

SGI® IRIS® Release 2 Gigabit Ethernet Board User's Guide

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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 Gigabit Ethernet board operates under IRIX 6.5.18 or later or 6.5.17 or later with a patch.

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 nm and 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 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, “Operating the Gigabit Ethernet Board,” 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.
<i>variable</i>	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.” on page 2
- “Copper Board Features” on page 4

Fiber-Optic Gigabit Ethernet is defined in the IEEE standard P802.3z. The Fiber-Optic Gigabit Ethernet board is compatible with this approved standard. Copper Gigabit Ethernet is defined in the IEEE standard P802.3ab. The Copper Gigabit Ethernet board is compatible with this approved standard.

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
- 32-/64-bit, 66-/133-MHz PCI-X bus interface
- Universal dual-voltage signaling (3.3 V and 5 V)
- Compliance with PCI Local Bus revision 2.2 and PCI-X Local Bus revision 1.0 standards

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

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

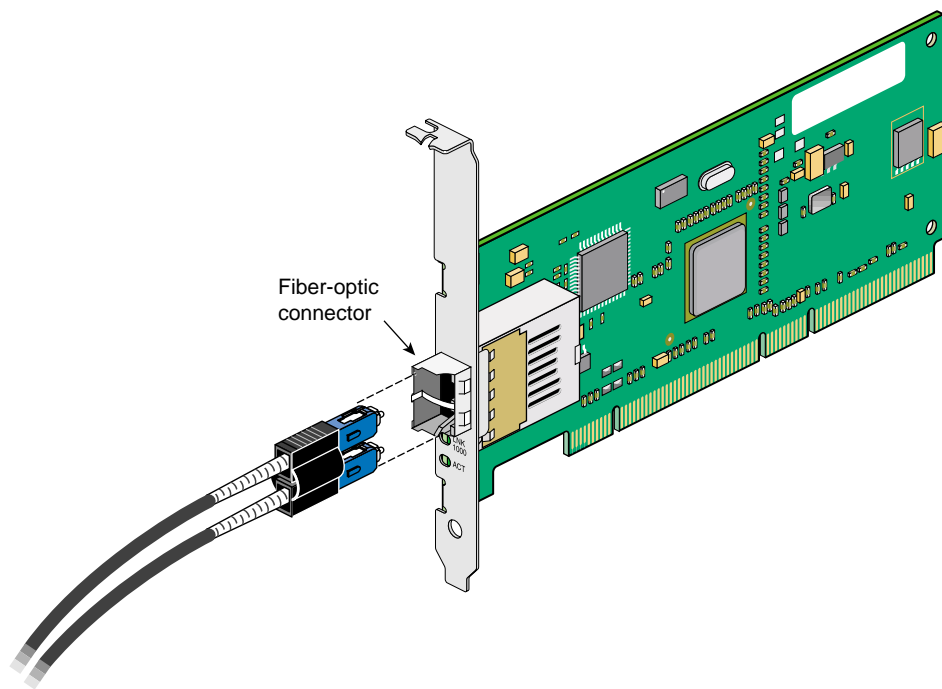


Figure 1-1 Fiber-Optic Gigabit Ethernet Board

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
- 32-/64-bit, 66-/133-MHz PCI-X bus interface
- Universal dual-voltage signaling (3.3 V and 5 V)
- Compliance with PCI Local Bus revision 2.2 and PCI-X Local Bus revision 1.0 standards

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

Figure 1-2 shows the Copper Gigabit Ethernet board.

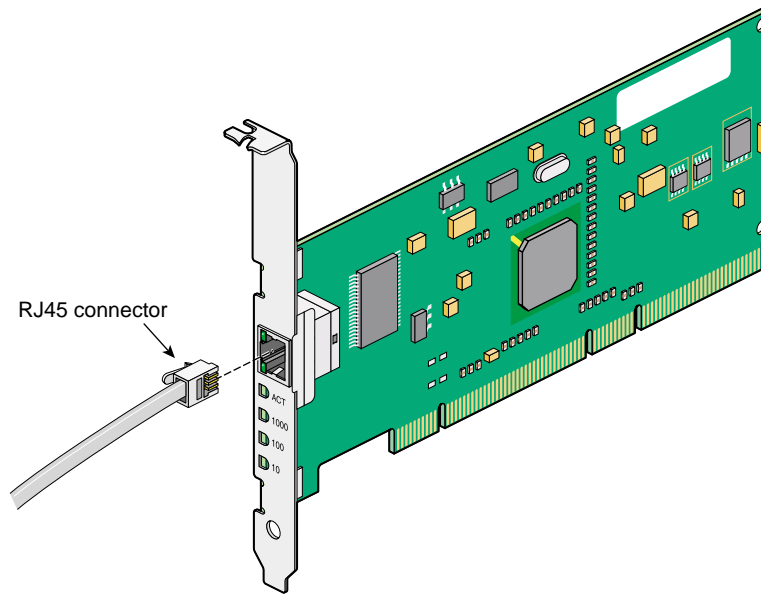


Figure 1-2 Copper Gigabit Ethernet Board

Cabling

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

- “Fiber-Optic Board Cabling” on page 5
- “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.

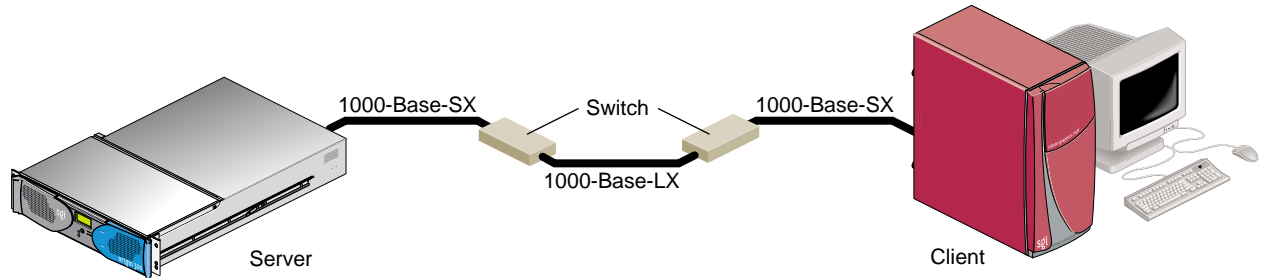


Figure 1-3 Example of 1000-Base-LX Configuration

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.

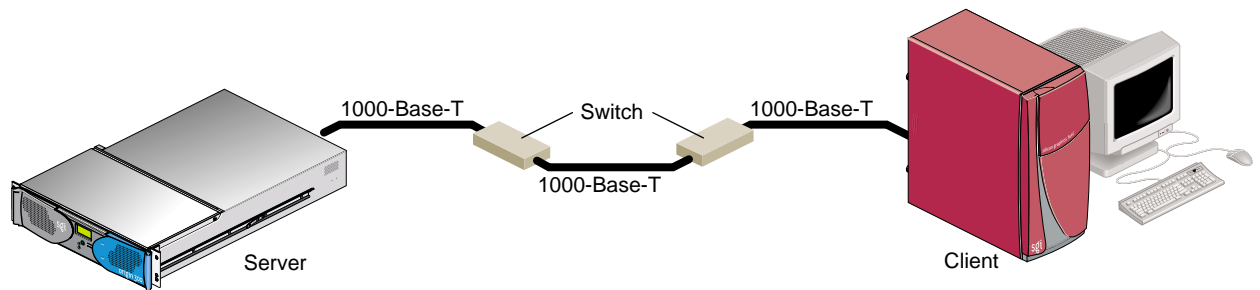


Figure 1-4 Example of 1000-Base-T Configuration

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 GIGAchanel	1 per module/2 total
Origin 2000	2 per system
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.

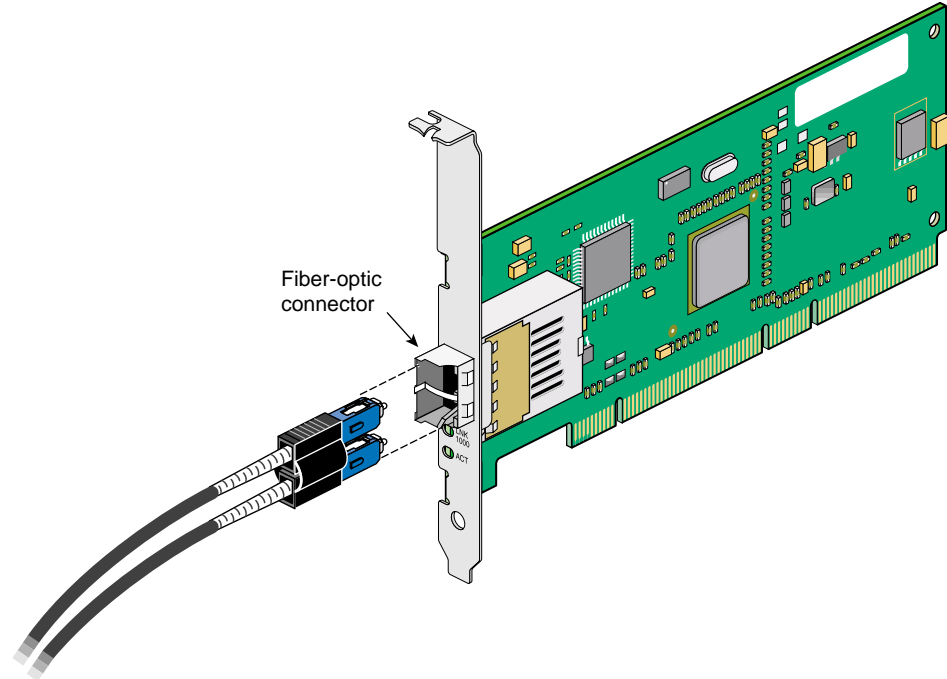


Figure 2-1 Connecting the Fiber-Optic Cable

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.

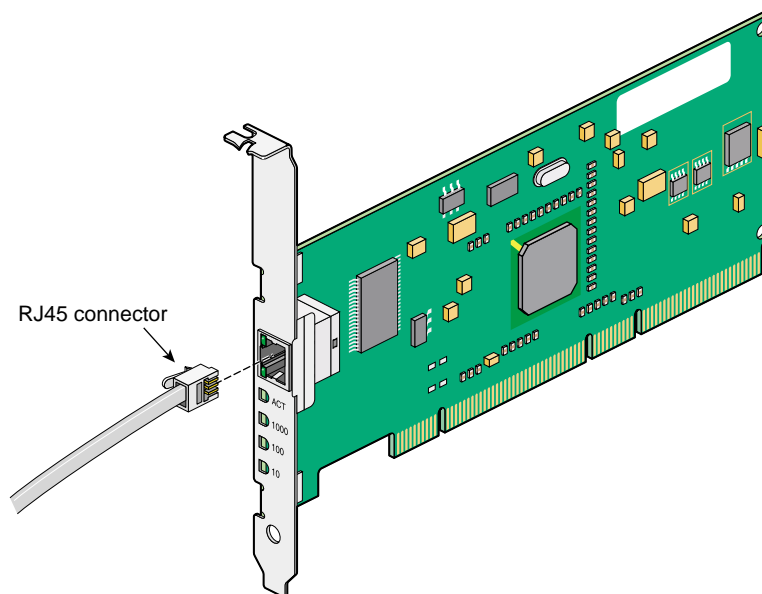


Figure 2-2 Connecting the Copper Cable

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 14
This configuration is recommended for a diskless workstation.
- “Gigabit Ethernet as the Only Network Interface” on page 16

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:

```
: iflname=
```

7. Change it to the following:

```
iflname=tg0
```

8. Find this line:

```
: ifladdr=
```

9. Change it to the following:

```
ifladdr=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=tg0
```
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*.

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:
 `: iflname=`
7. Change it to the following:
 `iflname=tg0`
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*.

Operating the Gigabit Ethernet Board

This chapter describes various issues that may occur when using a Gigabit Ethernet network. It includes the following sections:

- “Verifying Functionality” on page 19
- “Resetting the Board” on page 22
- “Configuration Parameters” on page 23

Verifying Functionality

This section explains the following:

- “Using LEDs to Determine Board Functionality” on page 20
- “Verifying Board Recognition” on page 21
- “Verifying Board Configuration and Enabling” on page 22

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, as discussed in the following sections.

Fiber-Optic Board LEDs

Figure 1-1 on page 3 shows the location of the two small LEDs on the Fiber-Optic Gigabit Ethernet board. Table 3-1 describes the functions of these LEDs.

Table 3-1 LEDs on the Fiber-Optic Gigabit Ethernet Board

LED	State	Purpose
ACT	Blinking	Data detected
	Off	No data detected
LINK1000	On	Good link
	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.

Copper Board LEDs

The Copper Gigabit Ethernet board has four small LEDs, one for each port speed option (10 Mbps, 100 Mbps, and 1 Gbps). These LEDs indicate which link speed is active and the

status of data transfer. Figure 1-2 on page 5 shows the location of these LEDs. Table 3-2 describes the functions of these LEDs.

Table 3-2 LEDs on the Copper Gigabit Ethernet Board

LED	State	Purpose
ACT	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	On	Good 10-Mbps Ethernet link
	Off	No 10-Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch
100	On	Good 100-Mbps Fast Ethernet link
	Off	No 100-Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch
1000	On	Good Gigabit Ethernet link
	Off	No 1000-Mbps 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 *tg<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 the following:

```
% /bin/hinv
```

A line similar to the following should appear:

```
Gigabit Ethernet: tg<N>, module 001c10, PCI bus 0 slot 1
```

where *tg<N>* is the number of the board, (for example, *tg0*).

Verifying Board Configuration and Enabling

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

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

Columns with the following headings should appear:

```
Name Mtu Network Address
```

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

In the `Mtu` column, the size of the current Maximum Transmission Unit (MTU) should appear. The MTU size is set via the `-mtu` switch of the `ifconfig` command. If no size is specified by the `-mtu` switch, the board defaults to an MTU size of 1500.

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

See also 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 the following:


```
ifconfig tg<N> down  
ifconfig tg<N> up
```

where <N> is the board number.

Configuration Parameters

The configuration of your Gigabit Ethernet board is controlled by a number of parameters, which are discussed in the following sections:

- “Autonegotiation” on page 23
- “Link Preference” on page 24
- “Flow Control Settings” on page 25
- “Interrupt Coalescence Settings” on page 26
- “MTU Size Settings” on page 26

To change the configuration of your board, use the `tgconfig` utility. For more information, enter `man tgconfig` at the command prompt.

Autonegotiation

The autonegotiation parameter controls the negotiation process between the Gigabit Ethernet board and its link partner. If autonegotiation is enabled in the `etc/config/tgconfig.options` file, each link partner will advertise which link speeds and duplex modes it can support. Table 3-3 describes the settings for the `autoneg` parameter.

Table 3-3 Autonegotiation Settings

Setting	Result
ON (default)	The Gigabit Ethernet board will attempt to negotiate the link speed and duplex mode with its link partner. The board will initiate and respond to autonegotiation requests. Note that the Gigabit standard requires autonegotiation.
OFF	The board will not initiate or respond to autonegotiation requests. Note that autonegotiation should only be disabled if the board is being linked to a non-gigabit device that does not support autonegotiation. Also, note that the <code>link_pref</code> parameter cannot be set to AUTO or 10-100 when autonegotiation is disabled.

Link Preference

The `link_pref` parameter controls the link speed and duplex mode of the connection. Table 3-4 describes the settings for the `link_pref` parameter.

Table 3-4 Link Preference Settings

Setting	Result	Board Version
AUTO (Default)	The link speed and duplex setting are determined by the autonegotiation process.	All
10_100	Link speeds are limited to 10 or 100 Mbps and full- or half- duplex.	Copper
1000_FULL	When autonegotiation is enabled, the card will only advertise at 1000 Mbps full-duplex. With autonegotiation disabled, the card is locked down to 1000 Mbps full-duplex.	Copper

Table 3-4 Link Preference Settings

Setting	Result	Board Version
1000_HALF	When autonegotiation is enabled, the card will only advertise at 1000 Mbps half-duplex. With autonegotiation disabled, the card is locked down to 1000 Mbps half-duplex.	Copper
100_FULL	When autonegotiation is enabled, the card will only advertise at 100 Mbps full-duplex. With autonegotiation disabled, the card is locked down to 100 Mbps full-duplex.	Copper
100_HALF	When autonegotiation is enabled, the card will only advertise at 100 Mbps half-duplex. With autonegotiation disabled, the card is locked down to 100 Mbps half-duplex.	Copper
10_FULL	When autonegotiation is enabled, the card will only advertise at 10 Mbps full-duplex. With autonegotiation disabled, the card is locked down to 10 Mbps full-duplex.	Copper
10_HALF	When autonegotiation is enabled, the card will only advertise at 10 Mbps half-duplex. With autonegotiation disabled, the card is locked down to 10 Mbps half-duplex.	Copper

Flow Control Settings

The `flow_cntrl` parameter controls the sending and receiving of 802.3x XON/XOFF PAUSE frames for flow control. The possible settings are as follows:

- **ON (Default):** If the autonegotiation parameter is enabled, the board will advertise flow control capability. If autonegotiation is disabled, the board will force flow control to be enabled.
- **OFF:** If the autonegotiation parameter is enabled, the board will not advertise flow control capability. If autonegotiation is disabled, the board will force flow control to be disabled.

Interrupt Coalescence Settings

The Gigabit Ethernet board can reduce network overhead related to interrupt handling. It does this by sending and receiving multiple Ethernet frames between driver interrupts. This is referred to as “interrupt coalescence.” Interrupts are generated whenever a certain number of packets are transmitted or received.

The following parameters control transmit interrupts:

- `coal_frames_tx`
This parameter controls the number of frames that are transmitted between interrupts.
- `coal_usecs_tx`
This parameter controls the number of microseconds between interrupts.

If both of these parameters are set to zero, which is the default, the driver will use predetermined values that are based on the Maximum Transmission Unit (MTU) size. Transmit interrupts can usually be delayed without sacrificing performance, so the default settings should not usually be changed.

The following parameters control receive interrupts:

- `coal_frames_rxa`
This parameter controls the number of frames that are received between interrupts.
- `coal_usecs_rx`
This parameter controls the number of microseconds between interrupts.

If both of these parameters are set to zero, which is the default, the driver will use predetermined values that are based on the Maximum Transmission Unit (MTU) size. These default values were chosen to optimize overall throughput and should probably not be changed in most systems.

MTU Size Settings

The Maximum Transmission Unit (MTU) size is controlled by the “`mtu <mtu_size>`” switch of the `ifconfig` command. There are two possible MTU sizes: 1500 bytes (standard-size Ethernet frames) and 9000 bytes (“jumbo” Ethernet frames). Configuring the Gigabit Ethernet board to use jumbo frames will increase network bandwidth and reduce CPU load, but only if the network supports jumbo frames. To configure the MTU size, follow these steps:

1. At the command prompt, enter the following command:

```
netstat -i
```

The output will display information about the network adapters currently installed in the system, as shown below:

Name	Mtu	Network	Address	Ipkts	Ierrs	Opkts	Oerrs	Coll
tg1	1500	10.50.1	system.name	0	0	1	0	0

2. To bring down the Gigabit Ethernet board, enter the following command:

```
ifconfig tg<n> down
```

where <n> is the number of the board.

3. To change the MTU size of the Gigabit Ethernet adapter and restart the board, enter the following command:

```
ifconfig tg<n> mtu 9000 up
```

where <n> is the number of the board.

4. Enter the following command to verify that the MTU size has been changed:

```
netstat -i
```

The output should look similar to the following:

Name	Mtu	Network	Address	Ipkts	Ierrs	Opkts	Oerrs	Coll
tg1	9000	10.50.1	system.name	0	0	3	0	0

Specifications

This appendix provides the following information:

- “Physical and Performance Characteristics” on page 29
- “Environmental Specifications” on page 30
- “Operating Ranges (1000-Base-SX and 1000-Base-LX)” on page 31

Physical and Performance Characteristics

Table A-1 summarizes the physical and performance characteristics of the Fiber-Optic and Copper boards.

Table A-1 Specifications of the Gigabit Ethernet Boards

Characteristic	Feature	Value
Dimensions	Length	17.3 cm (6.8 in.)
	Width	6.4 cm (3.6 in.)
Performance	Maximum PCI clock rate	66 MHz max
	Maximum PCI-X clock rate	133 MHz max
	PCI data burst transfer rate	132 Mbps (32-bit bus) 264 Mbps (64-bit bus) 528 Mbps (64-bit bus at 66 MHz)
	PCI/data/address	32-bit and 64-bit
	PCI modes	Master/slave
Power requirements	Operating voltage	+5V 5%
	Maximum consumption	10 watts 2A @ +5V DC

Environmental Specifications

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

Table A-2 Environmental Specifications

Condition	Operating Specification	Storage Specification
Temperature	0 °C to 55 °C (32 °F to 131 °F)	-40 °C to +85 °C (-40 °F 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 ft)	Up to 10668 m (35,000 ft)
Shock	10 g, 1/2 sine wave, 11 msec	60 g, 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 an abbreviation 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.

MTU

Maximum Transmission Unit is a configuration parameter that controls the size of the Ethernet frames that the Gigabit Ethernet board can transmit and receive.

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. Many vendors offer 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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