SGI® Altix® Systems Quad-Port Gigabit Ethernet PCI Express Low Profile Card User's Guide

007-5515-002

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.

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Record of Revision

Version	Description
001	January 2009 Initial release.
002	April 2009 Updated to support additional hardware platforms.

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About this book

This guide describes the SGI Altix systems quad-port copper Gigabit Ethernet PCI Express Low Profile card and shows you how to connect the card to an Ethernet network, and explains how to operate the card.

You can use the quad-port copper Gigabit Ethernet PCI Express Low Profile card to replace the built-in Ethernet network adapter in your system, or use it in addition to your current adapter.

This guide is written for users of the quad-port copper Gigabit Ethernet PCI Express Low Profile card. It is assumed that you have general knowledge of Ethernet networks and the system in which the card is installed.

Chapter Descriptions

This guide contains the following chapters:

- Chapter 1, “Gigabit Ethernet Card Features and Capabilities,” summarizes card features, lists the protocols and interfaces with which the card is compatible, and gives card configuration limits for various systems.
- Chapter 2, “Connecting the Gigabit Ethernet Card to a Network,” shows you how to connect the Gigabit Ethernet card to your network.
- Chapter 3, “Operating the Gigabit Ethernet Card,” explains how to verify installation of the card and software, how to reset the card, 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 card.

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 quad-port Gigabit Ethernet card. For more information about installing and servicing the quad-port Gigabit Ethernet card, see the user's guide for the system in which the card is installed.

SGI Altix Hardware Documentation

For a list of current SGI hardware manual, see the *SGI ProPack 6 for Linux Service Pack 2 Start Here* (or later) available at http: / / docs.sgi.com.

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.
- For the latest information about software and documentation for your SGI ProPack software release, see the release notes that are in a file named `README.TXT` that is available in `/docs` directory on the SGI ProPack 6 for Linux CD.
- You can also view man pages by typing `man` <*title*> on a command line.

For example, to display the man page for the `apropos` command, type the following on a command line:

```
man apropos
```

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, “apropos(1)” refers to the `apropos` command and indicates that it is found in section 1 of Linux man pages.

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

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 bold, 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 Card Features and Capabilities

Gigabit Ethernet is technology that allows computer systems to communicate at speeds up to 1 gigabit per second (Gbps).

This card is supported in the following systems:

- SGI Altix 450 and SGI Altix 4700
- SGI Altix ICE 8200
- SGI Altix XE250
- SGI Altix XE270
- SGI Altix XE310
- SGI Altix XE320
- SGI Altix XE340

This chapter includes the following sections:

Card Description

Information in this chapter is from a Gigabit PCI Express card specification available at http://www.silicom-usa.com/default.asp?contentID=1245

The quad-port copper Gigabit Ethernet PCI Express card is a network interface card that contain multiple independent Gigabit Ethernet ports. The PCI Express server adapter card provides a fully integrated up to Layer 5 solution along with a complete Gigabit Ethernet ports.

Figure 1-1 shows the quad-port Copper Gigabit Ethernet card.

Note: The hardware MAC addresses for the four ports are lowest at the top of the card and highest at the bottom of the card.

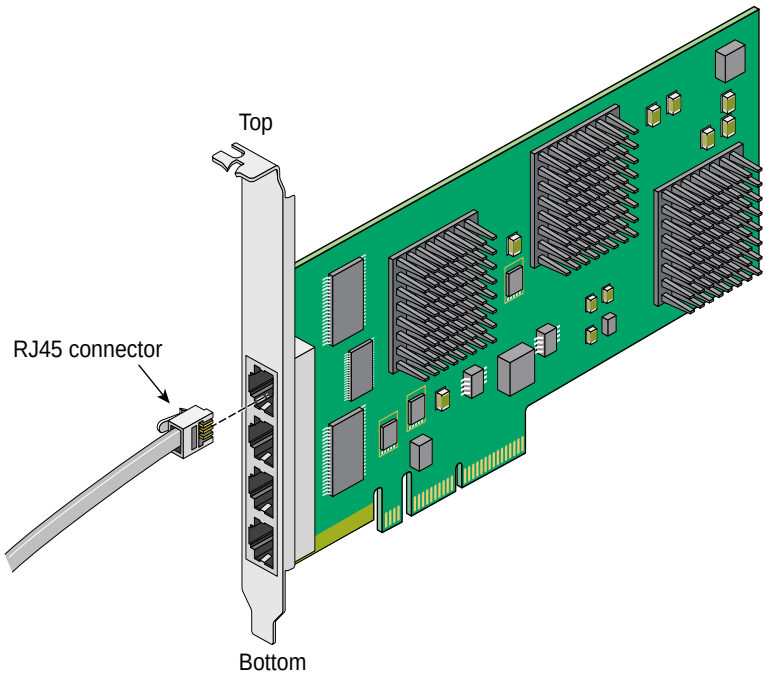

Figure 1-1 Copper Gigabit Ethernet Card

Card Features

The copper Gigabit Ethernet PCI Express card includes these features:

- Gigabit Ethernet (1000Base-T), Fast Ethernet (100Base-TX), Ethernet (10Base-T)
- Quad Ethernet ports

- Full-duplex and Simplex Gigabit Ethernet interface as defined in the IEEE P802.3ab approved standard
- RJ45 UTP connector for Category-5 copper cabling
- 2000 Mbit/s in full duplex mode per port
- High performance, reliable, low power, dual integrated MAC + PHY chip controller
- Dual, high-speed RISC processor per channel for advanced packet classification
- Hardware acceleration that can off-load tasks from the host processor. The controllers can off-load TCP/UDP/IP checksum calculations and TCP segmentation.
- Support for Jumbo Frames (9KB)

Note: The hardware MAC addresses for the four ports are lowest at the top of the card and highest at the bottom of the card.

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

Cabling

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

The Copper Gigabit Ethernet card 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 1-1 lists the SGI twisted pair cables. The operating range for 1000-Base-T is up to 100 m (328 ft).

Table 1-1 SGI Twisted Pair Cable

Length	Marketing Code
6 feet	CBL-GBE-RJ45-06FT-Z
10 feet	CBL-GBE-RJ45-10FT-Z
15 feet	CBL-GBE-RJ45-15FT-Z

Table 1-1 SGI Twisted Pair Cable

Length	Marketing Code
25 feet	CBL-GBE-RJ45-25FT-Z
50 feet	CBL-GBE-RJ45-50FT-Z

To achieve the longer distances available with 1000-Base-T, use a switch with 1000-Base-T ports.

Configuration Limits

The Quad-Port Gigabit Ethernet PCI Express Low Profile Card is supported on SGI PCIe capable platforms. For specific restrictions or other questions, please consult your sales representative.

SGI field support engineers can find up-to-date card configuration information on the SGI service information web site

Table 1-2 summarizes the configuration limits for the Copper Gigabit Ethernet card at the time of publication of this manual..

Table 1-2 Configuration Limits

System	Maximum Per Bus	Maximum Number of cards
Altix 450	1	8
Altix 4700	1	8
Altix XE250	1	3 cards @ x8 per node
Altix XE270	1	3 cards @ x8 per node
Altix XE310	1	1 card @ x8 per node (2 per chassis)
Altix XE320	1	1 card @ x8 per node (2 per chassis)

Table 1-2 Configuration Limits

System	Maximum Per Bus	Maximum Number of cards
Altix XE340	1	1 card @ x8 per node (2 per chassis)
Altix ICE 8200	1	1 per service node

Connecting the Gigabit Ethernet Card to a Network

This chapter shows you how to connect the copper Gigabit Ethernet card to a network, and how to configure your system for the card.

Following is a description of each section:

Installing the Card

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

- Altix 450 and Altix 4700: See "PCI Cards" in Chapter 1 of the *SGI Altix 4700 System User's Guide.*
- Altix ICE 8200: See "Service Nodes" in Chapter 3 of the *SGI Altix ICE 8200 Series System Hardware User's Guide.*

  The Gigabit Ethernet card is supported on the ice-csn node (6015b) that can be used as a service node, leader node, or admin node and is the default node type on an SGI Altix ICE 8200 system. For more information, see *Superserver 6015B User's Manua*l, 860-0473-001.
- Altix XE250: See the instructions for installing a PCI-E card in the user's or owner's guide that came with your system.
- Altix XE270: See the instructions for installing a PCI-E card in the user's or owner's guide that came with your system.
- Altix XE310: See the instructions for installing a PCI-E card in the user's or owner's guide that came with your system.
- Altix XE320: See the instructions for installing a PCI-E card in the user's or owner's guide that came with your system.

- Altix XE340: See the instructions for installing a PCI-E card in the user's or owner's guide that came with your system.

Connecting to the Network

To connect your copper Gigabit Ethernet card to a network, insert the RJ45 connector on one end of the copper cable into the Gigabit Ethernet card, as shown in Figure 2-1. 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.

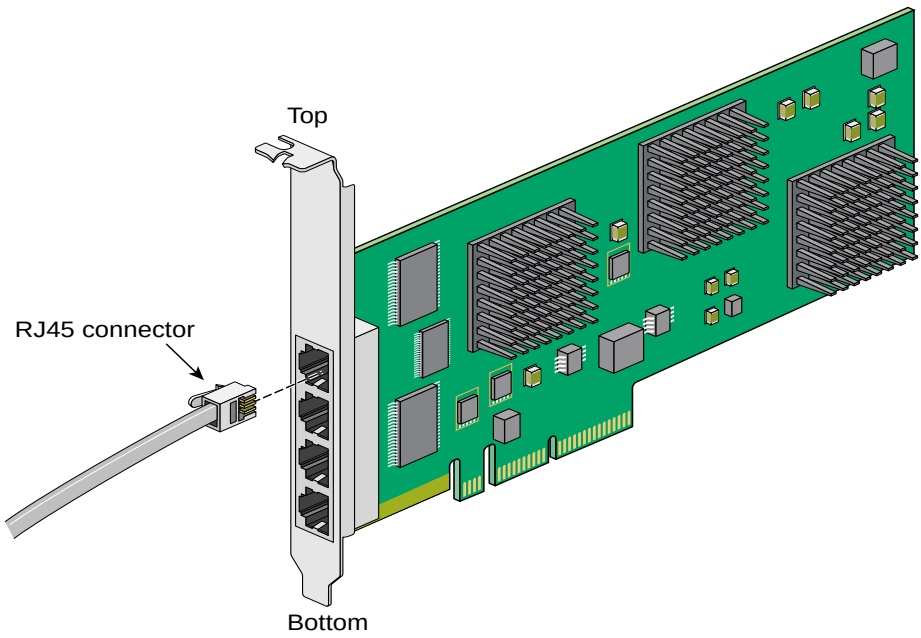

Figure 2-1 Connecting the Copper Cable

Operating the Gigabit Ethernet Card

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

Verifying Functionality

This section explains the following:

Using LEDs to Determine Card Functionality

The copper Gigabit Ethernet cards have light-emitting diodes (LEDs) that indicate whether the card is configured correctly and connected to an active Ethernet, as discussed in the following sections.

The copper Gigabit Ethernet card has three LEDs per ports. Table 3-1 describes the functions of these LEDs.

Table 3-1 LEDs on the Copper Gigabit Ethernet Card

Components	Purpose
LEDs	(2) LEDs per port Activity LED: Blinks on activity (green). Speed (Bi-color) LED 1000Mbits / s: Turns on Yellow. 100Mbit / s: Turns on Green. 10Mbit / s: Turns off
Connectors	Shielded RJ-45

Verifying Card Recognition

To verify that the operating system has located the Gigabit Ethernet card, use the Linux PCI utilities `lspci`(8) command, as follows:

```
# lspci -d 14e4:
0b:00.0 Ethernet controller: Broadcom Corporation NetXtreme II BCM5709 Gigabit Ethernet (rev 20)
0b:00.1 Ethernet controller: Broadcom Corporation NetXtreme II BCM5709 Gigabit Ethernet (rev 20)
0c:00.0 Ethernet controller: Broadcom Corporation NetXtreme II BCM5709 Gigabit Ethernet (rev 20)
0c:00.1 Ethernet controller: Broadcom Corporation NetXtreme II BCM5709 Gigabit Ethernet (rev 20)
```

In `0b:00.0 Ethernet controller identification`, `0b` is the bus number, `00` is the slot number, and `0` is the port, respectively.

Verifying Card Configuration and Enabling

Use the installation tool that comes with your operating system to install and configure the Ethernet card.

You can use the `ifconfig -a` command to verify the configuration information, as follows:

```
# ifconfig -a
eth0      Link encap:Ethernet  HWaddr 00:30:48:C2:CE:EA
          inet addr:150.166.38.60  Bcast:150.166.38.255  Mask:255.255.255.0
          inet6 addr: fe80::230:48ff:fec2:ceea/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:656008 errors:0 dropped:0 overruns:0 frame:0
          TX packets:55860 errors:43 dropped:0 overruns:0 carrier:43
          collisions:47 txqueuelen:100
          RX bytes:50809289 (48.4 Mb)  TX bytes:5802853 (5.5 Mb)
          Memory:d0c20000-d0c40000

eth1      Link encap:Ethernet  HWaddr 00:30:48:C2:CE:EB
          BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Memory:d0c60000-d0c80000

eth2      Link encap:Ethernet  HWaddr 00:E0:ED:13:25:60
          inet addr:10.148.0.1  Bcast:10.148.255.255  Mask:255.255.0.0
          inet6 addr: fe80::2e0:edff:fe13:2560/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7483523757 errors:0 dropped:1215 overruns:0 frame:0
          TX packets:7649919314 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7926280279475 (7559089.9 Mb)  TX bytes:7874281891557 (7509500.4 Mb)
          Interrupt:217 Memory:d2000000-d2012100

eth3      Link encap:Ethernet  HWaddr 00:E0:ED:13:25:62
          inet addr:10.149.0.1  Bcast:10.149.255.255  Mask:255.255.0.0
          inet6 addr: fe80::2e0:edff:fe13:2562/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7484564095 errors:0 dropped:2236 overruns:0 frame:0
          TX packets:7649815811 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7927283606349 (7560046.7 Mb)  TX bytes:7873615987564 (7508865.3 Mb)
          Interrupt:225 Memory:d4000000-d4012100

eth4      Link encap:Ethernet  HWaddr 00:E0:ED:13:25:64
          inet addr:10.150.0.1  Bcast:10.150.255.255  Mask:255.255.0.0
          inet6 addr: fe80::2e0:edff:fe13:2564/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7494149118 errors:0 dropped:657 overruns:0 frame:0
          TX packets:7660462326 errors:0 dropped:0 overruns:0 carrier:0
```

```
          collisions:0 txqueuelen:1000
          RX bytes:7937550911458 (7569838.4 Mb)  TX bytes:7884939113514 (7519663.9 Mb)
          Interrupt:225 Memory:d6000000-d6012100

eth5      Link encap:Ethernet  HWaddr 00:E0:ED:13:25:66
          inet addr:10.151.0.1  Bcast:10.151.255.255  Mask:255.255.0.0
          inet6 addr: fe80::2e0:edff:fe13:2566/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7482599270 errors:0 dropped:909 overruns:0 frame:0
          TX packets:7649784657 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7925075464327 (7557940.9 Mb)  TX bytes:7874740240254 (7509937.5 Mb)
          Interrupt:210 Memory:d8000000-d8012100

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:168 errors:0 dropped:0 overruns:0 frame:0
          TX packets:168 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:12270 (11.9 Kb)  TX bytes:12270 (11.9 Kb)

sit0      Link encap:IPv6-in-IPv4
          NOARP  MTU:1480  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
```

For more information on `ifconfig`, see the `ifconfig`(8) man page.

Resetting the Card

In the unlikely event that you need to reset the copper Gigabit Ethernet card, enter the following:

`ifconfig <`*`interface`***`> down`**
`ifconfig <`*`interface`***`> up`**

where `interface` is name of the interface. This is usually a driver name followed by a unit number, for example, `ifconfig eth0 down`, for the first Ethernet interface.

For more information on `ifconfig`, see the `ifconfig`(8) man page.

Configuration Parameters

Configuration changes for Ethernet devices drivers are made by means of the `ethtool`(8) command. The `ethtool` command works with all Linux Ethernet drivers.

In general, each feature has a `query` and a `modify` variant. If you are wondering whether the current driver and `ethtool` support a specific feature, attempt to run the `query` option first, an example is, as follows:

```
# ethtool -a eth2
Pause parameters for eth2:
Autonegotiate:  on
RX:             on
TX:             on
```

This shows the current settings of the `pause` (or flow control) parameters. You can then change these parameters with the `ethtool -A` option.

As with any system configuration changes, make sure to have a back out strategy, read the most recent documentation for potential changes and pitfalls, and consult with a relevant Linux archives for examples of common usage.

Specifications

This appendix provides the following information:

Information in this appendix is from a Gigabit PCI Express card specification available at http://www.silicom-usa.com/default.asp?contentID=1245

Physical and Performance Characteristics

Table A-1 summarizes the physical and performance characteristics for the copper card.

Table A-1 Copper Gigabit Ethernet Tech. Specs. - (1000Base-T) Adapters

Characteristic	Value
IEEE Standard / Network topology:	Gigabit Ethernet, 1000Base-T Fast Ethernet, 100Base-TX Ethernet, 10Base-T
Full duplex / Simplex	Supports both Simplex & Full duplex operation in all operating speeds
Auto negotiation:	Auto-negotiation between Full duplex and simplex operations and between 10Mb/s and 100Mb/s speeds and duplex 1000Mb/s speeds.

Table A-1 Copper Gigabit Ethernet Tech. Specs. - (1000Base-T) Adapters

Characteristic	Value
Data Transfer Rate:	1000 Mbit / s, 100 Mbit / s, and 10 Mbits / sec in simplex mode per port. 2000Mbit / s 200 and 20 Mbit / s in full duplex mode per port.
Cables and Operating distance	10Base-T Category 3, 4, or 5 maximum 100m 100Base-Tx Category 5 maximum 100m 1000Base-T Category 5E maximum 100m

General Technical Specifications

This section describes general technical specifications for the copper card.

Copper Card Technical Specifications

Table A-2 provides the general technical specifications the copper card.

Table A-2 Copper Card Gigabit Ethernet General Technical Specifications

Specification	Description
Interface Standard:	PCI Express Base Specification Revision 1.0a
Board Size:	Low profile Short PCI Add in card 167.64mm X 68.91 mm 6.6" X 2.713"
PCI Express Card Type	X8 Lane
PCI Express Voltage:	+3.3V +-9%, +12V +- 8%
PCI Connector:	X8 Lane
Controllers:	Broadcom BCM5709C
Holder:	Metal Bracket

Table A-2 Copper Card Gigabit Ethernet General Technical Specifications

Specification	Description
Weight:	120gr (4.233 oz)
Power Consumption:	10.06W, 0.72A at 12V and 0.43A at 3.3V: Typical all ports operate at 1000Mbit/s. 8.74W, 0.61A at 12V and 0.43A at 3.3V: Typical all ports operate at 100Mbit/s. 8.26W, 0.57A at 12V and 0.43A at 3.3V: Typical all ports operate at 10Mbit/s. 8.50W, 0.59A at 12V and 0.43A at 3.3V: Typical No link at all ports
Operating Temperature:	0˚C - 50˚C (32˚F - 122˚F)
Storage:	-20˚C - 65˚C (-4˚F - 149˚F)

Table A-2 Copper Card Gigabit Ethernet General Technical Specifications

Specification	Description
EMC Certifications:	FCC Part 15, Subpart B Class B Conducted Emissions Radiated Emissions CE EN 55022: 1998 Class B Amendments A1: 2000; A2: 2003 Conducted Emissions Radiated Emissions CE EN 55024: 1998 Amendments A1: 2000; A2: 2003 Immunity for ITE Amendment A1: 2001 CE EN 61000-3-2 2000, Class A Harmonic Current Emissions CE EN 61000 3-3 1995, Amendment A1: 2001 Voltage Fluctuations and Flicker CE IEC 6100-4-2: 1995 ESD Air Discharge 8kV. Contact Discharge 4kV. CE IEC 6100-4-3:1995 Radiated Immunity (80-1000Mhz), 3V / m 80% A.M. by 1kHz CE IEC 6100-4-4:1995 EFT / B: Immunity to electrical fast transients 1kV Power Leads, 0.5Kv Signals Leads CE IEC 6100-4-5:1995 Immunity to conductive surges COM Mode; 2kV, Dif. Mode 1kV CE IEC 6100-4-6:1996 Conducted immunity (0.15-80 MHz) 3VRMS 80% A.M. By 1kHz CE IEC 6100-4-11:1994 Voltage Dips and Short Interruptions V reduc >95%, 30% >95% Duration 0.5per, 25per, 250per

Table A-2 Copper Card Gigabit Ethernet General Technical Specifications

Specification	Description
MTBF:	99 (Years) *According to Telcordia SR-332 Issue 1 Environmental condition - GB (Ground, Fixed, Controlled). Ambient temperature - 25˚C. Temperature rise of 15˚ C above the system ambient temperature was assumed for the cards components.

Table A-3 summarizes the LEDs and connector specifications for the copper card.

Table A-3 Copper Card LEDs / Connector Specifications

Characteristic	Value
LEDs:	(2) LEDs per port Activity LED: Blinks on activity (green). Speed (Bi-color) LED 1000Mbits / s: Turns on Yellow. 100Mbit / s: Turns on Green. 10Mbit / s: Turns off
LEDs location:	LEDs are integrated on RJ-45 connector.
Connectors:	Shielded RJ-45

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.

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 Linux 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.

PCI Express

Peripheral Component Interconnect Express (PCI Express) is a computer expansion card standard introduced by Intel corporation in 2004 and is still widely used today.

reference page

See man (manual) page.

TCP/IP

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

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