

# **Using PCI 1000Base-T and HSC/PCI 1000Base-SX (Gigabit Ethernet)**



**Manufacturing Part Number : J5683-90002  
E0602**

U.S.A.

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## Preface

The information in this manual is intended for network managers who administer Gigabit Ethernet networks. It is assumed that the Gigabit Ethernet hardware and software have been installed and configured. For instructions on how to install and configure Gigabit Ethernet hardware and software, refer to the *Quick Installation Guide*, available in the /opt/networkdocs directory on your system and on the web (see “Manuals Available for Gigabit Ethernet” in Chapter 3).

This manual is organized as follows:

Chapter 1	Chapter 1, "Introduction," provides an overview of Gigabit Ethernet and lists its features.
Chapter 2	Chapter 2, "Configuring Gigabit Ethernet Parameters," describes how to configure Gigabit Ethernet parameters using the <code>lanadmin(1M)</code> command line interface.
Chapter 3	Chapter 3, "Gigabit Ethernet Resources," provides references to other useful tools for installing, configuring, and maintaining Gigabit Ethernet.
Chapter 4	Chapter 4, "Troubleshooting," provides flowcharts to help diagnose Gigabit Ethernet hardware and software problems.
Appendix A	Appendix A, "Gigabit Ethernet lanadmin Display," defines the terms listed in the <code>lanadmin(1M)</code> command display.
Appendix B	Appendix B, "Gigabit Ethernet Card Statistics," gives an explanation of the card statistics.
Appendix C	Appendix C, "Hardware Reference Information," provides information about the card LEDs, cabling requirements, and card specifications.
Appendix D	Appendix D, "Hardware Regulatory Statements," includes regulatory statements for the United States, Canada, Australia/New Zealand, Japan, and the European community.
Glossary	Provides definitions of terms used in the manual.



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# **1 Introduction**

This chapter gives an overview of the Gigabit Ethernet products and lists its features.

## Product Overview

Gigabit Ethernet is a high-performance Ethernet networking solution for HP servers and workstations.

The LAN adapters are data link adapters that support the IEEE 802.3z standard for 1000Base-SX operation over multimode fiber, and the IEEE 802.3ab standard for 1000Base-T operation over 4-pair Cat-5 or Cat-5E UTP copper wiring.

The Gigabit Ethernet intelligent adapters are designed to maximize host CPU efficiency by performing functions such as TCP/IP checksum, interrupt coalescing, and byte swapping. Bulk data transfers can be optimized with the use of Jumbo Frames; the large 9000 byte maximum transfer unit (MTU) improves system efficiency.

1000Base-T brings high bandwidth with 10, 100, and 1000 Mbps speeds, which makes more processing power available for applications. The tri-speed adapter supports autonegotiation and autosensing. It operates in full-duplex mode at 10, 100, and 1000 Mbps or in half-duplex mode at 10 and 100 Mbps.

1000Base-SX supports full-duplex point-to-point or back-to-back (via switch to adapter or adapter to adapter) operations only. The adapters do not support half-duplex and do not speed negotiate (1000 Mbps operation only), but do perform autonegotiation for other link parameters.

A6847A supports PCI only. Older 1000Base-SX adapters support HSC/PCI. 1000Base-T supports PCI only.

The PCI adapters require a single slot in the host system and support all PCI bus configurations: 32-bit, 33/66 MHz and 64-bit, 33/66 MHz. (Note: A6794A, A6847A, and A6825A support 64-bit only.)

## Features

Features of Gigabit Ethernet include:

- 1000Base-T features:
  - Triple speed 10/100/1000 Mbps
  - Full duplex operation at 10/100/1000 Mbps and half-duplex operation at 10/100 Mbps (no half-duplex support for 1000 Mbps)
  - Autonegotiation and autosensing to the highest available link speed
- 1000Base-SX features:
  - 1000 Mbps
  - Full-duplex operation
- Supports IEEE 802.1Q VLAN tagging and IEEE 802.1p Priority Queuing (HP-UX 11i)
- Minimized host CPU utilization
  - Protocol offloading through on-board TCP, UDP, and IP checksum calculations
  - Adaptive interrupt coalescence based on traffic load

- Jumbo Frame support
  - Large 9000 byte maximum transfer unit (MTU) for improved efficiency and performance with bulk data transfer
  - Supported only at 1000Mbps interface (link partner must also support Jumbo Frames)
- SNMP (MIB-II) support
- MC/ServiceGuard and Auto-Port Aggregation (APA) support for high availability

Note: MC/ServiceGuard is not supported on HP-UX 11iv1.5. APA is not supported on HP-UX 11i v1.5 and 11i v1.6.
- Configuration support through SAM
- Promiscuous mode (link and SAP) inbound and outbound support
- Supports TCP/IP, NFS, and DLPI applications. Ethernet and SNAP encapsulations are supported.
- Supports OLA/R (Online Addition and Replacement) (HP-UX 11i, PCI only)

Note that SX and T cards are **not** considered to be *like* cards for OLA/R, that is, you cannot replace an SX card with a T card, and vice versa.

HP does not support OLA/R on A6794A although HP-UX tools will allow the device to be suspended and resumed.

### **Performance on A6794A, A6847A, and A6825A**

TCP performance is improved with better throughput on inbound and bidirectional traffic and better request/response rate.

### **Differences Between gelan and igelan**

The differences between gelan and igelan are:

- Supported platforms - see Table 1-1, “List of Gigabit Ethernet Products”.
- LED behavior - see Table C-1, “LED Description and Status for 1000Base-SX” and Table C-2, “LED Description and Status for 1000Base-T”.

## About this Manual

The information in this manual applies to the following Gigabit Ethernet products:

**Table 1-1 List of Gigabit Ethernet Products**

Product	Description	Driver Name	Supported Systems	Operating System
A4924A	HSC 1000Base-SX for K-Class	<b>gelan</b>	K-Class server	10.20, 11.0, and 11i
A4925A	HSC 1000Base-SX for D/R-Class	<b>gelan</b>	D350 and above, R380 and R390 servers	10.20, 11.0, and 11i
A4926A A4929A	PCI 1000Base-SX PCI 1000Base-T	<b>gelan</b>	B-Class except B180L and below, C-Class except C1xx, J2240 and above workstations and rp2400 (A-Class) server  rp5400 series (L-Class), rp7400 (N-Class), and V-Class servers  SD (Superdome), rp7410, and rp8400 servers  rx4610 and rx9610 servers	10.20, 11.0, and 11i  11.0 and 11i  11i  11i v1.5, 11i v1.6
A6794A	1000Base-T/SCSI	<b>igelan</b>	rp7410 server core I/O See Note	11i, 64-bit only 11i v1.6
A6847A A6825A	PCI 1000Base-SX PCI 1000Base-T	<b>igelan</b>	B1000 and higher, C3000 and higher, and J5000 and higher workstations  rp5400 series (L-Class), rp7400 (N-Class), and rp2400 series (A400 and higher) servers  SD (Superdome), rp7410, and rp8400 servers  See Note	11.0 and 11i, 64-bit only  11.0 and 11i, 64-bit only  11i, 64-bit only  11i v1.6
<p>Note: For information on IPF (Itanium™ Processor Family) platforms supported on HP-UX 11i v1.6, see the Gigabit Ethernet support web page. Log on to <a href="http://itrc.hp.com">itrc.hp.com</a> and click on “navigate knowledge trees and response center FAQs” under “maintenance and support” to go to the Knowledge Tree area, then navigate to Networks/hp-ux networking/lan/gigabit ethernet/technical support.</p>				

This manual does not include step-by-step instructions on how to install and configure the Gigabit Ethernet hardware and software. Those instructions are provided in the *Quick Installation Guide*, which is available in the `/opt/networkdocs` directory on your system and on the web (see “Manuals Available for Gigabit Ethernet” on page 21).



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## 2

# Configuring Gigabit Ethernet Parameters

This chapter describes how to configure the Gigabit Ethernet parameters using the `lanadmin(1M)` command line interface.

## Understanding the Gigabit Ethernet Parameters

Several parameters can be configured using either the `lanadmin(1M)` command line interface or the graphical user interface provided by the System Administration Manager (SAM). Refer to the next section, “Using the lanadmin Tool with Gigabit Ethernet” for details on the use of the `lanadmin(1M)` command. The following parameters can be configured:

### Generic Parameters

- **Ethernet Station Address**

The Gigabit Ethernet cards come preprogrammed with an Ethernet Station Address in the read-only memory. This cannot be modified. However, the station address actually used by the card for sending and receiving network packets, also known as the MAC Address, can be set via `lanadmin` or SAM.

- **Maximum Transmission Unit (MTU)**

The MTU can be either the regular Ethernet MTU (1500 bytes) or the Jumbo Frame MTU (9000 bytes). For 1000Base-T, jumbo frames can be configured only when the link speed is 1000 Mbps.

### Link Parameters

- **Speed, Duplexity, and Autonegotiation**

While 1000Base-SX operates only at 1000 Mbps in full-duplex mode, 1000Base-T operates at 10 or 100 Mbps in either half-duplex or full-duplex mode and also at 1000 Mbps in full-duplex mode.

The speed and duplexity of 1000Base-SX cannot be modified, but its ability to autonegotiate can be turned on and off for other link parameters. Thus, autonegotiation has no effect on the speed or duplexity of 1000Base-SX.

1000Base-T can be manually set to 10 or 100 Mbps but not 1000 Mbps. To achieve gigabit speed, it must be allowed to autonegotiate with its link partner, and provided the partner *can* autonegotiate, 1000Base-T will operate at the highest common speed and duplexity. The following table summarizes the valid settings for 1000Base-T:

Speed	Duplexity	Autonegotiation
10	Half	Off
10	Full	Off
100	Half	Off
100	Full	Off
1000*	N/A*	On

\*When autonegotiation is on, 1000Base-T will autonegotiate with its link partner; then, if its partner *also* autonegotiates and can attain a speed of 1000 Mbps, 1000Base-T will operate at 1000 Mbps full-duplex (it is not designed to operate at 1000 Mbps half-duplex).

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**NOTE**

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Partners on a link must be configured to have the same setting, that is, either both must autonegotiate or both must be set to the same manual setting. For example, if the card is set to 100 Mbps full-duplex, the link partner must also be set to 100 Mbps full-duplex. This will help ensure operation without degraded performance.

- **Receive flow control**

Flow control allows use of flow control negotiation and sending and receiving of pause frames. When the flow control parameter is on, the card receives and manages pause frames sent by the link partner. When the flow control parameter is off, the card will silently discard these pause frames. The card cannot be configured to send pause frames.

### Performance Tuning Parameters

- Send Buffer Coalescing Threshold
- Receive Buffer Coalescing Threshold
- Send Interrupt Coalescing Ticks
- Receive Interrupt Coalescing Ticks

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**CAUTION**

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These features are for advanced users. If you set these parameters and you do not understand what they do, you may have unpredictable results. It is recommended to use the default settings.

When the card transmits or receives a frame, the system must be notified of the event. If the card interrupts the system for each transmitted and received frame, the result is a high degree of processor overhead. To prevent that, Gigabit Ethernet provides a feature called Interrupt Coalescence. Effective use of this feature can reduce system overhead and improve performance.

Interrupt Coalescence essentially means that the card interrupts the system after sending or receiving a few frames. The number of frames after which the card interrupts the processor can be tuned independently for both send and receive. The tuning can be specified via two parameters each for send and receive, so that there are four parameters

in all. One of the two parameters specifies the number of data buffers that the card must transmit (or receive) before interrupting and the other specifies the number of system clock ticks that must elapse before interrupting.

The four tuning parameters are summarized in the following table.

**Table 2-1 Performance Tuning Parameters**

Name	Range	Default	Units
send_max_bufs	1 – 128	16 (for gelan) 10 (for igelan)	# of buffers
recv_max_bufs	1 – 256	1	# of buffers
send_coal_ticks	0 – 10000000	1000 (for gelan) 150 (for igelan)	microseconds
recv_coal_ticks	0 – 10000000	0	microseconds

A send interrupt is generated by the card to the host when either:

- the number of buffers sent by the card since the previous send interrupt equals *send\_max\_bufs*
- or*
- the time that has elapsed since the previous send interrupt equals *send\_coal\_ticks* (a value of zero disables timer-based interrupt coalescing),

whichever occurs first.

A receive interrupt is generated by the card to the host when either:

- the number of frames received by the card since the previous receive interrupt equals *recv\_max\_bufs*
- or*
- the time that has elapsed since the previous receive interrupt equals *recv\_coal\_ticks* (a value of zero disables timer-based interrupt coalescing),

whichever occurs first.

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## Using the lanadmin Tool with Gigabit Ethernet

This section explains the options available in `lanadmin` to support the Gigabit Ethernet driver and how to use them. The `lanadmin(1M)` tool is used to display and set parameters, as specified by the following commands:

---

### NOTE

When your system is rebooted, settings that were made via the `lanadmin(1M)` command will be lost. To retain configuration settings permanently in the configuration file (`/etc/rc.config.d/hpgelanconf` or `/etc/rc.config.d/hpigelanconf`), use the SAM utility or manually edit the configuration file.

To display the card's station address, execute:

```
$ lanadmin -a nmid/ppa
```

To set the card's station address, execute:

```
$ lanadmin -A station_addr nmid/ppa
```

where *nmid* is the Network Management Identifier (NMID) (for HP-UX 10.20) and *ppa* is the Card Instance Number (also known as physical point of attachment or PPA) (for HP-UX 11.0 and later). Both the NMID and PPA may be obtained from the `lanscan(1M)` output.

To display the MTU, execute:

```
$ lanadmin -m nmid/ppa
```

To set the MTU, execute:

```
$ lanadmin -M mtu_size nmid/ppa
```

On HP-UX 10.20, the setting of the MTU should be followed by configuring the interface with the appropriate IP address using `ifconfig(1M)`. See the `ifconfig` man page for details. The change in MTU should be verified, on all HP-UX operating systems, by executing:

```
$ netstat -rn
```

To display link parameters, execute:

```
$ lanadmin -x option nmid/ppa
```

To set link parameters, execute:

```
$ lanadmin -X option nmid/ppa
```

where *option* specifies the operation to be carried out.

## Displaying Values

The command `$ lanadmin -x (or -X) help nmid/ppa` displays a list of valid options used to display values.

Option	Display
help	List of -x or -X options
speed	Speed and duplexity of the link
fctrl	Whether Receive Flow Control is enabled or not
send_max_bufs	Value of send buffer coalescing threshold
recv_max_bufs	Value of receive buffer coalescing threshold
send_coal_ticks	Value of send interrupt coalescing ticks
recv_coal_ticks	Value of receive interrupt coalescing ticks
stats drv	Driver and adapter statistics
card_info	Adapter and driver revision and settings

---

**NOTE**

If *option* is not specified, then the speed, duplexity, and autonegotiation settings are displayed.

### Examples

**Card Information** To display the card information, execute:

```
$ lanadmin -x card_info nmid/ppa
***** Version Information *****
Driver version: B.10.20.11
Firmware version: 12.4.5
Chip version: 0x6
PCI Sub-System ID: 0x106f (1000Base-SX)
PCI Sub-Vendor ID: 0x103c
Board revision: C
Software Key: 6
Engineering Date Code: B-3845
***** Card Setting *****
Driver State: GELAN_ONLINE
Auto Negotiation: On
Flow Control: On
Send Max Buf Descriptors: 16
Recv Max Buf Descriptors: 1
Send Coalesced Ticks: 1000
Recv Coalesced Ticks: 0
```

**Card Statistics** To display the card statistics, execute:

```
$ lanadmin -x stats drv nmid/ppa
```

---

**NOTE**

See Appendix B for a sample output and explanation of the card statistics.

**Send Buffer Coalescing** To display the send buffer coalescing threshold, execute:

```
$ lanadmin -x send_max_bufs nmid/ppa
```

```
Send buffer coalescing threshold = 16
```

**Receive Interrupt Coalescing** To display the receive interrupt coalescing ticks, execute:

```
$ lanadmin -x recv_coal_ticks nmid/ppa
```

```
Receive interrupt coalescing ticks = 0
```

**Flow Control** To display the flow control setting, execute:

```
$ lanadmin -x fctrl nmid/ppa
```

```
Flow control is enabled
```

## Setting Values

The command `$ lanadmin -X (or -x) help nmid/ppa` displays a list of valid options used to set values.

Option	Setting
help	Lists -X or -x options
auto_on	Turns on auto-negotiation mode
auto_off	Turns off autonegotiation mode for a 1000Base-SX
fctrl on	Turns on receive flow control
fctrl off	Turns off receive flow control
10hd	Sets speed of a 1000Base-T to 10 Mbps half-duplex
10fd	Sets speed of a 1000Base-T to 10 Mbps full-duplex
100hd	Sets speed of a 1000Base-T to 100 Mbps half-duplex
100fd	Sets speed of a 1000Base-T to 100 Mbps full-duplex
send_max_bufs*	Sets send buffer coalescing threshold [1 – 128]
recv_max_bufs*	Sets receive buffer coalescing threshold [1 – 256]
send_coal_ticks*	Sets send interrupt coalescing ticks [0 – 10000000]

Option	Setting
recv_coal_ticks*	Sets receive interrupt coalescing ticks [0 – 10000000]
stats clear	Clears all driver and adapter statistics
* These options require the desired value to be specified after the option name.	

### Examples

**Speed** To set the speed to 100 Mbps full-duplex on 1000Base-T, execute:

```
$ lanadmin -X 100fd nmid/ppa
```

---

**NOTE**

The `lanadmin -S` option to set the speed is not supported on Gigabit Ethernet.

**Stats Clear** To clear all driver and card statistics, execute:

```
$ lanadmin -X stats clear nmid/ppa
```

**Buffer Coalescing Threshold** To set the send buffer coalescing threshold, execute:

```
$ lanadmin -X send_max_bufs 32 nmid/ppa
```

Note that the tuning option `send_max_bufs` requires the additional option `32` (the coalescing threshold).

**Interrupt Coalescing Ticks** To set the send interrupt coalescing ticks, execute:

```
$ lanadmin -X send_coal_ticks 2000 nmid/ppa
```

Note that the tuning option `send_coal_ticks` requires the additional option `2000` (the number of coalescing ticks).

---

## **3 Gigabit Ethernet Resources**

This chapter provides references to other useful tools for installing, configuring, and maintaining Gigabit Ethernet.

## HP-UX Manual Reference Pages

While installing, configuring, or troubleshooting Gigabit Ethernet, you may need to refer to any of the following online manual reference pages (man pages) for useful HP-UX operating system or Gigabit Ethernet commands. To display a man page, type the following at the system prompt: `man command name`. For example, `man arp`.

- `arp(1M)` displays and modifies the Internet-to-station address mapping tables used by the Address Resolution Protocol.
- `hosts(4)` is a database that contains a single line entry for each host name entry.
- `ifconfig(1M)` assigns an address to a network interface and configures and displays network parameters.
- `ioscan(1M)` scans system hardware, usable I/O system devices, or kernel I/O system data structures as appropriate, and lists the results.
- `lanadmin(1M)` resets or reports the status of the LAN card.
- `lanconfig(1M)` in HP-UX 10.20 sets/resets the packet encapsulation method for a network interface.
- `lanscan(1M)` displays information about LAN cards that are successfully bound to the system.
- `linkloop(1M)` verifies network connectivity through the Data Link Layer (OSI Layer 2).
- `netfmt(1M)` formats common tracing and logging binary files.
- `netstat(1)` provides network statistics and information about network connections.
- `nettl(1M)` logs network events and traces packets as they enter and exit the Gigabit Ethernet driver.
- `ping(1M)` verifies network connectivity through the Network Layer (OSI Layer 3) and reports the round-trip time of communications between the local and remote hosts.
- `rad(1M)` in HP-UX 11i performs OLA/R functions without any comprehensive checks.
- `route(1M)` adds and deletes entries to the network routing table.
- `sam(1M)` configures networking software.
- `swinstall(1M)` loads software filesets.
- `swverify(1M)` verifies software installation.

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## Manuals Available for Gigabit Ethernet

Refer to the following *Quick Install Guide* for step-by-step instructions on how to install and configure Gigabit Ethernet hardware and software. This guide is available on the web at <http://docs.hp.com> under “Networking and Communications ” and in the /opt/networkdocs directory on your system.

- For A4924A, A4925A, A4926A, and A4929A:  
*PCI 1000Base-T and HSC/PCI 1000Base-SX/9000 Quick Installation*
- For A6794A, A6847A and A6825A:  
*PCI 1000Base-T and 1000Base-SX Quick Installation and Configuration Guide*

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### NOTE

For complete component installation instructions, refer to the *Service Guide HP 9000 Server* manual for your server or the appropriate *Owner's Guide* for your workstation.

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### Other Useful Manuals

The following manuals also provide useful information. They are available on the web at <http://docs.hp.com>.

- *Installing and Administering LAN/9000 Software*  
Provides information on installing and administering the LAN product. It also includes information on configuring other HP-UX link products.
- *Configuring HP-UX For Peripherals*  
Provides detailed information on using OLA/R (Online Addition and Replacement).

## Error Messages

Gigabit Ethernet comes with an online message catalog that is used to report networking problems. You must use the `nettl` logging and tracing utility to display the probable cause and action for a message.

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## Logging Messages

Gigabit Ethernet uses the `nettl(1M)` logging and tracing facility supplied with HP-UX. You may access the logging and tracing utility using either the graphical user interface (GUI) version or the command line interface.

Features of the GUI version, which are now a part of your HP 9000 system, include:

- An interface which guides you through logging and tracing tasks.
- An interface which allows you to create and format reports.
- The capability to collect logging and tracing subsystem-specific information.
- Report screens which are updated instantaneously with current logging and tracing information by the subsystem.
- Context-sensitive on-line help.

To access the GUI version of the logging and tracing utility, execute:

```
nettladm
```

See the `nettladm(1M)` man page for information on using the GUI version, or the `nettl(1M)` man page for information on using the command line interface.

Listed below are some example commands using the command line interface.

- To examine the log file with cause and action descriptions, execute:

```
netfmt -v -f /var/adm/nettl.LOG00 | more
```

```
netfmt -v -f /var/adm/nettl.LOG000 | more (for HP-UX 11i and later)
```

The `-v` option enables the reporting of available cause and action descriptions for each log message. A sample log message using the `-v` option is shown below.

```
*****Gigabit Ethernet LAN/9000 Networking*****
Timestamp           : Mon Aug 3 PDT 1998 18:37:16.175754
Process ID          : [ICS]                Subsystem:GELAN
User ID ( UID )    : -1                    Log Class:DISASTER
Device ID           : 3                    Path ID: 0
Connection ID      : 0                    Log Instance: 0
```

- To examine just the log messages in the log file, execute:

```
netfmt -f /var/adm/nettl.LOG00
```

```
netfmt -f /var/adm/nettl.LOG000 (for HP-UX 11i and later)
```

- To check network logging and tracing status, execute:

```
nettl -status
```

- To start Gigabit Ethernet tracing to the file `/tmp/tracefile.TRC0`, execute:

```
nettl -traceon all -entity gelan -file /tmp/tracefile
```

or

```
nettl -traceon all -entity igelan -file /tmp/tracefile
```

Note: `nettl(1m)` adds the `.TRC0` postfix for you.

- To stop Gigabit Ethernet tracing, execute:

```
nettl -traceoff -entity gelan
```

or

```
nettl -traceoff -entity igelan
```

- To format the Gigabit Ethernet trace file into the file `/tmp/traceout`, execute:

```
netfmt -f /tmp/tracefile.TRC0 > /tmp/traceout
```

Refer to the `netfmt(1M)` man page for further information on how to create a filter for trace formatting.

## Contacting Your HP Representative

If you have no service contract with HP, you may follow the procedure described below, but you will be billed accordingly for time and materials.

If you have a service contract with HP, document the problem as a Service Request (SR) and forward it to your HP representative. Include the following information where applicable:

- A characterization of the problem. Describe the events leading up to and including the problem. Attempt to describe the source and symptoms of the problem.

Your characterization should include: HP-UX commands; communication subsystem commands; job streams; result codes and messages; and data that can reproduce the problem. You should also provide a network map with the host name, IP/Internet address, and station address of each system connected with the HP system.

Illustrate as clearly as possible the context of any message(s). Prepare copies of information displayed at the system console and user terminal.

- Obtain the version, update, and fix information for all software. For example, to check the version number, execute:

```
what /stand/vmunix | grep gelan or the swlist command and look for  
GigEther-00 (for gelan on HP-UX 11i and later)
```

or

```
what /stand/vmunix | grep igelan or the swlist command and look for  
GigEther-01 (for igelan on HP-UX 11i and later).
```

To check the version of your kernel, execute `uname -r`.

This allows HP to determine if the problem is already known and if the correct software is installed at your site.

- Prepare copies of the `/etc/hosts`, `/etc/rc.config.d/hpgelanconf` (or `hpigelanconf`), and `/etc/rc.config.d/netconf` files.
- Execute the `dmesg` command and record messages about the status of the card.
- Execute the `lanscan -v` command and record the output.
- Execute the `display` command of the *lanadmin* diagnostic on the Gigabit Ethernet interface and record the output.
- Record the troubleshooting flowchart number where you are unable to resolve the problem.
- Record all error messages and numbers that appear at the user terminal and the system console.
- Save all network log files:

```
/var/adm/nettl.LOG00 and nettl. LOG01
```

```
/var/adm/nettl.LOG000 and nettl. LOG001 (for HP-UX 11i and later)
```

Make sure that ERROR and DISASTER log classes are enabled when log files are collected.

Prepare the formatted output and a copy of the log file for your HP representative to further analyze.

- Prepare a listing of the HP-UX I/O configuration you are using for your HP representative to further analyze. Use the `ioscan(1M)` command to help collect this information
- Try to determine the general area within the software where you think the problem exists. Refer to the appropriate reference manual and follow the guidelines on gathering information for that product.
- Document your interim, or “workaround,” solution. The cause of the problem can sometimes be found by comparing the circumstances in which it occurs with the circumstances in which it does not occur.
- Create copies of any Internet or Gigabit Ethernet link trace files that were active when the problem occurred for your HP representative to further analyze.
- **In the event of a system failure, a full memory dump must be taken.** Use the HP-UX utility `savecore(1M)` to save a core dump. Send the output to your HP representative.
- Run the `lanadmin` command to collect card configuration and statistics. Examples:

For HP-UX 10.20, execute:

```
lanadmin -x card_info nmid  
lanadmin -x stats drv nmid
```

For HP-UX 11.0 and later, execute:

```
lanadmin -x card_info ppa  
lanadmin -x stats drv ppa
```



---

## **4 Troubleshooting**

This chapter provides flowcharts that will help diagnose Gigabit Ethernet hardware and software problems.

## Troubleshooting Overview

As with any troubleshooting, a systematic approach is helpful. The following table and flowcharts provide a logical sequence of steps to follow when troubleshooting Gigabit Ethernet. Using the diagnostic flowcharts, identify whether the problem is with Gigabit Ethernet or any of the connections to the switch, or whether it is in some other part of the network, verify your assumptions and, if it is limited to Gigabit Ethernet software or hardware, correct the problem.

---

**NOTE**

To help ensure operation without degraded performance, make sure that both link partners are set to autonegotiate, or, if using manual settings, that each side is set to the same speed and duplexity.

If you cannot solve the problem on your own, call your HP representative. Use the guidelines at the end of Chapter 3 to help you effectively communicate what is wrong. The Gigabit Ethernet products use diagnostic tools compatible with the HP LAN Link product.

## Diagnostic Flowcharts

The following table summarizes the types of network tests in the diagnostic flowcharts.

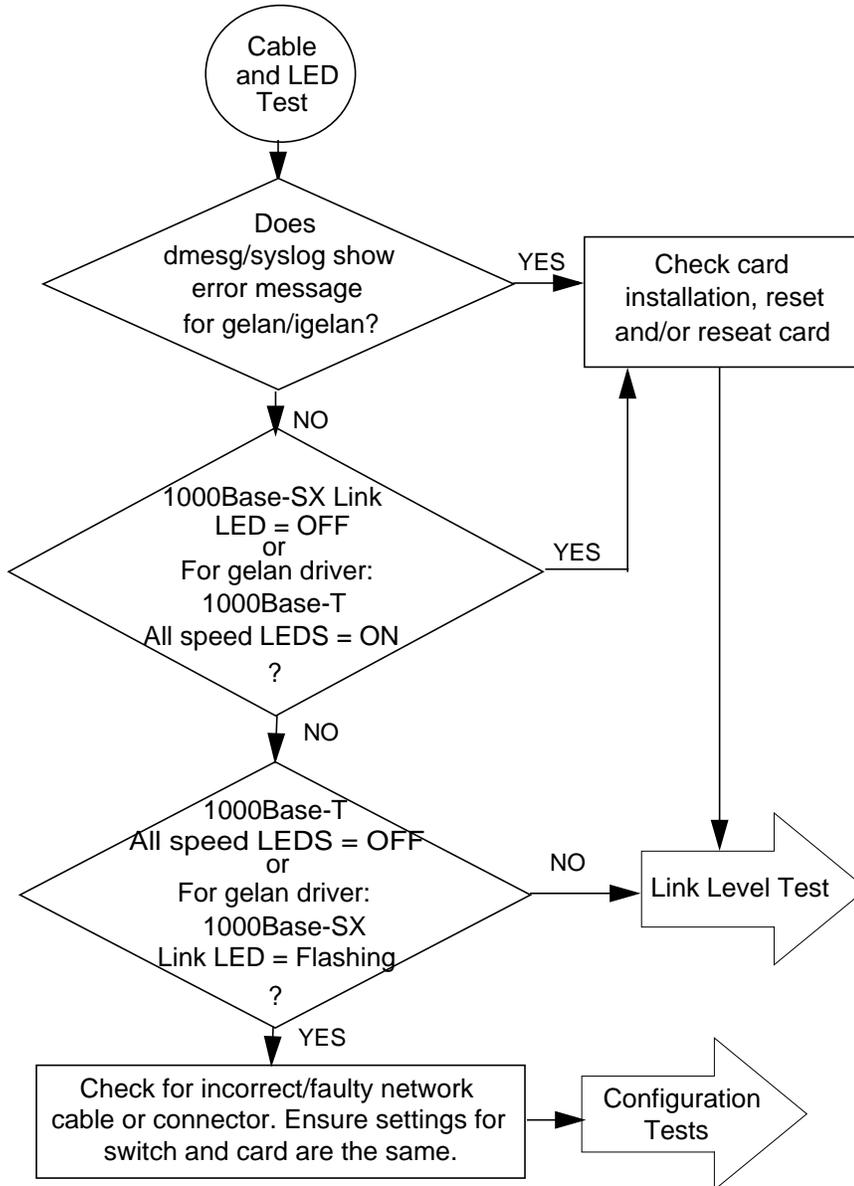
**Table 4-1**

Chart	Type of Test	Purpose
1	Cable and LED Test	Checks that hardware, cables, and connectors between your system and card are operational.
2	Link Level Test	Checks communication between link levels on source and target host using <code>linkloop(1M)</code> .
3	Network Level Tests	Validates <code>arp(1M)</code> entries and remote host availability. Checks communication between network layers on source and target host using <code>ping(1M)</code> .
3a	ARP Test	Verifies that an entry exists for the remote host in your system's ARP cache.
3b	ping Test	Checks communication between network layers on the source and target host.
4	Transport Level Test	Checks communication between transport layers on source and target host using <code>telnet</code> and <code>ftp</code> sessions.
5	Bridge/Gateway Loopback Test	Checks general network connections through a gateway.
6	Configuration Tests	Verifies configuration of network interface on a host using <code>ioscan(1M)</code> , <code>lanscan(1M)</code> , <code>netfmt(1M)</code> , <code>lanadmin(1M)</code> , and <code>ifconfig(1M)</code> .
6a	<code>ioscan</code> and <code>lanscan</code> Test	Verifies configuration of network interface on a host.
6b	<code>netfmt</code> and <code>lanadmin</code> Test	Verifies configuration of network interface on a host.
6c	<code>ifconfig</code> Test	Verifies configuration of network interface on a host.

### Flowchart 1: Cable and LED Test

Checks that hardware, cables, and connectors between your system and card are operational.

Figure 4-1 Flowchart 1



## Flowchart 1 Procedures

- Check dmesg/syslog output and look for error messages pertaining to gelan/igelan. Also, check nettl log messages. If errors, check card installation and reset and/or reseal card.
- Verify LEDs. If 1000Base-SX link LED = OFF or for gelan, 1000Base-T all speed LEDs = ON, check card installation and reset and/or reseal card. If LEDs are then displayed correctly, continue to Link Level Test.
- If 1000Base-T all speed LEDs = OFF or for gelan, 1000Base-SX Link LED = Flashing, check for incorrect or faulty network cable or connector. Ensure that switch is capable of 1000 Mbps operation. Ensure that the switch (or immediate link partner) and card are set to same autonegotiation settings. Then go to Configuration Tests. Otherwise, if 1000Base-SX link LED or one of 1000Base-T speed LEDs is on, continue to Link Level Test.

---

### NOTE

Refer to Table C-1, “LED Description and Status for 1000Base-SX” and Table C-2, “LED Description and Status for 1000Base-T” for LED status.

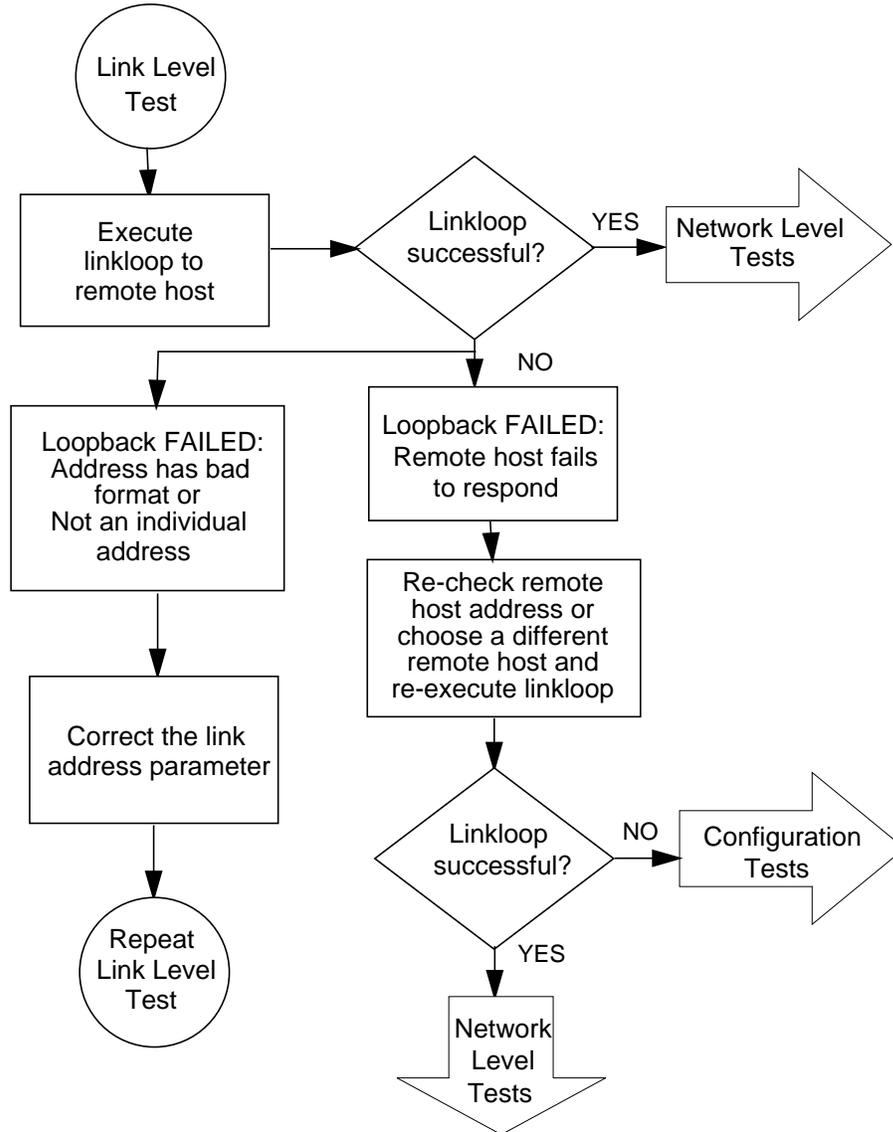
On a 1000Base-SX card, if both Link and Activity LEDs are on and there is no network connectivity, it could mean that the I/O cage is not seated well. Remove and reseal the entire PCI I/O cage and reboot.

---

## Flowchart 2: Link Level Test

Checks communications between link levels on source and target host using `linkloop(1M)`.

Figure 4-2 Flowchart 2



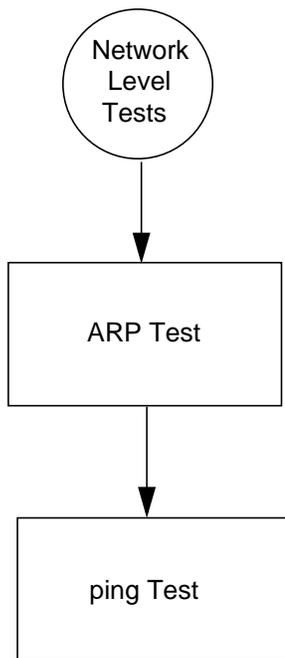
## Flowchart 2 Procedures

- Execute `linkloop(1M)` to remote host. If linkloop is successful, continue to Network Level Tests. Otherwise, note which error was returned.
- If loopback failed error = “Address has bad format” or “Not an individual address,” correct link level address with proper station address format/value and repeat Link Level Test.
- Otherwise, loopback failed because remote host did not respond. Double check remote host address or choose another remote host and re-execute `linkloop(1M)`. If linkloop is successful, continue to Network Level Tests. You may also want to call the node manager of the remote host that did not respond (if this was the case). If linkloop fails, go to Configuration Tests.

### Flowchart 3: Network Level Tests

Validates `arp(1M)` entries and remote host availability. Checks communication between network layers on source and target host using `ping(1M)`.

Figure 4-3 Flowchart 3



#### Flowchart 3 Procedures

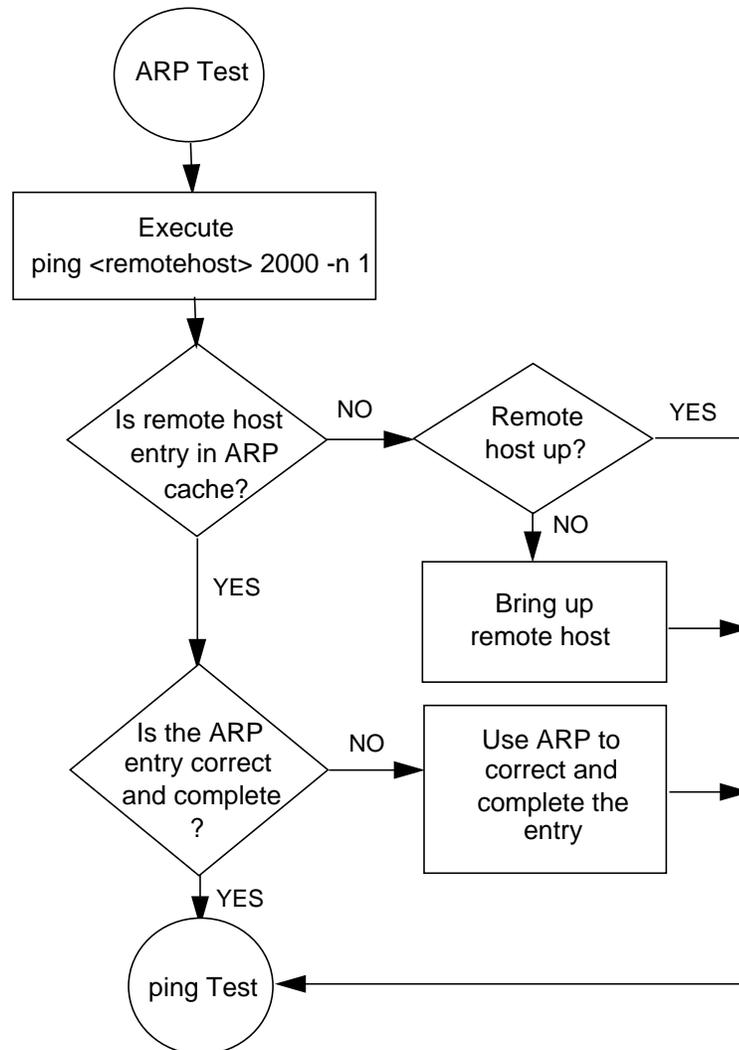
- See Flowchart 3a to validate `arp(1M)` entries and remote host availability.
- See Flowchart 3b to check communication between network layers on source and target host using `ping(1M)`.

### Flowchart 3a: ARP Test

Validates `arp(1M)` entries and remote host availability.

Figure 4-4

Flowchart 3a



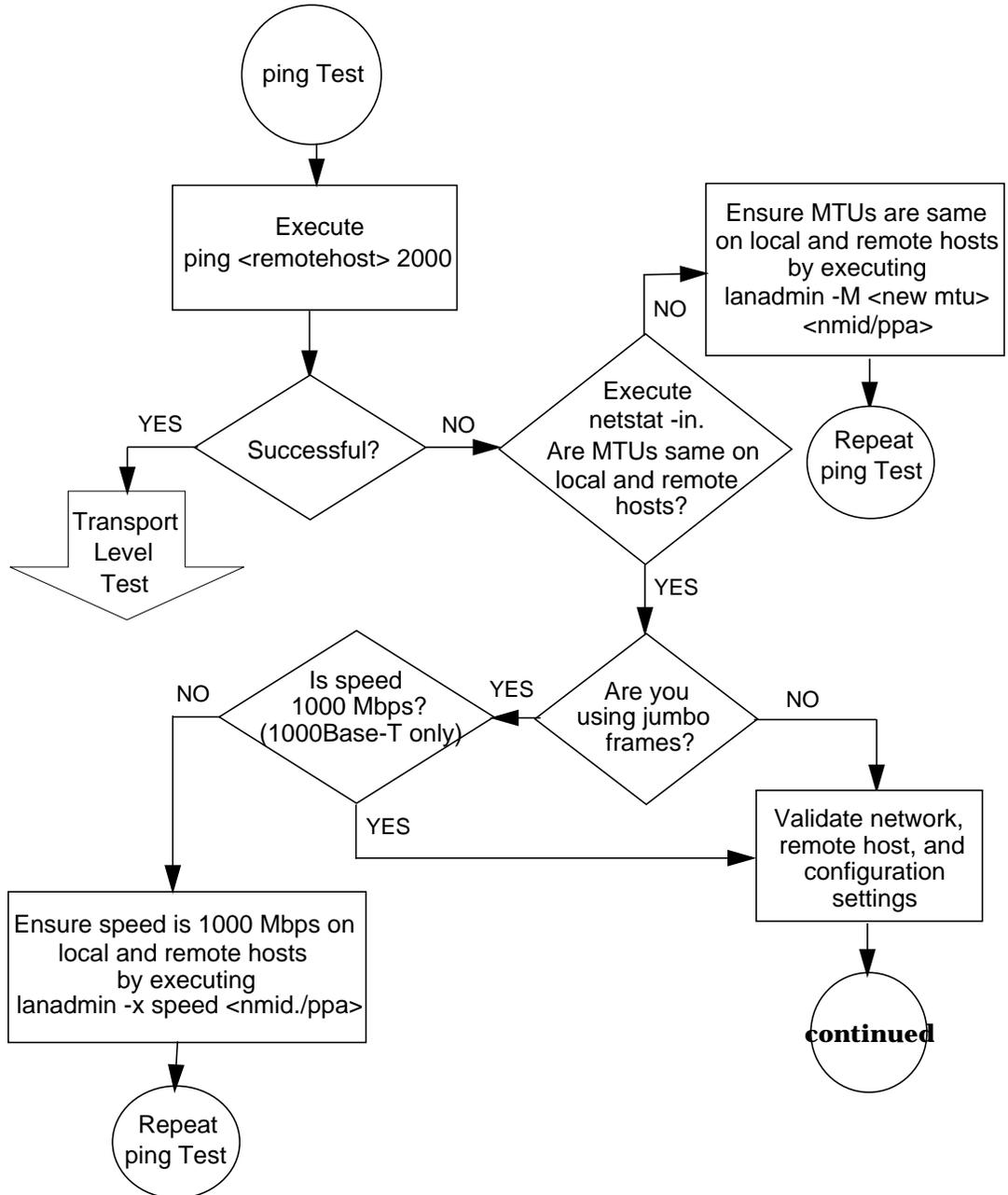
### Flowchart 3a Procedures

- Execute `ping(1M)` to remote host so that ARP entry is added. Whether or not ping is successful, proceed to the next step.
- Use `arp(1M)` to verify that an entry exists for the remote host in your system's ARP cache, executing `arp hostname`.
- If there is no ARP entry for the remote host, check to see if the remote host is up. If not, bring up remote host and continue to ping Test.
- If the ARP entry is correct or complete, continue to ping Test. Otherwise, use `arp(1M)` to enter the correct station address of the remote system and continue to ping Test.

### Flowchart 3b: ping Test

Checks communication between network layers on source and target host using ping(1M).

Figure 4-5 Flowchart 3b

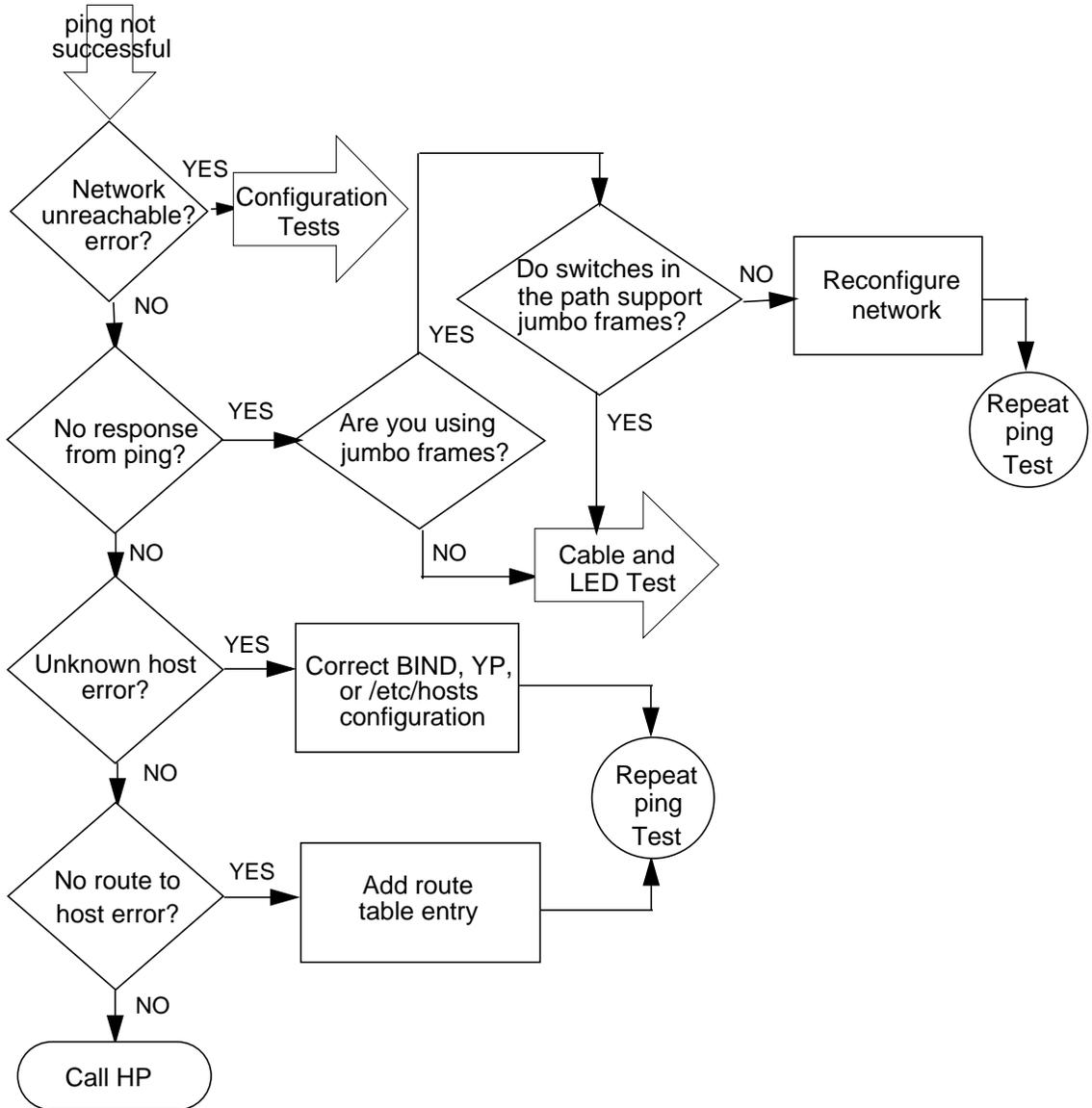


### Flowchart 3b Procedures

- Execute `ping(1M)` to remote host. If ping is successful, continue to Transport Level Test.
- If ping is not successful, execute `netstat -in` to verify MTU size. Ensure MTU size is the same on both local and remote hosts (9000 for jumbo frames and 1500 for standard frames) by executing `lanadmin -M new_mtu nmid/ppa`, and repeat ping Test.
- If ping is still not successful and you are either (1) not using jumbo frames or (2) using jumbo frames with the correct speed setting, continue to next flowchart to validate network, remote host, and configuration settings.
- If link speed is not 1000 Mbps, set it with `lanadmin -x speed nmid/ppa`, and repeat ping Test.

### Flowchart 3b (continued)

Figure 4-6 Flowchart 3b (continued)



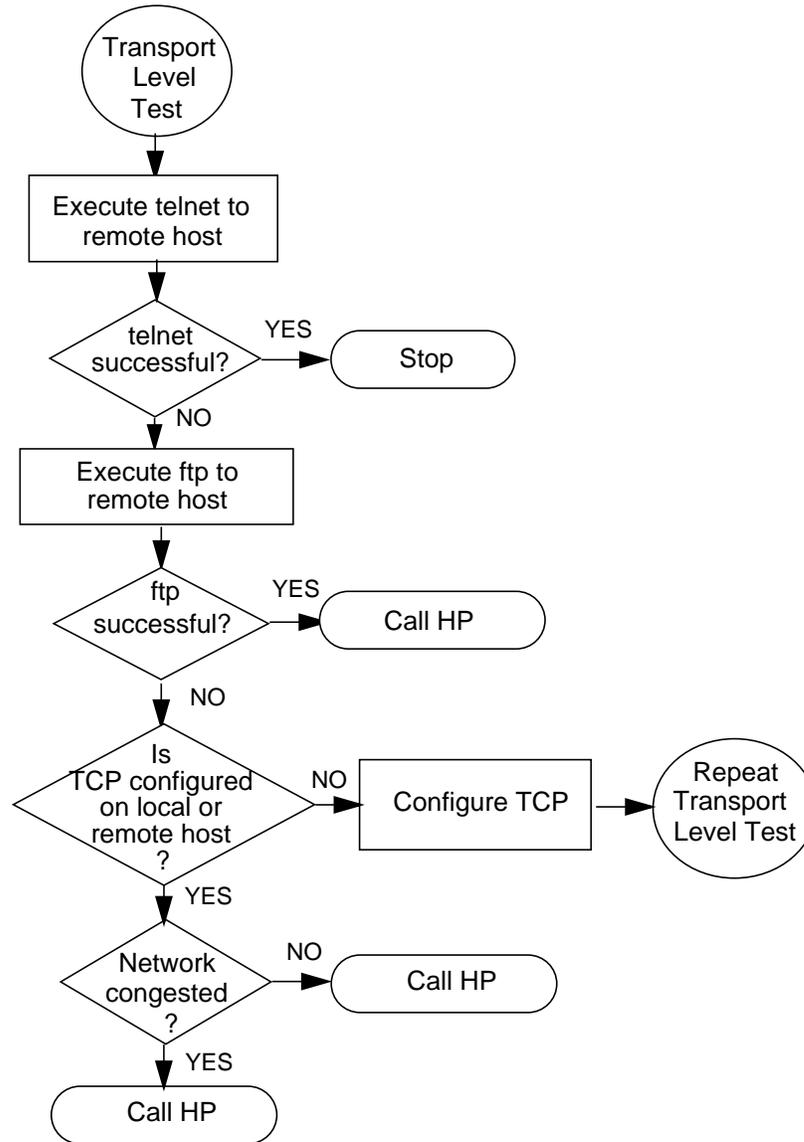
### Flowchart 3b (continued) Procedures

- If network unreachable error, go to Configuration Tests.
- If there is no response from ping, and using jumbo frames, validate that switches in the path support jumbo frames, making sure path MTU is 9000 from source host to destination host. Otherwise, reconfigure network path and repeat ping Test. If not using jumbo frames, or switches and path MTU are set for jumbo frames (9000 bytes), go to Cable and LED Test.
- If you receive an unknown host error, add missing host name and repeat ping Test.
- If you receive “error=SendTo: No route to host,” use `route(1M)` to add route table entry for missing host and repeat ping Test. Otherwise, call your HP representative.

### Flowchart 4: Transport Level Test

Checks communications between transport layers on source and target host using telnet and ftp sessions.

Figure 4-7 Flowchart 4



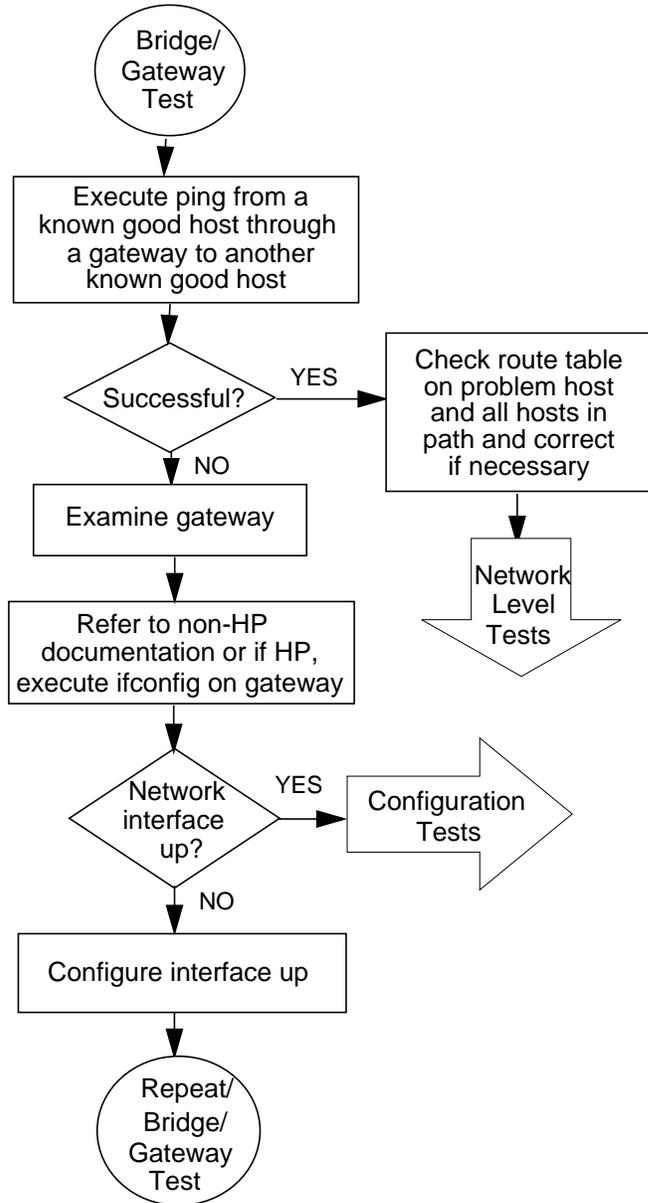
## Flowchart 4 Procedures

- Execute `telnet(1M)` to a remote host. If successful, stop.
- If not successful, try to establish an ftp to a remote host. Unlike telnet, ftp does not use a pseudoterminal (pty) driver on your system. This will determine if pty is why telnet failed. If ftp is successful, call your HP representative to determine why you have a problem with pty.
- If ftp fails, check to see if TCP is configured on both hosts by verifying the `/etc/protocols` file. Telnet and ftp work at transport layer and require TCP. If TCP is not configured, configure now and repeat Transport Level Test.
- If TCP is installed on both hosts, telnet to another host and/or use `netstat(1M)` to check for lost packets. If network is congested, you may need to reconfigure network. If network congestion is not the cause, more detailed network diagnostics are required. In either case, call your HP representative.

### Flowchart 5: Bridge/Gateway Loopback Test

Checks general network connections through a gateway.

Figure 4-8 Flowchart 5



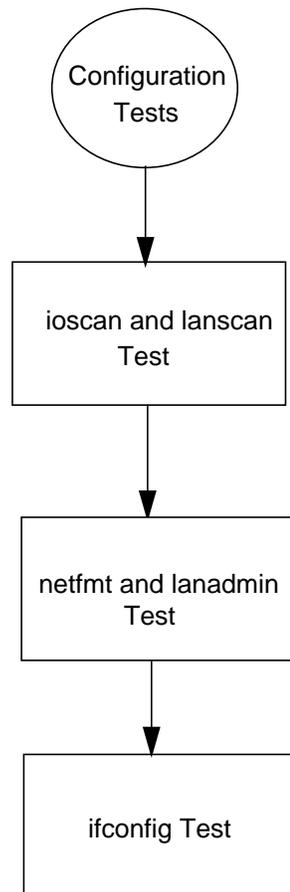
## Flowchart 5 Procedures

- Execute `ping(1M)` from a known good host through a gateway to another known good host. This will test connectivity through bridge/gateway level. If successful, execute `netstat -r` and examine route table on problem host and all hosts in path. If necessary, correct routing table and go to Network Level Tests.
- If ping fails, examine gateway to see if HP 9000 or non-HP. If non-HP, refer to networking documentation for that product. If HP 9000, execute `ifconfig(1M)` for all interfaces on gateway or host (see Configuration Tests for more details on `ifconfig`).
- If `ifconfig` does not show parameter as UP in output for gateway, execute `netstat -i` to check status of network interfaces. An asterisk (\*) indicates interface is down. If network interface is down, configure interface up and repeat Bridge/Gateway Test. If all interfaces are up, continue to Configuration Tests and test all interfaces on gateway.

## Flowchart 6: Configuration Tests

Verifies configuration of network interface on a host using `ioscan(1M)`, `lanscan(1M)`, `netfmt(1M)`, `lanadmin(1M)`, and `ifconfig(1M)`.

**Figure 4-9**      **Flowchart 6**



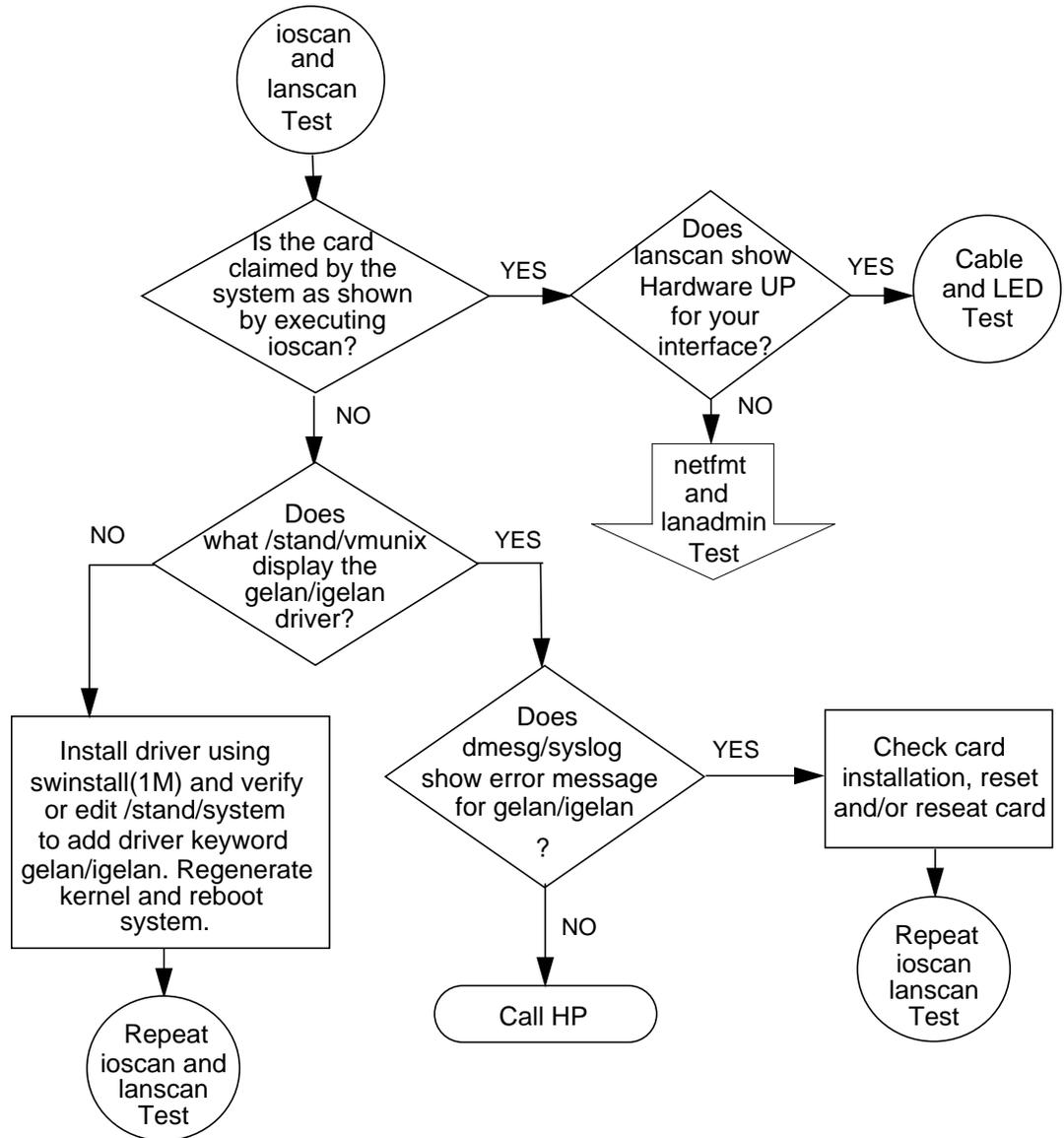
## Flowchart 6 Procedures

- Verify configuration of network interface on a host using `ioscan(1M)`, `lanscan(1M)`, `netfmt(1M)`, `lanadmin(1M)`, and `ifconfig(1M)`.

### Flowchart 6a: ioscan and lanscan Test

Verifies configuration of network interface on a host using `ioscan(1M)` and `lanscan(1M)`.

Figure 4-10 Flowchart 6a



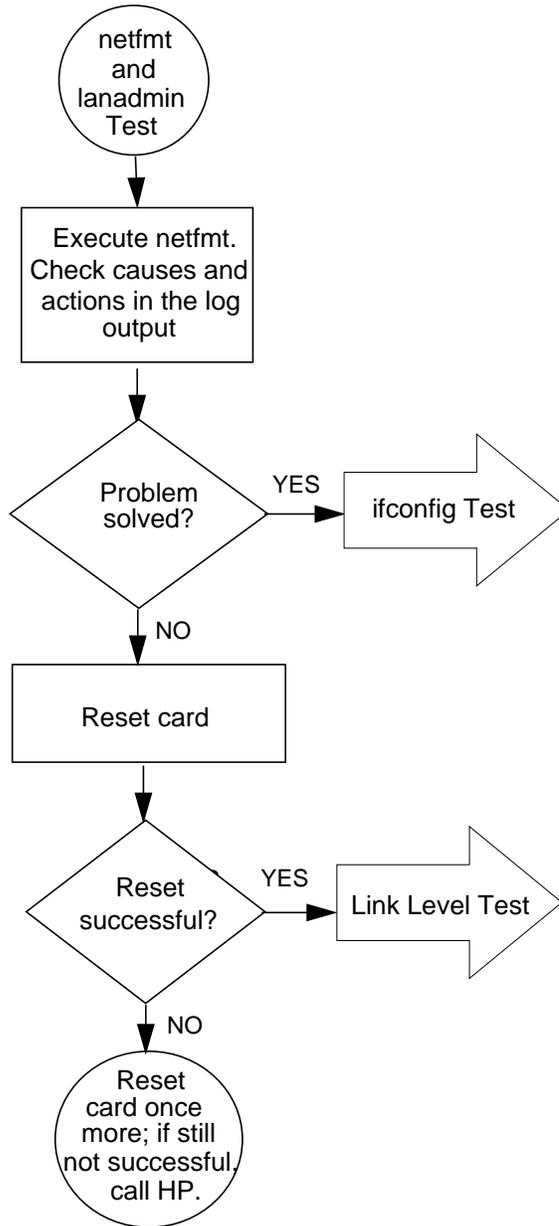
## Flowchart 6a Procedures

- Execute `ioscan(1M)` as follows:  
`ioscan -kfd drivername`, where *drivername* is either `gelan` or `igelan` (refer to Table 1-1, “List of Gigabit Ethernet Products”).  
Verify output from `ioscan` shows card “CLAIMED” by the system.
- If card is claimed, execute `lanscan(1M)` and check if the hardware state display shows “UP.” If so, go to Cable and LED Test. If not, continue to `netfmt` and `lanadmin` Test.
- If card is not claimed, execute `what /stand/vmunix | grep drivername`, where *drivername* is as mentioned above. Verify if the output is similar to the output documented in the Release Notes for your Gigabit Ethernet product. Use the name of the running kernel image file in place of “/stand/vmunix” as appropriate.
- If driver is displayed, check if `dmesg/syslog` output shows error messages pertaining to `gelan/igelan`. Also, check `nettl` log messages. If errors, check card installation and reset and/or reseal card, then repeat `ioscan` and `lanscan` Test. Otherwise, call your HP representative.
- If driver is not displayed, install driver using `swinstall(1M)` and verify or edit `/stand/system` to contain `gelan` or `igelan` keyword. (See Chapter 3 of *Installing and Administering LAN/9000 Software* for instructions on how to edit `/stand/system` and create a new kernel.) Reboot system and repeat `ioscan` and `lanscan` Test.

### Flowchart 6b: netfmt and lanadmin Test

Verifies configuration of network interface on a host using netfmt (1M) and lanadmin (1M).

Figure 4-11 Flowchart 6b



## Flowchart 6b Procedures

- Execute `netfmt(1M)` and view error and disaster log messages.

Example: `netfmt -vf /var/adm/nettl.LOG00`

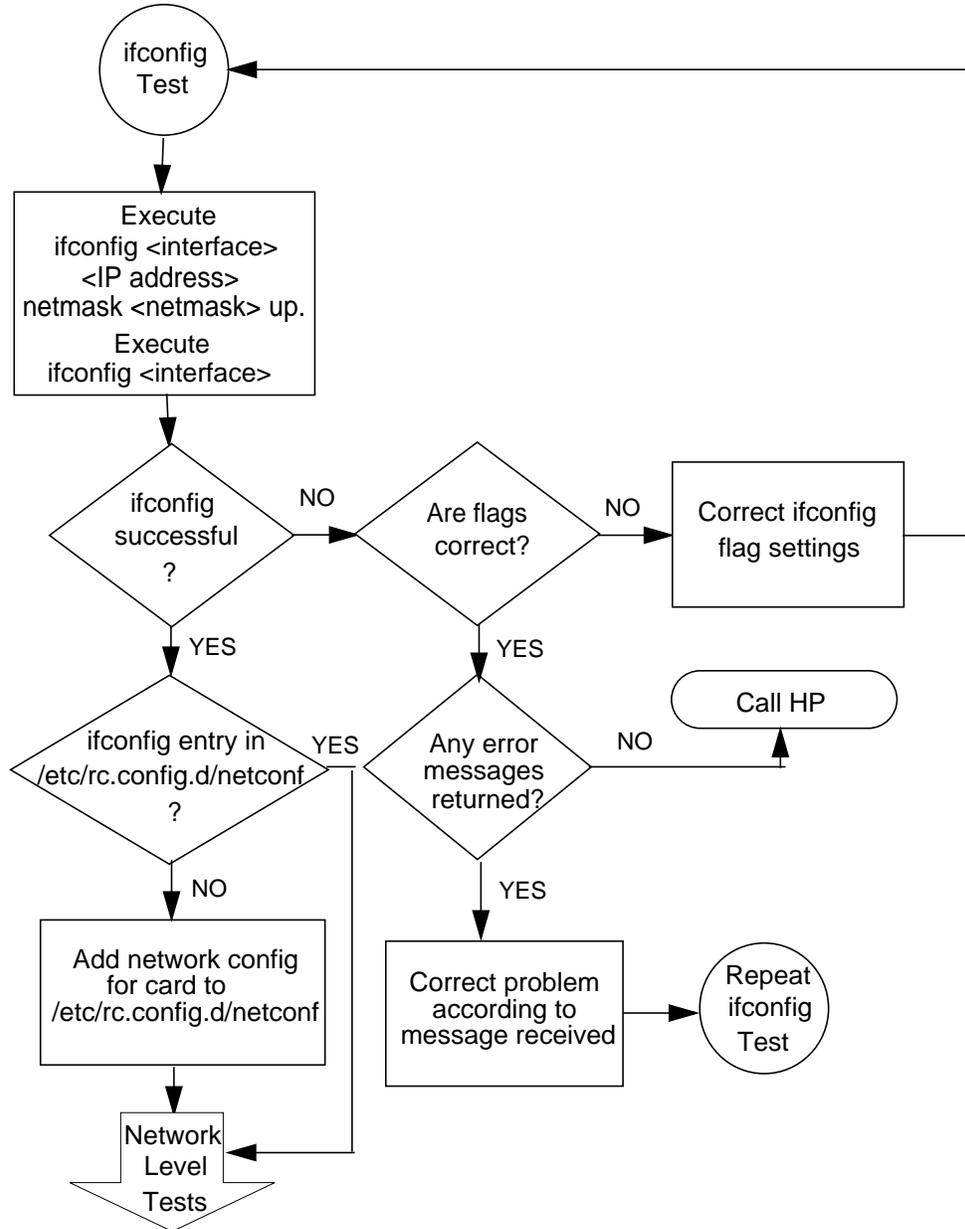
It will help to use the time stamp to find proper logs. Ensure you are looking at 1000Base-SX/T information.

- If problem is solved, continue to `ifconfig` Test.
- If problem persists, run `lanadmin(1M)` to reset card.
- If reset is successful, go to Link Level Test. Otherwise, reset the card once more; if still not successful, call your HP representative.

### Flowchart 6c: ifconfig Test

Verifies configuration of network interface on a host using `ifconfig(1M)`.

Figure 4-12 Flowchart 6c



## Flowchart 6c Procedures

- Execute `ifconfig(1M)` on the interface you want to configure to ensure that interface is enabled. Example:

```
ifconfig lan1 192.6.1.17 netmask 255.255.255.0 up
```

Next, execute `ifconfig interface` to test and verify flag setting is UP and correct IP address is displayed. Example:

```
ifconfig lan1
```

```
<UP,BROADCAST,RUNNING,MULTICAST,CKO>
```

- If IP and flags are correct, verify there is an entry for card interface in `/etc/rc.config.d/netconf`. If so, go to Network Level Tests. Otherwise, add correct interface parameters to `/etc/rc.config.d/netconf` file and reboot. If flags are incorrect, correct them with `ifconfig` and repeat `ifconfig Test`. Otherwise, if `ifconfig` is not successful and error messages appear, correct them accordingly and repeat `ifconfig Test`.
- If you cannot correct errors, call your HP representative.



---

## **A** **Gigabit Ethernet lanadmin Display**

This appendix defines the terms listed in the `lanadmin(1M)` command display.

## LAN Interface Status Display

The following is a sample of a lanadmin(1M) command display. The fields are defined in the section that follows.

HP-UX 10.20 lanadmin output:

```
LAN INTERFACE STATUS DISPLAY
Sun, Jun 21,1998 14:39:36

Network Management ID          = 5
Description                    = lan3 HP 1000Base-SX Adapter HW Rev A-3814
Type (value)                   = ethernet-csmacd(6)
MTU Size                       = 1500
Speed                          = 1000000000
Station Address                 = 0x60b0c41121
Administration Status (value)  = up(1)
Operation Status (value)       = up(1)
Last Change                    = 1
Inbound Octets                 = 0
Inbound Unicast Packets        = 0
Inbound Non-Unicast Packets    = 0
Inbound Discards               = 0
Inbound Errors                 = 0
Inbound Unknown Protocols      = 0
Outbound Octets                = 0
Outbound Unicast Packets       = 0
Outbound Non-Unicast Packets   = 0
Outbound Discards              = 0
Outbound Errors                = 0
Outbound Queue Length          = 0
Specific                       = 655367

Ethernet-like Statistics Group

Index                          = 5
Alignment Errors               = 0
FCS Errors                     = 0
Single Collision Frames        = 0
Multiple Collision Frames      = 0
Deferred Transmissions         = 0
Late Collisions                = 0
Excessive Collisions           = 0
Internal MAC Transmit Errors   = 0
Carrier Sense Errors           = 0
Frames Too Long                = 0
Internal MAC Receive Errors    = 0
```

HP-UX 11.0 lanadmin output:

LAN INTERFACE STATUS DISPLAY  
Sun, Jun 21, 1998 14:49:43

```
PPA Number                = 3
Description                = lan3 HP 1000Base-SX Adapter HW Rev
A-3814
Type (value)              = ethernet-csmacd(6)
MTU Size                  = 1500
Speed                     = 10000000000
Station Address           = 0x60b0c401d4
Administration Status (value) = up(1)
Operation Status (value)  = up(1)
Last Change               = 14
Inbound Octets            = 2220359858
Inbound Unicast Packets   = 87658661
Inbound Non-Unicast Packets = 577
Inbound Discards          = 0
Inbound Errors            = 0
Inbound Unknown Protocols = 0
Outbound Octets           = 2729643634
Outbound Unicast Packets  = 107383997
Outbound Non-Unicast Packets = 285158
Outbound Discards         = 0
Outbound Errors           = 0
Outbound Queue Length     = 0
Specific                  = 655367
```

Ethernet-like Statistics Group

```
Index                     = 9
Alignment Errors          = 0
FCS Errors                 = 0
Single Collision Frames   = 0
Multiple Collision Frames = 0
Deferred Transmissions    = 0
Late Collisions           = 0
Excessive Collisions      = 0
Internal MAC Transmit Errors = 0
Carrier Sense Errors      = 0
Frames Too Long           = 0
Internal MAC Receive Errors = 0
```

## RFC 1213 MIB II

Following are descriptions of the statistics fields in the `lanadmin(1M)` command display. For more detailed information about the fields, refer to RFC 1213.

Field	Description						
Network Management ID	A unique ID assigned by the system for the network management of each network interface.						
PPA Number	A unique number assigned to each network interface, distinct from NMID.						
Description	A textual string containing information about the interface.						
Type (value)	The type of interface, distinguished according to the physical/link protocols, immediately below the network layer in the protocol stack.  Gigabit Ethernet can have one of the following values: <i>ethernet</i> or <i>IEEE 802.3</i> .						
MTU Size	The size of the largest datagram which can be sent/received on the interface specified in octets. This value can be 1500 or 9000.						
Speed in bits per second	The speed of the card — 1000 Mbps for 1000Base-SX and 10, 100, or 1000 Mbps for 1000Base-T.						
Station Address	The interface address at the protocol layer immediately below the network layer in the protocol stack. For interfaces which do not have such an address, such as serial line, this object contains an octet string of zero length.						
Administration Status	The status of the card. This parameter is set to <code>up(1)</code> and is not configurable. It will have one of the following values:  <table><tbody><tr><td><code>up(1)</code></td><td>Ready to pass packets</td></tr><tr><td><code>down(2)</code></td><td>Not operative</td></tr><tr><td><code>testing(3)</code></td><td>In test mode</td></tr></tbody></table>	<code>up(1)</code>	Ready to pass packets	<code>down(2)</code>	Not operative	<code>testing(3)</code>	In test mode
<code>up(1)</code>	Ready to pass packets						
<code>down(2)</code>	Not operative						
<code>testing(3)</code>	In test mode						
Operation Status	The status of the link. This value is the same as the administration status. If the value is <code>up</code> , the link is operational.						
Last Change	The value of <code>SysUpTime</code> at the time the interface entered its current operational state. If the current state was entered prior to the last reinitialization of the local network management subsystem, then this object contains a zero value.						

Inbound Octets	The total number of octets received on the interface, including framing characters.
Inbound Unicast Packets	The number of subnetwork-unicast packets delivered to a high-layer protocol.
Inbound Non-Unicast Packets	The number of non-unicast (subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
Inbound Discards	The number of inbound packets that were discarded even though no errors had been detected, preventing them from being delivered to a higher-layer protocol. One possible reason for discarding such a packet could be out of receive buffers.
Inbound Errors	The number of inbound packets that contained errors, preventing them from being deliverable to a higher-layer protocol.
Inbound Unknown Protocols	The number of packets received via the interface that were discarded because of an unknown or unsupported protocol.
Outbound Octets	The total number of octets transmitted out of the interface, including framing characters.
Outbound Unicast Packets	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.
Outbound Non-Unicast Packets	The total number of packets that higher-level protocols requested be transmitted to a non-unicast (a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.
Outbound Discards	The number of outbound packets that were discarded even though no errors had been detected to prevent them from being transmitted. One possible reason for discarding such a packet could be out of transmit buffers.
Outbound Errors	The number of outbound packets that could not be transmitted because of errors.
Outbound Queue Length	The length of the output packet queue (in packets).

## RFC 1284 Ethernet-Like Interface Statistics

Following are descriptions of the Ethernet-like statistics fields in the `lanadmin(1M)` command display.

<b>Field</b>	<b>Description</b>
Index	A value that uniquely identifies an interface to an 802.3 medium.
Alignment Errors	A count of frames received on a particular interface that are not an integral number of octets in length and do not pass the FCS check.
FCS Errors	A count of frames received on a particular interface that are not an integral number of octets in length and do not pass the FCS check.
Single Collision Frames	A count of successfully transmitted frames on a particular interface for which transmission is inhibited by exactly one collision.
Multiple Collision Frames	A count of successfully transmitted frames on a particular interface for which transmission is inhibited by more than one collision.
Deferred Transmissions	A count of frames for which the first transmission attempt on a particular interface is delayed because the medium is busy. The count represented by an instance of this object does not include frames involved in collisions.
Late Collisions	The number of times that a collision is detected on a particular interface later than 512 bit-times into the transmission of a packet.
Excessive Collisions	A couple of frames for which transmission on a particular interface fails due to excessive collisions or packets dropped.
Internal MAC Transmit Errors	A count of frames for which transmission on a particular interface fails due to an internal MAC sublayer transmit error.
Carrier Sense Errors	The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame on a particular interface.
Frames Too Long	A count of frames received on a particular interface that exceed the maximum permitted frame size.
Internal MAC Receive Errors	A count of frames for which reception on a particular interface fails due to an internal MAC sublayer receive error.

---

## **B** **Gigabit Ethernet Card Statistics**

This appendix defines the card statistics that are output from the `lanadmin(1M)` command.

## Card Statistics Output

The following is a sample card statistics output. An explanation of the statistics is in the section that follows.

```
***** Driver Statistics *****
In Packet Error                0
Out Packet Error               0
Loopback packets               0
Link down events               0

***** Host Command Statistics *****
nicCmdsDelMcastAddr           0
nicCmdsSetMACAddr             0
nicCmdsSetMulticastMode       0
micCmdsClearStats             0

***** NIC Events Statistics *****
nicEventsFirmwareOperational  1
nicEventsStatsUpdated         362765
nicEventsLinkStateChanged     1
nicEventsMcastListUpdated     1

***** Interface Statistics *****
ifIndex                        4
ifType                         6
ifMtu                          1514
ifSpeed                        1000000000
ifAdminStatus                  1
ifOperStatus                   1
ifLastChange                   12
ifInDiscards                   0
ifInErrors                     0
ifInUnknownProtos              0
ifOutDiscards                  0
ifOutErrors                    0
ifOutQLen                      0
ifInOctets_low                 26719576
ifInOctets_high                0
ifInUcastPkts_low              0
ifInUcastPkts_high             0
ifInMulticastPkts_low         0
ifInMulticastPkts_high        0
ifInBroadcastPkts_low         382146
ifInBroadcastPkts_high        0
ifOutOctets_low                0
ifOutOctets_high               0
ifOutUcastPkts_low             0
ifOutUcastPkts_high            0
ifOutMulticastPkts_low        0
ifOutMulticastPkts_high       0
ifOutBroadcastPkts_low        0
ifOutBroadcastPkts_high       0
```

## Explanation of Card Statistics

Following are descriptions of the card statistics that are output from the `lanadmin(1M)` command.

Field	Description
<b>Driver Statistics</b>	
In Packet Error	Number of inbound packets discarded because they were received when the driver was not operational or the packet length was incorrect.
Out Packet Error	Number of outbound packets discarded because the driver was not operational or the driver had insufficient resources (Memory) to transmit the packet.
Loopback packets	Number of packets looped back to the upper layers by the driver.
Link Down events	Number of link down events, i.e., cable disconnects processed by the driver.
<b>Host Command Statistics</b>	
<code>nicCmdsDelMCastAddr</code>	Number of times the driver has issued a command to the NIC to delete a multicast MAC address.
<code>nicCmdsSetPromiscMode</code>	Number of times the NIC received a command to enable or disable promiscuous mode.
<code>nicCmdsSetMACAddr</code>	Number of times the NIC received a command to set the current MAC address.
<code>nicCmdsClearStats</code>	Number of times the NIC received a command to clear the card statistics maintained by the card.
<b>NIC Events Statistics</b>	
<code>nicEventsFirmwareOperational</code>	The number of events the driver has received from the NIC indicating that the firmware on the NIC is in the operational state.
<code>nicEventsStatsUpdated</code>	The number of times the NIC has updated the MIB interface statistics.
<code>nicEventsLinkStateChanged</code>	The number of events the driver has processed indicating that the status of the link has changed.
<code>nicEventsMCastListUpdated</code>	The number of times the NIC generated an event to report the addition or deletion of a multicast MAC address.

### Interface Statistics

These are the MIB statistics collected by the card as documented in RFC1066.



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## **C** **Hardware Reference Information**

This appendix contains information about the card LEDs, cabling requirements, and card specifications.

## The Meaning of the LEDs

The Link LED indicates the card's status and must be on for the card to function properly. Note that there is no Link LED on the 1000Base-T card. In its place are three LEDs which indicate what speed (10, 100, or 1000 Mbps) the link has been established.

The following tables show the LED description and status.

**Table C-1 LED Description and Status for 1000Base-SX**

LED Description and Color	On (Steady)	Flashing	Off
Link - Green	Good connection between card and network at 1000 Mbps.	Port disabled by software, connection failed, or card trying to establish connection.  Note: A6847A is not programmed to flash the Link LED.	No connection between card and network
ACT (Activity) - Amber	Data detected	Data detected	No data detected

**Table C-2 LED Description and Status for 1000Base-T**

LED Description and Color	On (Steady)	Flashing	Off
1000 - Green 100 - Green 10 - Green  Note: Only one speed LED should be on at any given time.	Good connection between card and network at either 10, 100, or 1000 Mbps as indicated by LED.  Note: For A4929A, if all Link speed LEDs are on steady, the driver is disabled or not installed.	N/A	No connection between card and network.
ACT (Activity) - Amber (Green on A6794A)	Data detected	Data detected	No data detected

## Cabling Requirements

Connectors on LAN cards adhere to appropriate standards agreed upon by various standards bodies and are widely available. The 1000Base-SX port is compatible with the IEEE 802.3z standard and uses a single duplex SC connector. The 1000Base-T port is compatible with the IEEE 802.3ab standard and uses an RJ-45 connector.

Incorrectly wired or installed cabling is the most common cause of communications problems for local area networks. HP recommends that you work with a qualified cable installer for assistance in your cabling requirements. The following tables summarize cabling requirements:

**Table C-3 Cabling Requirements for 1000Base-SX**

Description (850nm short-wave laser)	Modal Bandwidth	Operating Distance
62.5 micron MMF (multimode fibre)	160 (MHz * km)	2 to 220 meters
	200 (MHz * km)	2 to 275 meters
50 micron MMF (multimode fibre)	400 (MHz * km)	2 to 500 meters
	500 (MHz * km)	2 to 550 meters

**Table C-4 Cabling Requirements for 1000Base-T**

Description	Bandwidth	Operating Distance
Cat 5 or Cat 5E UTP	100 MHz	Up to 100 meters

### Back-to-Back Connection

When running 1000Base-T back-to-back at either 10 or 100 Mbps, you must use a crossover cable configuration. At 1000 Mbps, you can use either a crossover or straight-through cable.

## Card Specifications

For compliance to European directives and related specifications, see the Declaration of Conformity statement in Appendix D.

### A4924A/A4925A/A4926A

#### Physical

Dimensions (HSC for K):	5.625 in by 3.25 in
Dimensions (HSC for D/R):	13.375 in by 4.875 in
Dimensions (PCI):	6.73 in by 4.75 in

#### Electrical

Power requirement (HSC):	+15 watts max
Power requirement (PCI):	+14 watts max

#### Environmental

Temperature  
Degrees F = (1.8 x Degrees C) + 32

Operating Temperature:	0° C to 55° C
Storage Temperature:	-40° C to 70° C

#### Humidity

Operating Relative Humidity Range	5 to 85% non-condensing 40° C: 16 hour dwells at extremes
Non-operating/Storage Humidity:	5 to 95% non-condensing 10° C/hour

#### Altitude

Operating:	10,000 ft (3.1km)
Non-operating:	35,000 ft

#### Electromagnetic Compatibility

FCC Class A	USA
CISPR-22/EN55022 Class A	International and Europe
EN55082-1	Europe

VCCI Class A (PCI card only)      Japan

## **A4929A**

### **Physical**

Dimensions:                              6.73 in by 4.75 in

### **Electrical**

Power requirement:                      +14 watts max

### **Environmental**

#### Temperature

Degrees F = (1.8 x Degrees C) + 32

Operating Temperature:                0° C to 45° C

Storage Temperature:                  -40° C to 70° C

### **Humidity**

Operating Relative Humidity      15 to 80% non-condensing  
Range  
40° C: 16 hour dwells at extremes

Non-operating/Storage                5 to 95% non-condensing  
Humidity:  
10° C/hour

### **Altitude**

Operating:                                10,000 ft (3.1km)

Non-operating:                          35,000 ft

### **Electromagnetic Compatibility**

FCC Class A                              USA

CISPR-22/EN55022 Class A          International and Europe

EN55082-1                                Europe

VCCI Class A                              Japan

## **A6825A/A6847A**

### **Physical**

Dimensions: 6.6 in by 2.5 in

### **Electrical**

Power requirement: +8 watts max

### **Environmental**

Temperature  
Degrees F = (1.8 x Degrees C) + 32

Operating Temperature: 0° C to 50° C

Storage Temperature: -40° C to 60° C

### **Humidity**

Operating Relative humidity range 5 to 95% non-condensing  
(40° C: 16 hour dwells at extremes)

Non-operating/storage humidity: 5 to 95% non-condensing  
20° C/hour

### **Altitude**

Operating: 10,000 ft (3.1km)

Non-operating: 35,000 ft

### **Electromagnetic Compatibility**

FCC Class A USA

CISPR-22/EN55022 Class A International and Europe

CISPR-24 Europe

VCCI Class A Japan

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## **D** **Hardware Regulatory Statements**

This appendix contains regulatory statements for the United States, Canada, Australia/New Zealand, Japan, and the European community.

## **FCC Statement (For U.S.A.)**

### **Federal Communications Commission Radio Frequency Interference Statement**

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**WARNING**

**This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:**

- (1) This device may not cause harmful interference and**
- (2) this device must accept any interference received, including interference that might cause undesired operation.**

**This equipment has been tested and found to comply 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 interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.**

**Hewlett-Packard's system certification tests were conducted with HP-supported peripheral devices and cables, such as those received with your system. Changes or modifications to this equipment not expressly approved by Hewlett-Packard could void the user's authority to operate the equipment.**

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## **Canada**

**Warning: This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.**

**Cet appareil numérique de la classe A respecte toutes les exigences du règlement sur le matériel brouilleur du Canada.**

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## EMI (Australia and New Zealand)

This product meets the applicable requirements of the Australia and New Zealand EMC Framework.



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## VCCI (Japan) (PCI Card Only)

This equipment complies with the Class A category for information technology equipment based on the rules of Voluntary Control Council for Interference by Information Technology Equipment. When used in a residential area, radio interference may be caused. In this case, the user may be required to take appropriate corrective actions.

**Figure D-1**

### VCCI Regulatory Statement

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

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## EMI Statement (European Community)

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**NOTE**

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case you may be required to take adequate measures.

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## Laser Safety Statements

### Laser Safety Statements - U.S. FDA/CDRH - Optical (laser) Transceiver

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**CAUTION**

The optical transceiver provided on the network interface card contains a laser system and is classified as a “Class-I Laser Product” under a U.S. Department of Health and Human Services (DHHS) Radiation Performance standard according to the Radiation Control for Health and Safety Act of 1968. The Class I label and compliance statement are located on the optical transceiver.

To ensure proper use of this product, please read this instruction manual carefully and retain for future reference. Should the unit ever require maintenance, contact an authorized service location.

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**CAUTION**

Use of controls, adjustments or the performance procedures other than those specified herein may result in hazardous radiation exposure. To prevent direct exposure to laser beam, do not try to open the enclosure.

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### Laser Safety - European Union - Optical Transceiver Only

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**CAUTION**

The optical transceiver provided on the network interface card contains a laser system and is classified as a “Class 1 Laser Product” per EN 60825-1, Safety of Laser products. Class 1 laser products are considered safe and do not pose a biological hazard if used within the data sheet limits and instructions.

To ensure proper use of this product, please read this instruction manual carefully and retain for future reference. Should the unit ever require maintenance, contact an authorized service location.

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**CAUTION**

Use of controls, adjustments or the performance procedures other than those specified herein may result in hazardous radiation exposure. To prevent direct exposure to laser beam, do not try to open the enclosure.

There are no user serviceable parts nor any maintenance required for the optical transceiver. All adjustments are made at the factory before shipment to customers. Tampering with or any attempt to modify the optical transceiver will result in voided product warranty. It may also result in improper operation of the network card circuitry and possible overstress of the laser source. Device degradation or product failure may result.

<b>DECLARATION OF CONFORMITY</b> according to ISO/IEC Guide 22 and EN 45014	
<b>Manufacturer's Name:</b>	Hewlett-Packard Company
<b>Manufacturer's Address:</b>	8000 Foothills Blvd. Roseville, CA 95747 USA
<b>declares, that the product</b>	
<b>Product Name:</b>	1000 Base-SX Network Interface Card
<b>Model Number(s):</b>	A4924-60001 (HSC-K) Card (Prod. Number A4924A) A4925-60001 (HSC-D) Card (Prod. Number A4925A) A4926-60001 (PCI) Card (Prod. Number A4926A)
<b>Product Options:</b>	All
<b>conforms to the following Product Specifications:</b>	
<b>Safety:</b>	IEC 950:1991 + A1, A2, A3, A4 / EN 60950:1992 + A1, A2, A3, A4 IEC 825-1:1993 / EN 60825-1:1994, Laser Class 1
<b>EMC:</b>	CISPR 22:1993 / EN 55022:1994 - Class A <sup>1</sup> EN 50082-1:1992, Generic Immunity, including: IEC 801-2:1991, 4 kV CD, 8 kV AD IEC 801-3:1984, 3 V/m IEC 801-4:1988, 1 kV Power Lines Signal Lines Not Tested (fiber-optic cable)
<b>Supplementary information:</b>	
The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.	
1) The product was tested in a typical configuration with Hewlett-Packard information technology equipment.	
Roseville, CA, June 12, 1998	 Frank D. Dembski Jr., Quality Manager
European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)	

<b>DECLARATION OF CONFORMITY</b> According to ISO/IEC Guide 22 and EN 45014	
<b>Manufacturer's Name:</b>	Hewlett-Packard Company Systems Interconnect Solutions Lab
<b>Manufacturer's Address:</b>	8000 Foothills Blvd. Roseville, CA 95747 USA
<b>declares, that the product</b>	
<b>Product Name:</b>	Gigabit Ethernet 1000BaseT
<b>Model Number(s):</b>	A4929-60001 (Product No. A4929A)
<b>Product Options:</b>	All
<b>conforms to the following Product Specifications:</b>	
Safety:	IEC 950:1991 + A1, A2, A3, A4 / EN 60950:1992 + A1, A2, A3, A4, A11 GB 4943-1995
EMC:	CISPR 22:1993 / EN 55022:1994 & A2 1996 - Class A <sup>1</sup> CNS 13438, GB 9254-1988, CFR47, Part 15 Class A CISPR 24:1997 / EN 55024:1998 IEC 61000-4-2 IEC 61000-4-3 / ENV 50204 IEC 61000-4-4 IEC 61000-4-6 IEC 61000-4-8
<b>Supplementary Information:</b>	
The product herewith complies with the requirements of the EMC Directive 89/336/EEC and carries the CE marking accordingly.	
1) The Product was tested in a typical configuration with Hewlett-Packard information technology equipment.	
Roseville, CA, March 30, 2000	 Frank D. Dembski Jr., Quality Manager
European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)	

<b>DECLARATION OF CONFORMITY</b> According to ISO/IEC Guide 22 and EN 45014	
<b>Manufacturer's Name:</b>	Hewlett-Packard Company Systems Interconnect Solutions Lab
<b>Manufacturer's Address:</b>	8000 Foothills Blvd. Roseville, CA 95747 USA
<b>declares, that the product</b>	
<b>Product Name:</b>	PCI 1000BT / PCI 1000SX
<b>Model Number(s):</b>	A6825A and A6847A
<b>Product Options:</b>	All
<b>conforms to the following Product Specifications:</b>	
<b>Safety:</b>	IEC 950:1991 + A1, A2, A3, A4 / EN 60950:1992 + A1, A2, A3, A4, A11 GB 4943-1995, IEC 825-1:1993/ EN60825-1:1994+A1, Class 1 Laser
<b>EMC:</b>	CISPR 22:1997 / EN 55022:1998 - Class A CNS 13438, GB 9254-1998, CFR47, Part 15 Class A CISPR 24:1997 / EN 55024:1998 IEC 61000-4-2 IEC 61000-4-3 / ENV 50204 IEC 61000-4-4 IEC 61000-4-6
<b>Supplementary Information:</b>	
The product herewith complies with the requirements of the EMC Directive 89/336/EEC and carries the CE marking accordingly.	
1) The Product was tested in a typical configuration with Hewlett-Packard information technology equipment.	
	
	<b>Tom Le, Hardware Engineer</b>
Cupertino, CA, April, 2002	
European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department HQ-TRE, Hanserböcker Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)	



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# Glossary

## Numerics

**1000Base-SX:** A specific implementation of 1000Mbps operating over two multimode fiber cables, as specified in Standard IEEE 802.3z/D.50-1998.

**1000Base-T:** A specific implementation of 1000 Mbps operating over four-pair Cat-5 or Cat-5e UTP cables, as specified in IEEE 802.3ab standards.

## A

**Alias:** Name of the interface that corresponds to a given Internet address on a system.

**Autonegotiation:** A mechanism defined in IEEE 802.3u-1995 whereby devices sharing a link segment can exchange data and automatically configure themselves to operate at the highest capability mode shared between them. This is also used for link configuration per IEEE 802.3z and IEEE 802.3ab standards of duplex and flow control configuration between two 1000Base-SX/T links.

## C

**Card Instance Number:** A number that uniquely identifies a device within a class. A class of devices is a logical grouping of similar devices.

## D

**Destination Address:** A field in the message packet format identifying the end node(s) to which the packet is being sent.

**DHCP:** Dynamic Host Configuration Protocol

**DLPI:** Data Link Provider Interface. An industry-standard definition for message communications to STREAMS-based network interface drivers.

## E

**Ethernet:** A 10 Mbps LAN, developed by Digital Equipment Corporation, Intel, and Xerox Corporation, upon which the IEEE 802.3 network is based.

## F

**Fast Ethernet:** A commonly used name applied to 100Base-T.

**Full-Duplex Mode:** A mode of media utilization whereby data can flow in both directions simultaneously across the multiple wire pairs of a physical link. While full-duplex operation is not defined per se in the IEEE 802.3u-1995 specification, the specification does define a mechanism for this mode to be autonegotiated between devices on each end of a link. Full-duplex mode is typically found on switches.

## H

**HSC:** High-speed connect bus.

**Half-Duplex Mode:** The media utilization mode of IEEE 802.3u-1995 networks whereby data can flow in only one direction at a time across the multiple wire pairs of a physical link.

**Hardware Path:** An identifier assigned by the system according to the physical location (slot) of the card in the hardware backplane. On HP servers, the I/O subsystem identifies each LAN card by its hardware path.

**Hostname:** Name of system on the network.

**Hub:** A network interconnection device that allows multiple devices to share a single logical link segment.

## I

**IEEE:** The Institute of Electrical and Electronics Engineers. A national association, whose activities include publishing standards applicable to various electronic technologies. The IEEE technical committees are numbered and grouped by area. The 802.3 committee produced the standard for LAN networks.

**IEEE 802.3u-1995 network:** A 10 or 100 Mbps LAN, specified in the IEEE 802.3u-1995 Standard for Local Area Networks. It uses the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) network access method to give every node equal access to the network.

**Internet Address:** The network address of a computer node. This address identifies both which network the host is on and which host it is. Refer to the *Installing and Administering LAN/9000 Software* manual for detailed information about network addressing.

**IP Address:** See Internet Address.

## L

**LAN:** See Local Area Network.

**Local Area Network (LAN):** A data communications system that allows a number of independent devices to communicate with each other.

**Local Network:** The network to which a node is directly attached.

## M

**Major Number:** Unique value that identifies an individual hardware device.

**Maximum Transmission Unit (MTU):** Largest amount of data that can be transmitted through that interface. This value does not include the LLC or MAC headers.

**Mbps:** Megabits per second

**MBps:** Megabytes per second

**MTU:** See Maximum Transmission Unit

## N

**Network Interface:** A communication path through which messages can be sent and received. A hardware network interface has a hardware device associated with it, such as a LAN or FDDI card. A software network interface does not include a hardware device, for example, the loopback interface. For every IP address instance, there must be one network interface configured.

**Network Management Identifier (NMID):** A unique ID assigned by the system for the network management of each network interface.

**NMID:** See Network Management Identifier

**Node:** Any point in a network where services are provided or communications channels are interconnected. A node could be a workstation or a server processor.

## O

**Online Addition/Replacement (OLA/R):** The ability of a PCI I/O card to be added or replaced without the need to shut down or reboot the system. For instructions on how to perform OLA/R, refer to *Configuring HP-UX For Peripherals*.

## P

**PCI:** Peripheral Component Interconnect.

**Packet:** A sequence of binary digits that is transmitted as a unit in a computer network. A packet usually contains control information plus data.

**Physical Point of Attachment:** A unique number assigned to each network interface, distinct from NMID.

**PMTU:** Path MTU

**PPA:** See Physical Point of Attachment

**Protocol:** A specification for coding messages exchanged between two communications processes.

## R

**RJ-45:** The name for the connector type used with UTP cabling.

## S

**Subnetwork:** Small discrete physical networks connected via gateways which share the same network address space. Refer to *Installing and Administering LAN/9000 Software* for detailed information about subnetworks and subnet addressing.

**Subnet mask:** A 32-bit mask which, when AND'd with an internet address, determines a subnetwork address. When the internet address is AND'd with the subnet mask, the ones in the host portion of the subnet mask will "overwrite" the corresponding bits of the host portion of the internet address, resulting

in the subnet address. Refer to *Installing and Administering LAN/9000 Software* for detailed information about subnet masks.

**Switch:** A network interconnection device that allows multiple connected senders and receivers to communicate simultaneously in contrast to a hub (repeater) where only one device can send at a time. Some switches have fixed port speeds (10 or 100 Mbps) while others allow port speeds to be configured or autonegotiated.

## T

**Topology:** The physical and logical geometry governing placement of nodes in a computer network. Also, the layout of the transmission medium for a network.

## U

**Unshielded Twisted Pair:** A data cable type consisting of pairs of wires twisted together without an electrically shielding jacket.

**UTP:** See Unshielded Twisted Pair