QLOGIC

Simplify

Troubleshooting Guide

2-Gbps Fibre Channel Host Bus Adapters

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Rev. A.1 Changes	Document Sections Affected
Removed section 6.8, "Why does the QLogic HBA have the same word wide node name on two different HBAs in the same system?"	was 6.8

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Introduction

1.1
How to Use this Guide

This guide contains information about configuring and troubleshooting QLogic® 2-Gbps fibre channel host bus adapters (HBAs). These HBAs are collectively referred to as *QLogic HBAs* and *adapters* throughout this guide.

The contents of this guide are described in the following paragraphs:

- **Section 2—Driver Parameters.** This section describes driver parameters and their use for the Windows NT®/Windows® 2000, Novell® NetWare®, Red Hat Linux®, and Solaris SPARC® operating systems.
- **Section 3—Failover Boot from Storage.** This section describes how to set up a system so that it can boot while it is in, or in the process of, a failover state.
- **Section 4—Flash and NVRAM Programming.** This section describes the flasutil command line options.
- **Section 5—Translating Event and Error Logs.** This section describes how to find, read, and understand event and error logs for Windows NT, Novell NetWare, Red Hat Linux, and Solaris SPARC.
- **Section 6—Frequently Asked Questions.** This section answers the most common questions received by QLogic technical support.
- **Appendix A—Glossary.** This section describes common hardware, firmware, and Fibre Channel terms that are used in this guide and throughout the Fibre Channel industry.

Notes

Section 2

Driver Parameters

This section describes driver parameters and their use for the following operating systems (OS):

- Windows NT/Windows 2000
- Red Hat Linux
- Solaris SPARC
- Novell NetWare

2.1 Windows NT/Windows 2000

2.1.1 Driver Registry Parameter

The available driver registry parameter is listed below and described in the following section:

- UseSameNN

2.1.1.1 UseSameNN

By default, UseSameNN has a value of 0, indicating that each HBA uses the world wide node name from its NVRAM. When UseSameNN is 1, driver overrides this behavior and assigns the world wide node name obtained from the first HBA to the rest of the HBAs.

To set UseSameNN to 1, follow these steps:

1. Click **Start**, select **Run**, and open the **REGEDT32** program.
2. Select **HKEY_LOCAL_MACHINE** and follow the tree structure to the QL2*x*00.SYS driver:

   HKEY_LOCAL_MACHINE
   SYSTEM
   CurrentControlSet
   Services
   QI2300 (or the appropriate QLogic HBA model number)
   Parameters
   Device

3. Double-click **DriverParameters:REG_SZ:UseSameNN=0**.

4. If the string **UseSameNN=** does not display, add the following text to the end of the string:

   ```
   ;UseSameNN=1
   ```

5. If the string **UseSameNN=0** displays, change the value from 0 to 1.
6. Click **OK**.
7. Exit the **REGEDT32** program, then reboot the system.

2.1.2 System Registry Parameters

The available system registry parameters are listed below and described in the following sections:

- MaximumSGList
- NumberOfRequests

2.1.2.1 MaximumSGList

Windows 2000/Windows NT includes enhanced scatter/gather list support for doing large SCSI I/O transfers. Windows 2000 supports up to 256 scatter/gather segments of 4096 bytes each, allowing transfers up to 1048576 bytes.

NOTE: OEMSETUP.INF automatically updates the registry to support 65 scatter/gather segments. In normal operations, no additional changes are necessary, as this setting provides the best overall performance.

To change this value, follow these steps:

1. Click **Start**, select **Run**, and open the **REGEDT32** program.
2. Select **HKEY_LOCAL_MACHINE** and follow the tree structure to the QL2300.SYS driver:

   HKEY_LOCAL_MACHINE
   SYSTEM
   CurrentControlSet
   Services
   Ql2300 (or the appropriate QLogic HBA model number)
   Parameters
   Device

3. Double-click **MaximumSGList:REG_DWORD:0x21**.
4. Enter a value from 16 to 255 (10h to FFh). A value of 255 (FFh) enables the maximum 1-MB transfer size. Any value above 255 enables 64K transfers. The default value is 33 (21h).

5. Click **OK**.
6. Exit the **REGEDT32** program, then reboot the system.

2.1.2.2
NumberOfRequests

The NumberOfRequests registry parameter specifies the maximum number of outstanding requests per QLogic HBA. When the QL2300.SYS driver is installed, the registry is automatically updated with this parameter set to 150 (96h).

CAUTION! Increasing this parameter above 150 can result in a system failure.

2.2 NetWare

The NetWare driver has two types of optional parameters:

- System parameters (specified when the driver is loaded) (see section 2.2.1)
- NVRAM parameters (stored in the QLogic HBA's NVRAM) (see section 2.2.2)

2.2.1 System Parameters

The optional system parameters are specified on the driver load line. There are two types of system parameters:

- **Global.** The parameter applies to all driver instances; the value specified in the first instance is used globally for all instances.
- **Instance.** The parameter applies only to the individual driver where it is specified No instance parameters were supported at the time of publication.

In the following parameters, *QL2x00* refers to one of the following: 2300, 2200, or 2100. The exception to this is the configuration file, QL2x00.CFG, where the *x* character is literal.

The system parameters are described in the following paragraphs.

2.2.1.1
SLOT = *n*

Type Instance

Range —

Description This parameters tells NetWare the PCI slot number (*n*) of the HBA on which to load this driver instance.

Example
```
LOAD QL2300.HAM SLOT=3
```

2.2.1.2
/LUNS

Type Instance

Range 0 to *n*–1, where *n* is specified by the /MAXLUNS=*n* option.

Description This parameter tells NetWare to scan for all LUNs when this driver is loaded. Otherwise, NetWare scans only for LUN zero devices.

This parameter is required for RAID subsystems.

Example
```
LOAD QL2300.HAM SLOT=3 /LUNS
```

2.2.1.3
/GNNFT

Type Instance

Range —

Description This parameter uses a single GNN_FT command to obtain a list of ports from the fabric name server without having to build the list from an iteration sequence of individual get all next (GAN) commands (which is time consuming). Most new fabric switches support the GNN_FT command.

Example
```
LOAD QL2x00.HAM SLOT=3 /LUNS /GNNFT
```

2.2.1.4
/MAXLUNS=*n*

Type Instance

Range —

Description This parameter sets the maximum number of LUNs allowed during the LUN scan. The range of LUNs searched is 0 to (*n* – 1).

Example
```
LOAD QL2x00.HAM SLOT=3 /LUNS /MAXLUNS=256
```

2.2.2
NVRAM Parameters

The QLogic HBA NVRAM settings are modified by entering *Fast!*UTIL during the QLA®2*xxx* HBA BIOS initialization. Table 2-1 lists the settings and how they affect the NetWare driver.

Table 2-1. NVRAM Parameters

Setting	Used by Driver	Default Value; Do Not Change	Not Used by Driver (Change Has No Effect)
Host Adapter Settings			
Frame Size	✔		
Loop Reset Delay			✔
Adapter Hard Loop ID	✔		
Hard Loop ID	✔		
Advanced Adapter Settings			
Execution Throttle	✔		
Fast Command Posting	✔		
>4GB Addressing			✔
Luns per Target	✔		
Enable LIP Reset	✔		
Enable LIP Full Login	✔		
Enable Target Reset	✔		
Login Retry Count			✔
Port Down Retry Count	✔		
Drivers Load RISC Code	✔		
Enable Database Updates			✔
Disable Database Load			✔
IOCB Allocation			✔
Extended Error Logging			✔
Extended Firmware Settings			
Extended Control Block			✔
RIO Operation Mode		✔	
Connection Options	✔		
Class 2 Service		✔	
ACK0		✔	
Fibre Channel Tape Support	✔		
Fibre Channel Confirm	✔		

Table 2-1. NVRAM Parameters (Continued)

Setting	Used by Driver	Default Value; Do Not Change	Not Used by Driver (Change Has No Effect)
Command Reference Number		✔	
Read Transfer Ready		✔	
Response Timer		✔	
Interrupt Delay Timer		✔	
Data Rate	✔		

NOTE:

- Enable the following extended firmware parameters to support FC-TAPE:
  - Fibre Channel Tape Support
  - Fibre Channel Confirm
- The timeout for loop/link/port down is set (in seconds) by the **Port Down Retry Count** parameter. For best results, set this parameter to 15 or 20.

2.3 Red Hat Linux

Red Hat Linux parameters are listed below and described in the following sections:

- max_scsi_luns (multiple LUN support)
- Driver command line parameters:
  - verbose
  - quiet

2.3.1 System Driver Parameter max_scsi_luns

Support for multiple LUNs can be configured in one of three ways. Currently, the maximum number of LUNs that can be scanned for each device is 128.

The kernel must be configured to support multiple LUNs so that nonzero LUNs can be configured and accessible. Use the *make menuconfig* command to build a kernel that has the option under SCSI Support enabled to probe all LUNs on SCSI devices.

NOTE: If you have multiple QLogic HBAs, set max_scsi_luns to the largest number of LUNs supported by any one of these HBAs.

- To configure multiple LUN support during boot time, type the following at the boot prompt:

```
boot: linux max_scsi_luns=128
```

- If the SCSI mid-layer is compiled as a module, add the following line to the /etc/modules.conf file to scan for multiple LUNs at each boot:

```
option scsi_mod max_scsi_luns=128
```

- If the SCSI mid-layer is not compiled as a module, the boot loader can be configured to scan for multiple LUNs each time the system boots.

  For LILO, perform the following steps:

  1. Add the following line to each of the kernel images listed in the /etc/lilo.conf file:

```
append="max_scsi_luns=128"
```

  2. Type the following command:

```
#lilo
```

  3. Reboot the system.

  For GRUB, perform the following steps:

  1. Append the max_scsi_luns parameters to each of the kernel images listed in the /etc/grub.conf file. For example:

```
kernel /vmlinux-2.4.7-10 ro root=/dev/hda2 max_scsi_luns=128
```

  2. Reboot the system.

2.3.2 Driver Command Line Parameters

The following driver command line options are listed below and described in the following sections:

- Verbose
- Quiet

2.3.2.1 Verbose

This option provides detailed debug information. For example:

```
insmod qla2300.o options = verbose
```

The following command line examples use the verbose option:

```
insmod qla2200.o options = verbose
insmod qla2300.o options = verbose
```

2.3.2.2
Quiet

This option keeps the driver from displaying. For example:

```
Waiting for LIP to complete....
scsi%d: Topology - %s, Host Loop address 0x%x
scsi(%d): LIP occurred
scsi(%d): LIP reset occurred
```

The following command line examples use the quiet option:

```
insmod qla2200.o ql2xopts = quiet
insmod qla2300.o ql2xopts = quiet
```

2.4 Solaris SPARC

Parameter values can be specified on a per instance basis for the QLogic driver. The configuration file containing these parameters is either /kernel/drv/qla2200.conf or /kernel/drv/qla2300.conf. During system initialization, the driver outputs its ID banner to the console. This ID banner includes the driver version number and instance number. The driver's ID banner is also preserved in the /var/adm/messages file. The parameter values are applied on a per instance basis, using the driver instance number specified in the *hba* field of the parameter.

The general format of a driver parameter entry is as follows:

```
hba<instance number>-<parameter name>=<parameter value>
```

There are no leading spaces for the actual parameter entries. For example, to specify the loop-down-timeout value for driver instance 3, the parameter entry is as follows, without the leading spaces:

```
hba3-loop-down-timeout=60;
```

In systems with multiple adapter instances, the value of a specific parameter for instance 0 is applied to an instance if no entry has been made for that instance. (The parameter value specified for instance 0 is also the default value.) Persistent name binding entries are exempt from this rule.

In a system with a single QLogic HBA, the instance number may not be 0; the instance number depends on the other configured HBAs and the kernel's bus scanning procedure.

The parameters are described in the following paragraphs.

2.4.1
Maximum Frame Length

Integer Type Byte

Range 512, 1024, 2048

Default 1024 (QLA22*xx*), 2048 (QLA23*xx*)

Description This parameter specifies the frame payload length (in bytes) used by the ISP2*xxx* firmware.

The minimum value is 512 bytes; if this value is not equal to 512, 1024, or 2048, the QLA2*xxx* uses one of the default values (1024 or 2048).

Example
```
hba0-max-frame-length=1024
```

2.4.2
Execution Throttle

Integer Type Commands

Range 1–65535

Default 16

Description This parameter specifies the maximum number of commands executing on any one port. When a port's execution throttle is reached, no new commands are executed until the current command finishes executing. The valid options for this setting are 1–256. The default is 1.

Entering a value that exceeds the device's capabilities causes unneeded command retries that impact performance.

Example
```
hba0-execution-throttle=16
```

2.4.3
Login Retry Count

Integer Type Count

Range 0–255

Default 1

Description This field specifies the maximum number of times the firmware tries to login to a device.

Large values can cause long delays during initialization and device reconfiguration.

Example
```
hba0-login-retry-count=8;
```

2.4.4
Enable Adapter Hard Loop ID

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 0 (disable)

Description This parameter sets the QLogic HBA's hard loop ID on the Fibre Channel bus.

This parameter may be necessary on some bus configurations where devices fail to appear.

Example
```
hba0-enable-adapter-hard-loop-ID=0;
```

2.4.5
Adapter Hard Loop ID

Integer Type ID

Range 0–125

Default 0

Description If the **Enable Adapter Hard Loop ID** parameter is enabled, the QLogic HBA attempts to use the ID specified in this setting.

Example
```
hba0-adapter-hard-loop-ID=0;
```

2.4.6
Enable LIP Reset

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 0 (disable)

Description This parameter determines the type of LIP reset that is used when the operating system initiates a bus reset routine. When this parameter is enabled, the driver initiates a global LIP reset to clear the target device reservations. When this parameter is disabled, the driver initiates a global LIP reset with full login.

Example
```
hba0-enable-LIP-reset=0;
```

2.4.7
Enable LIP Full Login

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 1 (enable)

Description This parameter instructs the ISP chip to re-login to all ports after any loop initialization process (LIP).

Example
```
hba0-enable-LIP-full-login=1;
```

2.4.8
Enable LIP Target Reset

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 0 (disable)

Description This parameter enables the QLogic HBA to issue a LIP target reset during Fibre Channel reset.

Example
```
hba0-enable-target-reset=0;
```

2.4.9
Reset Delay

Integer Type Seconds

Range 0–255

Default 5

Description This parameter specifies the delay after a reset before sending commands to the devices on the Fibre Channel bus.

Example
```
hba0-reset-delay=5;
```

2.4.10
Port Down Retry Count

Integer Type Count

Range 0–255

Default 8

Description This parameter specifies the number of times the software retries a command to a port returning port down status.

Large values can cause long delays for failover software to detect a failing device.

Example
```
hba0-port-down-retry-count=8;
```

2.4.11
Maximum LUNs per Target

Integer Type Count

Range 1–256

Default 8

Description This parameter specifies the number of LUNs per target. Multiple LUN support is typically for RAID boxes that use LUNs to map drives. If you do not need multiple LUN support, set the number of LUNs to 0. Large values can cause long delays during boot.

Example `hba0-maximum-luns-per-target=8;`

2.4.12
Connection Options

Integer Type Mode

Range 0–2:
0 = loop only
1 = point-to-point only (QLA22*xx*/QLA23*xx* only)
2 = loop preferred, else point-to-point (QLA22*xx*/QLA23*xx* only)

Default 2

Description This parameter specifies the connection mode used by the driver firmware. When connecting the QLogic HBA to a switch port with auto-mode sensing capability (a G port), QLogic recommends that this parameter be set to 0 or 1, not 2. Setting this parameter to 2 when connected to a G port on a switch may cause the device to be lost or the system to hang.

Example `hba0-connection-options=2;`

2.4.13
FC Tape Support

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 1 (enable)

Description This parameter enables/disables Fibre Channel tape support.

Example `hba0-fc-tape=1;`

2.4.14
Fibre Channel Data Rate Option (QLogic QLA23*xx* only)

Integer Type Mode

Range 0–2:
0 = 1 Gbps
1 = 2 Gbps
2 = Auto-negotiate

Default 2

Description This setting determines the QLogic QLA23*xx* adapter data rate. When this setting is 1, the QLA23*xx* adapter runs at 2 Gbps. When this setting is 2, the software determines what rate your system can accommodate and sets the rate accordingly.

Example
```
hba0-fc-data-rate=2;
```

2.4.15
PCI Latency Timer

Integer Type Bytes

Range 0h–F8h

Default 40h

Description This parameter specifies the minimum number of PCI clocks that the QLogic HBA has on the PCI bus when bursting data.
This parameter is in multiples of eight bytes.

Example
```
hba0-pci-latency-timer=0x40;
```

2.4.16
PCI-X Maximum Memory Read Byte Count

Integer Type Bytes

Range 0, 512, 1024, 2048, 4096

Default 0 (system default)

Description This parameter specifies the maximum byte count that the QLogic HBA can specify in the attribute phase of an initiated burst memory read command.

Example
```
hba0-pci-x-max-memory-read-byte-count=0;
```

2.4.17
Link Down Error

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 1 (enable)

Description This field disables driver error reporting when the link is down.

Example
```
hba0-link-down-error=1;
```

2.4.18
Loop Down Timeout

Integer Type Seconds

Range 0–240

Default 60

Description This parameter specifies how much time the driver waits for a Fibre Channel loop to come up before reporting the failure.

Small values can report transient errors that should be ignored.

Example
```
hba0-loop-down-timeout=60;
```

2.4.19
Persistent Binding Only Option

Integer Type Mode

Range 0–1:

0 = Reports to OS discovery of binded and nonbinded devices
1 = Reports to OS discovery of persistent binded devices.

Default 0

Description This parameter reports the devices that are persistently bound only to the OS.

Example
```
hba0-persistent-binding-configuration=0;
```

2.4.20
Persistent Binding by Port ID

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 0 (disable)

Description This parameter enables persistent binding by port ID instead of by node/port names.

Example
```
hba0-persistent-binding-by-port-ID=0;
```

2.4.21
Fast Error Reporting

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 0 (disable)

Description This parameter enables fast driver error reporting to Solaris.

Example `hba0-fast-error-reporting=0;`

2.4.22
Enable SBus Initialization for Xilink Download

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 0 (disable)

Description This parameter enables SBus HBA initialization by the driver for use with the Xilink emulator.

Example `hba0-xilinx-mode=0;`

2.4.23
Enable Extended Logging

Integer Type Flag

Range 0 (disable), 1 (enable)

Default 0 (disable)

Description This field enables logging the driver detected events that occur in the driver or the Fibre Channel bus. Events are logged in the Solaris /var/adm/messages file.

Example `hba0-extended-logging=0;`

Notes

Section 3

Failover Boot from Storage

This section describes how to set up a system so it can boot while it is in, or in the process of, a failover state.

3.1 Hardware and Software Requirements

Failover boot from storage requires the following hardware and software:

- Intel compatible, PCI based computer
- One dual-port QLogic HBA (minimum) or two single-port QLogic HBAs
- Fibre Channel switch or switches (optional)
- Two Fibre Channel storage ports

  NOTE: These two ports must have direct access to the same LUN.

- Bootable OS CD-ROM or bootable disks with CD-ROM
- QLogic HBA driver

3.2 Recommendations for RAID Storage

QLogic recommends mapping a single LUN to both HBA ports, which simplifies device/LUN assignment and selecting a drive to install the OS. When installation is complete, map the other devices/LUNs in your configuration requirements.

3.3 Connections

Perform the following steps to connect the QLogic HBAs:

1. Connect both HBA ports to the storage through Fibre Channel cables.

   NOTE: If the connection is though a switch, attach all HBA and storage ports to the switch.

2. If you haven't already, power-up the switch.
3. If you haven't already, power-up the storage.

3.4

Configure the QLogic HBAs to Boot

Booting from either QLogic HBA is accomplished by attaching the same LUN to both ports using the BIOS. The following procedure assumes that the HBA has the correct topology to participate in the storage area network (SAN).

This procedure uses the QLogic *Fast!*UTIL BIOS utility. To select options in *Fast!*UTIL, use the UP ARROW and DOWN ARROW keys.

1. Power-up the system.
2. When the QLogic banner displays, press CTRL+Q.

```
QLogic Corporation
QLA2200 PCI Fibre Channel Rom BIOS Version 1.76
Copyright (C) QLogic Corporation 1993-2001. All rights
          reserved.
www.qlogic.com
Press <CTRL-Q> for Fast!UTIL
```

3. When the HBA ports are initialized, the QLogic *Fast!*UTIL window displays. Select a port, then press ENTER.
4. The **Fast!UTIL Options** screen displays. Press ENTER. The **Configuration Settings** screen displays.
5. In the **Configuration Setting** screen, select **Selectable Boot Settings**, then press ENTER.
6. By default, the **Selectable Boot** option is **Disabled**; press ENTER to change the option to **Enabled**.
7. Select the line with **(Primary)** next to it. This should be the next line from step 5.
8. Press ENTER. The **Select Fibre Channel Device** screen displays.
9. Select the device from which to boot, then press ENTER to assign the device to the QLogic HBA.
   a. If the device is on a JBOD, the selection is a drive; the **Selectable Boot Settings** screen displays with the port name/LUN of the device listed.
   b. If the device is a RAID system, a list of LUNs is displayed. Select the LUN, then press ENTER. The **Selectable Boot Settings** screen displays with the port name/LUN of the device list.
10. Press ESC. The **Configuration Settings** screen displays. The default selection should be **Host Adapter Settings**.

11. Press ENTER to display the **Host Adapter Settings** options.
12. The **Host Adapter BIOS** option should be highlighted. (The default is **Disabled**.) Press ENTER to change the option to **Enabled**.
13. Press ESC twice. The red **Configuration settings modified** screen displays.
14. With **Save changes** highlighted, press ENTER to accept the changes and apply them to the QLogic HBA. This process make take up to a minute.
15. When the change is made, the **Fast!UTIL Options** screen displays. If you want to configure the second port, select **Select Host Adapter** and repeat steps 3 through 14. Be sure to assign the same device/LUN.
16. When port configuration is complete, press ESC.
17. The red **Exit Fast!UTIL** screen displays. Press ENTER to reboot the system.
18. Continue with the procedure in section 3.5.

3.5 Install the OS to a Fibre Channel Device/LUN

There are additional steps to install an OS onto a SAN device; the installation process includes using the QLogic driver. When the drive is activated, the installation process accesses the device/LUN on the Fibre Channel. If multiple LUNs are presented to the HBA ports, this may cause some confusion (see section 3.2).

Perform the following steps to install the OS to a Fibre Channel device/LUN:

1. Insert the Windows 2000 Setup disk or CD-ROM (if booting from a bootable CD-ROM drive) in an appropriate drive.
2. If you are booting from the CD, press F6 if you see the message **Press F6 if you want to install a third party SCSI or RAID Driver...**

   After all the standard devices have been loaded, press S to **Specify Additional Device.** Go to step 4.
3. If you are booting from the Setup disks, after the standard devices have been detected and configured, press S to **Specify Additional Device**.
4. Select **Other**, then press ENTER.
5. Insert the QLogic disk in an appropriate drive and press ENTER.
6. Select **QLogic QLA2300 PCI Fibre Channel Adapter**, then press ENTER.
7. Continue with the standard installation procedure.

3.6 Troubleshooting

This section provides solutions to issues that may occur during configuration and setup.

Table 3-1. Troubleshooting Failover Boot from Storage

Problem	Reason/Solution
*There are no devices in the **Select Fibre Channel Device** screen.*	**Reason:** The QLogic HBA and storage have incompatible speeds or topologies. (This is also the case with an in-line switch.) **Solution:** Find the specification for all devices that make up the path to the device/LUN and correct accordingly. **Reason:** The Fibre channel cable may be faulty. **Solution:** Replace the cable with a known good cable. **Reason:** The storage is not in the same zone as the QLogic HBA. Zoning is a function of Fibre Channel switch fabrics, not the HBA. **Solution:** Access the switch and correct the zone information.
There are no LUNs under the selected device.	**Reason:** The storage does not have a LUN mapped to the HBA port. **Solution:** Access the storage mapping function. **Reason:** The LUNs are not available through the storage port being queried. **Solution:** If possible, assign the LUN to the storage port being accessed by the HBA port. If this is not possible (and the port is on the partner controller and a backup port), cause a failover to force the LUN to be accessed though the port in question. **Reason:** There are no LUNs configured on the storage. **Solution:** Create and assign LUNs.
Pressing CTRL+Q hangs, but then recovers.	**Reason:** *Fast!*UTIL is having trouble with Fibre login and is waiting for a timeout. There may not be a physical connection to a Fibre Channel device. **Solution:** Attach the QLogic HBA to a Fibre Channel device with matching specifications. **Reason:** The speed or topology to a device is incompatible. **Solution:** Find the specification for all devices that make up the path to the device/LUN and correct accordingly. See section 6.3 for additional information.

Table 3-1. Troubleshooting Failover Boot from Storage (Continued)

Problem	Reason/Solution
*The JBOD physically has (for example) five drives, but some are not displayed in the **Select Fibre Channel Device** screen.*	**Reason:** There may be a faulty drive or incompatible drive in the JBOD. **Solution:** Replace the questionable drive with a known good drive. **Reason:** The device is not in the same zone as the HBA. Zoning is a function of Fibre Channel switch fabrics, not the HBA. **Solution:** Access the switch and correct the zone information.

Notes

Section 4

Flash and NVRAM Programming Utility (flasutil)

The QLogic flash and NVRAM programming utility (referred to as *flasutil*) is a DOS utility that allows you to flash the BIOS and NVRAM on the QLogic HBA. This section defines the command line options and explains how to use them. There are two types of options; they are described in the following sections:

- BIOS flash options
- NVRAM options

In these options, the variable *xxxx* indicates the HBA address. To determine the address, type the following, which lists all HBAs and their addresses:

```
/i-
```

4.1 BIOS Flash Options

The BIOS flash options are described in table 4-1. For examples using these parameters, see section 4.3.

Table 4-1. Flasutil BIOS Options

Parameter	Description
/F *xxxx*	This parameter writes the BIOS flash at QLogic HBA address *xxxx*. If no address is specified, the BIOS flash is written to all adapters. If the flash already contains a valid BIOS, the existing NVRAM defaults are preserved.
/O <*filename.ext*>	This parameter specifies the BIOS binary file name. Use <*filename.ext*> instead of QL*xx*RXX.BIN.
/I	When this parameter is used, the subsystem ID is ignored.
/M	When this parameter is used, no prompt displays for the I/O address.
/Q	This parameter enables quiet mode. No messages are displayed in this mode.
/C *xxxx*	This parameter verifies the BIOS flash of the QLogic HBA at address *xxxx*. If no address specified, the BIOS flash is verified for all QLogic HBAs.
/W *xxxx*	This parameter copies the BIOS flash to file QL1xROM.SAV at QLogic HBA address *xxxx*.
/V *xxxx*	This parameter displays the current BIOS version number of the QLogic HBAs at address *xxxx*. If no address is specified, then the BIOS version numbers of all QLogic HBAs are displayed.

Table 4-1. Flasutil BIOS Options (Continued)

Parameter	Description
/S *xxxx*	This parameter displays the QLogic HBA serial number at address *xxxx*. If no address is specified, then the serial numbers of all QLogic HBAs are displayed.
/Y *xxxx*	This parameter displays the QLogic HBA port name at address *xxxx*. If no address is specified, then the port names of all the QLogic HBAs are displayed.
/U *xxxx*	This parameter updates the NVRAM defaults (with the NVRAM files) in the BIOS at QLogic HBA address *xxxx*. If no address is specified, than the NVRAM defaults are updated for all HBAs. This option also updates the NVRAM. If the SSVID/SSID in the NVRAM files do not match those in the NVRAM, the NVRAM and the BIOS will not be updated.

4.2 NVRAM Options

The NVRAM options are described in table 4-2. For examples using these parameters, see section 4.3.

Table 4-2. Flasutil NVRAM Options

Parameter	Description
/L *xxxx*	This parameter writes the NVRAM at QLogic HBA address *xxxx*. If no address is specified, then the NVRAM is written to all HBAs.
/N <*filename.ext*>	This parameter specifies the NVRAM file name. Use <*filename.ext*> instead of NVRMxxX.DAT.
/X *xxxx*	This parameter verifies the NVRAM of the QLogic HBA at address *xxxx*. If no address is specified, then the NVRAM for all QLogic HBAs is verified.
/D *xxxx*	This parameter copies the NVRAM to file QL1xNVRM.SAV at QLogic HBA address *xxxx*.

4.3 Examples

The NVRAM can only be written/updated using the production options (/p and /t) under one of the following conditions:

- The QLogic HBA NVRAM is blank.
- The QLogic HBA has a subsystem vendor ID/subsystem ID (SSVID/SSID) that does not match IDs in the current NVRAM files.

When the NVRAM has been initialized, the BIOS and NVRAM can be updated as described in the following paragraphs.

These examples apply to QLogic HBAs with valid BIOS and NVRAM contents.

- To write the flash in all QLogic HBAs in a system without being prompted for I/O address, type the following:

  ```
  flasutil /f
  ```

  This example updates the BIOS, but does not change the current NVRAM defaults.

- To write the NVRAM and change defaults in the BIOS, type the following:

  ```
  flasutil /u
  ```

  This example writes the NVRAM and updates the BIOS defaults.

- To write the NVRAM in all QLogic HBAs in a system without being prompted for the I/O address, type the following:

  ```
  flasutil /l
  ```

  This example updates the NVRAM (the existing SSID/SSVID in the NVRAM must match those in the provided NVRAM files).

- To write the NVRAM using NVRAM file with nonstandard QLogic names, type the following:

  ```
  flasutil /l /n <filename.ext>
  ```

Notes

Section 5

Translating Event and Error Logs

This section describes how to find, read, and understand event and error logs for the following operating systems:

- Windows 2000
- Novell NetWare
- Red Hat Linux
- Solaris

5.1 Windows 2000

NOTE: For the most current error log/event information, see the QLogic support Web site at support.qlogic.com.

Event logging is included in the QLogic NT miniport drivers for troubleshooting problems. This additional event information can be viewed using the NT Event Viewer. Events logged by the driver are listed with the **Source** field set to a QLogic adapter. For example, of you are using a QLA2100, the **Source** field is set to **ql2100** and the Event field is set to **11**.

Double-click the event entry to view the event details, then set the data format to **Words**. The detailed event code is displayed at the offset 34h. Figure 5-1 contains a list of detailed event codes for the QLogic HBAs.

Additional data is recorded for some event codes in the least significant 16 bits of the longword. Additional data can also be recorded in the longword at offset 10h.

NOTE: On the QLogic HBAs, the Extended Error Logging parameter in *Fast!*UTIL enables additional event logging. The event codes with an asterisk (*), listed in the logs and in table 5-1, are enabled with this parameter. By default, these events are not logged.

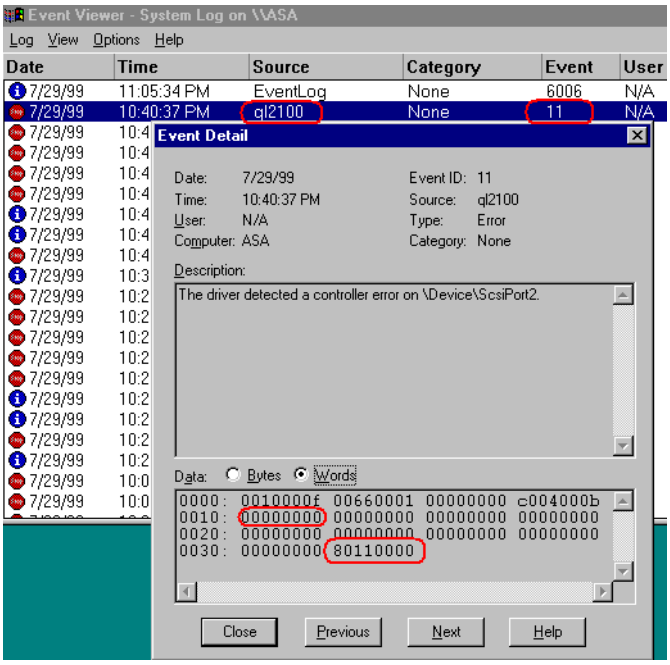


Figure 5-1. Windows NT Event Viewer

Table 5-1 lists the event codes for the QLogic HBAs. Find the code in the table and follow the instructions in the **Suggested Action** column.

Table 5-1. Windows NT Event Codes

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
4001xxxx,	yyyy00zz,	Invalid mailbox command xxxx = mailbox1 yyyy = mailbox2 zz = command	The error should not occur; send the event log to QLogic.
4002xxxx	yyyy00zz	Host interface error xxxx = mailbox1 yyyy = mailbox2 zz = command	A hardware DMA error occurred; replace the QLogic HBA.
4003xxxx	yyyy00zz	Mailbox command test failed xxxx = mailbox1 yyyy = mailbox2 zz = command	The error should not occur; send the event log to QLogic.

Table 5-1. Windows NT Event Codes (Continued)

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
4005xxxx	Yyyy00zz	Mailbox command error xxxx = mailbox1 yyyy = mailbox2 zz = command	This error usually indicates that the is loop down. Check all cabling.
4005xx6F	yyyyyyzz	Login fabric port mailbox command error xx = adapter state yyyyyy = port ID zz = loop ID	This error usually indicates that the is loop down. Check all cabling.
4006xxxx	yyyy00zz	Mailbox command parameter error xxxx = mailbox1 yyyy = mailbox2 zz = command	The error should not occur; send the event log to QLogic.
*80010000	00000000	Reset detected	This error is not logged during normal operations.
8002xxxx	yyyyzzzz	RISC system error xxxx = mailbox1 yyyy = mailbox2 zzzz = mailbox3	The error should not occur; send the event log to QLogic.
8003xxxx	yyyyzzzz	RISC request queue transfer error xxxx = mailbox1 yyyy = mailbox2 zzzz = mailbox3	A hardware error occurred; replace the QLogic HBA.
8004xxxx	yyyyzzzz	RISC response queue transfer error xxxx = mailbox1 yyyy = mailbox2 zzzz = mailbox3	A hardware error occurred; replace the QLogic HBA.
80100000	0000xxxx	LIP occurred xxxx = mailbox1	This error is not logged during normal operations.

Table 5-1. Windows NT Event Codes (Continued)

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
*80110000	xxxxyyzz	Link up 2200: xxxx = current ISP connection mode: 0 = loop 1 = point to point (P2P) yy = ISP connection option: 0 = loop 1 = P2P 2 = loop->P2P 3 = P2P->loop zz = starting loop ID for remote devices 2100 xxxx = 0000 yyyy = 0000	This error is not logged during normal operations.
80120000	00000000	Link down error	This error is not logged during normal operations.
80130000	0000xxxx	LIP reset occurred xxxx = mailbox1	This error is not logged during normal operations.
*F0000000	00000000	Restarting RISC firmware	This error indicates that the Initial driver load or loop has been down longer than 4 minutes.
F0010000	0000xxxx	Invalid IOCB/IOSB handle from RISC xxxx = IOCB/IOSB handle	The error should not occur; send the event log to QLogic.
F0020000	000000xx	Invalid entry type in response queue xx = response queue entry type	The error should not occur; send the event log to QLogic.
F0030002	00xx00yy	Command DMA direction error xx = CDB opcode yy = target loop ID	The error should not occur; send the event log to QLogic.
*F0030004	00xx00yy	Reset command completion error xx = CDB opcode yy = target loop ID	This error is not logged during normal operations.
*F0030005	00xx00yy	Command aborted by OS xx = CDB opcode yy = target loop ID	This error is not logged during normal operations.

Table 5-1. Windows NT Event Codes (Continued)

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
F0030006	00xx00yy	Command timeout error xx = CDB opcode yy = target loop ID	The error should not occur; send the event log to QLogic.
F0030028	00xx00yy	Port unavailable command completion error xx = CDB opcode yy = target loop ID	Check target device and cabling.
F0030029	00xx00yy	Port logged out command completion error xx = CDB opcode yy = target loop ID	Check target device and cabling.
F003001C	00xx00yy	Target device queue full (SCSI status 28 from target) xx = CDB opcode yy = target loop ID	Check target device and cabling.
F0040000	00000000	Command not returned error	The error should not occur; send the event log to QLogic.
F0050000	000000xx	Mailbox command error xx = mailbox command opcode	The error should not occur; send the event log to QLogic.
F0060000	000000xx	Mailbox command timeout error xx = mailbox command opcode	The error should not occur; send the event log to QLogic.
F0070000	0000xxxx	Invalid response queue pointer from RISC xxxx = response queue pointer	The error should not occur; send the event log to QLogic.
F0080000	0000xxxx	Invalid/unexpected async event code from RISC xxxx = async event code	The error should not occur; send the event log to QLogic.
*F00A0000	0000xxxx	RISC firmware state during adapter initialization xxxx = firmware state	This error is not logged during normal operations.
F00B0000	00000000	Reset ISP chip failed	—
F00D0000	00000000	Failed to allocate noncached memory	—
F00E0000	00000000	Failed to map ISP registers	—
F00F0000	00000000	Failed to load RISC code	—
F0100000	0000xxxx	Failed to start RISC code xxxx = mailbox0	—

Table 5-1. Windows NT Event Codes (Continued)

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
F0110000	0000xxxx	Failed to initialize firmware xxxx = mailbox0	—
F0120000	0000xxxx	Failed to get firmware state xxxx = mailbox0	—
*F0130000	00000000	Port update notification (RISC database changed)	—
*F0140000	xxxxxxxx	RSCN notification (name server change detected) xxxx = RSCN information	—
*F0150000	00xx00yy	Name server query rejected (v6 2100) xx = 'Reason Code' yy = 'Explanation Code' (valid if reason code is 0x09)	—
*F0150000	xxxxyyzz	Name server query rejected (v7 2100/2200) xxxx = response status yy = 'Reason Code' zz = 'Explanation Code' (valid if reason code is 0x09) e.g. if z = 0x09, yy = 07, this means no SCSI device found	—
*F0160000	00000000	Driver reset called — command timed out	—
*F0170000	00xxxxxx	Fabric port login (for information only) xxxxxx = port ID	—
F0180000	000000xx	Excessive link errors, loop down xx = number of link errors per second	—
*F0190000	00000000	Verify firmware checksum failure	—
F01A0000	0000xxxx	Invalid IOCB/IOSB IP handle from RISC xxxx = IOCB/IOSB IP handle	The error should not occur; send the event log to QLogic.

Table 5-1. Windows NT Event Codes (Continued)

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
*F01B0000	000000xx	Device marked offline after being 'not ready' longer than port down retry count Xx = loop ID of device	—
*F01C0000	000000xx	Bad type field in IOCB from RISC Xx = IOCB type	—
*F01D0000	00000000	Error down loading post RISC code	—
*F01Exxxx	Yyyyzzzz	Error running post RISC code Xxxx = mailbox0 Yyyy = mailbox1 zzzz = mailbox2	—
*F01Fxxyy	Zzzzzzzz	DMA 64 bit (PAE) configuration (for information only) Xx = Dma64BitAddressess flag set by W2K Yy = Dma64BitAddressess flag set by driver Zzzzzzzz = driver adapter flags	—
F0200000	Xxxxyyyy	Error ISP not accessible Xxxx = ISP host command and control yyyy = ISP interrupt status	—
*F0210000	xxyy00zz	ISP connection option/topology (for information only) xx = ISP connection option from NVRAM yy = previous ISP topology zz = current ISP topology topology code: 0000 = loop 0001 = FL_Port 0002 = N_Port to N_Port 0003 = F_Port	—

Table 5-1. Windows NT Event Codes (Continued)

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
*F0220000	0000xxxx	External RISC RAM parity error (for 2200G only) xxxx = number of parity errors detected	—
*F0230000	Xxxxyyyy	Subvendor ID not match (for information only) xxxx = actual subvendor ID yyyy = expected subvendor ID	—

5.2 NetWare

The Netware OS does not support event logging; nor does it allow the release (nondebug) driver to write to the console (except during the driver load phase).

The Netware OS does allow the driver to post a system alert (the console beeps and displays a text message passed back by the driver). To post system alerts to the console, add the /CONSOLE parameter to the driver load line. For example:

```
LOAD QL2x00.HAM SLOT=3 /LUNS /CONSOLE
```

The following system alerts are posted:

- **Failover id X on slot Y due to path timeout.** This alert is posted when the QLogic HBA fibre link fails and triggers an HBA failover.
- **Failover id X on slot Y due to port timeout.** This alert is posted when the storage port fibre link fails and triggers a storage port failover.

To see more detailed information, the debug driver must be loaded instead of the release driver. The debug driver is the same as the release driver, except that the prints are turn on (the performance hit is about one percent). The debug driver is very informative and allows you to monitor driver performance and determine whether the QLogic driver is responsible when the server appears to be hung.

5.3 Red Hat Linux

All messages from the qla2*x*00 Linux driver are sent to console. In addition, the messages are available in the /var/log/messages[*n*] file; *n* is a number from 1–*n*.

Figure 5-2 is an excerpt from a /var/log/messages[*n*] file.

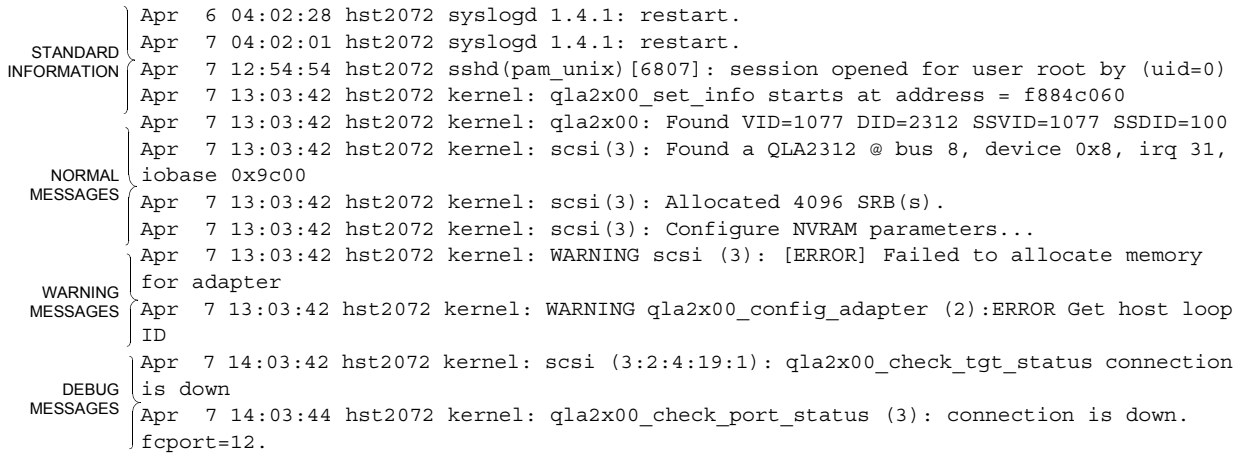


Figure 5-2. Red Hat Linux Error Logging Message File

As shown in figure 5-2, there are three types of messages, which are described in the following sections:

- Normal (see section 5.3.1)
- Warning (see section 5.3.2)
- Debug (see section 5.3.3)

5.3.1 Normal Messages

Normal messages are displayed during normal operations and indicate standard Red Hat Linux events. Table 5-2 lists the normal messages and their meanings.

Table 5-2. Red Hat Linux Normal Messages

Message	Meaning
%s: Can't find adapter for host number *%d*	The read operation from /proc/scsi/qla2*x*00 did not specify the correct adapter host number. *%s* indicates the function name. %d indicates the QLogic HBA number.
%s(): **** CMD derives a NULL HA	The command does not point to the adapter structure. *%s* indicates the function name.
%s(): **** CMD derives a NULL search HA\n	The command does not point to the adapter structure. *%s* indicates the function name.
%s(): **** CMD derives a NULL TGT_Q	The command does not point to an OS target.
%s(): Ran out of paths - pid *%d*	There are no more paths to try for the request. *%s* indicates the function name, and *%d* indicates the mid-level process or command number (pid).

Table 5-2. Red Hat Linux Normal Messages (Continued)

Message	Meaning
%s(): **** SP->ref_count greater than two	A coding error has occurred. *%s* indicates the function name.
%s(): **** SP->ref_count not zero	A coding error has occurred. *%s* indicates the function name.
%s(*%ld*): RISC paused, dumping HCCR (*%x*) and schedule an ISP abort (big-hammer)	The driver has detected that the RISC in the pause state. *%s* indicates the function name. (*%ld*) indicates the QLogic HBA number. (*%x*) indicates the value of the Host Command and Control register.
cmd_timeout: LOST command state = 0*x%x*	The command is in an undefined state. *0x%x* indicates the state number.
Mailbox command timeout mbx0=*%x*.	The driver detected a mailbox command timeout. *%x* indicates the error code.
PCI cache line size set incorrectly (*%d* bytes) by BIOS/FW,	The cache size has been corrected. *%d* indicates the new cache size.
qla*%d* Loop Down - aborting ISP	The driver is attempting to restart the loop by resetting the adapter. This is usually done by the driver when sync is not detected by the firmware for more than 4 minutes. The most common cause of this message is that the HBA port is not connected to the switch/loop. *%d* indicates the QLogic HBA number.
qla2x00_abort_isp(*%d*): **** FAILED ****	The driver could not perform an adapter reset. (*%d*) indicates the QLogic HBA number.
qla2x00: Found VID=*xxxx* DID=*yyyy* SSVID=*zzzz* SSDID=*vvvv* Found QLA2312	The driver is reporting the adapter it found during initialization.
qla2x00: ISP System Error...	The driver received an asynchronous ISP system error event from the firmware.
qla2x00: Performing ISP error recovery - ha=*%p*.	The driver has started an adapter reset. *%p* indicates the address of the HBA structure.
qla2x00_set_info starts at address = *xxxxxxxx*	The driver is reporting the starting address where the driver was loaded in case an Oops occurs in the driver.
Response pointer error mb5= *%x*.Driver detected a response queue index error from the firmware. %x indicates the queue index.	The driver detected a response queue index error from the firmware. *%x* indicates the queue index.
qla_cmd_timeout: State indicates it is with ISP, But not in active array	A coding error has occurred.

Table 5-2. Red Hat Linux Normal Messages (Continued)

Message	Meaning
scsi(*%ld:%d:%d:%d*): DEVICE RESET ISSUED.	A device reset is being issued. *%ld:%d:%d:%d* indicates the host:bus:target:LUN.
scsi(*%ld:%d:%d:%d*): Enabled tagged queuing, queue depth *%d*.	This message indicates the queue depth. *%ld:%d:%d:%d* indicates the host:bus:target:LUN.
scsi(*%ld:%d:%d:%d*): now issue ADAPTER RESET.	An adapter reset is being issued. *%ld:%d:%d:%d* indicates the host:bus:target:LUN.
scsi(*%ld:%d:%d:%d*): LOOP RESET ISSUED.\n	A loop reset is being issued. *%ld:%d:%d:%d* indicates the host:bus:target:LUN.
scsi(*%ld*): Mid-layer underflow detected (*%x* of *%x* bytes) wanted *%x* bytes...returning DID_ERROR status!\n	An underflow was detected. (*%ld*) indicates the QLogic HBA number. (*%x* of *%x* bytes) indicates the remaining bytes of the total bytes, for example, 200 of 512. *%x* bytes indicates the minimum number of expected bytes.
scsi(*%d*): 64 Bit PCI Addressing Enabled	The driver has configured the QLogic HBA for 64-bit transfers. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): Allocated *xxxxx* SRB(s)	The driver is reporting how many simultaneous commands can be executed by the QLogic HBA. The max_srbs option can change this number. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): *%s* asynchronous Reset.	The driver received an asynchronous reset event from the firmware. *%s* indicates the function name. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): Cable is unplugged...	The firmware state is loss of sync, which indicates that the cable is missing. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): Cannot get topology - retrying	The firmware returned busy status. (*%d*) indicates the QLogic HBA number.
scsi(*%d)*: Configuration change detected: value *%d*	The driver received a change in connection asynchronous event from the firmware. (*%d*) indicates the QLogic HBA number. *%d* indicates that additional information follows the message, for example, the mailbox 1 register value from the firmware.
scsi(*%d*): Configure NVRAM parameters...	The driver has read and configured the NVRAM parameters. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): Link node is up	The driver received a point-to-point asynchronous event from the firmware. The asynchronous event code is 8030h. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): LIP occurred,...	The driver received a LIP asynchronous event from the firmware. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): LIP reset...	The driver received a LIP reset asynchronous event from the firmware. (*%d*) indicates the QLogic HBA number.

Table 5-2. Red Hat Linux Normal Messages (Continued)

Message	Meaning
scsi(*%d*) LOOP DOWN detected	The driver received a loop down asynchronous event from the firmware. (*%d*) indicates the QLogic HBA number.
scsi(*%d*) LOOP UP detected	The driver received a loop up asynchronous event from the firmware. (*%d*) indicates the QLogic HBA number.
scsi*(%d)*: Port database changed	The driver received a port database asynchronous event from the firmware. (*%d*) indicates the QLogic HBA number.
scsi*%d*: QLogic *XXXXXX* PCI to Fibre Channel Host Adapter:... Firmware version: 3.01.13, Driver version 6.01.00-*xx*	The driver is reporting information discovered during its initialization. This information includes: ■ Adapter ID ■ Firmware version ■ Driver version: xx = fo (failover) enabled or debug (debugging) enabled ■ NL-PORT (*%d*) indicates the QLogic HBA number.
scsi(*%d*): RSCN,...	The driver received a registered state change notification (RSCN) asynchronous event from the firmware. Additional information follows the message, for example, the mailbox register values from the firmware.
scsi*%d*: Topology - (*%s*), Host Loop address 0*x*0	This message indicates the firmware connection type. (*%d*) indicates the QLogic HBA number. *%s* indicates one of the following the host adapter loop IDs: ■ FL-PORT ■ N-PORT ■ F-PORT ■ NL-PORT
scsi(*%d*): Unknown status detected *%x-%x*	The status returned from the firmware is not supported. *%x-%x* indicates the completion-scsi status.
scsi(*%d*): Verifying chip...	The driver has verified the chip on the QLogic HBA. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): Verifying loaded RISC code...	The driver has verified the RISC code. The RISC code is running. (*%d*) indicates the QLogic HBA number.
scsi(*%d*): Waiting for LIP to complete...	The driver is waiting for the firmware to be ready. (*%d*) indicates the QLogic HBA number.
Status entry invalid handle = *%x*	The driver detected an invalid entry in the ISP response queue from the firmware. *%x* indicates the queue index.

5.3.2
Warning Messages

Warning messages and their meanings are listed in table 5-3.

Table 5-3. Red Hat Linux Warning Messages

Message	Meaning
WARNING *%s*(*%d*):ERROR Get host loop ID	The firmware did not return the adapter loop ID. %*s* indicates the function name. (*%d*) indicates the QLogic HBA.
WARNING *%s*(): Couldn't allocate memory for sp - retried.	The driver could not allocate kernel memory for the SCSI pointer (sp). %*s* indicates the function name.
WARNING Error entry invalid handle	The driver detected an invalid entry from the firmware in the ISP response queue. This error causes an ISP reset.
WARNING MS entry invalid handle	The driver detected a management server command timeout.
WARNING qla2x00: couldn't register with scsi layer	The driver could not register with the SCSI layer; the most common reason is that the driver could not allocate the memory required for the QLogic HBA.
WARNING qla2x00: Failed to initialize adapter	A previous error is preventing the adapter instance from initializing properly.
WARNING scsi*%d*: Failed to register resources.	The driver could not register with the kernel. (*%d*) indicates the QLogic HBA number.
WARNING qla2x00: Failed to reserve interrupt *%d* already in use	The driver could not register for the interrupt IRQ because the IRQ is being used by another driver. *%d* indicates the IRQ number.
WARNING qla2x00: Failed to reserved i/o base region *0x%04lx-0x%04lx* already in use	The driver could not register for the I/O base address because the address is being used by another driver. *0x%04lx-0x%04lx* indicates the starting-ending address of the I/O base region.
WARNING qla2*x*00: (*%x:%x:%x*) No LUN queue	The command does not have a LUN pointer. (*%x:%x:%x*) indicates the host:target:LUN.

Table 5-3. Red Hat Linux Warning Messages (Continued)

Message	Meaning
WARNING qla2x00: Please read the file /usr/src/linux/drivers/scsi/README.qla2x00 qla2x00: to see the proper way to specify options to the qla2*x*00 module qla2*x*00: Specifically, don't use any commas when passing arguments to qla2x00: insmod or else it might trash certain memory	The space allowed to pass options has been exceeded.
WARNING qla2x00: Request Transfer Error	The driver received a request transfer error asynchronous event from the firmware.
WARNING qla2100: Response Transfer Error	The driver received a response transfer error asynchronous event from the firmware.
WARNING scsi(*%d*): [ERROR] Failed to allocate memory for adapter*n*	The driver could not allocate enough kernel memory. (*%d*) indicates the QLogic HBA number.

5.3.3 Debug Messages

The standard debug messages are enabled by setting the debug flag defined in the qla_settings.h header file. For example:

```
# define DEBUG_QLA2100
```

In addition, the driver has 12 different debug levels that can be compiled in the driver to log information about certain sections of the driver. These debug levels are defined as comments in the qla2*x*00.h header files.

To active a DEBUG_LEVEL_*x,* un-comment the definition, then recompile the driver. The following lines define the different debug levels:

```
/*
 * Driver debug definitions.
 */
DEBUG_LEVEL_1  - Log all register accesses
DEBUG_LEVEL_2  - Log error tracing
DEBUG_LEVEL_3  - Log entry and exit function tracing
DEBUG_LEVEL_4  - Log NVRAM tracing
DEBUG_LEVEL_5  - Log request/response ring tracing
DEBUG_LEVEL_7  - Log RISC load tracing
DEBUG_LEVEL_8  - Log request/response ring saturation
DEBUG_LEVEL_9  - Log IOCTL trace msgs
DEBUG_LEVEL_10 - Log IOCTL error msgs
DEBUG_LEVEL_11 - Log Mailbox command tracing
DEBUG_LEVEL_12 - Log IP tracing
```

Debug messages and their meanings are listed in table 5-4.

Table 5-4. Red Hat Linux Debug Messages

Message	Meaning
scsi(*%ld:%2d:%2d:%2d*):%s connection is down	There is a condition indicating that the connection is down. *%ld:%2d:%2d:%2d* indicates host:bus:target:LUN. *%s* indicates the function name.
%s(*%ld*): connection is down. fcport=*%p*.	There is a condition indicating that the connection is down. *%s* indicates the function name. (*%ld*) indicates the QLogic HBA number. *%p* indicates the address of the port structure.

5.4 Solaris SPARC

Solaris SPARC extended error logging is available with series 4.*x* and above drivers. This feature allows you to print out additional debug messages without having to install a complete (full) debug driver.

NOTE: If QLogic technical support needs additional information, a complete debug driver may be required. This driver is used by QLogic to reproduce the customer problem. This driver is not available to QLogic customers.

To enable extended error logging in Solaris SPARC, add the following parameter in the /kernel/drv/qla2*x*00.conf or qla2*x*00.conf file:

`hba`*`x`*`-extended-error-logging=`*`n`*

Where:

x = Driver instance number

n = 0 (error logging disabled) or 1 (error logging enabled)

You must reboot the machine for the change to take effect. The messages are available in the /var/adm/messages file.

The following types of messages are displayed:

- Topology information
- Asynchronous events: RSCNs, LIPs, etc.
- Device configuration/discovery messages, such as lost devices, found devices, new devices, word wide node names, and world wide port names
- Fatal errors (8002s reported)
- Unusual events and status
- Expected failure messages

Figure 5-3 is an excerpt from a /var/adm/messages file.

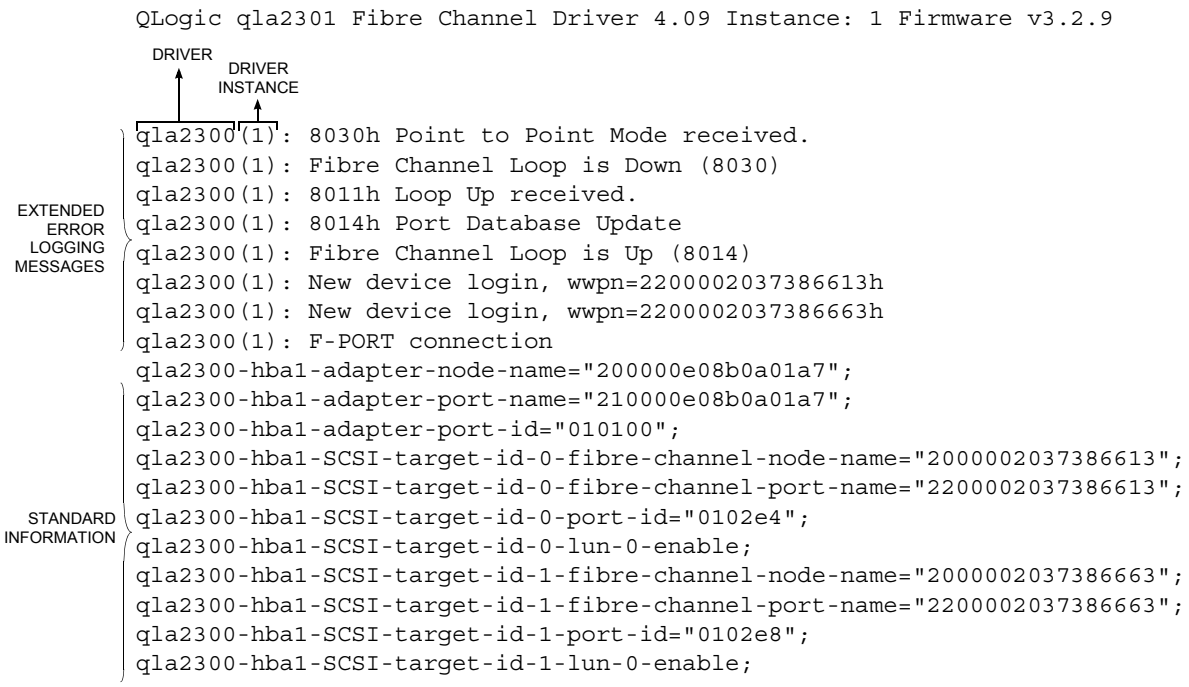


Figure 5-3. Solaris SPARC Extended Error Logging Message File

As shown in figure 5-3, the extended error logging messages are displayed in the following format:

driver(*driver instance*): *xxx*h (if applicable) *error message* (*xxx*h) (if applicable)

Table 5-5 lists the error messages and their meanings. All messages apply to driver version 4.08 and above unless otherwise noted.

Table 5-5. Solaris SPARC Extended Error Logging Messages

Message	Meaning
%d gigabit data rate connection	This message indicates the firmware data rate connection. (*%d*) is 1 or 2.
%s-PORT connection	This message indicates the firmware connection type. *%s* is one of the following: ■ FL-PORT ■ N-PORT ■ F-PORT ■ NL-PORT
%x Bypass Notification received	The driver received a bypass notification asynchronous event from the firmware. *%x* indicates the asynchronous event code.

Table 5-5. Solaris SPARC Extended Error Logging Messages (Continued)

Message	Meaning
%x Change In Connection received	The driver received a change in connection asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x IP low water mark.	The driver received an IP low water mark asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x IP receive buffer empty	The driver received an IP receive buffer empty asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x ISP System Error...	The driver received an asynchronous ISP system error event from the firmware. *%x* indicates the asynchronous event code. Additional information follows the message, for example, mailbox values from the firmware.
%x LIP F8 received.	The driver received a LIP (F8h) asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x LIP Occurred,...	The driver received a LIP asynchronous event from the firmware. *%x* indicates the asynchronous event code. Additional information follows the message, for example, mailbox values from the firmware.
%x LIP Reset...	The driver received a LIP reset asynchronous event from the firmware. *%x* indicates the asynchronous event code. Additional information follows the message, for example, mailbox values from the firmware.
%x Loop Down received	The driver received a loop down asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x Loop Up received	The driver received a loop up asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x Point to Point Mode received	The driver received a point to point asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x Port Database Update	The driver received a port database asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x Port Database Update, Login/Logout	The driver received a port database asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x Request Transfer Error received	The driver received a request transfer error asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x Reset received	The driver received an asynchronous reset event from the firmware. *%x* indicates the asynchronous event code.

Table 5-5. Solaris SPARC Extended Error Logging Messages (Continued)

Message	Meaning
%x Response Transfer Error received	The driver received a response transfer error asynchronous event from the firmware. *%x* indicates the asynchronous event code.
%x RSCN,...	The driver received a registered state change notification (RSCN) asynchronous event from the firmware. *%x* indicates the asynchronous event code. Additional information follows the message, for example, mailbox values from the firmware.
801bh Fabric Authentication Requested[a]	The switch has indicated support for fibre channel security protocols.
Adapter initialization failed	A previous error is preventing the adapter instance from properly initializing.
Check condition, *t0d0*[a]	There is a SCSI check condition on a device. *t0* indicates the target ID. *d0* indicates the LUN.
Corrupt NVRAM, proceeding with driver defaults[a]	The driver detected an invalid NVRAM; consequently, the driver defaults are used.
Device lost...	The driver is reporting that the specified device was in the driver database and has not logged back into the switch. Additional device information follows the message, for example, the WWPN of the lost device.
Duplicate persistent bindings found for WWPN: *%x …*[a]	An attempt was made to persistently bind a device to two different target IDs. *%x* indicates the world wide port number.
Error entry invalid handle = *%x*	The driver detected an invalid entry in the ISP response queue from the firmware. *%x* indicates the queue index.
Failed to get adapter ID	The firmware failed to return the adapter loop ID.
Failed to get request packet	This message indicates that the I/O cannot submit the packet to the firmware request queue.
FARP entry invalid handle = *%x*	This message indicates that the firmware returned an invalid FARP entry to the driver. *%x* indicates the index.
Fast Post invalid handle = *%x*	This message indicates that the firmware returned an invalid entry to the driver. *%x* indicates the index.
Fibre Channel Loop is Up	The driver indicates that the FC loop is up.
Firmware state = *%x*	The driver could not successfully initialize the firmware. *%x* indicates the firmware error code.
Fx_Port FAILED Authentication, port=*%x* [a]	There is a switch failure of the fibre channel security protocols.*%x* indicates the port number.
Inquiry Busy error, *t0d0*[a]	A SCSI Inquiry command returned a busy condition for a device. *t0* indicates the target ID. *d0* indicates the LUN.

Table 5-5. Solaris SPARC Extended Error Logging Messages (Continued)

Message	Meaning
IP entry invalid handle = *%x*	This message indicates that the firmware returned an invalid I/O pointer to the driver. *%x* indicates the index.
IP RCV cont entry invalid index = *%x*	This message indicates that the firmware returned an invalid IP continuation entry to the driver. *%x* indicates the index.
IP RCV entry invalid index = *%x*	This message indicates that the firmware returned an invalid IP receive entry to the driver. *%x* indicates the index.
Mailbox command timeout mbx0=*%x*	The driver detected a mailbox command timeout. *%x* indicates the error code.
MS entry invalid handle = *%x*	The driver detected a management server command timeout. *%x* indicates the queue index.
MULTI_CHIP_ADAPTER board	The driver is reporting the NVRAM's indication that the HBA is a multichip adapter.
New device login, wwpn =...	The driver is reporting that the specified device is new (not in the driver database), and that it has logged in successfully.
Nx_Port FAILED Authentication, id=*%x*[a]	There is a port failure of the fibre channel security protocols.*%x* indicates the loop ID.
Packet completion status error=*%x*, reason=*%y*, *t0d0*, id=*%z*[a]	This message indicates an I/O command block completion status error. *%x* indicates the I/O command block completion status number. *%y* indicates the OS reason code. *%z* indicates the loop ID.
PCI configuration failed	The driver cannot assign or allocate a system PCI resource.
Re-login of device...	The driver is reporting that the specified device has logged back in successfully. Additional device information follows the message, for example, the world wide port name (WWPN) of the device.
Response index error = *%x*	The driver detected a response queue index error from the firmware. *%x* indicates the queue index.
Restart Loop	The driver is attempting to restart the loop by resetting the adapter. This is usually done by the driver when sync is not detected by the firmware for 4 or more minutes, and usually means that the HBA port is not connected to the switch/loop.
Sense Data *%x*[a]	The SCSI request sense data has been received for a check condition. %x indicates the SCSI request sense data.

Table 5-5. Solaris SPARC Extended Error Logging Messages (Continued)

Message	Meaning
Status entry invalid handle = *%x*	The driver detected an invalid entry in the ISP response queue from the firmware. *%x* indicates the queue index.
Watchdog command timeout	The driver has detected an I/O that has not been returned or timed out by the firmware within the specified time period.

Table Notes

[a]This message was added in driver version 4.12.

Notes

Section 6

Frequently Asked Questions

This section answers the most frequent questions received by QLogic technical support. Each section has a troubleshooting procedure to help you solve the problem.

6.1 How do I decode system event ID 11 errors in the Windows NT/Windows 2000 system event log?

Perform the following steps to troubleshoot this issue:

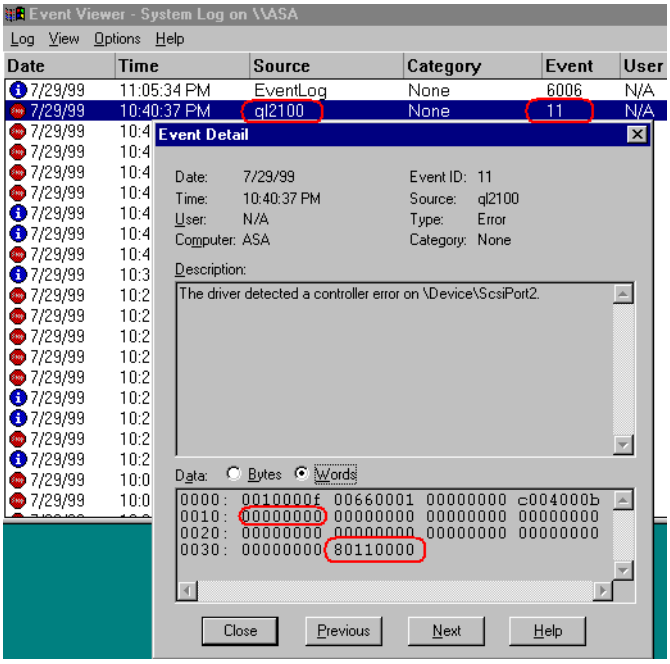
1. Locate the system event log system.evt.
2. Open the event log file with the Windows Event Viewer Utility.
3. Determine the event ID. (Check the **Event Column** in the event log.)

   If the errors are event ID 11, go to step 4.

   If the errors are not event ID 11, they are not caused by the QLogic miniport driver. Contact Microsoft for assistance.

4. Open the **Event ID 11 Error** that has ql2xxx as the source.
5. Change **Data** from **Bytes** to **Words**.

6. Look up 34 hex (80110000 below), then 10 hex (00000000 below).



7. Use the *QLogic Guide to Interpreting The Event Error Log* to look up the error. The guide can be found at the following location: www.qlogic.com/support/logs/qla2xxx_error.asp

   a. If the error data is not listed in the guide, call QLogic Technical Support and email the event log to support@qlogic.com.

   b. If the error is listed in the guide, see the **Suggested Action** column for the appropriate solution.

   c. If the error has an asterisk (see the following table), disable extended error logging in *Fast!*UTIL.

Event Code Offset 34h	More Data Offset 10h	Description	Suggested Action
* 80100000	0000xxxx	LIP occurred xxxx = mailbox1	This error is not logged during normal operations

6.2

How is Windows 2000 installed into a Fibre Channel disk?

Perform the following steps to install Windows 2000 into a Fibre Channel disk:

1. In the system BIOS, set the boot device to CD-ROM, then SCSI.

   Boot to the system BIOS and set the boot options for SCSI. Check your PC hardware manual for information about boot options.

2. Open *Fast!*UTIL: press CTRL+Q when prompted to enter *Fast!*UTIL during POST (after memory is counted and drives are detected). Use the UP ARROW and DOWN ARROW keys to make your selection.
3. Select **Scan for Fibre Devices**, then press ENTER.
4. If you can see the storage, go to step 5.

   If you can't see the storage, check the following:

   - Check connections
     - Make sure that the cables are plugged in.
     - Make sure that the links to the switch are active.
   - Check the QLogic HBA connection options. In *Fast!*UTIL, select **Configuration Settings**, then press ENTER. From the displayed options, select **Extended Firmware**, the press ENTER. Select **Connection Options**, then press ENTER. Make sure that this setting is configured for the type of switch or storage port you are using. For example, if the switch is configured as a fabric port, the connection options must be set to point to point.
   - Check switch zoning. Make sure that both the QLogic HBA port and storage port are in the zone (see the appropriate switch management documentation).
   - Check the storage configuration (see the appropriate storage management documentation)
     - Check the LUN security.
     - Make sure that all the LUNs have been defined.
   - Check the QLogic HBA BIOS version. In *Fast!*UTIL, select **Configuration Settings**, then press ENTER. Select **Host Adapter Settings**, then press ENTER. If necessary, update the BIOS. (Be sure to check the QLogic web site (www.qlogic.com) for the most current BIOS.)

   Repeat step 3.

5. Perform the following steps from the *Fast!*UTIL main menu :
   a. Select **Configuration Settings**, then press ENTER.
   b. Enable the BIOS.
   c. Select **Selectable Boot Settings**, then press ENTER.
   d. Select your Fibre Channel storage and LUN.
   e. Press ESC.
   f. When prompted, press ENTER to save the changes.
   g. Select **Exit Fast!UTIL**, then press ENTER.
6. Reboot with the Windows 2000 CD in CD-ROM drive.
7. After the QLogic BIOS banner, press the SPACEBAR to boot from the CD-ROM when prompted.
8. Press F6 when prompted for additional drivers.
9. Press S to select additional drivers.
10. Insert the QLogic HBA drivers disk and select the Fibre Channel HBA model number.
11. Follow the instructions until the partition options screen displays.
12. When you are prompted to install the OS, perform the following steps to define the partition:
    a. Press C to create the partition.
    b. Select your Fibre Channel storage device.
    c. Specify the size for the ‘C:\’ primary partition.
13. When prompted, select the file system type (NTFS or FAT).
14. Windows 2000 formats and copies all necessary the files and completes the installation.

6.3

Why can't I enter the BIOS of a QLogic HBA (*Fast!*UTIL)?

The BIOS may be corrupt, or it is conflicting with another BIOS on another QLogic HBA. Perform the following steps to troubleshoot this issue:

1. Does the following banner display after POST?

```
QLogic Corporation
QLA2200 PCI Fibre Channel Rom BIOS Version 1.76
Copyright (C) QLogic Corporation 1993-2001. All rights
          reserved.
www.qlogic.com
Press <CTRL-Q> for Fast!UTIL
```

2. If the banner displays and the system locks when you press CTRL+Q, perform the following steps:
   a. Search for a conflicting device.

      Remove all other PCI HBAs in the system, and reboot.

   b. If the HBA works after removing the other PCI HBAs, perform the following steps:
      i. Re-install the other HBAs one at a time until the QLogic HBA fails again.
      ii. Once the faulty HBA is identified, change the PCI slot that it goes into. If this works, go to step 5.
      iii. If the HBA still fails, contact the HBA manufacturer to see if they have a work around or an update. In addition, contact QLogic Technical Support to see if there are any BIOS incompatibility issues.

3. If the banner does not display and *Fast!*UTIL fails, perform the following steps:
   a. Install the QLogic HBA in a different PCI slot or different PC/server.
   b. If the banner still does not display, re-flash the QLogic HBA (see section 6.4).

4. If the banner still does not display, return the QLogic HBA to QLogic for repair.

5. If the QLogic HBA does work in the new PCI slot or PC/server, perform the following steps:
   a. If the banner displays, then there is a problem between the server and the QLogic HBA. Make sure that the PC/server's BIOS is the latest version.
   b. If the PC/server's BIOS is not the latest version, flash the BIOS to update the version, then re-test.
   c. If the PC/server's BIOS is the latest version, contact QLogic Technical Support to see if there are any compatibility issues.
6. If the QLogic HBA still fails after the PC/server BIOS is updated, contact QLogic Technical Support to see if there are any compatibility issues.

6.4 How do I flash the QLogic HBA BIOS?

Perform the following steps to flash the QLogic HBA BIOS:

1. Create a blank, bootable disk formatted with MS-DOS, PC-DOS, or DR-DOS. If MS-DOS or PC-DOS is not available, download **DrDOS 7.X Disk For Bios Flashing Basic- No Drivers** from www.bootdisk.com.
2. Using a text editor, verify that the config.sys and autoexec.bat files are blank and contain no entries.
3. Insert the disk created in step 1 in an appropriate drive. Double-click the archive icon, then type the following in the **Unzip to folder** field to extract the contents of the BIOS files archived to the disk:

   ```
   a:\
   ```

4. Insert the disk created in step 1 into the drive of the PC that contains the QLogic HBA and boot from the disk.
5. At the a:\ prompt, type `flasutil`, then press ENTER.

   If the QLogic HBA is detected, the following line displays:

   ```
   QLA2xxx Adapter found at I/O address: xxxx
   ```

   If the QLogic HBA is not detected, run flasutil with the /I (ignore subsystem ID) parameter.
6. Select F to write to the flash. Flasutil writes the flash to the QLogic HBA.

7. Remove the disk and reboot the PC. After POST, perform the following steps:
   a. Press CTRL+Q to enter *Fast!*UTIL when the following BIOS banner displays:

```
QLogic Corporation
QLA2200 PCI Fibre Channel Rom BIOS Version 1.76
Copyright (C) QLogic Corporation 1993-2001. All rights
          reserved.
www.qlogic.com
Press <CTRL-Q> for Fast!UTIL
```

   b. Perform the following steps to restore the default settings and reboot the PC. Use the UP ARROW and DOWN ARROW keys to make your selection.
      i. Select **Configuration Settings**, then press ENTER.
      ii. Select **Restore Default Settings**, then press ENTER.
      iii. You are prompted to press any key. Press ENTER.
      iv. Press ESC.
      v. When prompted, press ENTER to save the changes.
      vi. Select **Exit Fast!UTIL**, then press ENTER.
      vii. When prompted to reboot the system, press ENTER.

6.5 How is a driver configured to work with a tape drive?

There is no additional configuration needed for the QLogic HBA driver. However, if the tape device is not seen from Windows 2000 or Windows NT 4, perform the following steps:

1. Reboot the PC. During system boot, press CTRL+Q to enter *Fast!*UTIL.
2. Select **Scan Fibre Devices**, then press ENTER. Verify that the QLogic HBA can see the tape drives, then reboot.
3. If the QLogic HBA cannot see the tape drives, perform the following steps:
   a. Check the switch zoning to verify that the card is in a zone that contains the tape devices.
   b. Swap cables and GBICs/SFPs with known good components.

4. If the QLogic HBA can see the tape drives, then the driver needs to be re-installed. Please see the tape drive documentation for information about installing a driver for the tape drive.
5. If the tape drive is a native Fibre channel device, perform the following steps in *Fast!*UTIL to verify that Fibre Channel tape support is enabled. Use the UP ARROW and DOWN ARROW keys to make your selection.
   a. Select **Configuration Settings**, then press ENTER.
   b. Select **Extended Firmware Settings**, then press ENTER.
   c. Select **Fibre Channel Tape Support**, then press ENTER.
   d. Press ESC twice.
   e. When prompted, press ENTER to save the changes.
   f. Select **Exit Fast!UTIL**, then press ENTER.
   g. When prompted to reboot the system, press ENTER.
6. Boot into Windows, install the tape backup software (if not already installed), and perform a small backup to verify correct operation.

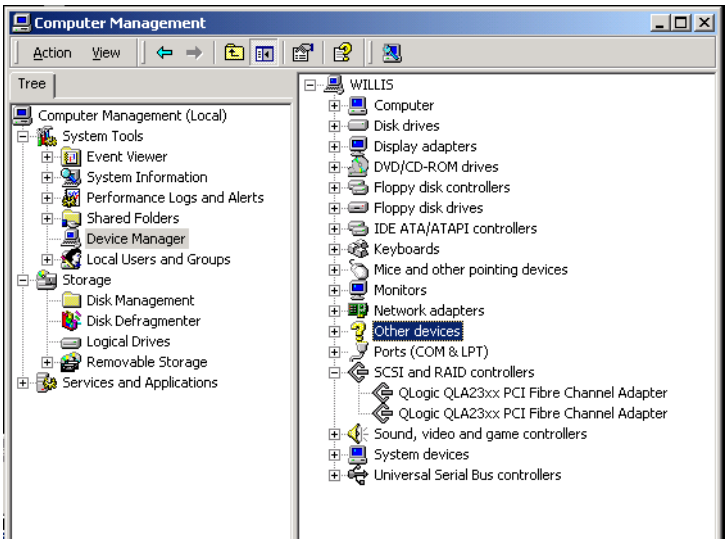
6.6 Why can't I see LUNs on a RAID array?

There may be zoning, cabling, or GBIC issues. The RAID may not be properly configured. Perform the following steps to troubleshoot this issue:

1. Does the *Fast!*UTIL BIOS banner display when the system boots?
   a. If the banner displays, press CTRL+Q to enter *Fast!*UTIL. Use the UP ARROW and DOWN ARROW keys to select **Scan Fibre Devices** to find out if the QLogic HBA can see the RAID array's world wide name (WWN).
      i. If you cannot see the WWN, check for issues with switch zoning, cabling, and GBICs.
      ii. If you can see the WWN, press ESC to exit *Fast!*UTIL, and continue to boot into Windows 2000.
   b. If the banner does not display, follow the procedures for re-flashing the QLogic HBA with latest x86 BIOS version (see section 6.4).
   c. If re-flashing the QLogic HBA with the latest x86 BIOS does not work, the QLogic HBA may be defective. Contact QLogic technical support.
2. If you are connecting to the RAID array through a switch, can you see the RAID array and the QLogic HBA in the name server of the switch?

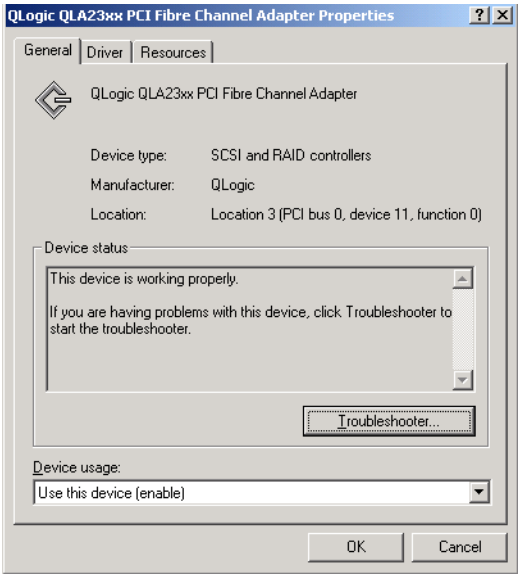
If the RAID array and QLogic HBA are not displayed in the name server of the switch, check for issues with cabling, GBICs, and physical connections to the switch. If the RAID array and QLogic HBA are displayed in the name server, check for zoning issues. If none of these issues is causing the problem, contact QLogic technical support.

3. Can you see the QLogic HBA in the **Device Manager** under SCSI and RAID controllers? See the following picture.

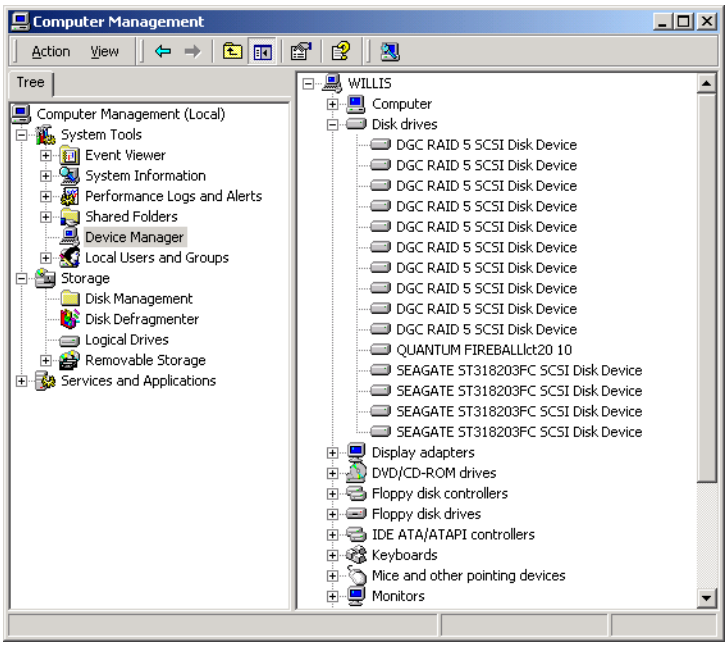


a. If you cannot see the QLogic HBA, verify that the latest QLogic driver has been installed.

b. If you can see the QLogic HBA, right-click the QLogic HBA and select **Properties**. Under the **General** tab, verify that the device is working properly (see the following picture). If the device is not working properly, re-install the driver.

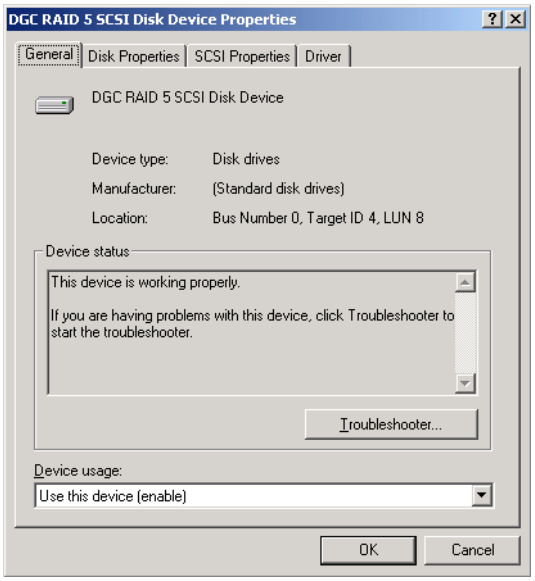


4. In the **Device Manager**, can you see the RAID storage under the disk drives? See the following picture.



If you cannot see the RAID storage, check for issues with switch zoning, cabling, and GBICs.

5. Right-click the RAID array. Are the target ID and LUN number displayed next to the location bus number? See the following picture.



If the target ID and LUN number are not displayed, call the RAID array's manufacturer and determine if LUN security is enabled.

6.7 How does an QLogic HBA log into a switch as a Fabric or Loop?

Perform the following steps to troubleshoot this issue:

1. During system boot, press CTRL+Q to enter *Fast!*UTIL. Use the UP ARROW and DOWN ARROW keys to make selections in *Fast!*UTIL.
2. Select **Configuration Settings**, then press ENTER.
3. Select **Host Adapter Settings**, then press ENTER.
4. Select **Extended Firmware Settings**, then press ENTER. Set the **Connection Options** as appropriate for your system.

Option	Connection Type
0	Loop only
1	Point to point only (Fabric)
2	Loop preferred, otherwise point to point (Fabric)
3	Point to point, otherwise loop. This is the default setting.

5. If you have the QLogic HBA set to point-to point only and the connection is still not logging in as fabric, contact QLogic technical support.

6.8

Why does the Windows 2000 system take a long time to boot when devices are attached to the QLogic HBA?

There may be a conflict on the SAN, or the port to which the device is attached is returning port down status. Perform the following steps to troubleshoot this issue:

1. Make sure the current driver and BIOS are installed.

   If the current driver and BIOS are not installed, upgrade to the latest drivers and firmware from the QLogic web site: http://support.qlogic.com.

2. If the current drivers are installed but the boot time is slow, perform the following steps:

   a. Remove the driver from the device manager and remove the QL2xxx entry from the registry using REGEDIT:

      i. Click **Start**, select **Run**, and open the **REGEDIT** program.

      ii. Select **HKEY_LOCAL_MACHINE** and follow the tree structure to the QLogic HBA model number:

      HKEY_LOCAL_MACHINE
      SYSTEM
      CurrentControlSet
      Services
      QL2200 (or appropriate QLogic HBA model number)

      iii. Reinstall the driver.

      iv. Reboot the system.

3. If the boot time is still slow after installing the driver, perform the following steps:

   a. Reduce the port down retry counts.

   b. Reboot the system. During system boot, press CTRL+Q to enter *Fast!*UTIL. Use the UP ARROW and DOWN ARROW keys to make your selection.

      i. Select **Advance Adapter Settings**, then press ENTER.

      ii. Lower the **Retry Count** to achieve the preferred boot time. The default is 8 retries.

      iii. Press ESC.

      iv. When prompted, press ENTER to save the changes.

      v. Select **Exit Fast!UTIL**, then press ENTER.

4. If the boot time is still slow, consider the following:
   - A conflicting device on the SAN may also cause slow boot up time.
   - Limit the number of devices on the SAN to determine what is causing the conflict.
   - A storage device or switch might be causing the problem. In either case, contact QLogic technical support.

Appendix A
Glossary

This section describes common hardware, firmware, and Fibre Channel terms that are used in this guide and throughout Fibre Channel documentation. Italicized terms in the definitions are described in this glossary (if viewing as a PDF, the terms are hyperlinked to their definitions).

8B/10B	8B/10B is the IBM patented method for encoding an 8-bit data byte to a 10-bit *Transmission Character*. Data bytes are converted to transmission characters to improve the physical signal, providing the following benefits: ■ Bit synchronization is easily achieved. ■ Receiver and transmitter design is simplified. ■ Error detection is improved. ■ Control characters (for example, the *Special Character*) can be distinguished from data characters.
10B Errors	10B errors are reported during the process of converting 8-bit data bytes to 10-bit transmission words.
ACK (acknowledgement frame)	ACKs are used for end-to-end flow control. An ACK is sent to verify receipt of one or more *Frames* in Class 1 and Class 2 services.
Adapter	An adapter is the board that interfaces between the host system and the disk. Adapter is synonymous with host adapter, adapter board, and *HBA*.
Address Identifier	An address identifier is a three-byte that addresses an *N_Port*. The Address identifier is usually assigned by the *Fabric*, and is used in *Frames* in the *S_ID* (source identifier) and *D_ID* (destination identifier) fields.

Airflow	Airflow indicates the direction of air circulating throughout a device. The SANbox switches can be purchased with airflow either front-to-back or back-to-front. The front of the SANbox switches is the side with the *Ports*, not necessarily the direction it is mounted in a rack.
AL_PA *(Arbitrated loop physical address)*	This one-byte value is used in *Arbitrated Loop* topology to identify L_Ports. The AL_PA is also the last byte of the *Address Identifier* for each public *L_Port* on the loop.
ALUT *(address loop-up table)*	The ALUT is used by SANbox switch *Ports* for segmented loop (SANbox1) and translated loop features. The SANbox2 ALUT is only used for translated loop.
ARB *(arbitrate primitive signal)*	This primitive signal applies only to *Arbitrated Loop* topology. It is transmitted as the fill word by an *L_Port* to indicate that the L_Port is arbitrating to access to the loop.
Arbitrated Loop	Arbitrated loop is one of three Fibre Channel topologies. One *FL_Port* and up to 126 *NL_Ports* are configured in a unidirectional loop. *Ports* arbitrate for access to the loop based on their *AL_PA*. Ports with lower AL_PAs have higher priority than those with higher AL_PAs.
ARP *(address resolution protocol)*	ARP is part of the TCP/IP suite that maps IP addresses to *Ethernet* addresses. TCP/IP requires ARP for use with Ethernet. (Newton's Telecom Dictionary, 10th edition)
ASIC *(application specific integrated circuit)*	An ASIC is a computer chip designed to integrate specific features. ASIC development makes specific features available in a smaller footprint, reducing the cost of the product. For example: ❑ SANbox 8 and 16 switches (1 Gb) have four *Ports* per ASIC ❑ SANbox2 (2 Gb) switches have 16 ports per ASIC

BB_Credit *(buffer-to-buffer credit value)*	BB_Credit, also referred to as receive buffer credit, is used for buffer-to-buffer flow control. BB_Credit determines the number of frame buffers available in the *Port* in which it is attached, that is, the maximum number of *Frames* it cab transmit without receiving an R_RDY.
Blink Code	Blink code refers to the flashes shown on the heartbeat LED when a POST reports a failure on the SANbox switches.
Bootp *(Boot protocol)*	Bootp is a TCP/IP protocol that allows a node to discover startup information, for example, an IP address.
Class 1 Service	Class 1 service is a method of communicating between *N_Ports* that establishes a dedicated connection between the *Ports*. The ports are guaranteed the full connection bandwidth, and *Frames* from other N_Ports may be blocked while the connection exists. In-order delivery of Frames is guaranteed. Only end-to-end flow control is used. Class 1 service is not widely used in the *SAN* environment.
Class 2 Service	Class 2 service is a method of communicating between *N_Ports* that does not establish a connection. Each *Frame* is acknowledged by the receiver. Frames are routed through the *Fabric*, and each frame may take a different route. In-order delivery of frame*s* is not guaranteed. Class 2 uses both buffer-to-buffer flow and end-to-end flow control. SANbox switches support Class 2 service on all *Ports*.
Class 3 Service	Class 3 service is a method of communicating between *N_Ports* that is similar to *Class 2 Service*, except that there is no acknowledgment of received *Frames*. Frames are routed through the *Fabric* as in Class 2. In-order delivery is not guaranteed. Only buffer-to-buffer flow control is used. The SANbox switches support Class 3 service on all *Ports*.

CLS
(close primitive signal)

This primitive signal applies only to *Arbitrated Loop* topology. The CLS signal is sent by an *L_Port* that is currently communicating on the loop (that is, it has won access to the loop or was opened by another L_Port that won access to the loop) to close communication with the other L_Port.

CRC
(cyclic redundancy check)

CRC is a method of error detection in data transmission. On the transmitting end, a mathematical computation is performed on the bitstream and the result is added to the data packet.

The process is reversed on the receiving end. If the two results do not match, a CRC error is generated.

Crossbar

Crossbar is a type of switching system that forms a web so that every *Port* has a connection to every other port.

D_ID
(Destination identifier)

The D_ID is a three-byte field in the *Frame* header that indicates the address identifier of the *N_Port* where the frame will be delivered.

Data Tabs

This term is used in SANsurfer2 to designate the tabs at the bottom of the screen. Each of the data tabs controls the information that is shown in the *Data Window*.

Data Window

This term is used in SANsurfer2 to designate the area of the screen with information about the *Fabric* or the switch. The data window information is controlled by the *Data Tabs*.

Disparity

Disparity is the difference between the number of ones and zeros in a *Transmission Character*. A transmission character with more ones than zeros has positive running disparity. A transmission character with more zeroes than ones has negative running disparity. A transmission character with an equal number of ones and zeros is has neutral disparity.

Driver

Driver refers to software that interfaces between the file system and a physical data storage device or network media.

The level structure for Windows NT/2000 drivers is as follows:

- Class Driver. This is the highest driver level. There is a separate class for disk, *Ethernet*, etc. This level handles all generic aspects of operations for that class.
- *Port* Driver. This is the middle driver level, which handles aspects of the operation specific to the *Port* type; for example, there is a port driver for *SCSI*.
- Miniport Driver. This is the lowest driver level and device specific. This level is usually supplied by the manufacturer as a companion to a physical device.
- Monolithic Driver. This level combines the functions of different driver levels in the same driver to increase performance.
- Adjunct Driver. This level works along side a driver at the same level to increase performance.

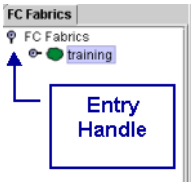
In NetWare, the required drivers include:

- Host Adapter Module (HAM). HAM is the driver component associated with the host adapter hardware. It provides the functionality to route requests to the bus where a specified device is attached.
- Custom Device Module (CDM). CDM is the drive component associated with storage devices. It provides the functionality to build device-specific commands from I/O messages received from NetWare's Media Manager.

Driver (continued)	In Red Hat Linux, the driver layers include: ■ *SCSI* Upper Layer. This is the device management layer. It handles device-dependent tasks for devices, such as disks and tapes. ■ *SCSI* Middle Layer. This is the SCSI traffic handling layer. It directs requests between the kernel and the SCSI. ■ *SCSI* Lower Layer. This is the SCSI host bus adapter driver. It communications directly to the SCSI HBA. The structure for Solaris SPARC drivers includes: ■ Nexus Drivers. Nexus drivers provide bus mapping and translation services to subordinate nexus and leaf devices. These include drivers for PCI-to-PCI bridges, PCMCIA adapters, and *SCSI* HBAs. ■ Leaf Drivers. Leaf drivers provide the traditional character and block driver interfaces for reading and writing data to storage and communication devices. These include drivers for peripheral devices, including QLA2*xxx* adapters, disks, tapes, network adapters, and frame buffers.
E_D_TOV *(error detect timeout value)*	E_D_TOV represents the longest possible time for a *Frame* to make a round-trip through the *Fabric*. This value is negotiated at *N_Port* login and is typically a few seconds. E_D_TOV decides when a particular error recovery action must be taken.
E_Port	By Fibre Channel definitions, the E_Port is the expansion *Port* that connects two switches. FC-SW2 specifications include the standard operation of E_Port communication. SANbox2 uses this specification for inter-switch communication, making it fully compatible with other switches enforcing the standard.
EE_Credit *(end-to-end credit value)*	EE_Credit is used for end-to-end flow control. It determines the maximum number of *Frames* that can remain unacknowledged.

Entry Handle

This term refers to the icon in the *Fabric* tree of the SANbox Manager GUI.



Ethernet

An Ethernet is a local area network (LAN) used for connecting computers. The term Ethernet often refers to the physical link and the data link protocols. Ethernet supports baseband transmission of 10 or 100 megabits per second (Mbps); 1-Gb Ethernet is also available.

Ethernet Port

An Ethernet *Port*, also referred to as an Ethernet management port, is the Ethernet connection on the SANbox switches. The port has a factory default IP address of 10.0.0.1

The Ethernet port uses an RJ45-type connector. A crossover cable is needed for direct connection to a management workstation.

EOF
(end of frame delimiter)

This *Ordered Set* is always the last *Transmission Word* of a *Frame*. EOF indicates that a frame has ended and whether the frame is valid.

Exchange

Exchange is the highest level Fibre Channel mechanism used for communication between *N_Ports*. Exchanges are composed of one or more related sequences. Exchanges may be bidirectional or unidirectional.

F_BSY
(fabric port busy frame)

This *Frame* is issued by the *Fabric* to indicate that a particular frame cannot be delivered because the fabric or the destination *N_Port* too busy.

F_Port
(fabric port)

An F_Port is a *Port* on a *Fabric* switch that can be directly connected to *N_Ports*. An F_Port uses the address identifier FFFFFEh.

F_RJT
(fabric port reject frame)

This *Frame* is issued by the *Fabric* to indicate that a particular frame cannot be delivered. Some reasons for issuing an F_RJT include:

- The class is not supported.
- The header fields are invalid.
- The N_Port is unavailable.

Fabric

A Fabric is one of three Fibre Channel topologies.

In general, a fabric consists of cross-connected Fibre Channel devices and switches.

In the switch Fabric topology, *N_Ports* are connected to F_Ports on a switch. Depending on vendor support, fabric switches may be interconnected to support up to 16 million or more N_Ports on a single network.

Fabric Switch

A fabric switch connects multiple devices from independent *FC_ALs* and *Point-to-Point* topologies into a *Fabric*.

Fabric Tree

The fabric tree is a navigation window for SANsurfer2. The fabric tree has icons for each fabric and one for each switch in the fabric. You can click any icon to navigation to that display. The icons change color to indicate status:

- Green = normal operation
- Yellow or orange = errors
- Red = failed
- Blue = unknown status

Failover Path

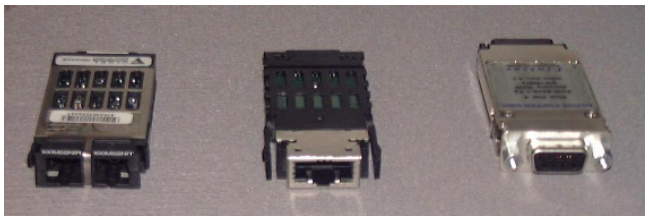
The failover path software feature ensures data availability and system reliability by assigning alternate path and automatic adapter failover for device resources.

FC-0 *(Fibre Channel layer 0)*	This Fibre Channel layer contains specifications for signaling, media, transmitters, and receivers.
FC-1 *(Fibre Channel layer 1)*	This Fibre Channel layer contains specifications for the IBM patented *8B/10B* data encoding used in Fibre Channel.
FC-2 *(Fibre Channel layer 2)*	This Fibre Channel layer contains specifications for the *Frame* format, sequence/exchange management, and *Ordered Set* usage in Fibre Channel.
FC-3 *(Fibre Channel layer 3)*	This Fibre Channel layer contains specifications for common services required for advanced services.
FC-4 *(Fibre Channel layer 4)*	This Fibre Channel layer contains specifications for mapping upper level protocols, such as *SCSI* and IP, onto the Fibre Channel protocol.
FC_AL *(Fibre Channel arbitrated loop)*	FC_AL refers to the ANSI FC_AL document, which specifies operation of the *Arbitrated Loop* topology.
FC-PH *(Fibre Channel physical and signaling interface)*	FC-PH refers to the ANSI FC-PH document, which specifies the *FC-0*, *FC-1*, and *FC-2* layers of the Fibre Channel protocol. FC-0 is Fibre Channel layer 0. FC-PH specifies the physical signaling used in Fibre Channel, as well as cable plants, media types, and transmission speeds.
Fill Word	A fill word is a primitive signal, containing no specific information, that is transmitted by an operational *Port*. Fill words can also separate *Frames*. In *Point-to-Point* and *Fabric* technologies, the only fill word is *Idle*. In an *Arbitrated Loop*, fill words can be Idle or ARBx.
FL_Port *(fabric-loop port)*	FL_Port is an *FL_Port* capable of supporting an attached *Arbitrated Loop*. An FL_Port on a loop has the *AL_PA* of 00h, giving the *Fabric* highest priority access to the loop. An FL_Port is the gateway to the Fabric for *NL_Ports* on a loop.
Flash BIOS	The flash BIOS refers to QLogic HBA's flash PROM, which contains the code that allows booting from the adapter at startup.

FLOGI *(fabric login)*	The FLOGI process is used by a node *Port* to initiate a session with the *Fabric* to communicate with other node ports in the fabric. Among other parameters, this is when a node port receives its fabric address.
F-NL_Port	An F-NL_Port is an *NL_Port* that can provide some *Fabric* services to other *NL_Ports* on a loop in the absence of a fabric. This NL_Port responds to requests to open communication with *AL_PA* 00h, even though it may have another value for its AL_PA.
Forced PROM	Forced PROM is a setting on the SANbox switches that allows you to force the switch into its default *Ethernet* configuration. ■ SANbox8 and 16 switches. This mode sets the Blink Code to 5. Only TFTP commands can communicate with the switch. This mode is used as a last resort when the IP address of the *Ethernet Port* is not known. Forced PROM mode is disruptive to the fabric. ■ SANbox2 switches. While Forced PROM mode is available on SANbox2, it is not disruptive to the fabric to use the serial *Port* for reconfiguring the IP address.
Frame	The basic unit of communication between two *NL_Ports*. Frames are composed of a starting delimiter (*SOF*), a header, the payload, the cyclic redundancy check (*CRC*), and an ending delimiter (*EOF*).
FRU *(field replaceable unit)*	A FRU is replaced easily at the customer site without voiding the warranty. The FRUs for SANbox switches are: ■ *GBIC* ■ *SFP* ■ Power supplies (SANbox2 and 16HA) ■ Fans (SANbox2)
G_Port *(generic port)*	A G_Port auto-configures to other *Ports*, depending on the device connected to the port. A G_Port does not use *Arbitrated Loop* handshaking, so it only auto-configures to an *F_Port* or an *E_Port*.

GBIC
(gigabyte interface converter (connector))

GBICs are hot pluggable devices for *SAN* equipment. They interface the *Port* to the cable. See also *SFF* and *SFP*.



optical (shortwave) | HSSDC (copper) | DB9 (copper)

GL_Port
(generic loop port)

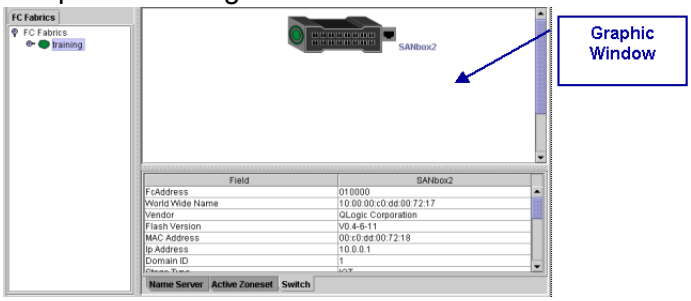
A GL_Port autoconfigures to any other *Port* defined in the FC specifications.

The GL_Port autodetects a device connected to it and changes to operate as an *F_Port*, *FL_Port*, or *E_Port*.

GL_Port is the default setting for the SANbox2 switch.

Graphic Window

This term is used in SANsurfer2 to designate the area of the screen showing the *Fabric* topology or the faceplate of a single switch.



HBA
(host bus adapter)

An HBA is a card that connects Fibre Channel peripherals and server hosts such as PCI and SBus.

A QLogic QLA2342L HBA is shown below. It is a dual-channel, 2-Gb, low profile, optical card.

Heartbeat

A heartbeat is an amber LED indicator on the front of the SANbox switches. The LED flashes once per second during normal operations.

Hot Swap	Hot swapping is the ability to remove and replace a *FRU* while the rest of the system remains operable.
HSSDC *(high speed serial data connection)*	HSSDC is a copper connector used in Fibre Channel. HSSDC implies 1 Gbps speeds.
HSSDC2 *(high speed serial data connection 2)*	HSSDC2 is a copper connector that fits into an *SFF* or *SFP* slot and operates at 2 Gbps speeds.  (Picture courtesy of CS Electronics)
Idle	Idle is an *Ordered Set* transmitted continuously over a link when no data is being transmitted. Idle is transmitted to maintain an active link over a fibre and lets the receiver and transmitter maintain bit, byte, and word synchronization. For *Point-to-Point* and *Fabric* topologies, Idle is the only *Fill Word*.
Initiator	Initiator refers to a *SCSI* device, usually a host, which requests that an I/O process be performed by another SCSI device *(Target).*
Intermix	Intermix is a service in which *Class 2 Service* and *Class 3 Service Frames* can be delivered to an *N_Port* that has a *Class 1 Service* dedicated connection open. The Class 2 and 3 frames are delivered when no Class 1 frames are being delivered on the connection.
IOCB	IOCB stands for I/O control block. An IOCB is a command structure in QLogic ISP architecture.
IOP *(input/output processor)*	IOP is an acronym for the i960 processor that handles communication within the SANbox 8 and 16 switches (1 Gb). The IOP is used for *Ethernet* communication, fabric login, name service, and error handling for the switch.
ISL *(interswitch link)*	ISL is a generic term for a connection between switches.

JBOD *(just a bunch of disks)*	A JBOD device has several disk drives in a single closure. Each disk has a world wide name (WWN) for communication in a fabric. These devices use *Arbitrated Loop* Fibre Channel.
JBOS *(just a bunch of switches)*	JBOS refers to idea of cross-connecting 16-port switches to make a single, 64-port switch.
L_Port *(loop port)*	L_Port is a generic term for an *NL_Port* or an *FL_Port*; that is, any Fibre Channel *Port* that supports *Arbitrated Loop* topology.
Latency	Latency refers to the time it takes for any media to send packets. Latency in Fibre Channel is usually the time it takes for a switch to process data coming in until the data leaves the switch. In the SANbox switches, latency is determined by the characteristics of the *ASIC* and the speed of the *Port* with which it is interacting.
Legacy	Legacy is a designation for older equipment.
LIFA *(loop initialization fabric assigned frame)*	LIFA is the first *Frame* transmitted in the loop initialization process after a temporary loop master has been selected. Loop *Ports* that have been assigned their *AL_PA* by the *Fabric* select their AL_PAs in this frame as it makes its way around the loop.
LIHA *(loop initialization hard assigned frame)*	LIHA is the third *Frame* transmitted in the loop initialization process after a temporary loop master has been selected. Loop *Ports* that are programmed to select a particular *AL_PA* (if available) select their AL_PAs in this frame as it makes its way around the loop.
LILP *(loop initialization loop position frame)*	LILP is the second *Frame* transmitted in the loop initialization process after all *L_Ports* have selected an *AL_PA* (after *LISA* has been around the loop). This frame is transmitted around the loop so that all L_Ports know the relative position of the other L_Ports around the loop. Support for this frame by an L_Port is optional.
Link Service	Link service facilities are used between an *N_Port* and a *Fabric* or between two N_Ports. Link services provide login, sequence and exchange management, and connection maintenance.

LIP *(loop initialization primitive sequence)*	This *Primitive Sequence* applies only to *Arbitrated Loop* topology. It is transmitted by an *L_Port* to re-initialize the loop.
LIPA *(loop initialization previously assigned frame)*	LIPA is the second *Frame* transmitted in the loop initialization process after a temporary loop master has been selected. *L_Ports* that had an *AL_PA* before loop initialization select their AL_PAs in this frame as it makes its way around the loop.
LIRP *(loop initialization report position frame)*	LIRP is the first *Frame* transmitted in the loop initialization process after all *L_Ports* have selected an *AL_PA* (after *LISA* has been around the loop). This frame is transmitted around the loop so that all L_Ports report their relative physical position on the loop. Support for this frame by an L_Port is optional.
LISA *(loop initialization soft assigned frame)*	LISA is the fourth *Frame* transmitted in the loop initialization process after a temporary loop master has been selected. *L_Ports* that did not select an *AL_PA* in a previous loop initialization frame (*LIFA*, *LIPA*, or *LIHA*) select their AL_PAs in this frame as it makes its way around the loop.
LISM *(loop initialization select master frame)*	LISM applies only to *Arbitrated Loop* topology. It is the first frame transmitted in the initialization process where *L_Ports* select an *AL_PA*. LISM selects either a temporary loop master or the L_Port that subsequently initiates transmission of the remaining initialization frames (*LIFA*, *LIPA*, *LIHA*, *LISA*, *LIRP*, and *LILP*).
LLUT *(loop lookup table)*	LLUT is used by the SANbox switch *Ports* for *Segmented Loop* and *Translative Loop* features. The LLUT in the SANbox 8 and 16 switches has 32 entries. The SANbox2 LLUT has 64 entries and is only used for translative loop.
Load Balancing	Load balancing is a software feature that improves system performance by balancing device access between multiple QLogic HBAs for maximum resource efficiency.
Loopback	Loopback is a diagnostic tool where data is transmitted and received by the QLogic HBA.

LPB *(loop port bypass primitive sequence)*	This *Primitive Sequence* applies only to *Arbitrated Loop* topology. It is transmitted by an *L_Port* to bypass the L_Port to which it is directed. For example, if port A suspects that port B is malfunctioning, port A can send an LPB to port B so that port B re-transmits everything it receives, and will not be active on the loop.
LPE *(loop port enable primitive sequence)*	This *Primitive Sequence* applies only to *Arbitrated Loop* topology. It is transmitted by an *L_Port* to enable an L_Port that has been bypassed with the *LPB Primitive Sequence*.
LPSM *(loop port state machine)*	The LPSM is maintained by an *L_Port* to track its behavior through different phases of loop operation, for example, how it behaves when it is arbitrating for loop access or how it behaves when it has control of the loop.
LR *(link reset primitive sequence)*	This *Primitive Sequence* is used during link initialization between two *N_Ports* in *Point-to-Point* topology or between an N_Port and an *F_Port* in *Fabric* topology. The expected response to a *Port* sending LR is the *LRR* primitive sequence.
LRR *(link reset response primitive sequence)*	This *Primitive Sequence* is used during link initialization between two *N_Ports* in *Point-to-Point* topology or between an N_Port and an *F_Port* in *Fabric* topology. An LRR is sent in response to the *LR* primitive sequence.The expected response to a *Port* sending LRR is *Idle*.
LUN *(logical unit number)*	LUN is the small integer handle that identifies a portion of disk storage. A LUN can consist of a single physical disk or many physical disks. A physical disk can be broken into multiple LUNs.
LUN Masking	LUN masking is a software feature that assigns LUNs to specific servers or hides LUNs from specific servers for maximum access and availability control.
MAC *(media access control addresses)*	MAC is the hardware address of an *Ethernet* port.

Media	Media are carriers of information. Fibre Channel supports several different physical media: copper, multimode optical, and single-mode optical, which differ in the maximum cable length. All Fibre Channel protocols are supported on all media.
Members	Members are devices that are inserted into a zone. Members are either targets or initiators. The following types of members can be included in a zone: ■ World wide name (WWN) ■ Fibre Channel address ■ *Ports*
MRK *(mark primitive signal)*	This *Primitive Signal* applies only to *Arbitrated Loop* topology. MRK is transmitted by an *L_Port* for synchronization purposes; its use is vendor specific.
N_Port *(node port)*	An N_Port refers to a *Port* on a computer, disk drive, etc. through which the device communicates with the Fibre Channel.
NIC *(network interface controller)*	NIC is synonymous with HBA.
NL_Port *(Node-loop port)*	An NL_Port is an *N_Port* that can operate on *Arbitrated Loop* topology.
Nonparticipating mode	An *L_Port* enters nonparticipating mode if there are more than 127 devices on a loop (meaning that it cannot acquire an *AL_PA*). A loop *Port* can also voluntarily enter nonparticipating mode if it is still physically connected to the loop, but does not want not to participate. A loop port in nonparticipating mode cannot generate *Transmission Words* on the loop; it can only re-transmit words received on its inbound fibre.
NOS *(not operational primitive sequence)*	This *Primitive Sequence* is used during link initialization between two *N_Ports* in *Point-to-Point* topology or between an N_Port and an *F_Port* in *Fabric* topology. An NOS is sent to indicate that the transmitting *Port* has detected a link failure or is offline. The expected response to a port sending NOS is the *OLS Primitive Sequence*.

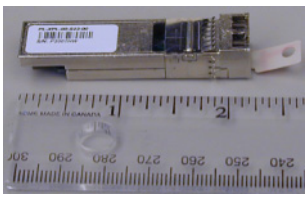
Null Modem	A null modem is a device that connects two computing devices together by emulating communication characteristics of a modem.
Null Modem Cable	A null modem cable has pins reversed for receive and transmit to act as a null modem.
NVRAM *(nonvolatile random access memory)*	NVRAM configuration settings are stored in NVRAM. You can configure NVRAM settings or restore them from a file. These settings are saved in NVRAM and are retained when power is removed.
OFC *(open fibre control)*	OFC is a method to disable and enable laser signaling for higher intensity laser transceivers.
OLS *(offline primitive sequence)*	This *Primitive Sequence* is used during link initialization between two *N_Ports* in *Point-to-Point* topology or between an N_Port and an *F_Port* in *Fabric* topology. OLS is sent to indicate that the transmitting *Port* is attempting to initialize the link, has recognized the NOS primitive sequence, or is going offline. The expected response to a port sending OLS is the *LR* primitive sequence.
ONC *(open network computing)*	ONC is a remote procedure call developed by Sun Microsystems.
OPN *(open primitive signal)*	This *Primitive Signal* applies only to *Arbitrated Loop* topology. An *L_Port* that has won the arbitration process to open communication with one or more *Ports* on the loop sends the OPN primitive signal.
Ordered Set	An ordered set is a four-byte *Transmission Word* that has the *Special Character* as its first *Transmission Character*. An ordered set can be a *Frame* delimiter, a *Primitive Signal*, or a *Primitive Sequence*. Ordered sets distinguish Fibre Channel control information from data.
Originator	The originator is the *N_Port* that originated an *Exchange*.
OX_ID *(originator exchange identifier)*	An OX_ID is a two-byte field in the frame header used by the originator of an *Exchange* to identify *Frames* as part of a particular exchange.

Participating Mode	Participating mode is the normal operating mode for an *L_Port* on a loop. An L_Port in this mode has acquired an *AL_PA* and can communicate on the loop.
Path	A path to a device is a combination of a QLogic HBA and a *Target Port*. Note that this is distinct from any internal paths within the *Fabric* network. A fabric network appears to the operating system as an opaque network between the adapter (*Initiator*) and the Target port. Since a path is a combination of an adapter and a target port, a path is distinct from another path if it is accessed through a different adapter and/or it is accessing a different target port. Consequently, when switching from one path to another, the driver might be selecting a different adapter (initiator), a different target port, or both. This makes a difference to the driver when selecting the proper method of failover notification. It can make a difference to the target device, which might have to take different actions when receiving retries of the request from another initiator or on a different port.
PLOGI *(port login)*	After an *N_Port* has completed its *FLOGI*, it must perform a *PLOGI* to each device with which it wants to communicate. PLOGI establishes session and exchange identities, as well as service parameters.
Point-to-Point	Two Fibre Channel nodes directly connected (nonloop).
Port	Ports are access points in a device where a link attaches. See definitions for the four types of ports: ■ *N_Port* ■ *NL_Port* ■ *F_Port* ■ *FL_Port*
POST *(power on self test)*	When power is turned on, POST is the diagnostic testing sequence that is run by a computer's start up program to determine if various components in the computer are working correctly.

Primitive Sequence	A primitive sequence is an *Ordered Set* transmitted repeatedly; it establishes and maintains a link. *LR*, *LRR*, *NOS*, and *OLS* are primitive sequences that establish an active link in a connection between two *N_Ports* or between an N_Port and an *F_Port*. *LIP*, *LPB*, and *LPE* are primitive sequences used in *Arbitrated Loop* topology for initializing the loop and enabling or disabling an *L_Port*.
Primitive Signal	A primitive signal is an *Ordered Set* that indicates an event. *Idle* and R_RDY are used in all three topologies. *ARB*, *OPN*, *CLS*, and *MRK* are used only in *Arbitrated Loop* topology.
Private Device	A private device is a Fibre Channel (loop) device that uses only eight bits for addressing (*AL_PA*). Private device is another term for a device that is not fabric aware. Private devices can be connected to the SANbox switches through a *TL_Port* (*Translative Loop*). This configuration allows a private device to communicate across the fabric. The SANbox switches use the *ALUT* and *LLUT* to make this possible.
Private Loop	A private loop is an *Arbitrated Loop* that stands on its own; that is, it is not connected to a *Fabric*.
Private NL_Port	A private NL_Port communicates only with other *Ports* on the loop, not with the *Fabric*. Note that a private NL_Port can exist on a *Private Loop* or a *Public Loop*.
PRLI *(process login)*	PRLI establishes a session between two *FC-4* level processes at different *N_Ports*.
PRLO *(process logout)*	PRLO logs out a session between two *FC-4* level processes at different *N_Ports.*
Public Device	A public device uses 24-bit addressing; a *Private Device* uses 8-bit addressing. All *Point-to-Point* (*N_Port*) devices are public. Loop (*NL_Port*) devices may or may not be public.
Public Loop	A public loop is an *Arbitrated Loop* that is connected to a *Fabric*.
Public NL_Port	A public NL_Port can communicate with other *Ports* on the loop as well as through an *FL_Port* to other *N_Ports* connected to the *Fabric*.

RAID *(redundant array of independent disks)*	Formerly redundant array of inexpensive disks.
RARP *(reverse address resolution protocol)*	RARP is a TCP/IP protocol that controls the translation of the *MAC* address to the IP address of an *Ethernet* (or other TCP/IP) connection.
Responder	The responder is the *N_Port* with which an *Exchange* originator wishes to communicate.
RX_ID *(responder exchange identifier)*	An RX_ID is a two-byte field in the frame header used by the responder of the *Exchange* to identify *Frames* as being part of a particular exchange.
S_ID *(source identifier)*	An S_ID is a three-byte field in the frame header that indicates the address identifier of the *N_Port* from which the frame was sent.
SAN *(storage area network)*	A SAN consists of multiple storage units and servers connected by networking topology.
SANbox®	SANbox refers to the Fibre Channel switch designed by QLogic: ■ SANbox8 is the 8-port, 1-Gb switch. ■ SANbox16 is the 16-port, 1-Gb switch. ■ SANbox16HA is the 16-port, 1-Gb, high availability switch (dual power supplies). ■ SANbox2-16 is the 16-port, 2 Gb switch. ■ SANbox3 designates the second generation, 2-Gbps switch.
SANblade Manager™	SANblade manager is the GUI designed for QLogic HBAs.
SANbox Manager™	SANbox manager is the GUI designed for QLogic2-Gbps switches.
SANsurfer®2	SANsurfer2 refers to the GUI for versions 1.0 and 1.2 versions of the SANbox2 switch.
SANtrack™	SANtrack refers to the service and support program of QLogic. SANtrack offers the many benefits of QLogic technical support.

SCSI *(small computer system interface)*	The original SCSI specification was a hardware bus specification and a packet-oriented protocol specification for communicating on that bus. SCSI over Fibre Channel uses the packet-oriented protocol to communicate with storage devices on the Fibre Channel.
Segmented Loop	Segmented loop is a proprietary mode of an early SANbox (1-Gb) switch. This mode allows the switch *Port* to act like a Fibre Channel hub port. Segmented loop is not supported in the SANbox2 switch.
SEQ_ID *(sequence identifier)*	SEQ_ID is a one-byte field in the frame header that identifies from which *Sequence* of an *Exchange* a particular *Frame* belongs.
Sequence	A sequence is a group of related *Frames* transmitted unidirectionally from one *N_Port* to another.
Sequence Initiator	The sequence initiator is the *N_Port* that began a new *Sequence* and transmits *Frames* to another N_Port.
Sequence Recipient	The sequence recipient is the *N_Port* to which a particular *Sequence* of data *Frames* is directed.
SERDES *(serializer/deserializer)*	A SERDES is a computer chip that converts a serial bitstream to a bus architecture.
Serial Port	The SANbox2-16 (2-Gb) comes with a serial *Port* on the switch, which allows for command line interface (CLI) communication with the switch if the IP address to the *Ethernet* port is lost. The communication settings for the serial port are: ■ Bits per second: 9600 ■ Data bits: 8 ■ Parity: none ■ Stop bits: 1 ■ Flow control: none
SFF *(small form factor)*	SFF refers to the smaller connections used in Fibre Channel to save space. SFFs are hardwired to the circuit board.

SFP *(small form factor pluggable)*	SPF refers to the hot-swappable version of *SFF*. These are smaller versions of *GBIC* connections and can be used for 1-Gb or 2-Gb connections. 
SL_Port (segmented loop port)	SL_Port is a term used by QLogic to denote a *Port* that is set to *Segmented Loop* features. Segmented Loop is not supported in the SANbox2 product.
SOF *(start of frame delimiter)*	The SOF *Ordered Set* is always the first *Transmission Word* of a *Frame*. SOF indicates that a frame will immediately follow as well as which class of service the frame will use.
Special Character	This special 10-bit *Transmission Character* does not have a corresponding eight-bit value, but is still considered valid. The special character indicates that a particular *Transmission Word* is an *Ordered Set*. The special character is the only transmission character to have five ones or zeros in a row. The special character is also referred to as K28.5 when using K/D format.
SPIFFI *(specification for platform-independent failover and failback integration)*	SPIFFI is a cooperative effort that defines a nonvendor-specific failover mechanism.
T_Port *(transfer port)*	T_Port is the proprietary *Port* for early SANbox switches. The T_Port connects the *ISL* for firmware versions 3.xx.xx and earlier. T_Port is not supported in firmware versions 4.xx.xx or higher in the SANbox8 and 16, or any version of SANbox2; the industry standard *E_Port* is used instead.
Target	Target refers to a device that performs operations requested by an *Initiator*.

TFTP *(trivial file transfer protocol)*	TFTP is used for rudimentary communication with the Fibre Channel switch. If needed, TFTP can change the IP address of the switch. TFTP is the only protocol that communicates with the SANbox 8 and 16 in *Forced PROM* mode. TFTP is not used with SANbox2.
Test Mode Switch	This term refers to a potentiometer (turn switch) or push-button switch on the SANbox switches. The test mode switch is used in the field to set the switch into *Forced PROM* mode.
TL_Port *(translative loop port)*	TL_Port is the proprietary *Port* for QLogic-designed switches. The TL_Port allows the connection of any private device for fabric communications. See also *Private Device*.
Topology	Topology refers to the physical or logical layout of a network.
Translative Loop	Also referred to as translated loop, a translative loop is a proprietary feature of QLogic-designed switches. This feature allows *Private Devices*, both *Initiators* and *Targets*, to participate in full fabric operation. See also *TL_Port*.
Transmission Character	A transmission character is a valid or invalid 10-bit character transmitted serially over the fibre. Valid transmission characters are determined by the *8B/10B* encoding specification.
Transmission Word	Transmission Word is a string of four consecutive *Transmission Characters*.
ULP *(upper level protocol)*	ULP is the protocol that runs on top of Fibre Channel through the *FC-4* layer. Typical ULPs running over Fibre Channel are small computer system interface (*SCSI*), internet protocol (IP), high performance parallel interface (HIPPI), and intelligent peripheral interface (IPI).

Zone Set	A zone set is a group of zones that can be activated in the *Fabric*. A zone set is the highest point in the zoning hierarchy. Only one zone set can be active in a fabric at any time. Several zone sets may be configured and stored for multiple fabric operations.
Zones	Zones are groups of devices that communicate with each other across the *Fabric*. Zones are placed in *Zone Sets,* while *Members* are placed inside zones.