# SGI® IRIS® Gigabit Ethernet Board User's Guide

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FCC WARNING
This equipment has been tested and found compliant with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

ATTENTION
This product requires the use of external shielded cables in order to maintain compliance pursuant to Part 15 of the FCC Rules.

VDE 0871/6.78
This equipment has been tested to and is in compliance with the Level A limits per VDE 0871.

EUROPEAN UNION STATEMENT
This device complies with the European Directives listed on the "Declaration of Conformity" which is included with each product. The CE mark insignia displayed on the device is an indication of conformity to the aforementioned European requirements.

International Special Committee on Radio Interference (CISPR)
This equipment has been tested to and is in compliance with the Class A limits per CISPR publication 22.

# Record of Revision

| Version | Description |
|---------|-------------|
| 001 | May 1998<br>Initial Revision |
| 002 | April 2000<br>First Revision |
| 003 | October 2001<br>Second Revision |
| 004 | December 2002<br>Third Revision |

# Contents

# Figures

# Tables

# About this book

This guide describes the two versions of the Gigabit Ethernet board, shows you how to connect the boards to an Ethernet network, and explains how to operate the boards.

You can use the Gigabit Ethernet board to replace the built-in Ethernet network adapter in your system, or use it in addition to your current adapter. The fiber-optic Gigabit Ethernet board operates under IRIX 6.4 or later. The copper Gigabit Ethernet board operates under IRIX 6.5.7 or later.

This guide is written for users of the Gigabit Ethernet board. It is assumed that you have general knowledge of Ethernet networks and the system in which the board is installed.

## Important Information

**Warning:** **Never look into the end of a fiber optic cable to confirm that light is being emitted (or for any other reason). Most fiber optic laser wavelengths (1300 nmand 1550nm) are invisible to the eye and cause permanent eye damage. Shorter wavelength lasers (for example, 780 nm) are visible and can cause significant eye damage. Use only an optical power meter to verify light output.**

**Warning:** **Never look into the end of a fiber optic cable on a powered device with any type of magnifying device, such as a microscope, eye loupe, or magnifying glass. Such activity causes cause a permanent burn on the retina of the eye. Optical signal cannot be determined by looking into the fiber end.**

# Chapter Descriptions

This guide contains the following chapters:

- Chapter 1, "Gigabit Ethernet Board Features and Capabilities," summarizes board features, lists the protocols and interfaces with which the board is compatible, and gives board configuration limits for various systems.

- Chapter 2, "Connecting the Gigabit Ethernet Board to a Network," shows you how to connect the Gigabit Ethernet board to your network.

- Chapter 3, "Gigabit Ethernet Board Operation," explains how to verify installation of the board and software, how to reset the board, how to set parameters to improve performance, and how to set configuration parameters.

- Appendix A, "Specifications", summarizes the physical and performance characteristics, environmental information, and operating ranges of the board.

A glossary and an index complete this guide.

# Related Publications

This guide is part of a document set that fully supports the installation, operation, and service of the Gigabit Ethernet board. For more information about installing and servicing the Gigabit Ethernet board, see the user's guide for the system in which the board is installed.

You can obtain SGI documentation, release notes, or man pages in the following ways:

- See the SGI Technical Publications Library at http://docs.sgi.com. Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.

- If it is installed on your SGI system, you can use InfoSearch, an online tool that provides a more limited set of online books, release notes, and man pages. With an IRIX system, select **Help** from the Toolchest, and then select **InfoSearch**. Or you can type infosearch on a command line.

- You can also view release notes by typing either grelnotes or relnotes on a command line.

- You can also view man pages by typing man *<title>* on a command line.

SGI systems include a set of IRIX man pages, formatted in the standard UNIX "man page" style. These are found online on the internal system disk (or CD-ROM) and are displayed using the man command. For example, to display the man page for the Add_disk command, type the following on a command line:

**man Add_disk**

Important system configuration files and commands are documented on man pages. References in the documentation to these pages include the name of the command and the section number in which the command is found. For example, "Add_disk(1)" refers to the Add_disk command and indicates that it is found in section 1 of the IRIX reference.

For additional information about displaying reference pages using the man command, see man(1).

In addition, the apropos command locates man pages based on keywords. For example, to display a list of man pages that describe disks, type the following on a command line:

**apropos disk**

For information about setting up and using apropos, see apropos(1) and makewhatis(1M).

## Conventions

The following conventions are used throughout this document:

| Convention | Meaning |
|---|---|
| Command | This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures. |
| *variable* | The italic typeface denotes variable entries and words or concepts being defined. Italic typeface also is used for book titles. |
| **user input** | This fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font. |
| [ ] | Brackets enclose optional portions of a command or directive line. |
| ... | Ellipses indicate that a preceding element can be repeated. |

man page(*x*)    Man page section identifiers appear in parentheses after man page names.

**GUI element**    This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, menus, toolbars, icons, buttons, boxes, fields, and lists.

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# Gigabit Ethernet Board Features and Capabilities

Gigabit Ethernet is an extension of existing Ethernet technology that allows computer systems to communicate at speeds up to 1 gigabit per second (Gbps), which is theoretically ten times the rate of existing Fast Ethernet (100-Base-T) technology.

Gigabit Ethernet is targeted at backbone networks and interserver connectivity. It provides an upgrade path for high-end workstations that require more bandwidth than Fast Ethernet can provide. This board is supported in the following systems:

- Silicon Graphics Octane
- Silicon Graphics Octane2
- SGI Origin 200
- SGI Origin 2000 (XIO adapter required)
- Silicon Graphics Onyx2 (XIO adapter required)
- SGI Origin 300
- Silicon Graphics Onyx 300
- SGI Origin 3000
- Silicon Graphics Onyx 3000
- Silicon Graphics Fuel

This chapter includes the following sections:

- "Board Features" on page 2
- "Cabling" on page 5
- "Configuration Limits" on page 8

# Board Features

The Gigabit Ethernet board is available in two formats: the Fiber-Optic Gigabit Ethernet board and the Copper Gigabit Ethernet board. These boards are described in the following sections:

## Fiber-Optic Board Features

The Fiber-Optic Gigabit Ethernet board includes these features:

- Full-duplex Gigabit Ethernet interface as defined in the IEEE P802.3u approved standard

- Support for Ethernet frame sizes up to 9000 bytes

- Dual DMA channels

- ASIC with on-chip MAC and RISC processors (two)

- Duplex SC fiber connector

- 32-/64-bit, 33-/66-MHz PCI bus interface with adaptive DMA

- Universal dual-voltage signaling (3.3 V and 5 V)

- Compliance with PCI Local Bus revision 2.1

For full technical specifications of the board, see Appendix A, "Specifications".

Figure 1-1 shows the Fiber-Optic Gigabit Ethernet board.



**Figure 1-1**     Fiber-Optic Gigabit Ethernet Board

## Copper Board Features

The Copper Gigabit Ethernet board includes these features:

- Full-duplex Gigabit Ethernet interface as defined in the IEEE P802.3ab approved standard
- Support for Ethernet frame sizes up to 9000 bytes
- Dual DMA channels
- ASIC with on-chip MAC and RISC processors (two)
- RJ45 UTP connector for Category-5 copper cabling
- 32-/64-bit, 33-/66-MHz PCI bus interface
- 3Universal dual-voltage signaling (3.3 V and 5 V)
- Compliance with PCI Local Bus revision 2.1

For full technical specifications of the board, see Appendix A, "Specifications".
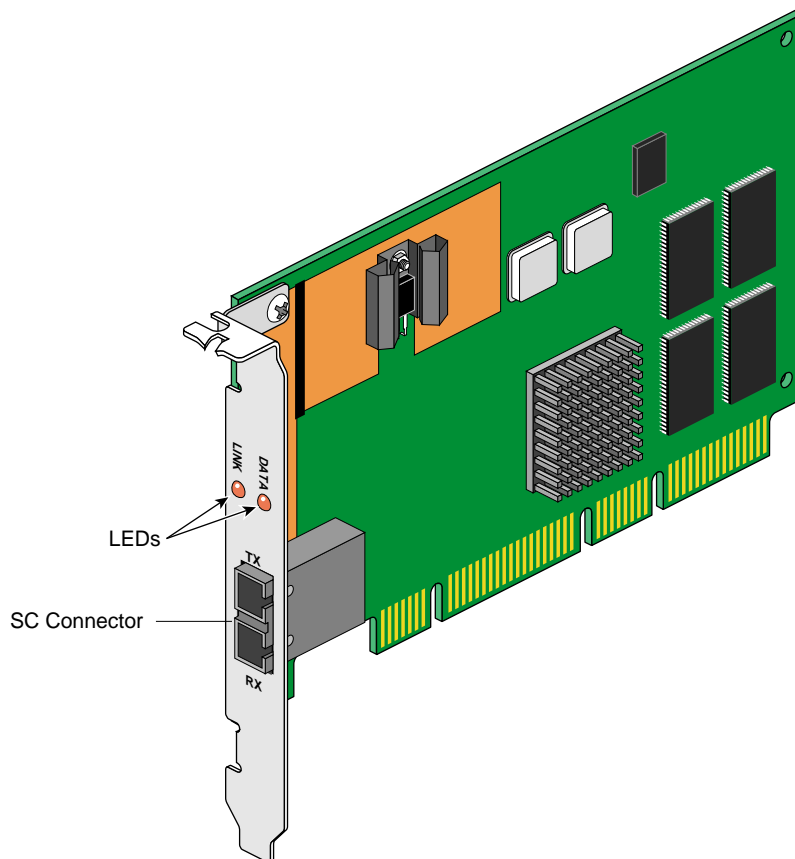
Figure 1-2 shows the Copper Gigabit Ethernet board.
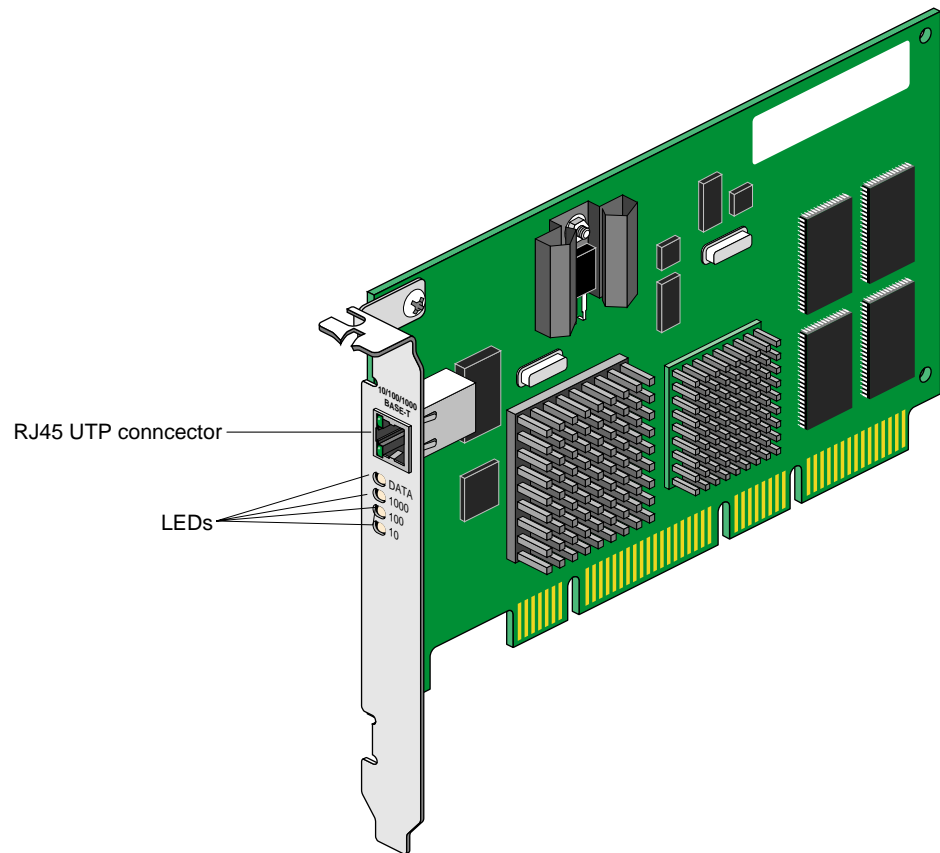


**Figure 1-2**      Copper Gigabit Ethernet Board

## Cabling

The cabling for the Gigabit Ethernet board is described in the following sections:

- "Fiber-Optic Board Cabling" on page 6
- "Copper Board Cabling" on page 7

## Fiber-Optic Board Cabling

The Fiber-Optic Gigabit Ethernet board is connected to the network using fiber-optic cable. The cable, which is not included in the shipment, must be a 50-micron or 62.5-micron multimode duplex cable with an SC connector at each end. Table 1-1 lists SGI fiber-optic cables.

**Table 1-1**     SGI 62.5-Micron Cable Options for Fiber-Optic Gigabit Ethernet

| Length | Marketing Code |
|---|---|
| 3 m (9.8 ft) | X-F-OPT-3M |
| 10 m (39.3 ft) | X-F-OPT-10M |
| 25 m (82 ft) | X-F-OPT-25M |
| 100 m (328 ft) | X-F-OPT-100M |

Table 1-2 lists operating ranges for 50-micron and 62.5-micron cables for a 1000-BASE-SX port. Fiber type is MM.

**Table 1-2**     Fiber-Optic Operating Range, 1000-BASE-SX Standard

| Diameter (Microns) | Modal Bandwidth (MHz * km) | Range (Meters) |
|---|---|---|
| 62.5 | 160 | 2 to 220[a] |
| 62.5 | 200 | 2 to 275[b] |
| 50 | 400 | 2 to 500 |
| 5 | 500 | 2 to 550[c] |

a.  The TIA 568 building wiring standard specifies 160/500 MHz * km multimode fiber.

b.  The international ISO/IEC 11801 building wiring standard specifies 200/500 MHz * km multimode fiber.

c.  The ANSI Fibre Channel specification specifies 500/500 MHz * km 50 micron multimode fiber, and 500/500 MHz * km fiber has been proposed for addition to ISO/IEC 11801.

To achieve the longer distances available with 1000-Base-LX, use a switch with 1000-Base-LX ports. Figure 1-3 diagrams an example configuration.
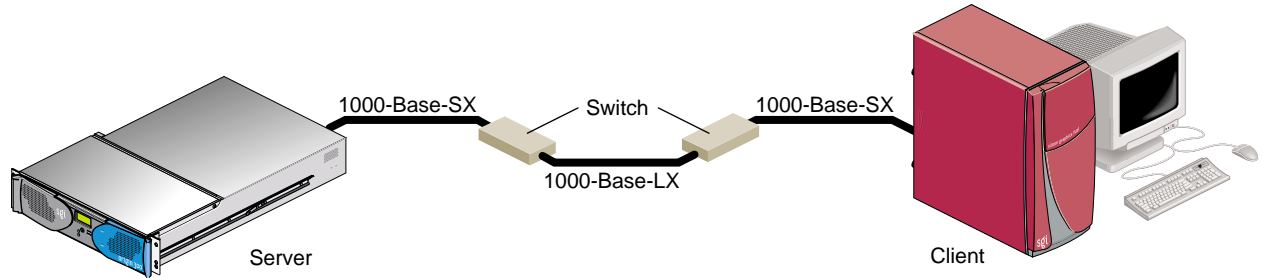
**Figure 1-3**     Example of 1000-Base-LX Configuration

## Copper Board Cabling

The Copper Gigabit Ethernet board is implemented using twisted pair cable. The cable, which is not included in the shipment, must be Category-5 cable plant (4-pair) with an RJ45 UTP connector at each end. Table 1-3 lists the SGI twisted pair cables. The operating range for 1000-Base-T is up to 100 m (328 ft).

**Table 1-3**     SGI Twisted Pair Cable

| Length | Marketing Code |
|--------|----------------|
| 10 feet | X-TP-JUMP-10FT |

To achieve the longer distances available with 1000-Base-T, use a switch with 1000-Base-T ports. Figure 1-4 diagrams an example configuration.
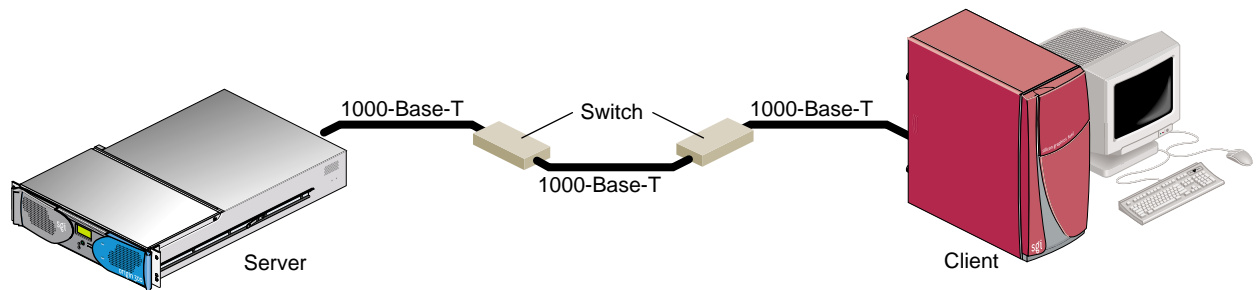


**Figure 1-4**     Example of 1000-Base-T Configuration

## Configuration Limits

Table 1-4 summarizes the configuration limits for the Fiber-Optic and Copper Gigabit Ethernet boards.

**Table 1-4**    Configuration Limits

| System | Maximum Number of Boards |
|---|---|
| Octane and Octane2 | 1 |
| Origin 200 (two-CPU system) | 1 |
| Origin 200 (four-CPU system) | 1 per module/2 total |
| Origin 200 GIGAchannel | 1 per module/2 total |
| Onyx2 deskside | 3 |
| Origin 2000 and Onyx2 rackmount | 6 per module/ 6 total |
| Origin 300 and Onyx 300 | 2 per system |
| Origin 3000 and Onyx 3000 | 20 per system (single image) |

# Connecting the Gigabit Ethernet Board to a Network

This chapter shows you how to connect the Fiber-Optic Gigabit Ethernet board or the Copper Gigabit Ethernet board to a network, and how to configure your system for the board.

Following is a description of each section:

- "Installing the Board" on page 9
- "Connecting to the Network" on page 10
- "Configuring the Board" on page 12

## Installing the Board

The installation instructions for the Gigabit Ethernet board are different for different systems. Refer to the following sources for installation instructions:

- Onyx2, Onyx 300, Origin 2000, or Origin 3000: Your Gigabit Ethernet board must be installed by an SGI certified service provider.

- Origin 200 and Origin 300: See the instructions for installing a PCI card in the user's or owner's guide that came with your system.

- Octane, Octane2, or Silicon Graphics Fuel: See the instructions for installing a PCI card in the user's or owner's guide that came with your workstation.

# Connecting to the Network

This section shows you how to connect the Gigabit Ethernet board to a network in the following sections:

- "Connecting the Fiber-Optic Board" on page 10
- "Connecting the Copper Board" on page 11

## Connecting the Fiber-Optic Board

To connect your Fiber-Optic Gigabit Ethernet board to a network, insert the SC connector on one end of the fiber-optic cable into the Gigabit Ethernet board, as shown in Figure 2-1. Ensure that the connector is inserted completely into the jack. Then insert the connector on the other end of the fiber-optic cable into the connector on the Ethernet switch, or another computer system (as appropriate).

**Note:** If your network connects to an Ethernet switch, consult the operating manual for the switch to ensure that the switch port is enabled and configured correctly.
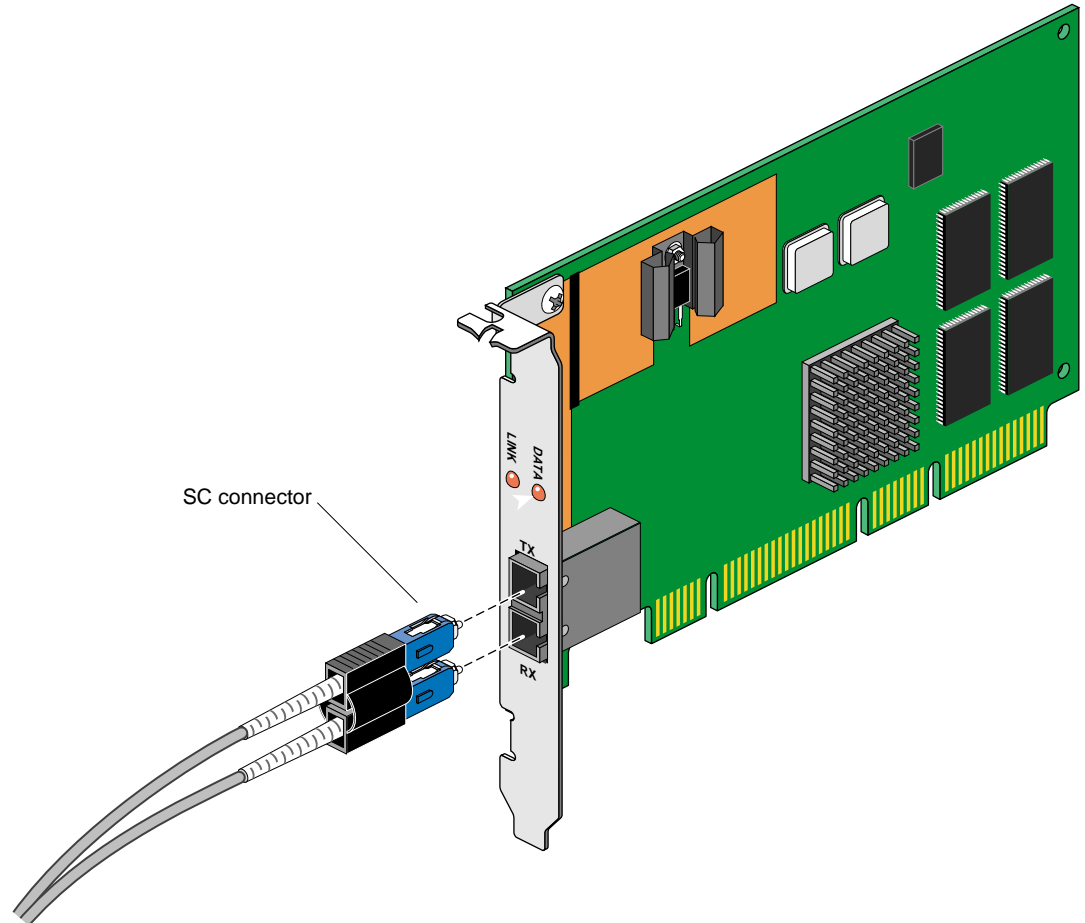
SC connector

**Figure 2-1**    Connecting the Fiber-Optic Cable

## Connecting the Copper Board

To connect your Copper Gigabit Ethernet board to a network, insert the RJ45 connector on one end of the copper cable into the Gigabit Ethernet board, as shown in Figure 2-2. Make sure the connector is inserted completely into the jack, and then insert the connector on the other end of the copper cable into the jack on the Ethernet switch, or another computer system (as appropriate).

**Note:** If your network connects to an Ethernet switch, consult the operating manual for the switch to ensure that the switch port is enabled and configured correctly.
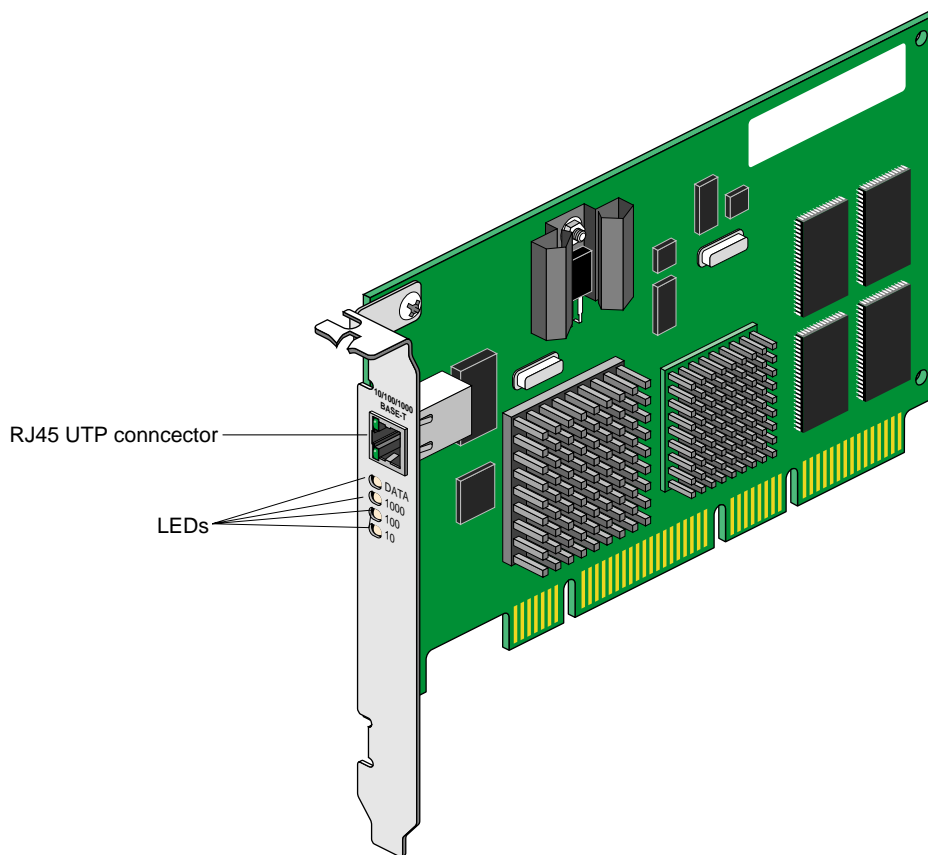


RJ45 UTP conncector

10/100/1000
BASE-T

DATA
1000
100
10

LEDs

**Figure 2-2**     Connecting the Copper Cable

## Configuring the Board

This section explains three ways to configure your system for Gigabit Ethernet:

- "Gigabit Ethernet as Primary and Fast Ethernet as Secondary" on page 13

Recommended for systems with two network connections and a disk, this configuration provides the best performance.

- "Fast Ethernet as Primary and Gigabit Ethernet as Secondary" on page 15

   This configuration is recommended for a diskless workstation.

- "Gigabit Ethernet as the Only Network Interface" on page 16

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**Note:** The instructions in this section assume that your system already has (or has had) a functional Ethernet connection. If this is not the case, see the latest version of *IRIX Admin: Networking and Mail* for instructions on configuring your system for networking (giving it a hostname, IP address, and so on).

---

## Gigabit Ethernet as Primary and Fast Ethernet as Secondary

This section explains how to set up your system with the Gigabit Ethernet connection serving as the primary network interface and fast Ethernet as the secondary network interface. This configuration is the easiest to set up and provides the best performance. Follow these steps:

1. If necessary, become superuser (root) as follows:

   ```
   % su
   Password: thepassword
   #
   ```

2. To determine your system's hostname, enter the following:

   ```
   # hostname
   ```

3. Use your favorite editor to edit the /etc/hosts file. To open the file with nedit, enter the following:

   ```
   # /usr/sbin/nedit /etc/hosts
   ```

4. Find the line with your system's hostname and add the IP address entries. For example, if you are making an entry for a system with a hostname of systemname residing in the domain group1.com with a Gigabit Ethernet IP address of 187.8.27.6 and a Fast Ethernet IP address of 199.26.34.6, enter these lines in the /etc/hosts file:

   ```
   187.8.27.6 systemname.group1.com systemname # gigabit ethernet
   ```

**199.26.34.6 gate-systemname.group1.com gate-systemname # fast ethernet**

5.  If your site uses an NIS service, make the changes in step 4 to the hosts database on the NIS server.

6.  Open the file `/etc/config/netif.options` and find this line:

    `: if1name=`

7.  Change it to the following:

    **if1name=eg0**

8.  Find this line:

    `: if1addr=`

9.  Change it to the following:

    **if1addr=**_systemname_

10. Find this line:

    `: if2name=`

11. Change it to the following:

    **if2name=ef0**

12. Find this line:

    `: if2addr=`

13. Change it to the following:

    **if2addr=gate-**_systemname_

14. Find this line:

    `: if_num=8`

15. Change it to the following:

    **if_num=2**

16. Save and close the file.

17. Restart the machine to ensure that the changes you just made will take effect.

---

**Note:** If you cannot shut down the machine, restart the network script.

---

**Note:** If you need to change the net mask or other options for the network interface cards, see *IRIX Admin: Networking and Mail*.

## Fast Ethernet as Primary and Gigabit Ethernet as Secondary

To configure your system with Fast Ethernet as the primary interface and Gigabit Ethernet as the secondary interface, follow these steps:

1. If necessary, become superuser (root), as follows:

   ```
   % su
   Password: thepassword
   #
   ```

2. To determine your system's hostname, enter the following:

   ```
   # hostname
   ```

3. Use your favorite editor to edit the /etc/hosts file. To open the file with nedit, enter

   ```
   # /usr/sbin/nedit /etc/hosts
   ```

4. Find the line with your system's hostname and add the IP address entries. For example, if you are making an entry for a system with a hostname of systemname residing in the domain group1.com with a Gigabit Ethernet IP address of 187.8.27.6 and a Fast Ethernet IP address of 199.26.34.6, enter these lines in the /etc/hosts file:

   ```
   187.8.27.6 gate-systemname.group1.com gate-systemname #
   gigabit ethernet
   ```

   ```
   199.26.34.6 systemname.group1.com systemname # fast ethernet
   ```

5. If your site uses an NIS service, make the changes in step 4 to the hosts database on the NIS server.

6. Open the file /etc/config/netif.options and find this line:

   ```
   : if1name=
   ```

7. Change it to the following:

   ```
   if1name=ef0
   ```

8. Find this line:

```
                   : if1addr=
```

9.  Change it to the following:

    **if1addr=**_systemname_

10. Find this line:

    ```
                   : if2name=
    ```

11. Change it to the following:

    **if2name=eg0**

12. Find this line:

    ```
                   : if2addr=
    ```

13. Change it to the following:

    **if2addr=gate-**_systemname_

14. Find this line:

    ```
                   : if_num=8
    ```

15. Change it to the following:

    **if_num=2**

16. Save and close the file.

17. Restart the machine to ensure that the changes you just made will take effect.

---

**Note:** If you cannot shut down the machine, restart the network script.

---

---

**Note:** If you need to change the net mask or other options for the network interface cards, see _IRIX Admin: Networking and Mail_.

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## Gigabit Ethernet as the Only Network Interface

To set up your system with the Gigabit Ethernet connection as the only network connection, follow these steps:

1. If necessary, become superuser (root), as follows:

   ```
   % su
   Password: thepassword
   #
   ```

2. To determine your system's hostname, enter the following:

   ```
   # hostname
   ```

3. Use your favorite editor to edit the /etc/hosts file. To open the file with nedit, enter

   ```
   # /usr/sbin/nedit /etc/hosts
   ```

4. Find the line with your system's hostname and add the IP address entries. For example, if you are making an entry for a system with a hostname of systemname residing in the domain group1.com with a gigabit Ethernet IP address of 187.8.27.6, enter this line in the /etc/hosts file:

   ```
   187.8.27.6 systemname.group1.com systemname # gigabit ethernet
   ```

5. If your site uses an NIS service, make the changes in step 4 to the hosts database on the NIS server.

6. Open the file /etc/config/netif.options and find this line:

   ```
   : if1name=
   ```

7. Change it to the following:

   ```
   if1name=eg0
   ```

8. Find this line:

   ```
   : if_num=8
   ```

9. Change it to the following:

   ```
   if_num=1
   ```

10. Save and close the file.

11. Restart the machine to ensure that the changes you just made will take effect.

---

**Note:** If you cannot shut down the machine, restart the network script.

---

**Note:** If you need to change the net mask or other options for the network interface cards, see *IRIX Admin: Networking and Mail*.

# Gigabit Ethernet Board Operation

This chapter describes various issues which may occur when using a gigabit Ethernet network:

Following is a description of each section:

## Verifying Functionality

This section explains

## Using LEDs to Determine Board Functionality

The Fiber-Optic and Copper Gigabit Ethernet boards have light-emitting diodes (LEDs) that indicate whether the board is configured correctly and connected to an active Ethernet.

## Fiber-Optic Board LEDs

The Fiber-Optic Gigabit Ethernet board has two small light-emitting diodes (LEDs). Figure 1-1 on page 3 shows the location of these LEDs. Table 3-1 describes LED functions on the Fiber-Optic Gigabit Ethernet board.

**Table 3-1**    Gigabit Ethernet Fiber-Optic Board LEDs

| LED | State | Purpose |
|-----|-------|---------|
| **DATA** | Blinking | Data detected |
| | Off | No data detected |
| **LINK** | On | Good link |
| | Blinking | Port has been disabled by software |
| | Off | No link: faulty cable, faulty connector, or communication mismatch |

During normal operation, the link LED is on; the data LED blinks whenever the board is receiving traffic. If the ifconfig(1M) command is used to mark the interface as being down, the link LED flashes until the interface is re-enabled.

## Copper Board LEDs

The Copper Gigabit Ethernet board has four small light-emitting diodes (LEDs), one for each port speed option (10Mps, 100Mps, and 1Gbps) to indicate which link is active, and one LED for data transfer status. Figure 1-2 on page 5 shows the location of these LEDs. Until the driver software is installed, all four LEDs remain lit when the server is powered on. Table 3-2 describes LED functions on the Copper Gigabit Ethernet board.

**Table 3-2**      Gigabit Ethernet Copper Board LEDs

| LED | State | Purpose |
|-----|-------|---------|
| **DATA** | Blinking | Brief bursts of data detected on the port |
| | On | Streams of data detected on the port |
| | Off | No data detected on the port |
| **10** | Blinking slowly | Port has been disabled by software |
| | On | Good 10Mbps Ethernet link |
| | Off | No 10Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch |
| **100** | Blinking slowly | Port has been disabled by software |
| | On | Good 100Mbps Fast Ethernet link |
| | Off | No 100Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch |
| **1000** | Blinking slowly | Port has been disabled by software |
| | On | Good Gigabit Ethernet link |
| | Off | No 1000Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch |

## Verifying Board Recognition

The network interface name for the Fiber-Optic and Copper Gigabit Ethernet boards is *eg<N>*, where *<N>* is 0 for the first board, 1 for the second board (if installed), and so on. Use the commands in the example below to display the network interface names.

To verify that the operating system has located the Gigabit Ethernet board, enter

```
% /bin/hinv
```

A line similar to the following should appear:

```
Gigabit Ethernet: eg<N>, module 1, XIO slot io6, firmware version
11.3.1
```

where *eg<N>* is the number of the board; for example, `eg0`.

If a similar line does not appear, a required patch may not be installed correctly on your system.

---

**Note:** After installing the Gigabit Ethernet patch, run *autoconfig* to reconfigure the kernel and reboot the system.

---

## Verifying Board Configuration and Enabling

To verify that the network interface is configured properly and is enabled, enter

```
% /usr/etc/netstat -ina
```

Columns with the following headings should appear:

```
Name Mtu Network Address
```

In the `Name` column, the *eg* number should appear. If it is followed by an asterisk (*), the interface is disabled for some reason.

In the `Mtu` column, the number 1500 should appear.

In the `Network` column, the IP network address should appear.

In the `Address` column, the canonical MAC address of the Gigabit Ethernet board should appear, which looks similar to

```
08:00:69:0b:e0:41
```

In this address, the first three sets of numbers (for example, 08:00:69) are the organizationally unique identifier (OUI) of the board vendor. The last three sets vary depending on the system.

Refer also to the netstat(1) man page for more details.

## Resetting the Board

In the unlikely event that you need to reset the Fiber-Optic or Copper Gigabit Ethernet board, enter

```
egconfig eg<N>
ifconfig eg<N> down
ifconfig eg<N> up
```

where <N> is the board number. Unlike other network adapters, the Gigabit Ethernet board must be reset with *egconfig* (as shown above) as well as with *ifconfig*.

## Performance Tuning

To take full advantage of your gigabit Ethernet network's performance, tune TCP/IP. Set the following parameters to the values shown in Table 3-3.

**Table 3-3**    TCP/IP Tuning

| Parameter | Value |
|-----------|-------|
| *tcp_recvspace* | 262144 |
| *tcp_sendspace* | 262144 |

Use the method appropriate for the IRIX release on your system:

- For IRIX 6.5, configure these values in the `/etc/config/ifconfig-*.options` files.

- For IRIX 6.4, hand-edit the variables *tcp_sendspace* and *tcp_recvspace* in the file */var/sysgen/master.d/bsd*.

## Disabling Autonegotiation

The Gigabit Ethernet Fiber-Optic and Copper boards have autonegotiation on by default. However, some equipment does not implement the most up-to-date standard for autonegotiation of link speed. For such cases, you can disable the Gigabit Ethernet board's autonegotiation. For example, if you attach the Gigabit Ethernet board to a switch or end system that does not support autonegotiation, the link LED (see "Using LEDs to Determine Board Functionality" on page 20) might not illuminate.

**Note:** You do not have to set a speed or duplex mode if you turn autonegotiation off; the Gigabit Ethernet board maintains its gigabit speed and full duplex setting.

To disable autonegotiation, follow these steps:

1. Make sure all users are off the system and that no I/O operations are in progress.

2. Enter

   ```
   ifconfig eg<N> down
   egconfig -l eg<N>
   ifconfig eg<N> up
   ```

   where *<N>* is the board number.

3. To preserve this configuration for the required reboot, open */etc/config/eg<N>.options* and add **-l**, which is a hyphen followed by the letter l.

4. Save and exit the file.

   Options in this file are automatically passed to the *egconfig* command when the system comes up after reboot.

## Disabling Flow Control

To disable flow control, follow these steps:

1. Make sure all users are off the system and that no I/O operations are in progress.

2. Enter

   ```
   ifconfig eg<N> down
   egconfig -f eg<N>
   ifconfig eg<N> up
   ```

   where *<N>* is the board number.

3. To preserve this configuration when the machine is rebooted, open */etc/config/eg<N>.options* and add **-f** to the end of the file.

4. Save and exit the file.

   Options in this file are automatically passed to the *egconfig* command when the system comes up after reboot.

## Setting Lockdown Values

Lockdown allows you to specify the speed and duplex at which your Gigabit Ethernet board will run. The following sections contain instructions for setting lockdown:

- "Setting Lockdown Values Temporarily" on page 25
- "Setting Lockdown Values Permanently" on page 26

### Setting Lockdown Values Temporarily

Follow these steps to set lockdown values temporarily.

---

**Note:** You will lose your lockdown settings if the machine is restarted.

---

1. At the command prompt, type **egcmd.** This command will display a list of possible LINK_PREF settings, denoted by the numbers 0 through 7. Choose a setting for you board and note the number of that setting.

2. At the command prompt, type **ifconfig eg<X> down**, where *<X>* is the number of your interface. For example, to bring down the Gigabit Ethernet board running on interface 2, enter the following:
   **ifconfig eg2 down**

3. Enter the following command to set the LINK_PREF value for you board:
   **egcmd eg<X> LINK_PREF <Y>**, where *<X>* is the number of your interface and
   *<Y>* is the LINK_PREF value that you selected in Step 1.

4. Bring the interface back up by entering the following command:
   **ifconfig eg<X> up** where *<X>* is the number of the interface.

## Setting Lockdown Values Permanently

Follow these steps to permanently set the lockdown values for your Gigabit Ethernet
board.

1. At the command prompt, type **egcmd.** This command will display a list of
   possible LINK_PREF settings, denoted by the numbers 0 through 7. Choose a
   setting for you board and note the number of that setting.

2. Open the following file in a text editor:
   /var/sysagen/master.d/if_eg

3. Find the line that contains the following text:
   int eg_link_pref[32]
   This line represents an array that contains LINK_PREF settings for each of the 32
   possible Gigabit Ethernet interfaces, beginning at 0.

4. Change the value in the array that corresponds to the Gigabit Ethernet interface you
   want to lockdown. For example, to change the lockdown values for the Gigabit
   Ether board attached to interface number 2, you would change the line from this:
   int eg_link_pref[32] = (0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0)
   to this:
   int eg_link_pref[32] = (0,0,<X>,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0)
   where *<X>* is the LINK_PREF setting number you chose in step 1.

5. Save the file and the run the autoconfig command. When the command has
   completed, restart the machine. Watch the boot messages to ensure that the interface
   is brought up with the correct lockdown values.

# Specifications

This appendix summarizes

- "Physical Characteristics" on page 27
- "Environmental Specifications" on page 28
- "Operating Ranges (1000-BASE-SX and 1000-BASE-LX)" on page 29

## Physical Characteristics

Table A-1 summarizes the Fiber-Optic and Copper board physical characteristics.

**Table A-1**      Gigabit Ethernet Adapter Board Specifications

|  | Feature | Value |
|---|---|---|
| Dimensions | Length<br>Width | 6.60 inches<br>3.75 inches |
| Performance | Maximum PCI clock rate | 66 MHz |
|  | PCI data burst transfer rate | 132 MBps |
|  | PCI/Data/address | 32-bit and 64-bit |
|  | PCI modes | Master/slave |
| Power requirements | Maximum consumption (fiber) | 14 watts<br>2.8A @ +5VDC |
|  | Maximum consumption (copper) | 14 watts<br>4.0A @ +5VDC |

# Environmental Specifications

Table A-2 provides the Fiber-Optic board and Copper board environmental specifications.

**Table A-2**     Environmental Specifications

| Condition | Operating Specification | Storage Specification |
|---|---|---|
| Temperature | 0˚ to 55˚ C (32˚ to 131˚ F) | -40˚ to +85˚ C (-40˚ to +185˚ F) |
| Relative humidity | 5 to 85% noncondensing 40˚ C (104˚ F), 16 hour dwells at extremes | 5 to 95% noncondensing 10˚ C/hour (50˚ F/hour) |
| Altitude | Up to 3048 m (10,000 feet) | Up to 10668 m (35,000 feet) |
| Shock | 10g, 1/2 sine wave, 11 msec | 60g, 1/2 sine wave, 11 msec |
| Vibration, peak-to-peak displacement | 0.005 in. max (5 to 32 Hz) | 0.1 in. max (5 to 17 Hz) |
| Vibration, peak acceleration | 0.25g (5 to 500 Hz) (sweep rate = 1 octave/minimum) | 0.25g (5 to 500 Hz) (sweep rate = 1 octave/minimum) |

# Operating Ranges (1000-BASE-SX and 1000-BASE-LX)

Table A-3 lists operating ranges for connecting to 1000-BASE-SX and 1000-BASE-LX ports as defined by the IEEE 802 LAN/MAN Standards Committee.

**Table A-3**    Fiber-Optic Operating Range

| Standard | Fiber Type | Diameter (Microns) | Modal Bandwidth (MHz * km) | Range (Meters) |
|---|---|---|---|---|
| 1000-BASE-SX | MM | 62.5 | 160 | 2 to 220[a] |
| | MM | 62.5 | 200 | 2 to 275[b] |
| | MM | 50 | 400 | 2 to 500 |
| | MM | 50 | 500 | 2 to 550[c] |
| 1000-BASE-LX | MM | 62.5 | 500 | 2 to 550 |
| | MM | 50 | 400 | 2 to 550 |
| | MM | 50 | 500 | 2 to 550 |
| | SM | 9 | N/A | 2 to 5000 |

a. The TIA 568 building wiring standard specifies 160/500 MHz * km multimode fiber.

b. The international ISO/IEC 11801 building wiring standard specifies 200/500 MHz * km multimode fiber.

c. The ANSI Fibre Channel specification specifies 500/500 MHz * km 50 micron multimode fiber and 500/500 MHz * km fiber has been proposed for addition to ISO/IEC 11801.

# Glossary

**acknowledge (Ack) packet**

The Ack packet informs the PE that initiated a message that the destination PE accepted the message.

**autonegotiation**

The process by which two computers (or a computer and a switch) connected by gigabit Ethernet determine the speed and other parameters with which they will communicate.

**CD-ROM (CD)**

A flat metallic disk that contains information that you can view and copy onto your own hard disk; you cannot change or add to the disk. CD-ROM is short for compact disc read-only memory.

**Ethernet**

A communication network used to connect computers.

**gigabit**

A communication rate of $2^{30}$ bits per second.

**host**

Any system connected to the network.

**hostname**

The name that uniquely identifies each host (system) on the network.

**IP address**

A number that uniquely identifies each host (system) on a TCP/IP network.

**IRIX**

The SGI version of the UNIX operating system.

**LED**

Light-emitting diode, a light on a piece of hardware that indicates status or error conditions.

**MAC**

Medium Access Control; also called the physical layer.

**MAC address**

The physical address of the gigabit Ethernet board, which is distinct from the IP address.

**man (manual) page**

An online document that describes how to use a particular IRIX command. Also called reference page.

**NIS**

Network Information Service, a distributed database mechanism for user accounts, host names, mail aliases, and so on.

**PCI**

Peripheral Component Interconnect, a bus specification. The PCI bus is a high-performance local bus used to connect peripherals to memory and a microprocessor. A wide range of vendors make devices that plug into the PCI bus.

**reference page**

*See* man (manual) page.

**TCP/IP**

A standard networking protocol that is included in the IRIX software.

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