Download Utility diskette in drive A.

3. Type this command:

    a:\>I386DNLD.EXE

The *i386DNLD.EXE* Main menu appears.

I386DNLD.EXE Main Menu
1. Test Host Adapters
2. Modify Test Options
3. Restart Host Adapters
4. Input/Output
5. Maintenance
6. Show Host Adapters Info
7. Quit

From the *I386DNLD.EXE* Main menu:

4. Type 5 and press **Enter**.

   This opens the Maintenance menu.

5. Type 3 and press **Enter**.

   This enables the Boot BIOS.

6. Type 0 and press the **Enter** key to return to the previous menu.

7. Type 7 and press **Enter** to exit the *I386DNLD.EXE* program.

Creating an MS-DOS Boot Diskette

From MS-DOS:

1. Create a bootable diskette by typing this command:

   Format a:/s

2. Copy these files onto the diskette.

   format.com
   fdisk.exe

3. Reboot your computer using the diskette and then verify that your computer boots properly.

4. Power down your computer.

5. Disable any IDE or SCSI Boot BIOS or disconnect the IDE or SCSI hard drive from its controller.

Designating a Fibre Channel Boot Drive on Your Computer

This procedure lets you select a fibre channel boot drive. Make all the connections between your boot HBA(s) and your storage devices.

1. Insert the newly created boot diskette in drive A.

2. Turn on your computer.

3. Press the **F5** key immediately when the message appears to go to the Emulex BIOS Utility.

> **NOTE:** Press the **F5** key within five seconds of the displayed message to invoke the Boot BIOS utility.

The Main menu screen appears showing a list of HBAs.

Host Bus Adapter BIOS Utility
Host Bus Adapters in the System:

1. ALPA: 18	PCI BUS #: 00	PCI DEVICE #: 10
2. ALPA: 01	PCI BUS #: 00	PCI DEVICE #: 0E
Enter a selection.		
Enter <x> to Exit.		

4. Select the HBA by entering the appropriate number.

   Any fibre channel drive attached to the HBA can be designated as the boot device.

Adapter 1:	ALPA: 18	PCI BUS#: 00	PCI DEVICE #: 10

1. Configure legacy private loop.
2. Configure boot devices.
3. Enable or disable BIOS on the adapter.
4. Change default ALPA of this device.
5. Changed Extended Link Service Timer (+ Advanced Option +).
6. Change FC Link Timer (+ Advanced Option +).
7. Change PLOGI Retry Timer (+ Advanced Option +).
8. Topology Selections (+ Advanced Option +).

Enter a Selection:

Enter <x> to Exit	<F6> to Default Values	<PageUp> to previous menu

5. Type 8 to select a Topology Selection. Enter a selection and then press the **PageUp** key.

6. Type 2 to select Configure Boot Devices:

   a. Select a boot entry

   b. Enter a selection

   c. Select the desired boot device. Enter a selection and then press the **PageUp** key.

7. Type 3 to enable or disable the BIOS on this HBA. Enter a selection and then press the **PageUp** key.

8. Type x to Exit.

9. Select y to reboot.

Formatting the Fibre Channel Drive on Your Computer

⚠ **CAUTION:** Ensure that your computer's IDE or SCSI hard drive is disabled before continuing. This lets the fibre channel drive boot, and prevents accidental erasure of the computer hard drive data during the following format procedure.

From the MS-DOS prompt:

1. Use the fdisk command to create a primary MS-DOS partition (maximum size) on the fibre channel hard drive.

2. Format the fibre channel hard drive using the copy system files option.

   a: \format c: /s

Enabling HBA Boot BIOS on a Fibre Channel Hard Drive

Purpose

This configuration procedure takes you through the steps necessary to enable the Boot BIOS and install the Windows NT 4.0 operating system on a designated fibre channel hard drive used as the boot drive.

Enabling the Boot BIOS

1. Install an HBA into any open PCI slot.

2. Connect fibre cables from the FC interconnect device, hub or switch to a RA8000 or ESA12000 and the HBA.

3. Configure your storage logical units and set the topology to your environment.

4. Boot your computer with the supplied Smart-Start CD version 4.30A.

5. Run the system erase utility. Your computer will have to be power cycled, but leave CD in.

6. When your computer boots, choose Installation using your language.

7. Set the Region Properties (time and date).

8. Select agree to Compaq Smart-Start Licensing prompt and then click Next.

9. Choose Manual Configuration instead of the defaulted Assisted Integration.

10. Select OS-Microsoft NT 4.0 for Select and then click Next. Verify OS type and then click Next.

12. Smart-Start prompts to create support diskettes. Proceed without creating these diskettes, after which the computer reboots and starts the System Configuration Utility.

13. After the System Configuration Utility runs, save the settings and reboot.

14. Use an MS-DOS boot diskette to boot your computer.

15. Insert the HBA driver diskette and run the *I386DNLD.EXE* diagnostic utility.

16. Enter the Firmware Maintenance option and enable the Boot BIOS. Exit the *I386DNLD.EXE* program.

17. Reboot your computer using the MS-DOS boot diskette to verify your computer is operating properly.

18. Power your computer down.

19. Boot your computer using the MS-DOS boot diskette.

20. Press the **F5** key when prompted to enter the HBA BIOS utility.

21. Select the HBA detected.

22. Select a device on the HBA that you designate as the boot device. Choose device 01.

23. Return to the previous menu and enable the Boot BIOS on the HBA.

24. Enable the BIOS on the selected drive.

25. Exit the Boot BIOS and reboot your computer using the MS-DOS diskette.

26. From MS-DOS run fdisk.

27. Delete any previous partition on the logical unit and then create a new partition using the entire unit.

28. Reboot your computer to let the fdisk changes take effect.

29. Follow the Windows NT 4.0 setup procedure to install the Windows NT 4.0 operating system on the selected fibre channel boot drive.

Installing Windows NT

These steps summarize the installation script provided by Windows NT. Consult the Windows NT documentation for detailed descriptions.

1. Boot your computer with the Windows NT installation diskette #1 in drive A.

2. When prompted the first time, press the **Enter** key to allow the Windows NT installation to detect the CD-ROM drive.

3. When prompted a second time, press the **S** key to skip mass storage device detection.

   NOTE: Bypassing this step permits manual detection of additional HBAs.

4. Select other and press **Enter**.

5. From the supplied software kit Insert Diskette # 2 I386 Driver, Windows NT SCSI driver diskette.

6. Select the Fibre Channel SCSI driver and press **Enter**.

7. Insert the Windows NT CD-ROM when prompted.

8. Insert the driver diskette when prompted.

9. Complete the setup process by following the Windows NT prompts.

Your computer should boot up Windows NT from the fibre channel hard drive. You can now use it as installed or install another operating system.

Appendix **A**

Regulatory Compliance Notices

FCC Compliance Information Statement
Model LP8000-F1 (1 X 9)

LightPulse™ LP8000 Fibre
Channel Host Adapter   **FC1020016**

FC

Tested to Comply
With FCC Standards

FOR HOME OR OFFICE USE
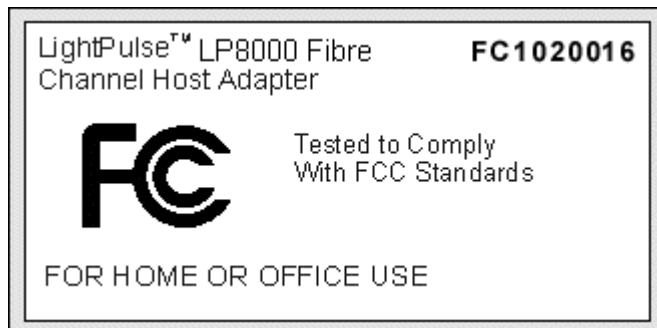
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party: Paul Folino, President & CEO,
Emulex Corporation,
3535 Harbor Blvd.,
Costa Mesa, CA 92626, USA, (714) 662-5600

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

■ Reorient or relocate the receiving antenna.

■ Increase the separation between the equipment and receiver.

■ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

■ Consult the dealer or an experienced radio/TV technician for help.

The reader is cautioned that any changes or modifications to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment.

Reference Manual Statements for Class B Equipment

VCCI

この装置は，情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＢ情報技術装置です。この装置は，家庭環境で使用することを目的としていますが，この装置がラジオやテレビジョン受信機に近接して使用されると，受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。

Federal Communications Commission Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Any modifications to this device - unless expressly approved by the manufacturer - can void the user's authority to operate this equipment under part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) This device must accept any interference that may cause undesirable operation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

■ Reorient or relocate the receiving antenna.

■ Increase the separation between the equipment and receiver.

■ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

■ Consult the dealer or an experienced radio/TV technician for help.

NOTE: Additional information on the need to interconnect the device with shielded (data) cables or the need for special devices, such as ferrite beads on cables, is required if such means of interference suppression was used in the qualification test for the device. This information will vary from device to device and needs to be obtained from the EMC group or product manager.

Glossary

ALPA Arbitrated Loop Physical Address. The address of a fibre channel node in an arbitrated loop.

Arbitration The process of selecting one respondent from a collection of several candidates that request service at the same time.

b/s (or bps) Bits per second. The number of energy pulses passing a given point in a transmission medium in one second; raw transmission speed before encoding.

Bandwidth A measure of the information-carrying capacity of an optical fiber, normalized to a unit of MHz km. This term is used to specify capacity of multi-mode fibers only. (For single-mode fibers, use dispersion). The difference between the highest and lowest frequencies in a specific range of frequencies.

Baud A unit of signaling speed equal to the number of signal intervals per second, which might or might not be equal to the data rate in bits per second. The encoded bit rate per second.

BIOS Basic Input/Output system. Software coded into the computer chips to accomplish various tasks.

Boot BIOS Software coded into the chips on the HBA. A special program used to boot and control the computer.

Broadband In data transmission, it denotes transmission facilities capable of handling frequencies greater than those required for high-grade voice communications. The higher frequency allows the carrying of several simultaneous channels.

Cladding	The dielectric material surrounding the core of an electrical fiber or material surrounding the core of a fiber optic cable. It usually refers to diameter, often 125 m measured in microns.
Connector	A mechanical device used to align and join two fibers together to provide a means for attaching and decoupling it to a transmitter, receiver, or another fiber.
Core	The central region of an optical fiber through which light is transmitted.
Custom Device Module (CDM)	A CDM is the driver component in the NetWare Peripheral Architecture used to drive specific storage devices attached to the HBA. The NPA separates NetWare driver support into two components: a Host Adapter Module (HAM), and a Custom Device Module (CDM).
Data Rate	The maximum number of bits of information that can be transmitted per second in a data transmission link. It is typically expressed as Megabits per second (Mbps).
Device Driver	A software program that enables a personal computer to communicate with hard drives, CD-ROM drives, printers, and other peripherals. Device drivers are stored on a hard drive and are loaded into memory at boot up.
Duplex Cable	A two-fiber cable suitable for duplex transmission or transmissions in two directions.
Duplex Transmission	Transmission in both directions, either one direction at a time (half duplex) or both directions simultaneously (full duplex).
Fabric	A fibre channel interconnection method that allows multiple simultaneous and concurrent data transfers between multiple hosts and/or storage devices connected with a multi-port hub.
FC-AL	Abbreviation for Fibre Channel Arbitrated Loop, an interconnection scheme that supports from 1 to 126 ports on a loop in a shared medium topology.
FCP	Fibre Channel Protocol.
FDDI	Fibre Distributed Data Interface. A network based on the use of optical-fiber cable to transmit data at 100Mbit/sec.

Fiber	Thin filament of glass. An optical waveguide consisting of a core and cladding, which is capable of carrying information in the form of light. Fibre is also a general term used to cover all physical media types supported by Fibre Channel, such as optical fiber, twisted pair, and coaxial cable.
Fiber Optics	Light transmission through optical fibers for communication or signaling.
Fibre Channel	A high-speed, serial, bi-directional, topology independent, multi-protocol, highly scaleable interconnection between computers, peripherals, and networks.
GLM	Gigabit Link Module. A transmitter and receiver that provides high-speed serial links, enabling continuous throughput in each direction simultaneously.
Host Adapter Module (HAM)	A HAM is the driver component used to drive specific HBA hardware in the NetWare Peripheral Architecture (NPA).
Interrupt Request (IRQ)	Network boards are supplied with default settings for the IRQ, I/O port and base memory address. An IRQ is a signal protocol used by hardware devices, such as printers and modems, to let the computer know that they need some attention. When an IRQ is invoked, the CPU puts its other work 'on hold' and services the needs of the interrupting device.
Kilometer	1,000 meters or 3,281 feet. The kilometer is a unit of measurement commonly used in fiber optics. To convert kilometers to miles, multiply the number of kilometers by .62 to achieve the number of miles. To convert miles to kilometers, multiply the number of miles by 1.61 to achieve the number in kilometers.
Laser	Light Amplification by Stimulated Emission of Radiation. A device that produces coherent light with a narrow range of wavelengths.
Latency	Delay in transmission; can be caused by arbitration time prior to winning control of the network.
Light	In the laser and optical communication fields, the portion of the electromagnetic spectrum that can be handled by the basic optical techniques used for the visible spectrum extending form the near ultraviolet region of approximately 0.3 micron, through the visible region and into the mid-infrared region of about 30 microns.
Light Emitting Diode (LED)	A device used in a transmitter to convert information from electrical to optical form. It typically has a large spectral width.

Lightwaves	Electromagnetic waves in the region of optical frequencies. The time "light" was originally restricted to radiation visible to the human eye, with wavelengths between 400 and 700 nanometers (nm). However, it has become customary to refer to radiation in the spectral regions adjacent to visible light (in the near infrared from 700 to about 2000 nm) as "light" to emphasize the physical and technical characteristics.
Link	A fiber optic cable with connectors attached to a transmitter (source) and receiver (detector).
Longwave	Refers to length of the wave or frequency in the spectrum of light. 780 nm is the operating range of short wave lasers, while 1300 nm describes the range of long wave lasers.
LUN	Logical Unit Number. A three-bit identifier for a Logical Unit. The maximum number of LUNs per SCSI target is 8, numbered LUN0 through LUN7.
Mb/s	Megabits per second or 1,000 bits per second. A reference to processing speed.
MB/s	Megabytes per second or 1,000 bytes per second. A reference to processing speed.
Media Manager (MM)	A database built into NetWare that keeps track of all peripheral storage devices and media attached to NetWare servers, and allows applications to gain access and get information. The Media Manager receives application I/O requests and converts them to messages compatible with the NPA architecture.
MIA	Media Interface Adapter. This device allows a conversion from fiber optic cable to copper media.
Micron (mm)	Another term for micrometer. One millionth of a meter. 10^{-6} meter.
Mode	A term used to describe a light path through a fiber, as in multi-mode or single-mode.
Multi-initiators	Two different fibre channel HBAs in one arbitrated loop sharing the same storage devices, but not communicating with each other.
Multi-Mode Fiber	An optical waveguide in which light travels in multiple modes. Typical core/cladding sized (measured in microns) are 50/125, 62.5/125, and 100/140.
Multiplexing	The process by which two or more signals are transmitted over a single communications channel.

nm	Nanometer. A unit of measurement equal to one billionth of a meter. 10exp-9 meter.
Non-OFC	Non-Open Fiber Control. GLMs that do not contain OFC control but still guarantee laser emission levels to be below Class 1.
OFC	Open Fiber Control. A power monitoring/control system which continuously monitors the optical fiber link between two ports and prevents any laser emission from exceeding Class 1 levels in the event of a break anywhere in the path.
Optical Waveguide	Dielectric waveguide with a core consisting of optically transparent material or low attenuation (usually silica glass) and with cladding consisting of optically transparent material of lower refractive index than that of the core. It is used for the transmission of signals with lightwaves and is frequently referred to as fiber.
PCI Bus #	An internal Peripheral Connect Interface bus number in a computer. BCI Bus # is set by the computer system's BIOS, and in most cases, the number is zero.
PCI Device #	PCI slot number in a computer.
Point-To-Point (PTP)	A connection established between two specific locations, as between two buildings.
Protocol	A data transmission convention encompassing timing, control, formatting, and data representation.
SCSI	Small Computer Systems Interface.
SelectID	Used to configure Seagate drives. A matrix for relating ALPA (hex) numbers to SelectID (hex) numbers.
Shortwave	Refers to length of the wave or frequency in the spectrum of light. 780 nm is the operating range of short wave lasers, while 1300nm describes the range of long wave lasers.
Simplex Cable	A term sometimes used for a single-fiber cable.
Simplex Transmission	Transmission in one direction only.

Single-Mode Fiber   An optical waveguide (or fiber) with a small core diameter in which only a single mode is capable of propagation. This type of fiber is particularly suitable for wideband transmission over large distances, since its bandwidth is limited only by chromatic dispersion.

Topology   The logical and/or physical arrangement of stations on a network.

Transducer   A device for converting energy from one form to another, such as optical energy to electrical energy.

ULP   Upper Level Protocol.

Waveguide   Structure that guides electromagnetic waves along its length. An optical fiber is an optical waveguide.

Wavelength   The distance between two crests of an electromagnetic waveform.

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