hp StorageWorks

host bus adapter for Windows NT, Windows 2000, and Linux installation guide

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This guide describes how to install, configure, and use the diagnostic utilities for the host bus adapter for Windows NT, Windows 2000, and Linux platforms.

hp

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About this Guide

This user guide provides information to help you:

- Install, configure, and use the diagnostic utilities for the host bus adapter for Windows and Linux platforms.

- Contact technical support for additional assistance

Intended Audience

This book is intended for use by system administrators who are experienced with the following:

- Windows NT, Windows 2000, and Linux operating systems

- Host bus adapters

Related Documentation

In addition to this guide, refer to the Release Notes for Windows 2000, Windows NT, and Linux 64-bit PCI to Fibre Channel Host Bus Adapter.

Document Conventions

The conventions included in Table 1 apply.

Table 1: Document Conventions

Element	Convention
Cross-reference links	Blue text: Figure 1
Key names, menu items, buttons, and dialog box titles	**Bold**
File names, application names, and text emphasis	*Italics*
User input, command names, system responses (output and messages)	`Monospace font` `COMMAND NAMES` are uppercase unless they are case sensitive
Variables	*`Monospace, italic font`*
Website addresses	Sans serif font (http://thenew.hp.com)

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 data.

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

Any enclosed 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. Contact with this surface could result in injury.

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 presence of multiple sources of power.

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

Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack Stability

⚠ **WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:**
- **The leveling jacks are extended to the floor.**
- **The full weight of the rack rests on the leveling jacks.**
- **In single rack installations, the stabilizing feet are attached to the rack.**
- **In multiple rack installations, the racks are coupled.**
- **Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.**

Getting Help

If you still have a question after reading this guide, contact an HP authorized service provider or access our website: http://thenew.hp.com.

HP Technical Support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

NOTE: For continuous quality improvement, calls may be recorded or monitored.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support: http://thenew.hp.com/country/us/eng/support.html.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

HP Website

The HP website has the latest information on this product, as well as the latest drivers. Access storage at: http://thenew.hp.com/country/us/eng/prodserv/storage.html. From this website, select the appropriate product or solution.

HP Authorized Reseller

For the name of your nearest HP Authorized Reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP website for locations and telephone numbers: http://thenew.hp.com.

1
Introduction

Overview

This introduction to the Host Bus Adapter (HBA) includes:

- Product Description
- Performance Specifications
- Boot BIOS Specifications
- Standards
- Agency Approvals

Product Description

The HBA has the following characteristics:

- Robust suite of software supporting Windows 2000, Windows NT, and Linux.
- Optical small form factor (LC) interface LC Fibre connector.
- Embedded optical short-wave laser, multi-mode Fibre Channel interface.
- 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 or PCI-X bus connection.
- 66/100/133MHz PCI-X 1.0a and PCI 2.2 compatibility.
- 266MIPs onboard processor, an embedded 1GB/2GB SERDES, and a high performance unified QDR SRAM.
- Controlled by a 266 MHz, 32-bit Intel StrongARM RISC processor.
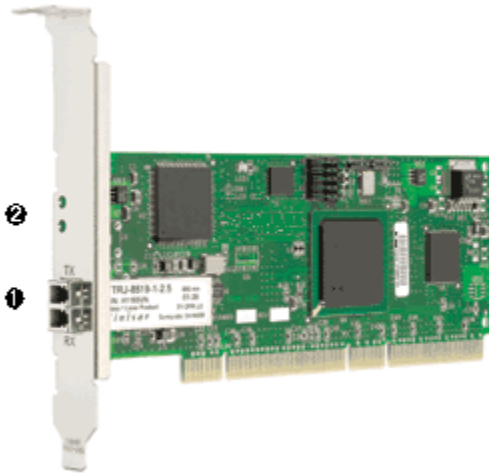
Figure 1–1: Host Bus Adapter

Table 1–1: Host Bus Adapter Diagram Description

Figure Legend	Description
❶	Fibre Channel (LC) connectors.
❷	POST LEDs indicators
	Note: See Table 2–1 and Table 4–1 for detailed descriptions.

Performance Specifications

The PCI-X host bus adapter offers a highly integrated 2Gbps Fibre Channel HBA for use in servers based on either PCI or the latest PCI-X expansion bus. The features of this PCI-X based HBA provide the flexibility and broad interoperability needed for complex, highly scalable SANs.

The HBA also features sophisticated hardware that provides superior performance in SANs and provides best in class server CPU offload. This exclusive hardware delivers low latency and high throughput in switched fabric, arbitrated loop, and clustered environments. Support for fiber optic cabling is provided through an embedded small form factor (LC) optical interface.

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

- Simultaneous full duplex 2 Gbps PCI bus speed data transfers of 400 MBps

- Full fabric support using F_PORT and FL_Port connections

- Full fabric boot support in x86 environments to multiple LUNs

- FC-Tape (FC-2) devices

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

- Storage protocol

- Fibre Channel class 2 and 3

- Automatic speed negotiation and topology detection

- End-to-end parity protection for high data integrity

Collectively, these characteristics create a high-performance Fibre Channel HBA.

Boot BIOS Specifications

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

Boot BIOS supports:

- Multiple topologies: Fabric Point-to-Point and FC-AL Private Loop

- Multiple boot compliance

- Supports Enhanced Disk Driver Services (EDD) Version 3.0

- A maximum of four Fibre Channel HBAs per server, depending on which *StorageWorks* product you are using.

- Up to 256 LUNs, with up to eight LUN entries per target ID

- Detecting up to 99 devices per HBA

- Displaying a maximum of 16 devices during the boot process

Boot BIOS System Requirements

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

- MS-DOS 6.0 or higher

- Windows NT 4.0 or Windows 2000 installation media

- Installed HBA
- Media containing the SCSI Miniport driver
- DOS Diagnostic utility, X86DNLD

Enabling Boot BIOS and External Boot

All HBAs have the BIOS firmware installed as a factory default. However, the BIOS functionality is not enabled.

In addition, you can optionally eliminate server-based, internal boot devices and boot from an external device to improve performance.

Refer to the BIOS Readme file on the HBA software kit as well as the documentation for your StorageWorks product for the following up-to-date information for enabling boot BIOS and external Boot:

- Enabling boot BIOS on an HBA
- Attaching HBAs in a supported configuration
- Enabling external boot for supported configurations

In addition, the HP website has the latest information on Boot BIOS upgrades. Access the HP website at: http://thenew.hp.com/country/us/eng/prodserv/storage.html.

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, Revisions 2.1 and 2.2
- Fibre Channel Class 1, 2, 3

Agency Approvals

The HBA has the following agency approvals:

- CFR Title 21, Laser AEL Class 1, FDA/CDRH
- UL recognized to UL1950
- CUR recognized to CSA22.2, No.950
- IEC 950 (1991) + Amendments 1, 2, 3, 4, and 11
- EN60950 (1992) + Amendments 1, 2, 3, 4, and 11
- EN68025-1 (1994) + Amendment 11
- EN68025-2 (1994)
- TUV certified to EN60950
- FCC Rules, CFR Title 47, Part 15, Subpart B, Class A
- Industry Canada, ICES-003, Class A
- EN55022 (1998)/CISPR22 (1997) Class A
- EN55024 (1998)
- European Union Low Voltage Directive 73/23/EEC
- CE-Marking Directive 93/68/EEC (CE Mark)
- EMC Directive 89/336/EEC (as amended by 92/31/EEC)
- Australian EMC Framework (C-Tick Mark)
- AS/NZS 3548:1995, Class A
- VCCI, Class A

2

Installation

Installation Overview

This chapter provides step-by-step instructions for installing the Host Bus Adapter (HBA) including:

- Hardware Requirements

- Recording Reference Numbers

- Installing the HBA into a Computer

- Verifying the Installation

- Configuration Guidelines

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:

- A host computer that provides 3.3VDC bus power

- One open 32- or 64-bit 33/66 MHz PCI or 66/100/133 MHz PCI-X bus slot with either a 3.3 or a 5.0 VDC signaling interface

- Multimode fiber optic cable with LC connector, used with short-wave lasers

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.

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

NOTE: The WWN is a static identifier that cannot be changed.

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 off.

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

3. Wearing a static wrist strap, remove the blank panel from an empty 32- or 64-bit PCI or PCI-X bus slot.

   Compare the removed panel to the bracket on the host bus adapter. Follow steps 4-7 to change the bracket if they are different sizes.

NOTE: The host bus adapter comes with a standard PCI bracket installed. The low-profile mounting bracket is shorter than the standard bracket; approximately 3.11 in. (7.9cm) compared to 4.75 in. (12.06 cm) long.

4. Remove the mounting bracket screws from the top of the host bus adapter.

5. Remove the bracket and store it for future use.

6. Align the new mounting bracket tabs with the holes in the HBA.

NOTE: Be careful not to push the bracket past the transceiver housing's grounding tabs.

7. Replace the screws that attach the HBA to the bracket.

8. Insert the HBA into the empty PCI or PCI-X bus slot; press firmly until it is seated securely.

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

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

11. Attach media:

   a. Connect the fiber optic cable to the LC connector on the HBA.

   b. Connect the other end of the cable to the Fibre Channel device.

NOTE: The HBA does not allow normal data transmission on an optical link unless it is connected to a similar or compatible laser product. That is, both products are multimode to multimode.

Verifying the Installation

To verify the HBA is properly installed and is operating:

1. Turn on the computer.

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 guide. The green LED indicates power functions and the amber LED signifies port activity. The amber LED blinks at all times during normal operation. Table 2–1 lists normal LED indications.

Table 2–1: Normal POST LED Indicators

Amber LED (L1)	Green LED (L2)	State
Off	Off	Wake-up failure (dead board)
On	Off	POST failure (dead board)
Slow blink (1 Hz)	Off	Wake-up failure (dead board)
Fast blink (4 Hz)	Off	Failure in POST (dead board)
Flashing (irregular)	Off	POST processing in progress
Off	On	Failure while functioning
On	On	Failure while functioning
Slow blink (1 Hz)	On	Normal—1 Gb link rate
Fast blink (4 Hz)	On	Normal—2 Gb link rate
Off	Blink (1 Hz)	Normal—link down or not yet started

Configuration Guidelines

The software for loading the driver also contains the default registry parameter settings that are loaded as part of the driver installation. Consult the following sources for any restriction and for information on supported configurations specific to your operating system and topology.

- Release Notes
- HP Website at: http://thenew.hp.com/country/us/eng/support.html.

3
Installing the SCSI Miniport Driver

Introduction

This chapter contains step-by-step instructions for installing the Windows NT, Windows 2000, and Linux SCSI Miniport drivers.

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

The software kit that is included with the HBA contains the latest version of the HBA's files and drivers at the time of shipment. Software files are updated periodically and can be obtained from the HP website at:
http://thenew.hp.com/country/us/eng/prodserv/storage.html.

NOTE: This chapter describes the steps for installing the device driver and for accessing Fibre Channel storage devices. For other configuration changes, see Chapter 5, Modify Diagnostic Driver Parameters in the Windows Registry.

Windows NT Device Driver Installation

This section describes the instructions for installing the Windows NT SCSI Miniport driver.

Windows NT 4.0 System Requirements

Ensure that your system has Windows NT 4.0 and Service Pack 6A or higher.

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

Installing the Windows NT SCSI Miniport Driver

Use the following procedure to installing the SCSI device driver and registry parameters for the first time.

From the Windows NT desktop:

1. Click **Start > Settings > Control Panel**.

2. Double-click the **SCSI Adapters** icon.

3. Choose the **Drivers** tab.

4. Click **Add**.

5. Click **Have Disk** and choose the location of the HBA kit.

6. Choose the Fibre Channel SCSI driver and then click **OK**.

7. Click **Install** and continue to install the driver.

8. Reboot the computer to restart Windows NT.

9. Verify the driver installation from the Windows NT desktop:

   a. Click **Start > Settings > Control Panel**.

   b. Double-click the **SCSI Adapters** icon.

   c. Choose the **Drivers** tab. Verify that the SCSI Miniport driver is present and started.

   d. Choose the **Default** tab. Verify that the HBA is present.

   e. Click the plus symbol (**+**) to expand the adapter list. Verify that the connected storage device is listed.

Removing the Windows NT SCSI Device Driver

To remove the device driver from the Windows NT desktop:

1. Click **Start > Settings > Control Panel**.

2. Double-click the **SCSI Adapters** icon.

3. Choose the **Drivers** tab.

4. Click **Remove**, and choose **Yes** to confirm.

5. Click **OK**.

6. Reboot the computer to restart Windows NT.

Windows 2000 Device Driver Installation

This section describes the instructions for installing the Windows 2000 SCSI Miniport driver.

Windows 2000 System Requirements

Ensure that your system meets these minimum requirements:

- Installed HBA
- Windows 2000 Miniport driver and registry parameter file from the software kit provided with the HBA
- Windows 2000 Service Pack 2 (recommended)
- *StorageWorks* Fibre Channel Storage subsystem (interconnect device and storage device)

Installing the Windows 2000 SCSI Miniport Driver

This section contains the steps for installing the Windows 2000 SCSI Miniport device driver on a Windows 2000 server.

From the Windows 2000 desktop:

1. Click **Start > Settings > Control Panel**.
2. Double-click **Administrative Tools**.
3. Double-click **Computer Management**.
4. Click **Device Manager**.
5. Open the SCSI and RAID controllers item in the list.
6. Choose the **Drivers** tab.
7. Choose **Update Driver** and click **Next**.
8. Choose **Display a list of known drivers for this device so that I can choose a specific driver** and click **Next**.
9. Click **Have Disk** and browse to the location of the HBA kit.
10. Choose the *.inf* file for the HBA, click **Open**, click **OK**.
11. Choose the HBA, click **Next**, click **Next**.

12. Click **Yes** to restart Windows 2000.

13. Verify the device driver installation:

   a. Click **Start > Settings > Control Panel**.

   b. Double-click the **System** icon.

   c. Click **Device Manager**.

   d. Verify that the SCSI Miniport driver is present and started.

Removing the Windows 2000 SCSI Device Driver

To remove the device driver from the Windows 2000 desktop:

1. Click **Start > Settings > Control Panel**.

2. Double-click the **System** icon.

3. Click **Device Manager**.

4. Open the SCSI and RAID controllers item in the list.

5. Click **Remove**.

6. Choose **Yes** to confirm.

7. Click **OK**.

8. Reboot the computer to restart Windows 2000.

Linux Device Driver Installation

This section describes the instructions for installing the Linux SCSI Miniport driver.

Linux System Requirements

Ensure that your system meets these minimum requirements:

- Installed HBA

- Linux Miniport driver and registry parameter file from the software kit provided with the HBA

- Linux operating system

- *StorageWorks* Fibre Channel Storage subsystem (interconnect device and storage device)

Installing the Linux Driver Using a Tar File

To install the driver and boot the system, you must be running as root.

1. Enter the following command to create a temporary directory (for example, emlxtemp).

   # mkdir emlxtemp

2. Enter the following command to change directory to the temporary directory.

   # cd emlxtemp

3. Copy or download the device driver file to the temporary directory.

4. Enter the following command if the file is in the format filename.rpm.Z:

   # tar xvzf   filename.tar.Z

   or else untar the driver file.

   # tar xvf   filename.tar

   The package unzips to one SourceBuild directory.

5. Enter the following command to change directory to the SourceBuild directory.

   # cd SourceBuild

   This becomes the driver_installation_directory.

Installing the Linux Driver Using an RPM File

To install the driver and boot the system, you must be running as root.

1. Enter the following command to create a temporary directory (for example, emlxtemp).

   # mkdir emlxtemp

2. Enter the following command to change directory to the temporary directory.

   # cd emlxtemp

3. Copy or download the device driver RPM file to the temporary directory.

4. Enter the following command if the file is in the format filename.rpm.Z and kernel source files are installed:

   # uncompress filename.rpm.Z

5. Enter the following command to install the driver into /usr/src/linux/drivers/scsi/lpfc, the driver_installation_directory.

   # rpm -i filename.rpm

6. Enter the following command to install the driver into /usr/src/<kernelsource>/drivers/scsi/lpfc, the driver_installation_directory.

   # rpm -i --prefix /usr/src/<kernelsource>/drivers/scsi/lpfc filename.rpm

   If the prefix option is used you must update BASEINCLUDE in the Makefile placed in the installation directory.

7. Enter the following command to verify that the RPM installation was successful:

   # rpm -a -q | grep lpfc

8. Enter the following command to remove the RPM type:

   # rpm -e rpm_name

9. Enter the following command to change directory to driver_installation_directory.

   # cd /usr/src/<kernelsource>/drivers/scsi/lpfc

Building the Driver as a Module

Once you have installed the source file, you can build the driver as a module.

1. At the shell prompt, edit lpfc.conf.c to reflect your desired configuration.

2. Enter the following command to verify that both kernel-headers and kernel-source RPMs are installed:

   # rpm -a -q | grep kernel

3. Enter the following command to install the kernel-headers and kernel-source RPMs if they are not installed:

   # rpm -i kernel-headers*
   # rpm -i kernel-source*

NOTE: Red Hat Version 7.3 does not recognize kernel headers. Kernel headers is replaced by glibc_kernelheaders.rpm.

By default, the driver looks for the kernel source under /usr/src/linux. If the source resides under a different directory, there are two ways to enable the driver to locate the kernel source.

4. Enter the following command if the kernel source resides in /usr/src/<kernelsource>:

   # ln -sf /usr/src/<kernelsource> /usr/src/linux

   A directory listing similar to the following displays:

   ```
   lrwxrwxrwx   1      root   root   11   Aug 2 13:51 linux -> linux-2.4.4
   drwxr-xr-x   14     1046   101    4096 Aug 2 13:51 linux-2.4.4
   ```

   Or change the BASEINCLUDE variable in Makefile to point to the correct location. For example:

   BASEINCLUDE = /usr/src/kernelsource

5. Enter the following command to verify the kernel type (SMP or non-SMP):

   # uname -r

6. Only for non-SMP kernel module (i386 platform only), edit the Makefile and delete the following text:

   -D__SMP__=1 \

   The edited text should now display as follows:

   ```
   # For 32-bit environment
   # If this is not a SMP environment remove the -D__SMP__=1 from CFLAGSCFLAGS =
   -D__KERNEL__=1 \
        $[MODINC] $[INCLUDEDIR]
   ```

7. For SuSE Linux, enter the following ifconfig command (all on one line):

   # cp /boot/vmlinuz.version.h /lib/modules/'uname-r'/build/include/linux/version.h

8. Enter the following command to build the drivers:

   # make build

   This will create the driver files similar to the following:

   ```
   -rw-r--r--   1 root   root   226200 Aug 13 10:33 lpfcdd.2.4.4.o
   -rw-r--r--   1 root   root   3334 Aug 13 10:33 lpfndd.2.4.4.o
   ```

9. Enter the following command to install both drivers under /lib/modules/kernel_version:

   # make install

Loading the Driver

There are two ways to load the driver: manually or through the RAM disk image.

Loading the Driver Manually

1. Enter the following commands:

   ```
   # insmod lpfcdd
   # insmod lpfndd
   ```

   lpfcdd - main driver, SCSI functionality, FCP support, diagnostic support

   lpfndd - IP support (this driver is dependent on lpfcdd being loaded first)

2. Enter the following command to bring up the interface:

   ```
   Edit /etc/sysconfig/network-scripts/ifcfg-lpfnX.
   ```

3. On SuSE, run the ifconfig command (all on one line) to configure the interface:

   ```
   insmod lpfndd
   ifconfig lpfn X inet 172.16.0.1 netmask 255.255.255.0
   broadcast 199.199.255.255
   ```

   Where X is the interface number, 0 through 7. This file should be created if you wish to configure IP. An example of this file:

   ```
   DEVICE=lpfn0IPADDR=138.239.40.6
   BROADCAST=138.239.40.255
   NETWORK=138.239.40.0
   NETMASK=255.255.255.0
   ONBOOT=yes
   ```

4. Enter the following command to manually bring up the IP interface:

   ```
   ifup lpfnX
   ```

   Where X is the interface number, 0 through 7.

5. Enter the following commands if the system does not have a SCSI driver loaded:

   ```
   # insmod scsi_mod
   # insmod sd_mod
   ```

   Rebooting the system will unload the driver. You should include the above commands in a start up script to automatically load the driver.

Loading the Driver Through the RAM Disk Image

1. To add SCSI and IP modules, edit /etc/conf.modules or modules.conf, depending on the Linux release.

   Add the following line to add a SCSI module:

   alias scsi_hostadapter lpfcdd

   Add the following line to add an IP module:

   alias lpfnX lpfndd

   where X is the interface number, 0 through 7.

   NOTE: If you want to configure SCSI only, just add the scsi_hostadapter line. The IP module is dependent on the SCSI modules being there, so you cannot configure just IP.

2. Run the following command to update your system with the information you added to /etc/conf.modules:

   # depmod -a

   Edit /etc/sysconfig/network-scripts/ifcfg-lpfnX.

   Where X is the interface number, 0 through 7. This file should be created if you wish to configure IP. An example of this file:

   DEVICE=lpfn0
   IPADDR=138.239.40.6
   BROADCAST=138.239.40.255
   NETWORK=138.239.40.0
   NETMASK=255.255.255.0
   ONBOOT=yes

   SuSE does not use the above structure.

3. Run the following script (all on one line) once lpfcdd is loaded to bring up IP:

   insmod lpfndd ifconfig lpfxdd inet n.n.n.n. broadcast n.n.n.n netmaskn.n.n.n.

   Edit /etc/lilo.conf to specify boot / startup parameters. Keep a boot image record that is known to be good, so you can boot the system in case of problems. A boot image record consists of lines between "image=kernel_version" entries. An example of a default /etc/lilo.conf:

   boot=/dev/sda
   map=/boot/map
   install=/boot/boot.bprompt
   timeout=50
   default=linux

```
image=/boot/vmlinuz-kernel_version
label=linux
root=/dev/sda8
initrd=/boot/initrd-kernel_version.imgread-only
```

4. Add the following lines to the end of the file to add a new boot record for the Emulex driver:

```
image=/boot/vmlinuz-kernel_version
label=new_label
root=/dev/sda8
initrd=/boot/new_image_filenameread-only
append="max_scsi_luns=128"
```

NOTE: Currently, lpfc is not supported as the root device, so keep the "root=/dev/xxx" parameter the same.

5. Add the following line to get multiple LUN support:

```
append="max_scsi_luns=LUNs"
```

Where LUNs is the number of LUNs per SCSI device. Adding this line is optional.

6. Run these commands to build the boot image. The boot image new_image_name must match the name specified in the /etc/lilo.conf file:

```
# rm -f /boot/new_image_filename
# /sbin/mkinitrd /boot/new_image_filename kernel_version
```

7. Run these commands to check and load the boot image:

```
# lilo -t -v
# lilo -v
```

8. Reboot the system to incorporate the new driver. At the shell prompt, enter the following:

```
# sync
# reboot
```

9. As the system reboots, you are prompted with LILO boot. At this point enter the name of the label of your boot image, new_label in the above example, or just press enter and the default boot image will be loaded.

Building the Driver Into the Kernel

SCSI Functionality

Once you have installed the source files, you can build the driver into the kernel.

1. Enter the following commands:

   ```
   # mkdir /usr/src/linus/scsi/lpfc
   # find . -print | cpio -pdumv /usr/src/linux/drivers/scsi/lpfc
   # cd /usr/src/linux/drivers/scsi/lpfc
   # cp Makefile.kernel Makefile
   ```

2. Edit the *Makefile* and the *lpfc.conf.c* files, if needed.

3. Enter the following command to change the directory to the Linux source:

   ```
   # cd /usr/src/linux/
   ```

4. Edit *Rules.make* and remove "$(sort and the matching closing parenthesis from this line:

   ```
   subdir-list = $(sort $(patsubst %,_subdir_%,$(SUB_DIRS)))
   ```

   The edited line should now display as follows:

   ```
   subdir-list = $(patsubst %,_subdir_%,$(SUB_DIRS))
   ```

   NOTE: For some 2.4 based kernels, this will allow the scsi/lpfc Makefile to be invoked BEFORE the scsi Makefile.

5. Edit the *Makefile* under the drivers directory:

   ```
   # cd /usr/src/linux/drivers
   # vi Makefile
   ```

6. Add a check for $(CONFIG_SCSI_LPFC) to add scsi/lpfc to the directory lists before $(CONFIG_SCSI) adds scsi to the directory lists. The scsi/lpfc Makefile should be invoked BEFORE the scsi Makefile. Edit the following lines:

   ```
   subdir-$(CONFIG_IDE) += ide
   subdir-$(CONFIG_SCSI) += scsi
   ```

7. Add the following line:

   ```
   subdir-$(CONFIG_SCSI_LPFC) += scsi/lpfc
   ```

The edited lines should now display as follows:

```
subdir-$(CONFIG_IDE) += ide
subdir-$(CONFIG_SCSI_LPFC) += scsi/lpfc
subdir-$(CONFIG_SCSI) += scsi
```

8. Go to the scsi directory:

```
# cd /usr/src/linux/drivers/scsi
```

Edit *Config.in* and locate the following lines (the lines may wrap.):

```
dep_tristate 'EATA-PIO [old DPT PM2001, PM2012A] support' CONFIG_SCSI_EATA_PIO
$CONFIG_SCSI
dep_tristate 'Future Domain 16xx sCSI/AHA-2920A support'
CONFIG_SCSI_FUTURE_DOMAIN $CONFIG_SCSI
```

9. Add the following line (in alphabetical order):

```
dep_tristate 'Emulex LightPulse Fibre Channel support' CONFIG_SCSI_LPFC
$CONFIG_SCSI
```

The edited lines should now display as follows.

```
dep_tristate 'EATA-PIO [old DPT PM2001, PM2012A] support' CONFIG_SCSI_EATA_PIO
$CONFIG_SCSI
dep_tristate 'Emulex LightPulse Fibre Channel support' CONFIG_SCSI_LPFC
$CONFIG_SCSI
dep_tristate 'Future Domain 16xx sCSI/AHA-2920A support'
CONFIG_SCSI_FUTURE_DOMAIN $CONFIG_SCSI
```

10. Edit *Makefile* and add (with other CONFIG_SCSI_devices) a check for
    $(CONFIG_SCSI_LPFC), if defined. Add `lpfcdd.o` to the object list.

11. Locate the following lines:

```
obj-$(CONFIG_SCSI_IPS) += ips.o
obj-$(CONFIG_SCSI_FD_MCS) += fd_mcs.o
obj-$(CONFIG_SCSI_FUTURE_DOMAIN)+= fdomain.o
```

12. Add the following line:

```
obj-$(CONFIG_SCSI_LPFC) += lpfcdd.o
```

The edited lines should now display as follows.

```
obj-$(CONFIG_SCSI_IPS) += ips.o
obj-$(CONFIG_SCSI_LPFC) += lpfcdd.o
obj-$(CONFIG_SCSI_FD_MCS) += fd_mcs.o
obj-$(CONFIG_SCSI_FUTURE_DOMAIN)+= fdomain.o
```

13. For some 2.2 based kernels, edit *hosts.c*. Add the following lines:

```
#ifdef CONFIG_SCSI_LPFC
#include "lpfc/include/fc_os.h"
#endif
```

14. At the end of the definition for Scsi_Host_Template, before "Removable host adapters", add the following lines:

```
#ifdef CONFIG_SCSI_LPFC
    EMULEXFC,
#endif
```

IP Functionality

1. Go to the net directory:

```
# cd /usr/src/linux/drivers/net
```

2. Edit *Config.in*. Edit the following lines:

```
bool 'Fibre Channel driver support' CONFIG_NET_FC
if ["$CONFIG_NET_FC" = "y"]; then
    dep_tristate' Interphase 5526 Tachyon chipset based adapter support'
CONFIG_IPHASE5526 $CONFIG_SCSI$CONFIG_PCI
fi
```

3. Add the following line (all one line):

```
dep_tristate ' Emulex LightPulse Fibre Channel support' CONFIG_NET_LPFC
$CONFIG_SCSI $CONFIG_PCI
```

The edited lines should now display as follows:

```
bool 'Fibre Channel driver support' CONFIG_NET_FC
if ["$CONFIG_NET_FC" = "y"]; then
    dep_tristate' Interphase 5526 Tachyon chipset based adapter support'
CONFIG_IPHASE5526 $CONFIG_SCSI$CONFIG_PCIdep_tristate ' Emulex LightPulse
Fibre Channel support' CONFIG_NET_LPFC $CONFIG_SCSI $CONFIG_PCI
fi
```

4. Locate the following text in *Space.c*:

```
#ifdef CONFIG_NET_FC
static int fcif_probe(struct net_device *dev)
{
if (dev->base_addr == -1)
return 1;
if (1
```

```
#ifdef CONFIG_IPHASE5526
        && iph5526_probe(dev)
#endif

        && 1) {
return 1; /* -ENODEV or -EAGAIN would be more accurate. */

    }
return 0;
}
#endif /* CONFIG_NET_FC */
```

5. Add this text after #ifdef CONFIG_NET_FC:

```
static int lpfnif_probe(struct net_device *dev){
#ifdef CONFIG_LPFC_SCSI
lpfn_probe();
#endif
return 0;
}
```

The edited lines should now display as follows:

```
#ifdef CONFIG_NET_FC
static int lpfnif_probe(struct net_device *dev)

{
#ifdef CONFIG_LPFC_SCSI
lpfn_probe();
#endif
return 0;
}
static int fcif_probe(struct net_device *dev)

{
if (dev->base_addr == -1)
return 1;
if (1
#ifdef CONFIG_IPHASE5526
&& iph5526_probe(dev)
#endif
&& 1) {
return 1; /* -ENODEV or -EAGAIN would be more accurate. */
}
return 0;
}

#endif /* CONFIG_NET_FC */}
```

6. Locate the following lines:

```
#ifdef CONFIG_NET_FC
static struct net_device fc1_dev = {
"fc1", 0, 0, 0, 0, 0, 0, 0, 0, 0, NEXT_DEV, fcif_probe};
static struct net_device fc0_dev = {
"fc0", 0, 0, 0, 0, 0, 0, 0, 0, 0, &fc1_dev, fcif_probe};
# undef NEXT_DEV
# define NEXT_DEV (&fc0_dev)
#endif
```

7. Add these lines after: # define NEXT_DEV (&fc0_dev):

```
static struct net_device lpfn_dev = {
"lpfn", 0, 0, 0, 0, 0, 0, 0, 0, 0, NEXT_DEV, lpfnif_probe};
# undef NEXT_DEV
# define NEXT_DEV (&lpfn_dev)
```

The edited lines display as follows:

```
#ifdef CONFIG_NET_FC
static struct net_device fc1_dev = {
"fc1", 0, 0, 0, 0, 0, 0, 0, 0, 0, NEXT_DEV, fcif_probe};
static struct net_device fc0_dev = {
"fc0", 0, 0, 0, 0, 0, 0, 0, 0, 0, &fc1_dev, fcif_probe};
# undef NEXT_DEV
# define NEXT_DEV (&fc0_dev)static struct net_device lpfn_dev = {
"lpfn", 0, 0, 0, 0, 0, 0, 0, 0, 0, NEXT_DEV, lpfnif_probe};
# undef NEXT_DEV
# define NEXT_DEV (&lpfn_dev)
#endif
```

8. Follow the normal procedures for building the Linux kernel and include all Emulex LightPulse Fibre Channel support:

```
# cd /usr/src/linux
# make mrproper
# make menuconfig
```

9. Choose 'Emulex LightPulse Fibre Channel support' under SCSI low level drivers for FCP support.

10. Choose "Fibre Channel driver support" "Emulex LightPulse Fibre Channel support" under Network Drive support for IP support.

11. Choose any other options that may be required.

12. Build the new kernel and modules:

```
# make dep
# make clean
# make install
# make modules
# make modules_install
```

1. Edit lilo.conf to reflect the new kernel and run mkinitrd and lilo as explained in the procedure for Building the Driver as a Module.

2. Reboot with the new kernel.

Setting up and Running Diagnostic Utilities

1. Go to the driver source directory.

```
# cd driver_installation_directory
```

2. Enter one of the following commands to run the diagnostic utilities:

```
# ./lputil
or
# ./dfc
```

Installing the Latest Version of HBA API and Utilities

1. Enter the following command to install the latest version of HBA API and utilities:

```
# sh Install.sh
```

4

Troubleshooting

Introduction

The Power-On Self Test (POST) and the Windows Event Viewer are troubleshooting utilities you can use for the 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 guide.

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: Normal POST LED Indicators

Amber LED (L1)	Green LED (L2)	State
Off	Off	Wake-up failure (dead board)
On	Off	POST failure (dead board)
Slow blink (1 Hz)	Off	Wake-up failure (dead board)
Fast blink (4 Hz)	Off	Failure in POST (dead board)
Flashing (irregular)	Off	POST processing in progress
Off	On	Failure while functioning
On	On	Failure while functioning
Slow blink (1 Hz)	On	Normal—1 Gb link rate
Fast blink (4 Hz)	On	Normal—2 Gb link rate
Off	Blink (1 Hz)	Normal—link down or not yet started

Using The Event Viewer

The Windows NT and Windows 2000 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 Event log.

Following is the procedure for viewing the event log.

From the Main menu:

3. Double-click or choose the **Administrative Tools** program group.

4. Double-click or choose the **Event Viewer**. The display shows a list of discrete events specifying the source name:

   - For Windows NT, specify **LPGNDS35**

   - For Windows 2000, specify **CPQKGPSA**.

5. Double-click any event with the source name.

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

7. 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. Table 4–3 and Table 4–4 list CmdStat values and Parameter error values.

Windows Miniport Event Log Codes

The Windows Miniport driver logs events and errors in the Windows Event log. Serious errors are always logged. Informational events are only 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 describes the SCSI port error log codes

Table 4–2: SCSI Port Error Log Codes

0x10 Offset	Explanation	0x11 to 0x13 Further Information
0xC0	Invalid Link Speed Selection (Windows NT)	
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
0xDA	Hard link down time-out occurred	0x11 = local req. state, 12 = discstate, 13 = mailbox word 0
0xE0	Node purged from configuration (Windows NT)	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

Table 4–2: SCSI Port Error Log Codes (Continued)

0x10 Offset	Explanation	0x11 to 0x13 Further Information
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) (Windows NT)	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
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 information
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
0x09	IOERR_BAC_CONTINUE
0x0A	IOERR_TOO_MANY_BUFFERS
0x0B	IOERR_RCV_BUFFER_WAITING
0x0C	IOERR_NO_CONNECTION

Table 4–4: Parameter Error Values Valid only when CmdStat=0x3 (Continued)

0x12 Offset	Explanation (Continued)
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
0x1A	IOERR_RESERVED
0x1B	IOERR_RESERVED
0x1C	IOERR_RESERVED
0x1D	IOERR_ABORT_MULTI_REQUESTED
0x1E	IOERR_RESERVED
0x1F	IOERR_RESERVED
0x20	IOERR_LINK_BUFFER_SHORTAGE
0x21	IOERR_RCV_XRIBUF_WAITING

Table 4–4: Parameter Error Values Valid only when CmdStat=0x3 (Continued)

0x12 Offset	Explanation (Continued)
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

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 initial inquiry scan until after discovery completes. The 31 target IDs per bus (Windows 2000 and Windows NT require the initiator to consume one of the IDs; the default is 31) are then mapped to either ascending or descending SEL_IDs (based on the ScanDown registry parameter).

NOTE: The driver uses the first bus if the parameter MapBus0=1 is used.

Fabric Device Mapping

In a fabric (switched) environment, devices are initially created in 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 (FC-AL, 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;w

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
IMPORTANT: *	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
	7	0-7	0x18	0x76	0xDA	0x07
	8	0-7	0x1B	0x75	0xD9	0x08
	9	0-7	0x1D	0x74	0xD6	0x09

*Use this translation if registry ScanDown = 0 (default).
**Use this translation if registry ScanDown = 1.
***If MapBus0= 1; then the device addressing starts with Bus#0, not Bus#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
	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
	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

*Use this translation if registry ScanDown = 0 (default).
**Use this translation if registry ScanDown = 1.
***If MapBus0= 1; then the device addressing starts with Bus#0, not Bus#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
IMPORTANT: ***	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
	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

*Use this translation if registry ScanDown = 0 (default).
**Use this translation if registry ScanDown = 1.
***If MapBus0= 1; then the device addressing starts with Bus#0, not Bus#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
	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
IMPORTANT: ***	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

*Use this translation if registry ScanDown = 0 (default).
**Use this translation if registry ScanDown = 1.
***If MapBus0= 1; then the device addressing starts with Bus#0, not Bus#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
	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
	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
IMPORTANT: ***	0	0-7	0xB2	0x20	0x45	0x5D
	1	0-7	0xB3	0x1F	0x43	0x5E

*Use this translation if registry ScanDown = 0 (default).
**Use this translation if registry ScanDown = 1.
***If MapBus0= 1; then the device addressing starts with Bus#0, not Bus#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
	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
	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

*Use this translation if registry ScanDown = 0 (default).
**Use this translation if registry ScanDown = 1.
***If MapBus0= 1; then the device addressing starts with Bus#0, not Bus#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
	25	0-7	0xDA	0x07	0x18	0x76
	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
	26	0-7	0xDC	0x06	0x17	0x77
	27	0-7	0xE0	0x05	0x10	0x78
	28	0-7	0xE1	0x04	0x0F	0x79

*Use this translation if registry ScanDown = 0 (default).
**Use this translation if registry ScanDown = 1.
***If MapBus0= 1; then the device addressing starts with Bus#0, not Bus#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
	29	0-7	0xE2	0x03	0x08	0x7A
	30	0-7	0xE4	0x02	0x04	0x7B
	31	0-7	None	None	None	None
IMPORTANT: ***	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 the device addressing starts with Bus#0, not Bus#1.

5

Diagnostic and Configuration Utilities

This chapter contains instructions for installing and using the following Windows NT and Windows 2000 utilities:

- DOS Diagnostic utility, *x86DNLD*, a DOS-based diagnostic and firmware download utility. This utility is used exclusively in standalone environments.

- LightPulse Utility/NT, *LP6DUTIL*, a Windows-based graphical user interface for updating firmware and Boot code. This utility is used in Software Solution kits.

NOTE: The diagnostic and firmware download utility is used to upgrade firmware on both Host Bus Adapter (HBA) environments.

The DOS Diagnostic Utility

The supplied software kit contains the DOS Diagnostic and firmware download utility.

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 for automating the use of the diagnostic utility program.

- Updating HBA firmware.

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

Installing the DOS Diagnostic Utility

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

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

To install the utility 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 *DIRNAME*
   C:\COPY A:\i386*.*C:*DIR_NAME*
   C:\CD *DIR_NAME*

DIR_NAME is the directory where the you install the diagnostic software.

Starting the DOS Diagnostic Utility

To start the program without any options, enter:

   X86DNLD.EXE

The options for X86DNLD are listed in Table 5–1. The syntax for using options is:

   A:\X86DNLD.EXE {I = infilename} {o = outfilename}

The following example shows a sample command:

   C:\ *X86DNLD.EXE* o = *PCIHA001*

PCIHA001 is the output filename.

Table 5–1: DOS Diagnostic Utility 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 number symbol (#) to indicate a comment line. Data entered by the user appears on a line by itself, not preceded by a #.

Using the DOS Diagnostic Utility for Preliminary Testing

The diagnostic program performs preliminary analysis of the HBA before displaying the 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 DOS Diagnostic Utility Start-Up Procedure.

```
**************************************************************

WARNING: This utility may not work with the Expanded Memory
Manager

(EMM386). Please read LP6DUTIL documentation for further
details.

**************************************************************

LP6000 Host Adapters found in the system: 1


PRELIMINARY TESTING of Host Adapter 1

Host Adapter 1: PASS 0xA: SLIM Memory Tests

Host Adapter 1: PASS 0xA: BIU Registers Tests

Host Adapter 1: PASS 0xA: BIU Configuration Registers Tests
```

```
Adapter 1 PASSED PRELIMINARY TESTS

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


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

LP6DUTIL Main Menu 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:
```

DOS Diagnostic Utility 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 choose which HBAs is to be tested.

Table 5–1 lists the function of each option on the Main menu.

Table 5–2: DOS Diagnosis Utility Main Menu Selections

Menu Selection	Description
1 – Test Host Adapters	Runs host-based internal and external loopback tests.
2 – 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.
3 – Restart Host Adapters	Resets the HBA.
4 – Input/Output	Opens or closes input and output files.
5 – Maintenance	Updates firmware or non-volatile parameters in FLASH ROM. Displays program images stored in memory.
6 – Show Host Adapters Info	Displays configuration and status data used by Compaq Technical Support.
7 – Quit	Exits the program.

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

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

LightPulse Utility/NT Utility

The LightPulse Utility/NT utility (lputilnt) is a Host Bus Adapter (HBA) utility that lets you:

- View HBA parameters
- Modify driver parameters in the Windows 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.

You can run the utility from the CD or copy and run it from your local hard drive.

NOTE: You must install and connect the SCSI Miniport driver to at least one drive before LightPulse Utility/NT can operate properly. You can alternately set the registry parameter Simulate Device= to 1.

View HBA Parameters

From the LightPulse Utility/NT Main menu screen:

1. Choose an HBA.

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

3. Choose 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.

    • Loop Map—View a list of the members of the selected HBA 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.

    • 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, and so on.

4. Expand the category list and choose **Firmware Maintenance**.

5. Click **Download**.

6. Locate the new upgrade file.

7. Click **Open**.

NOTE: The new software is transferred to the HBA.

8. Expand the category list and choose **Adapter Revision Levels**.

9. Verify that the new firmware revision is shown.

Modify Diagnostic Driver Parameters in the Windows Registry

This screen provides information about device driver parameters that are maintained in the Windows registry and allows you to modify those values.

⚠️ **CAUTION:** Do not modify the registry parameters unless specifically instructed to do so by support personnel. Modifying registry parameters can result in an unstable SAN.

The data display lists all available device driver parameters, 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.

Modify the Driver Parameters

From the LightPulse Utility/NT Main menu screen:

1. Choose the desired HBA.

2. Expand the category list and choose **Driver Parameters**.

3. Double-click a **Parameter Name**.

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

5. Choose the **Permanent** or **Global** checkbox:

    • Choose **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.

    • Choose **Global** to change the global registry entry. Otherwise, the change is made to the HBA-specific registry entry.

Table 5–3 lists the current parameters that you can set.

Table 5–3: 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 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.
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).

Table 5–3: Drive Parameters (Continued)

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 = ResetBus 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.
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.

Table 5–3: Drive Parameters (Continued)

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 5–4 lists the Arbitrated Loop Physical Addresses you can set.

Table 5–4: AL-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

Test Host Bus Adapters

Choose this option to run host-based internal and external loopback tests on the HBAs.

From the LightPulse Utility/NT Main menu screen:

1. Choose **Test Host Bus Adapters**.

2. Enable or disable the external loopback tests:

   a. Enable the external loopback tests by selecting **1=Y**. The default is disabled, **0=No**. Internal BIU PCI loopback and other loopback tests are run automatically.

   b. 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

Use this option to specify the number of passes on one or more of these tests: PCI loopback, internal loopback, external Loopback, or all three.

From the LightPulse Utility/NT Main menu screen:

1. Choose **Test**.

2. Choose the following data for the PCI loopback, Internal loopback, External Loopback tests:

   a. The number of passes. The default is 0x50. 0=infinity

   b. The action to take upon encountering errors. Choose one of the following:

   — 0 = stop (default)

   — 1 = repeat

   — 2 = ignore

Restart Host Bus Adapters

Choose this option to reset the HBA. When a restart HBA occurs, the HBA performs POST testing and reloads functional firmware.

Input/Output

Choose 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

Choose 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 memory. You must reboot the HBA for the new firmware to take effect.

Show Host Bus Adapter Info

Choose 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 the LightPulse Utility/NT Utility

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

A

Regulatory Compliance Notices

FCC Compliance Information Statement

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.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Shielded cables must be used between this equipment and attached peripheral devices. The reader is cautioned that changes or modifications made to the equipment not expressly approved could void the user's authority to operate this equipment.

Hewlett-Packard Computer Corporation
P. O. Box 692000, Mail Stop 530113
Houston, Texas 77269-2000

Or call 1-800-652-6672. (For continuous quality improvement, calls may be recorded or monitored.)

To identify the device, refer to the part, series or model number found on the product.

The above statement applies to products marketed in the USA.

Japanese Notice

に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波
妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ず
るよう要求されることがあります。

Canadian Notice

This Class A digital apparatus meets all requirements of the Canadian
Interference-Causing Equipment Regulations.

Avis Canadien

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur
le matériel brouilleur du Canada.

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.

Japanese Notice

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　取扱説明書に従って正しい取り扱いをして下さい。

Canadian Notice

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Avis Canadien

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Glossary

This glossary defines terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

AL-PA

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. See also NetWare Peripheral Architecture.

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.

Gb/s

Gigabits per second or 1 billion bits per second. A reference to processing speed.

GB/s

Gigabytes per second or 1,073,741,824 bytes per second. A reference to processing speed.

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 from 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 term "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.

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 sizes (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.

NetWare Peripheral Architecture (NWPA)

Network architecture that provides a broader and more reliable driver support for third-party host adapters and storage devices. The NPWA separates NetWare driver support into two components: a Host Adapter Module (HAM), and a Custom Device Module (CDM). See also Custom Device Module and Host Adapter Module.

nm

Nanometer. A unit of measurement equal to one billionth of a meter. 10^{-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. PCI 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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