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Hardware Installation Guide for the QLA2300 Board Family

Fibre Channel Host Adapter Boards for the PCI Bus
Part of the SANblade Family of Products

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Boards Affected
QLA2300 QLA2300F QLA2302F QLA2310 QLA2310F QLA2310FL QLA2312F QLA2312FL

QLogic Corporation, 26600 Laguna Hills Drive, Aliso Viejo, CA 92656
(800) 867-7274 or (949) 389-6000

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Section 1
Introduction

NOTE: The following SANblade QLogic host adapter boards are collectively referred to as the **QLA23xx *board*** unless otherwise noted:

- **QLA2300** family (64-bit PCI to Fibre Channel copper media)
- **QLA2300F** family (64-bit PCI to Fibre Channel optical media)
- **QLA2302F** family (64-bit PCI to dual-channel optical media)
- **QLA2310** family (64-bit PCI-X to Fibre Channel copper media)
- **QLA2310F** family (64-bit PCI-X to Fibre Channel optical media)
- **QLA2310FL** family (64-bit PCI-X to Fibre Channel optical media, low profile)
- **QLA2312F** family (64-bit PCI-X to dual-channel Fibre Channel optical media)
- **QLA2312FL** family (64-bit PCI-X to dual-channel Fibre Channel optical media, low profile)

1.1
General Description

Thank you for selecting the QLA23xx Fibre Channel (FC) board. The QLA23xx board is an intelligent, high-performance, DMA bus master host adapter designed for high-end systems. The intelligence and performance are derived from the ISP2300/2310/2312 chips, making the QLA23xx board a leading-edge host adapter. The ISP2300/2310/2312 combines a powerful RISC processor, a Fibre Channel protocol manager (FPM) with one 2-Gb Fibre Channel transceiver, and a peripheral component interconnect (PCI) or peripheral component interconnect-extended (PCI-X) local bus interface in a single-chip solution. The QLA23xx board supports all FC peripherals that support private loop direct attach (PLDA) and fabric loop attach (FLA). Installation of the QLA23xx board is quick and easy.

1.2
What is Fibre Channel?

Fibre Channel technology is outlined in the *SCSI-3 Fibre Channel Protocol* (SCSI-FCP) standard. Fibre Channel is a high-speed data transport technology used for mass storage and networking. It connects mainframes, super computers, workstations, storage devices, and servers.

Fibre Channel supports data transfer rates up to 200 MBps half-duplex and 400 MBps full-duplex on copper and optical interfaces. The QLA2300 and QLA2310

boards use a copper interface for short connections (less than 30 meters at a data rate of 1 Gbps; less than 15 meters at a data rate of 2 Gbps). The following boards use a multimode optical interface for intermediate distances (less than 500 meters at the data rate of 1 Gbps; less than 300 meters at the data rate of 2 Gbps).

- QLA2300F
- QLA2302F
- QLA2310F
- QLA2310FL
- QLA2312F
- QLA2312FL

With its increased connectivity and performance, Fibre Channel is the I/O technology preferred and used by system designers.

1.3
Features

- Compliance with *PCI Local Bus Specification* revision 2.2

- Compliance with *PCI-X Addendum (revision 1.0) to the PCI Local Bus Specification* (QLA2310/2310F/2310FL/2312F/2312FL)

- Compliance with *Third Generation Fibre Channel-Physical and Signaling Interface* (FC-PH-3) standard

- Compliance with *Fibre Channel-Arbitrated Loop* (FC-AL-2) standard

- Compliance with U.S. and international safety and emissions standards

- Support for bus master DMA

- *Fast!*UTIL BIOS utility to customize the configuration parameters on the QLA23*xx* board and attached drives

- Two independent channels on a single board (QLA2302F)

- Supports Fibre Channel protocol-SCSI (FCP-SCSI), IP, and Fibre Channel-virtual interface (FC-VI) protocols

- Supports point-to-point fabric connection (F-PORT FABRIC LOGIN)

Section 2
Hardware Installation

2.1
Preinstallation Procedures

Before installing your QLA23*xx* board, take a moment to read this guide.

<u>***CAUTION!***</u> The QLA23*xx* board contains parts that can be damaged by ESD. Before handling the QLA23*xx* board, use standard methods to discharge static electricity. Keep the QLA23*xx* board in the antistatic bag until you are ready to install it. Place the board on the bag when you examine or configure it. Retain the bag for future use.

2.2
What You Need for Installation

Before you install the QLA23*xx* board in your computer, you need the following:

- A screwdriver (usually a Phillips #1)

- A high-speed, serial data connector (HSSDC) cable that is compatible with data rates of 2 Gbps for the QLA2300 and QLA2310 boards

- An optical mutimode cable with an LC-style duplex connector for the QLA2300F/2310F/2310FL boards; two cables for the QLA2302F/2312F/2312FL boards.

2.3
QLA23*xx* Board Components

Figures 2-1 through 2-4 identify the QLA23*xx* board components referenced throughout this section.

Each QLA23*xx* board has a unique serial number; its location on the board is noted in figures 2-1 through 2-4. Take a minute to write down the serial number of the QLA23*xx* board.
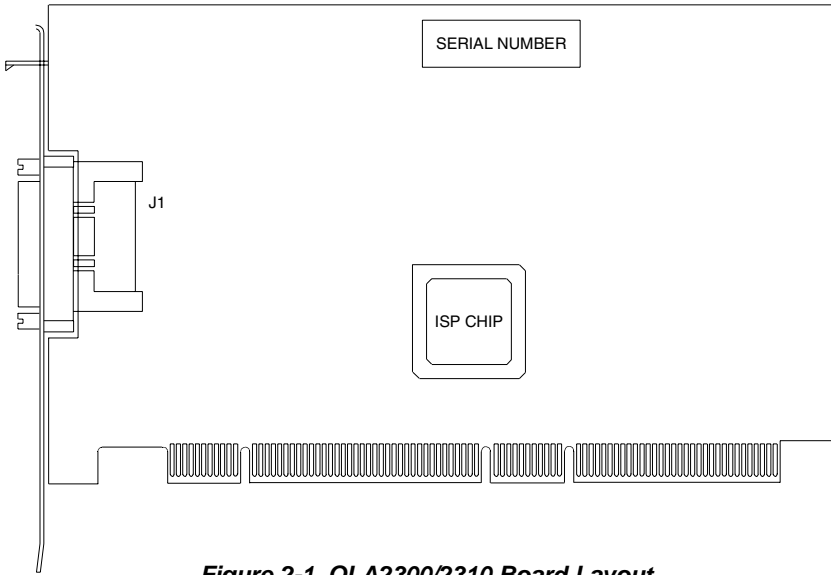
Figure 2-1. QLA2300/2310 Board Layout
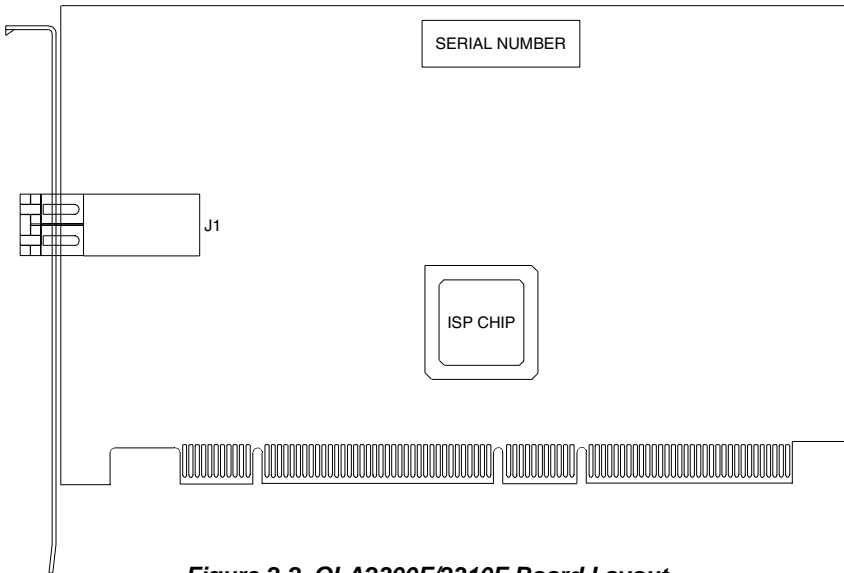
Figure 2-2. QLA2300F/2310F Board Layout
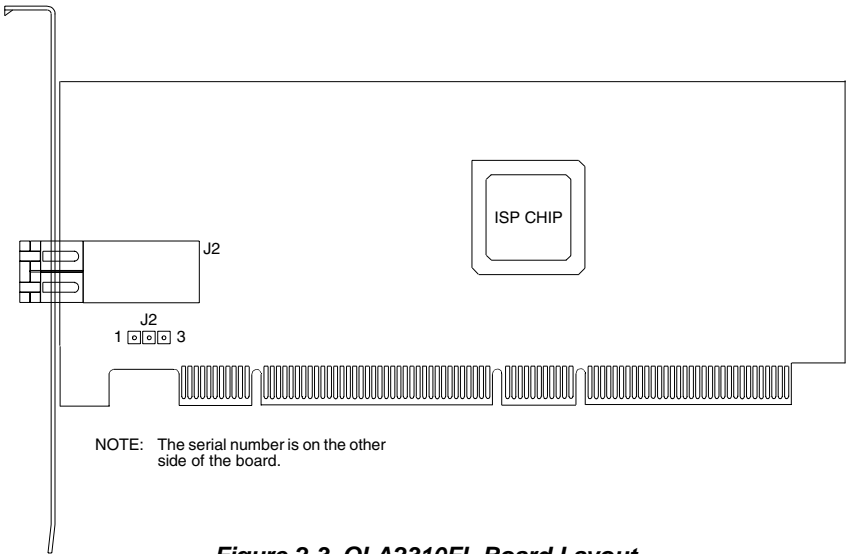
Figure 2-3. QLA2310FL Board Layout
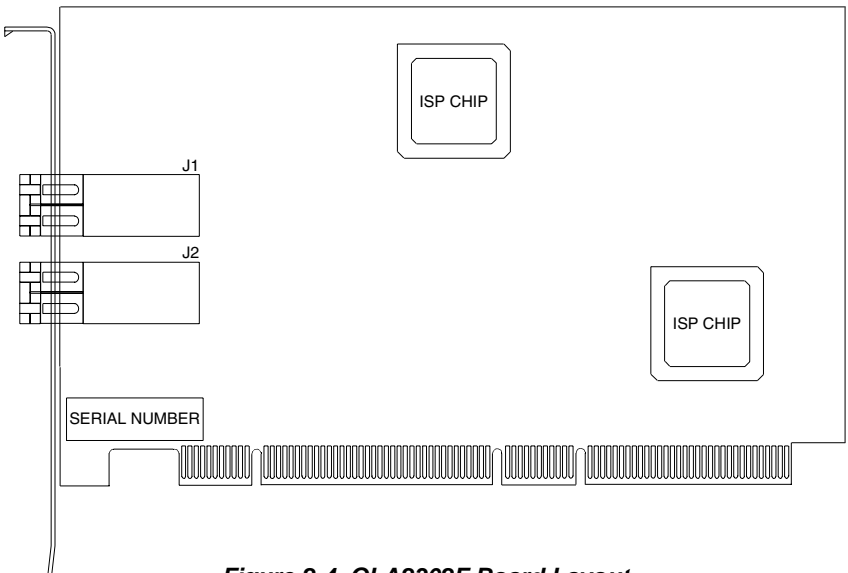
Figure 2-4. QLA2302F Board Layout

SERIAL NUMBER

J1
1 3

J2

J3

J4
1 3

ISP CHIP
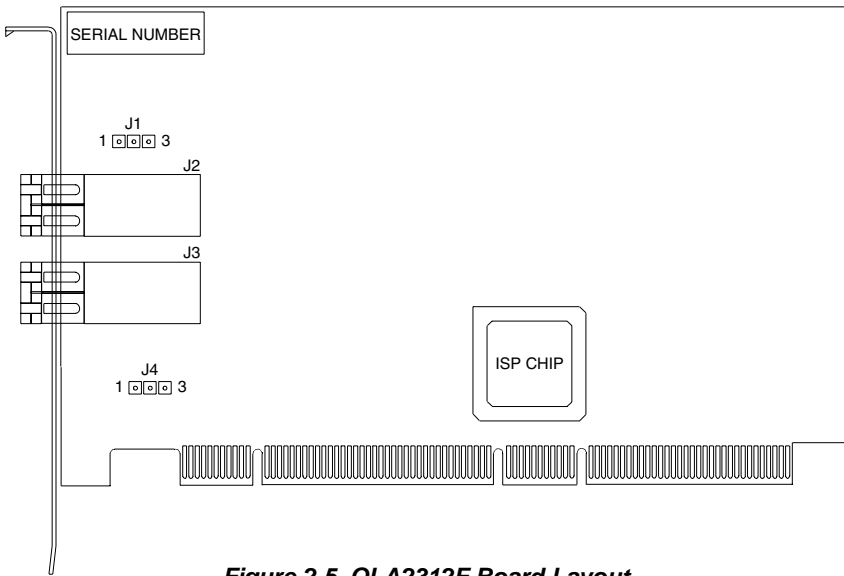
Figure 2-5. QLA2312F Board Layout

J3
1 3

J1

J2

J4
1 3

ISP CHIP

NOTE: The serial number is on the other
         side of the board.
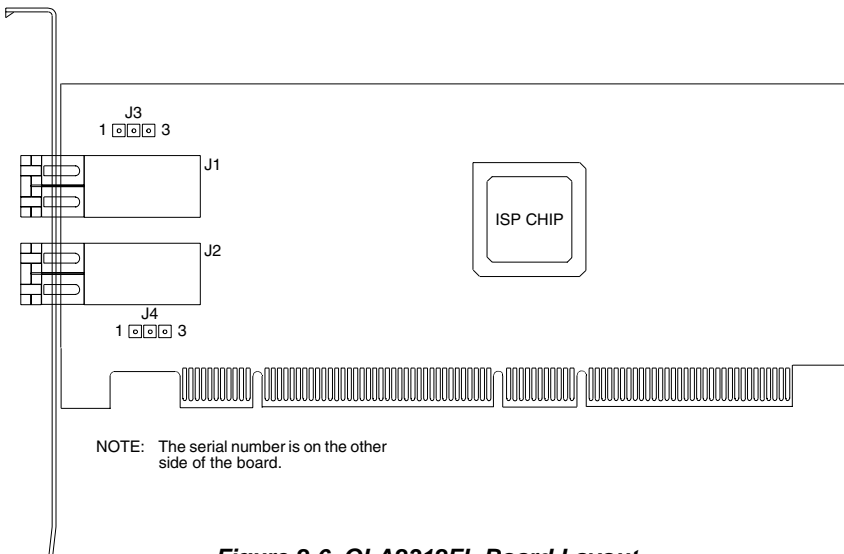
Figure 2-6. QLA2312FL Board Layout

2.3.1
LEDs

Figure 2-7 identifies and describes the activity of the QLA2300/2300F/2310/2310F/
2310FL board LEDs. Figure 2-8 identifies and describes the activity of the
QLA2302F/2312F board LEDs. The QLA2312FL board has no LEDs.

Green LED	Amber LED	Activity
On	On	Power
On	Off	Online
Off	On	Signal acquired
Off	Flashing	Loss of synchronization
Flashing	Flashing	Firmware error
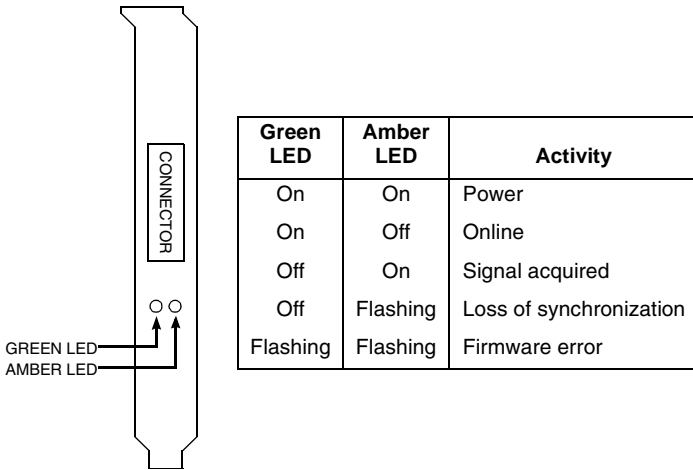
Figure 2-7. QLA2300/2300F/2310/2310F/2310FL Board LED Activity

Green LED	Amber LED	Activity
On	On	Power
On	Off	Online
Off	On	Signal acquired
Off	Flashing	Loss of synchronization
Flashing	Flashing	Firmware error

Figure 2-8. QLA2302F/2312F Board LED Activity

2.3.2
Jumpers

The jumpers on the QLA2310FL/2312F/2312FL boards set the default state of the laser and are set at the factory with a jumper plug on pins 1–2 of the following jumpers.

■ QLA2310FL (jumper J2)
■ QLA2312F (jumpers J1 and J4)
■ QLA2312FL (jumpers J3 and J4)

CAUTION!   Changing the jumper settings can result in the board being inoperable.

2.4
Power Distribution

The QLA2300 and QLA2310 boards supply +5 volts to pin 7 of the HSSDC copper interface to support an external media interface adapter (MIA), if required. (An MIA converts electrical bus signals to optical bus signals.)

2.5
Installation in the Computer

Perform the following steps to install the QLA23*xx* board in your PC:

1. Check the motherboard and make any configuration changes necessary to accommodate the QLA23*xx* board.

   The QLA23*xx* board is self-configuring; however, some motherboards require manual configuration. For example, some systems have a **PCI Device Configuration** menu in the motherboard setup BIOS where you must enable host adapter boards, bus master slots, and IRQ levels. If the motherboard supports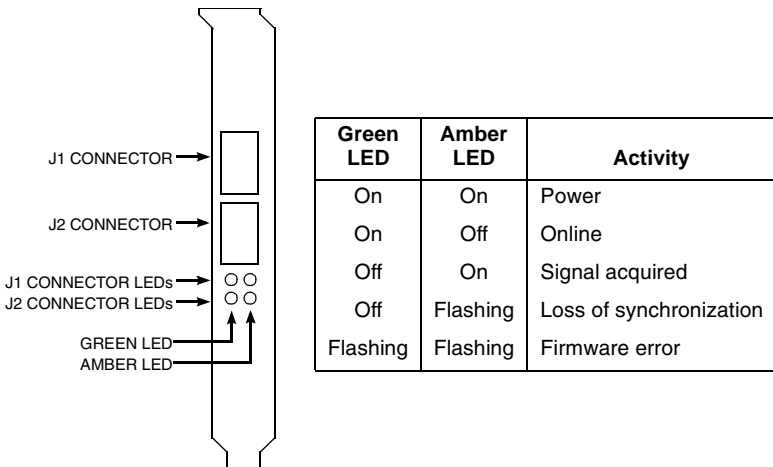 triggering, use *level triggering* for the QLA23*xx* board. See the documentation supplied with your computer, or contact your computer dealer to determine if your motherboard requires configuration.

2. Power down the peripherals, then the computer.

3. Remove the computer cover and save the screws.

4. Choose any PCI bus slot that supports bus mastering. Most motherboards automatically assign an IRQ level and interrupt line; if your motherboard does not, you must assign the IRQ level and use *interrupt line A* for this slot.

   NOTE:

   ■ Some motherboards have two kinds of PCI bus slots: master and slave. The QLA23*xx* board must be in a PCI bus master slot. (Some motherboards have PCI bus master slots that are shared with onboard devices. QLA23*xx* boards do not work in shared slots.)

- PCI connectors vary among system board manufacturers. The QLA23*xx* board is a 64-bit PCI device that can function in a 32-bit PCI slot; the slot conforms to the PCI specification (the rear edge of the PCI slot is notched). If you try to install the QLA23*xx* board into a PCI slot that does not conform to the PCI specification, you may damage the QLA23*xx* board.

- PCI and PCI-X slots look the same. If the PC contains both PCI and PCI-X slots, refer to the PC manufacturer's instructions to determine the slot type.

- The QLA2300/2300F/2302F boards are designed and tested to operate at PCI bus speeds of up to 66 MHz.

- The QLA2310/2310F/2310FL boards are designed and tested to operate at PCI-X bus speeds up to 66 MHz.

- The QLA2312F/2312FL boards are designed and tested to operate at PCI-X bus speeds of up to 133 MHz.

5. Remove the slot cover for the slot in which you will install the QLA23*xx* board.

6. Place the QLA23*xx* board into the slot. Carefully press the board into the slot until it seats firmly.

7. Secure the QLA23*xx* board to the chassis. Follow the PC manufacturer's instructions.

8. Connect the appropriate cable from the devices to the corresponding connector.

9. Carefully reinstall the computer cover. Insert and tighten the computer cover screws.

10. Power up all external FC devices, then power up the PC and observe the monitor. The BIOS is disabled by default. Consequently, the devices attached to the QLA23*xx* board are not identified. For example:

```
QLogic Corporation
QLA23xx PCI Fibre Channel ROM BIOS Version x.xx
Copyright (C) QLogic Corporation 2000 All rights reserved.
www.qlogic.com

Press <Alt-Q> for Fast!UTIL

BIOS for Adapter 0 is disabled

ROM BIOS not installed
```

> **NOTE:**
> - SunSPARC systems do not display the BIOS banner.
> - Enable the BIOS only if the boot device is attached to the QLA23*xx* board. This allows the system to boot faster.
> - For further information about enabling the QLA23*xx* board BIOS, see appendix A.

If the information displayed on your monitor is correct, congratulations! You have successfully installed the QLA23*xx* board in your computer.

See the *Software Installation Guide for the QLA2300 Board Family* (FC2253301-00) for detailed instructions on how to install the software drivers.

If the information displayed is not correct and you have checked the QLA23*xx* board's configuration, see section 3 for troubleshooting information.

2.6
Installation Help

If your system has an IDE hard disk, it may be assigned device number 80, which is the boot device. If your system does not have an IDE hard disk, a parallel SCSI host bus adapter (HBA), or a RAID adapter, the first bootable FC hard disk configured (the one with the lowest ID) is assigned device number 80 and becomes the boot device. The QLA23*xx* board BIOS must be enabled if the boot device is connected to the QLA23*xx* board.

If you have a selectable boot BIOS and want to boot to an FC hard disk, set the motherboard BIOS parameters to None or Not Installed. The ROM BIOS on the QLA23*xx* board automatically configures the FC peripherals.

Some new system BIOSs support selectable boot, which supersedes the QLA23*xx* board BIOS selectable boot setting. Select the QLA23*xx* board FC hard disk in the system BIOS to boot from an FC hard disk attached to the QLA23*xx* board.

Section 3
Troubleshooting

3.1
Problems After Installation

There are three basic types of installation problems that can cause your QLA23*xx* board to function incorrectly: hardware problems, system configuration problems, and Fibre Channel problems. The following section provides itemized checklists to help you determine why your QLA23*xx* board is not functioning.

3.2
Hardware Problem Checklist

■ Are all of the circuit cards installed securely in the system?

■ Are all of the cables securely connected to the correct connectors? Be sure that the FC cables that attach from the QLA23*xx* board connectors to the device are connected correctly. For example, the optical transmit connector on the QLA23*xx* board must be connected to the optical receive connector on the device. Some connectors require a firm push to ensure proper seating. An easy way to check for correct seating is to switch the connectors on either the QLA23*xx* board or the device, then reboot your system. If the BIOS is enabled, devices attached to the QLA23*xx* board are displayed on the screen.

■ Is the QLA23*xx* board installed correctly in the PCI slot? Is it seated firmly in the slot?

■ Check for interference due to nonstandard PCI connectors.

■ Is the *Fast!*UTIL data rate setting correct? See section A.2.6 for information about setting the data rate.

■ Are all external peripherals properly powered up? See section A.3 for information about displaying attached devices.

3.3
System Configuration Problem Checklist

All PCI-compliant and PCI-X-compliant systems automatically detect 32-bit or 64-bit boards and set the appropriate bus speed (for example, 33 MHz or 66 MHz). Check the motherboard for proper configuration (see section 2.5).

See the documentation supplied with your computer, or contact your computer dealer to determine if your motherboard requires special configuration.

3.4
Fibre Channel Problem Checklist

■ Were all of the FC devices powered up before you powered up the PC?

■ Check that all cables are properly connected.

■ If you are using an HSSDC cable, verify that it is compatible with data rates of 2 Gbps.

■ Have you configured your RAID controller using the utilities provided by the manufacturer?

■ Some Fibre Channel switches support zoning. Make sure that your switch is configured correctly.

Appendix A
*Fast!*UTIL

NOTE: The *Fast!*UTIL BIOS utility does not run on SunSPARC systems. Refer to the *Software Installation Guide for the QLA2300 Board Family* (FC2253301) for information regarding adapter configuration settings and for installing FCode on a QLA23*xx* board in a SunSPARC system.

A.1
Introduction

This appendix provides detailed configuration information for advanced users who want to customize the configuration of the QLA23*xx* board and the connected devices.

The QLA23*xx* board can be configured using *Fast!*UTIL, QLogic's BIOS-resident configuration tool. Access *Fast!*UTIL by pressing ALT+Q during the QLA23*xx* board BIOS initialization (it may take a few seconds for the **Fast!UTIL Options** menu to display). If you have more than one QLA23*xx* board, *Fast!*UTIL asks you to select the QLA23*xx* board you want to configure. After changing the settings and exiting the utility, *Fast!*UTIL reboots your system to load the new parameters.

CAUTION! If the configuration settings are incorrect, your QLA23*xx* board may not function properly.

The following sections describe the *Fast!*UTIL options.

A.2
Configuration Settings

The first selection on the **Fast!UTIL Options** menu is **Configuration Settings**. These settings configure the FC devices and the QLA23*xx* board to which they are attached.

A.2.1
Host Adapter Settings

From the **Configuration Settings** menu in *Fast!*UTIL, select **Host Adapter Settings**. The default settings for the QLA23*xx* board are listed in table A-1 and described in the following paragraphs.

Table A-1. Host Adapter Settings

Setting	Options	Default
Host Adapter BIOS	Enabled, Disabled	Disabled
Frame Size	512, 1024, 2048	2048
Loop Reset Delay	0–60 seconds	5 seconds
Adapter Hard Loop ID	Enabled, Disabled	Disabled
Hard Loop ID	0–125	0

- **Host Adapter BIOS.** When this setting is Disabled, the ROM BIOS on the QLA23*xx* board is disabled, freeing space in upper memory. This setting must be enabled if you are booting from an FC hard disk attached to the QLA23*xx* board. The default is Disabled.

- **Frame Size.** This setting specifies the maximum frame length supported by the QLA23*xx* board. The default size is 2048, which provides maximum performance for F-Port (point-to-point) connections.

- **Loop Reset Delay.** After resetting the loop, the firmware refrains from initiating any loop activity for the number of seconds specified in this setting. The default is 5 seconds.

- **Adapter Hard Loop ID.** This setting forces the adapter to attempt to use the ID specified in the Hard Loop ID setting. The default is Disabled.

- **Hard Loop ID.** If the Adapter Hard Loop ID setting is enabled, the adapter attempts to use the ID specified in this setting. The default ID is 0.

A.2.2
Selectable Boot Settings

The **Selectable Boot Settings** option is accessed from the **Configuration Settings** menu. If you enable this option, you can select the node name from which you want to boot. Once enabled, this option forces the system to boot on the selected FC hard disk, ignoring any IDE hard disks attached to your system. If you disable this option, the system looks for a boot device (as selected in the system BIOS). In disabled mode, the Boot ID and Boot LUN parameters have no effect.

Some new system BIOSs support selectable boot, which supersedes the *Fast!*UTIL selectable boot setting. To boot from an FC hard disk attached to the QLA23*xx* board, select the QLA23*xx* board FC hard disk on the system BIOS.

NOTE: This option applies only to hard disks; it does not apply to tape drives and other nondisk devices.

A.2.3
Restore Default Settings

The **Restore Defaults** option from the **Configuration Settings** menu restores the QLA23*xx* board default settings.

A.2.4
Raw NVRAM Data

This option displays the adapter's NVRAM contents in hexadecimal format. This is a QLogic troubleshooting tool; you cannot modify the data.

A.2.5
Advanced Adapter Settings

From the **Configuration Settings** menu in *Fast!*UTIL, select **Advanced Adapter Settings**. The default settings for the QLA23*xx* board are listed in table A-2 and described in the following paragraphs.

Table A-2. Advanced Adapter Settings

Setting	Options	Default
Execution Throttle	1–256	16
Fast Command Posting	Enabled, Disabled	Disabled
>4GByte Addressing	Enabled, Disabled	Disabled
Luns per Target	0, 8, 16, 32, 64, 128, 256	8
Enable LIP Reset	Yes, No	No
Enable LIP Full Login	Yes, No	Yes
Enable Target Reset	Yes, No	No
Login Retry Count	0–255	8
Port Down Retry Count	0–255	8
Drivers Load RISC Code	Enabled, Disabled	Enabled
Enable Database Updates	Yes, No	No
Disable Database Load	Yes, No	No
IOCB Allocation	1–512 buffers	256 buffers
Extended Error Logging	Enabled, Disabled	Disabled

■ **Execution Throttle.** This setting 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 16.

■ **Fast Command Posting.** This setting decreases command execution time by minimizing the number of interrupts. The default is Disabled.

■ **>4GByte Addressing.** This option should be Enabled if the system has more than 4 GB of memory available. The default is Disabled.

■ **LUNs per Target.** This setting specifies the number of LUNs per target. Multiple LUN support is typically for RAID boxes that use LUNs to map drives. The default is 8. If you do not need multiple LUN support, set the number of LUNs to 0.

■ **Enable LIP Reset.** This setting determines the type of loop initialization process (LIP) reset that is used when the operating system initiates a bus reset routine. When this setting is Yes, the driver initiates a global LIP reset to clear the target device reservations. When this setting is No, the driver initiates a global LIP reset with full login. The default is No.

■ **Enable LIP Full Login.** This setting instructs the ISP chip to re-login to all ports after any LIP. The default is Yes.

■ **Enable Target Reset.** This setting enables the drivers to issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued. The default is No.

■ **Login Retry Count.** This setting specifies the number of times the software tries to log in to a device. The default is 8 retries.

■ **Port Down Retry Count.** This setting specifies the number of times the software retries a command to a port returning port down status. The default is 8 retries.

■ **Drivers Load RISC Code.** When this setting is Enabled, the QLA23*xx* board uses the RISC firmware that is embedded in the software driver. When this setting is Disabled, the software driver loads the RISC firmware that is stored in the QLA23*xx* board BIOS. The default is Enabled.

> *NOTE:* The driver being loaded must support this setting. If the driver does not support this setting, the result is the same as Disabled regardless of the setting. Leaving this option enabled guaranties a certified combination of software driver and RISC firmware.

■ **Enable Database Updates.** When enabled, this setting allows the software to save the loop configuration information in flash memory when the system powers down. The default is No.

■ **Disable Database Load.** When enabled, the device database is read from the Registry during driver initialization. When disabled, the device database is created dynamically during driver initialization. The default is No.

> *NOTE:* This option usually applies to the Windows NT and Windows 2000 operating environments.

■ **IOCB Allocation.** This setting specifies the maximum number of buffers from the firmware's buffer pool that are allocated to any one port. The default is 256 buffers.

■ **Extended Error Logging.** This setting provides additional error and debug information to the operating system. When Enabled, events are logged into the Windows NT/Windows 2000 Event Viewer. The default is Disabled.

A.2.6
Extended Firmware Settings

From the **Configuration Settings** menu in *Fast!*UTIL, select **Extended Firmware Settings**. The default settings for the QLA23*xx* board are listed in table A-3 and described in the following paragraphs.

Table A-3. Extended Firmware Settings

Setting	Options	Default
Extended Control Block	Enabled, Disabled	Enabled
RIO Operation Mode	0, 1, 2, 3, 4	0
Connection Options	0, 1, 2	2
Class 2 Service	Enabled, Disabled	Disabled
ACK0	Enabled, Disabled	Disabled
Fibre Channel Tape Support	Enabled, Disabled	Disabled
Fibre Channel Confirm	Enabled, Disabled	Disabled
Command Reference Number	Enabled, Disabled	Disabled
Read Transfer Ready	Enabled, Disabled	Disabled
Response Timer	0–255	0
Interrupt Delay Timer	0–255	0
Data Rate	0, 1, 2	0

■ **Extended Control Block.** This setting enables all other extended firmware settings. The default is Enabled.

■ **RIO Operation Mode.** This setting specifies the reduced interrupt operation (RIO) modes, if supported by the software driver. RIO modes allow posting multiple command completions in a single interrupt (see table A-4). The default is 0.

Table A-4. RIO Operation Modes

Option	Operation Mode
0	No multiple responses
1	Multiple responses, 16-bit handles, interrupt host
2	Multiple responses, 32-bit handles, interrupt host
3	Multiple responses, 16-bit handles, delay host interrupt
4	Multiple responses, 32-bit handles, delay host interrupt

■ **Connection Options.** This setting defines the type of connection (loop or point-to-point) or connection preference (see table A-5). The default is 2.

Table A-5. Connection Options

Option	Type of Connection
0	Loop only
1	Point-to-point only
2	Loop preferred, otherwise point-to-point

■ **Class 2 Service.** This setting enables Class 2 service parameters to be provided during all automatic logins (loop ports). The default is Disabled.

■ **ACK0.** This setting determines the type of ACK used. When this setting is Enabled, sequence ACK is used. When this setting is Disabled, frame ACK is used. The default is Disabled.

   NOTE: The Class 2 Service setting must be Enabled to use the ACK0 setting.

■ **Fibre Channel Tape Support.** This setting enables FCP-2 recovery. The default is Disabled.

■ **Fibre Channel Confirm.** This setting enables the host to send the FCP confirmation frame when requested by the target. The default is Disabled. This setting must be Enabled if the Fibre Channel Tape Support setting is Enabled.

■ **Command Reference Number.** This setting is reserved. The default is Disabled.

- **Read Transfer Ready.** This setting is reserved. The default is Disabled.

- **Response Timer.** This setting contains the value (in 100-microsecond increments) used by a timer to limit the time waiting accumulating multiple responses. For example, if this field is 8, the time limit is 800 microseconds. The default is 0.

- **Interrupt Delay Timer.** This setting contains the value (in 100-microsecond increments) used by a timer to set the wait time between accessing (DMA) a set of handles and generating an interrupt. The default is 0.

- **Data Rate.** This setting determines the data rate. When this setting is 1, the QLA23*xx* board runs at 2 Gbps. When this setting is 2, *Fast!*UTIL determines what rate your system can accommodate and sets the rate accordingly. The default is 0 (the QLA23*xx* board runs at 1 Gbps).

A.3
Scan Fibre Channel Devices

This option scans the FC loop and lists all the connected devices by loop ID. Information about each device is listed, for example, vendor name, product name, and revision. This information is useful when configuring your QLA23*xx* board and attached devices.

A.4
Fibre Disk Utility

This option scans the FC loop and lists all the connected devices by loop ID. You can select a hard disk and perform a low-level format or verify the hard disk.

CAUTION!   Performing a low-level format destroys all data on the hard disk.

A.5
Select Host Adapter

If you have multiple QLA23*xx* boards in your system, use this setting to select and then configure or view the settings of a specific QLA23*xx* board.

Appendix B
Specifications

Table B-1. QLA23xx Board Operating Environment

Environment	Minimum	Maximum
Operating temperature	0°C/32°F	55°C/131°F
Storage temperature	-20 °C/-4 °F	70°C/158°F
Relative humidity (noncondensing)	10%	90%
Storage humidity (noncondensing)	5%	95%

Table B-2. QLA23xx Board Specifications

Type	Specification
Host bus	Conforms to *PCI Local Bus Specification*, revision 2.2 and the *PCI-X Addendum*, revision 1.0
PCI/PCI-X signaling environment	3.3 V and 5.0 V buses supported
PCI/PCI-X transfer rate	132 MBps maximum burst rate for 32-bit PCI operation at 33 MHz 264 MBps maximum burst rate for 32-bit PCI/PCI-X operation at 66 MHz 264 MBps maximum burst rate for 64-bit PCI operation at 33 MHz 528 MBps maximum burst rate for 64-bit PCI/PCI-X operation at 66 MHz 1GBps maximum burst rate for 64-bit PCI-X operation at 133 MHz (QLA2312F/2312FL)
Fibre Channel specifications	Bus type: Copper media, twisted pair (QLA2300/QLA2310) Multimode fibre optic media (QLA2300F/QLA2302F/QLA2310F/ QLA2312F/QAL2312FL) Bus transfer rate: 200 MBps maximum at half-duplex 400 MBps maximum at full-duplex Interface chip: ISP2300 (PCI QLA2300/2300F/2302F boards) ISP2310 (PCI-X QLA2310/2310F/2310FL boards) ISP2312 (PCI-X QLA2312F/2312FL boards)
CPU	Single-chip design that includes a QLogic RISC processor, Fibre Channel protocol manager, PCI/PCI-X DMA controller, and integrated serializer/deserializer (SERDES) and electrical transceivers that can auto-negotiate a data rate of 1 Gbps or 2 Gbps
RAM	256 KB of sync SRAM supporting parity protection
BIOS ROM	128 KB of flash ROM in two 64-KB, software selectable banks. The flash is field programmable.

Table B-2. QLA23xx Board Specifications (Continued)

Type	Specification
NVRAM	256 bytes, field programmable
Onboard DMA	Five-channel DMA controller: two data, one command, one auto-DMA request, and one auto-DMA response
Frame buffer FIFO	Integrated 4-KB transmit and 6-KB receive frame buffer FIFO for each data channel
Connectors	QLA2300/QLA2310: HSSDC connector that supports copper cabling. Fibre optic support available using an external MIA
	QLA2300F/QLA2310F: LC-style connector that supports non-OFC, multimode fibre optic cabling using a small form factor optical transceiver module
	QLA2302F: Two LC-style connectors for multimode fibre optic cabling using a small form factor optical transceiver module
Form factor	17.78 cm×10.67 cm (7.0"×4.2") (QLA2300/2300F/2302F/2310/2310F/2312F)
	16.93 cm×5.15 cm (6.7"×2.5") (QLA2310FL/2312FL)
Operating power	Less than 15 watts

Appendix C
Label

The transceiver on the QLA23*xx* board is a Class I laser product. It complies with IEC 825-1 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated under recommended operating conditions.

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CLASS I LASER PRODUCT

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