Using Dual Port 100Base-TX and Dual Port Wide Ultra2 SCSI

Version B.11.00.01



Manufacturing Part Number:
E1099

U. S. A.

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Preface

The information in this manual is intended for network managers who install and administer 10/100Base-TX networks and Wide Ultra2 SCSI devices. It is assumed the reader is experienced with the basics of local and wide area networking and SCSI technology.

This manual describes how to install, configure, and troubleshoot the 10/100Base-TX and SCSI software and hardware product on HP 9000 PCI systems.

The manual is organized as follows:

Chapter 1 , “Installing and Configuring PCI 10/100 Base-TX,” describes how to install and configure 10/100Base-TX software and hardware. Also it includes regulatory statements for the USA, Japan, and the European community.

Chapter 2 , “Configuring Network Connectivity Using SAM,” describes the steps to configure remote connectivity automatically using the System Administration Manager (SAM).

Chapter 3, “SCSI Parameter and Termination Information” describes the steps to configure remote connectivity automatically using the System Administration Manager (SAM).

Chapter 4, “Troubleshooting SCSI” describes the steps to troubleshoot the SCSI ports on the card.

Chapter 5 , “10/100Base-TX Resources,” provides references to other useful tools for installing, configuring, and maintaining HP 10/100Base-TX software.

Chapter 6 , “Troubleshooting 10/100Base-TX/9000,"' provides flowcharts to help diagnose 10/100Base-TX.

Appendix A , “10/100Base-TX Interface Card Statistics,” defines the terms listed in the *lanadmin(1M)* command display.

Appendix B , “Hardware Reference Information,” provides information about card specifications and cabling requirements.

1 Installing and Configuring PCI 10/100 Base-TX

This document contains information on the PCI 10/100Base-TX/9000 amd Wide Ultra2 SCSI cards for use with the 11.0 operating systems.

Compatibility and Installation Requirements

Following are the limits of the current PCI 10/100Base-TX/9000:

- The PCI 10/100Base-TX/9000 ports support autonegotiation and autosensing. *You should not normally need to manually configure the speed, autonegotiation, or duplex mode of the card.* If your switch does not support autonegotiation but is set to full-duplex mode, there may be a mismatch between the card and the switch, because the card defaults to half-duplex for switches that do not support autonegotiation. You can determine what the card is set to by using **`lanadmin -x`** and reset it if necessary using **`lanadmin -X`**. See "Manual Speed and Duplex Mode Configuration" for details.

  If you manually set the speed and duplex mode of the Base-TX card, autonegotiation will be turned off.

- Both full- and half-duplex modes are supported. If your hub or switch does not support autonegotiation, ensure that your hub or switch is set to the desired duplex mode.
- The PCI 0/100Base-TX/9000 LAN software is for use with only the following protocols: TCP/IP, ARPA, and NFS.
- When using the ioscan -f command to verify installation, the last digit of the H/W Path (hardware path) will show the port number of the card. The other fields of the output will show the driver as btlan , and the Hardware Type Description will be PCI.

Manual Speed and Duplex Mode Configuration

Because the PCI 10/100Base-TX/9000 LAN ports support autonegotiation, you should not normally need to manually set the duplex mode. Sometimes you may need to manually set the duplex mode of the card—for example, if the switch is operating at full-duplex but does not autonegotiate. Because the card defaults to half-duplex when autonegotiation is turned off, this could cause a mismatch between the card and switch (at either 10 or100 Mbits/s). To fix this, use the **`lanadmin -X`** command as described later in this section.

The CSMA/CD media access method used in IEEE 802.3u-1995 is inherently a half-duplex mechanism. That is, at any one time, there can be only one sender of data on the link segment. It is not possible for devices on either end of the link segment to transmit simultaneously.

Since Category 5 UTP contains multiple pairs of wires, it is possible to have devices on both ends of a link segment sending data to each other simultaneously. This is known as full-duplex operation. While the details of full-duplex operation are not currently defined by IEEE 802.3u-1995 (full-duplex mode essentially involves “turning off” the CSMA/CD access method which is the foundation of IEEE 802.3), the autonegotiation mechanism defined in IEEE 802.3u-1995 allows devices to advertise and configure themselves to operate in a full-duplex mode which is essentially vendor-specific. Devices that do not support autonegotiation can sometimes be manually configured to operate in full-duplex mode.

Full-duplex mode is most commonly found in, and indeed only makes sense for, switches rather than hubs. It may be found in either 10 Mbit/s or 100 Mbit/s switch devices. Full-duplex mode may provide a throughput advantage under some circumstances, but the degree of the advantage is application-dependent.

The PCI 10/100Base-TX ports support both half- and full-duplex operation.

Ensure that the speed, duplex mode, and autonegotiation of the associated switch are configured the same as on the PCI 10/100Base-TX card. If the switch supports autonegotiation on the ports connected to the cards, this should be enabled as explained in “Autonegotiation and Autosensing”.

Manual Speed and Duplex Mode Configuration

To manually set the duplex mode of the PCI ports, first ensure that your computer has the latest applicable patches installed as listed in the Required and Optional Patches section of this release note.

To list the current speed and duplex mode of the PCI 10/100Base-TX/9000 ports, use the **-x** option (NOTE: lowercase x) of the lanadmin command. Determine the speed and duplex mode of your hub or switch before performing manual configuration as follows:

lanadmin -x ***ppa*** (HP-UX 11.0)

To manually set the duplex mode of the interface, install one of the patches above and then use the **-X** option of **lanadmin** as follows:

lanadmin -X mode ***ppa*** (on HP-UX 11.0)

where:

mode can be any one of the following strings (and the **fd** or **hd** are case-insensitive):

10fd =10 full-duplex

10hd =10 half-duplex

100fd =100 full-duplex

100hd =100 half-duplex

and

lanadmin -X auto_on ***ppa*** (turns autonegotiation on for HP-UX 11.0)

The ***ppa*** is the physical point of attachment on HP-UX 11.0. You can get the ***ppa*** from the output of the **lanscan** command.

Example:

If the ***ppa*** of the 100Base-TX interface is 5, the command to set the card to 10Mbits/s and full-duplex mode would be:

```
lanadmin -X 10fd 5
```

After issuing the lanadmin -X, you must wait at least 11 seconds before attempting to use the specified network interface.

If you want the Duplex Mode setting to be effective in all subsequent reboots, you must enter the information in the following file:

/etc/rc.config.d/hpbtlanconf

Manually configuring the speed or duplex setting of a switch port on

some switches may disable that switch port from doing autonegotiation. Verify that both the card and the switch port are operating in the same speed and duplex mode as desired.

If you use manual configuration to change the card to a different speed and duplex mode, you may need to turn autonegotiation on first before the manual setting takes place.

NOTE Mismatches between the speed, autonegotiation, or duplex mode of the card and switch will cause incorrect operation.

Autonegotiation and Autosensing

Autonegotiation is a mechanism defined in the IEEE 802.3u specification whereby devices sharing a link segment can exchange information and automatically configure themselves to operate at the highest capability mode shared between them.

Autonegotiation is like a rotary switch that automatically switches to the correct technology such as 10Base-T or 100Base-TX or between half- and full-duplex modes. Once the highest performance common mode is determined, auto-negotiation passes control of the link to the appropriate technology, sets the appropriate duplex mode, and then becomes transparent until the link is broken.

Following is the IEEE 802.3u-defined hierarchy for resolving multiple common abilities for a 10/100Base-TX card. The PCI 10/100Base-TX/9000 ports provide the means for interfacing various types of HP 9000 workstations and servers to either a 10Base-T or 100Base-TX network. 100Base-TX is a subset of 100Base-T networking defined by the IEEE 802.3u-1995 standard. 100Base-TX provides 100 Mbit/s data transmission over category 5 unshielded twisted-par (UTP) cable. Two pairs of wires in the cable are used—one wire pair is for receiving data, and one wire pair is for transmitting data. The same card port that supports 100Base-TX operation can also support 10Base-T operation.

- 100Base-TX full-duplex
- 100Base-TX half-duplex
- 10Base-T full-duplex
- 10Base-T half-duplex

For example, if both devices on the link support 10Base-T (half-duplex) and 100Base-TX (half-duplex), autonegotiation at both ends will connect the 100Base-TX (half-duplex) instead of the 10Base-T (half-duplex).

Most Fast Ethernet devices on the market today such as hubs and switches do not support autonegotiation. Either the speed and duplex mode of the device are fixed (as is usually the case with hubs), or they are often manually configured at the desired speed and duplex (as is often the case for switches). However, switches that support autonegotiation are starting to be offered.

If a PCI 10/100Base-TX/9000 port is connected to a device, such as a switch, that is autonegotiating, the PCI card will autonegotiate with the device to mutually determine the highest possible speed and duplex settings between them.

NOTE

If a PCI 10/100Base-TX/9000 port is connected to a device that does not support autonegotiation or a device that has autonegotiation disabled, the PCI port will autosense the speed of the link and set itself accordingly. **The duplex mode of the card will be set to half-duplex in this case.** If you want the card to operate in full-duplex mode, you have to set it using the method described in Manual Speed and Duplex Mode Configuration.

The PCI 10/100Base-TX port will sense when the connection between itself and a hub or switch on the other end of a link has been broken. If a connection is made to another (or the same) device, the autonegotiation and autosensing process will be done again automatically. Autonegotiation and autosensing are also done whenever the interface is reset.

What Manuals are Available

The following documents summarize installation, configuration, verification and troubleshooting of the PCI 10/100Base-TX/9000 and Wide Ultra2 SCSI card:

PCI 10/100Base-TX/9000 and Wide Ultra2 SCSI Quick Installation

Software Availability in Native Languages

The commands used with this product are the ones supported by the Native Language Support Catalog of HP-UX.

PCI 10/100Base-TX/9000 and Wide Ultra2 SCSI Card

A5838A

Specifications

Physical

Table 1-1

Dimensions:	5.075 in by 3.9 in

Electrical

Table 1-2

Power requirement:	+5.Volts @ 1.5 Amps max

Environmental

Table 1-3

Operating temperature:	0^{o}C to 50^{o} C
Storage temperature	0^{o}C to 55^{o} C ambient
Shipping environment	-40^{o}C to 70^{o}C ambient
Relative humidity:	5% to 85% non-condensing

Electromagnetic Compatibility

Table 1-4

FCC part 15 Class B	USA, Canada, and Latin America
CISPR-22 Class A EN55022 Class A	Europe
VCCI Class A	Japan

Hardware Regulatory Statements

This section contains hardware regulatory statements for the PCI 100Base-TX/9000 and Wide Ultra2 SCSI product (A5838A) used in the United States, Japan, and the European community. Refer to your PCI 10/100Base-TX 9000 and Wide Ultra2 SCSI Quick Install card for product installation instructions.

FCC Statement (For U.S.A.)

Federal Communications Commission Radio Frequency Interference Statement

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.

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.

VCC I (Japan)

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.

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。

EMI Statement (European Community)

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.

Declarations of Conformity: The Declarations of Conformity comply with ISO/IEC Guide 22 and EN 45014. They identify the product, the manufacturer's name and address, and the applicable specifications that are recognized in the European community.

2 Configuring Network Connectivity Using SAM

This chapter describes how to configure remote connectivity using SAM. It contains the following sections:

- Step 1: Configuring Network Connectivity
- Step 2: Deleting a Default Gateway (Optional)

Step 1: Configuring Network Connectivity

Your system may not be able to communicate with other systems, for example, PCs, workstations, servers, etc., until you configure system-to-system connections by adding an entry in *hosts* for the remote system. You can use SAM to do this automatically by completing the following steps:

1. At the HP-UX prompt, type: **sam**
2. Double click *Networking and Communications* at the SAM main window.
3. Double click *Internet Addresses* to enable your system to communicate with other systems using the TCP/IP protocol.

   SAM displays the remote system names and Internet addresses that are already configured.
4. Choose **Add** from the "Actions" menu to open the Add Internet Address window to add the internet address and system name of a remote system.

   Use the SAM online help system for information about adding remote system connections.

   a. Enter the Internet address for the remote system.

      Upon exiting the **Internet Address** field, SAM checks to make sure you have entered a valid IP/Internet address. SAM also determines if a gateway is required for the connection (see step 4c).

   b. Enter the remote system name.

      Upon exiting the **Remote System Name** field, SAM checks to make sure that connectivity has not already been configured for this system. If it has, SAM displays an error message.

   c. Optionally, choose **Add Aliases** to open the Add Aliases window if you want to configure aliases for a remote system.

      You can modify or remove alias names for a remote system on this menu

      Activate the **OK** button to perform the task and return to the Add

Internet Addresses window.

Proceed to step 5 if a gateway is not required for this remote connection.

SAM displays fields for entering gateway information if a gateway is required for this remote system connection. Use the SAM online help system for information about gateways.

5. Activate the **OK** button to enable your system to communicate with this system and return to the System-to-System Connectivity object list.

   SAM updates the object list to include the remote system you configured.

NOTE You can modify or remove remote systems and modify default gateways by highlighting the Remote System Name from the object list and choosing Modify, Remove, or Modify Default Gateway from the "Actions" menu.

6. Choose Exit from the "File" menu.
7. At the Networking Communications window, choose **Exit SAM** from the "File" menu to leave SAM.
8. Verify remote system configuration.

   a. View the list of remote systems you can communicate with using a symbolic name by typing the following command at the HP-UX prompt:

      more /etc/hosts

   b. View the configured destinations reached through gateways and the gateways used to reach those destinations by typing the following command at the HP-UX prompt:

      netstat -r

To verify that you can communicate with a remote system via the 10/100Base-TX product, return to chapter 1, "Step 8: Verify the Installation."

Step 2: Deleting a Default Gateway

To delete a default gateway that you have added with SAM, do the following:

1. Enter the following command at the HP-UX prompt:

   `route delete default gateway_hostname`

   where *gateway_hostname* is the hostname of the default gateway you want to delete.

2. Edit the */etc/rc.config.d/netconf* file to remove the corresponding internet routing configuration parameter values for the gateway. For example:

   ROUTE_DESTINATION [0] = ROUTE_GATEWAY [0] = ROUTE_COUNT [0] =

3 SCSI Parameter and Termination Information

Configuring SCSI Parameters

In order to change the SCSI ID, the path for the card of interest must first be determined. Once the path is known, the SCSI ID may be changed. The example below lists the commands used to determine the path for the card of interest, change the SCSI ID of the A5838A, and also some of the other parameters of the card.

The machine should be booted to the BCH prompt before beginning this procedure.

The path for the A5838A SCSI card is determined as follows:

- at the Main Menu, type "in" (for information menu)

- at the Information Menu, type "io" (to display I/O interface information)

The information displayed should be similar to the following:

PCI DEVICE INFORMATION

Description	Path (dec)	Vendor Id	Device Id	Bus #	Slot #
----------	-----	----	----	---	---
.					
.					
SCSI bus cntlr	0/2/0/0	0x1000	0xb	16	6
.					
.					
.					

The path for the card in this example is '0/2/0/0'.

Once the path for the card is known:

- type "main" (to return to main menu)

- type "ser" (to display service menu)

- type "scsi" (to display current status of SCSI devices)

The information displayed should be similar to the following:

```
Path (dec)    Initiator ID    SCSI Rate    Auto Term
-----------   -------------   ----------   ---------------
.
.
0/2/0/0       7               Fast         ON
.
.
.
```

The SCSI bus speed (rate) can be changed as follows:

- if at the Main Menu, type "ser" (to display service menu)

- type "scsi rate <path> <speed>"

(where <path> is the path obtained as shown above, and <speed> is 'fast' or 'ultra')

The SCSI ID of the controller card can be changed as follows:

- if at the Main Menu, type "ser" (to display service menu)

- type "scsi init <path> <new ID>"

(where <path> is the path obtained as shown above, and

<new ID> is a single digit, 0 - 7)

SCSI Termination Information

The A5838A card is shipped from the factory with autotermination enabled. If the A5838A is placed at the end of a SCSI bus, autotermination is enabled, so there is no need for external terminators.

If the A5838A card is installed in the middle of a SCSI bus, you must change its SCSI ID and disable autotermination for the port by placing a jumper across two-pins on the card. Refer to the Quick Installation Guide for details.

4 Troubleshooting SCSI

Troubleshooting

The A5838A host bus adapter is a single field-replaceable unit (FRU) and does not contain any field-serviceable parts. Troubleshooting procedures described in this section are limited to verifying that the controller is operational and a valid connection is established.

General Procedure

1. Check the connection.

   Make sure that the correct cable is used, connected, and operating properly and that there are no bent pins in any of the connectors.

2. Check SCSI bus compatibility.

   Ensure transfer rate compatibility with the attached devices using the SCSI boot menu command.

3. Check the controller.

   Inspect the controller to make sure it is seated properly in the PCI bus slot. If necessary, power down the system, reseat the controller, and restart the system.

4. Run diagnostics.

   If a visual inspection of the controller and cable does not reveal any problems, or if an action taken as a result of the inspection does not produce a working controller, you may want to run diagnostics to determine whether the controller can communicate and respond to PCI bus instructions. Diagnostics are described in the next section.

If diagnostics determine that the controller is defective, you must replace it. Contact your local Hewlett-Packard customer representative or call the HP Response Center.

SCSI Bus Compatibility

Use the SCSI command to ensure SCSI controller and SCSI device compatibility by displaying and selecting SCSI bus parameters.

The SCSI command is available from the boot menu displayed after the test station has booted, provided autoboot is disabled.

```
Command                          Description
-------                          -----------
AUto [BOot|SEArch ON|OFF]         Display or set the specified flag
BOot [PRI|ALT|<path> <args>]      Boot from a specified path
BootTimer [time]                  Display or set boot delay time
CLEARPIM                          Clear PIM storage
CPUconfig [<proc>] [ON|OFF]       Configure/Deconfigure Processor
DEfault                           Set the sytem to defined values
DIsplay                           Display this menu
ForthMode                         Switch to the Forth OBP interface
IO                                List the I/O devices in the system
LS [<path>|flash]                 List the boot or flash volume
OS [hpux|sppux]                   Display/Select Operating System
PASSword                          Set the Forth password
PAth [PRI|ALT|CON] [<path>]       Display or modify a path
PDT [CLEAR|DEBUG]                Display/clear Non-Volatile PDT state
PIM_info [cpu#] [HPMC|TOC|LPMC]   Display PIM of current or any CPU
RESET [hard|debug]                Force a reset of the system
RESTrict [ON|OFF]                 Display/Select restricted access
                                  toForth
SCSI [INIT|RATE] [bus slot val]   List/Set SCSI controller parms
SEArch [<path>]                   Search for boot devices
SECure [ON|OFF]                   Display or set secure boot mode
TIme [cn:yr:mo:dy:hr:mn[:ss]]     Display or set the real-time clock
VErsion                           Display the firmware versions
Command:
```

Figure 1 Boot Menu

SCSI Command

Use the SCSI command to ensure SCSI controller and SCSI device compatibility by displaying and selecting SCSI bus parameters.

The SCSI command is available from the boot menu displayed after the test station has booted, provided autoboot is disabled.

The SCSI parameters can be displayed and modified using the SCSI command. The syntax for this command is:

SCSI rate *bus# slot# rate*

SCSI init *bus# slot# id#*

bus#	The bus number
slot#	The adapter's slot number
rate	The adapter's transfer rate 0: no limit 10: Fast SCSI 20: Ultra SCSI
id#	The SCSI ID number of the adapter

Display and Set SCSI Transfer Rates

1. Display the SCSI transfer rate for an adapter using the SCSI command.

   The following example lists the SCSI transfer rate for an adapter on bus 5 slot 2:

   command: **SCSI rate 5 2**

   ```
   PCI device /5.2 = no limit
   ```

   Enter the command without specifying a bus or slot number to list transfer rates for all bus and slot numbers:

   command: **SCSI rate**

2. Set the SCSI transfer rate for an adapter using the SCSI command.

   The following example sets the adapter on bus 5 slot 2 to Fast SCSI and then displays the results:

   command: **SCSI rate 5 2 10**

command: **SCSI rate 5 2**

```
PCI device /5.2 = fast scsi
```

Display and Set SCSI IDs

1. Display the initiator (SCSI) IDs for all controllers, buses, and slots using the SCSI command.

   The following example shows the SCSI ID for the controller on bus 5 slot 2.

   SCSI init 5 2

   ```
   PCI device /5.2 = 7
   ```

   Enter the command without specifying a bus or slot number to list initiator IDs for all bus and slot numbers:

   SCSI init

2. Set the initiator (SCSI) ID of an adapter using the SCSI command.

   The following example sets bus 5 slot 2 to initiator ID 6 and displays the results:

   SCSI init 5 2 6

   SCSI init 5 2

   ```
   PCI device /5.2 = 6
   ```

Contacting Your HP Representative

If the equipment is covered by an HP service contract, document the problem as a service request and forward it to your HP representative. Include the following information where applicable:

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

  Include HP-UX commands, communication subsystem commands, functionality of user programs, result codes and messages, and data that can reproduce the problem.

- Obtain the version, update, and fix information for all software. To check the version of the kernel, enter this command:

  uname -r

  To check patches, enter:

  what /stand/vmunix | grep scsi

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

- Illustrate as clearly as possible the context of any messages. Record all error messages and numbers that appear at the user terminal and the system console.

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

- Prepare a listing of the HP-UX I/O configuration being used for the HP representative to analyze.

- Try to determine the general area within the software where the problem may exist. Refer to the appropriate reference manual and follow the guidelines on gathering information for that product.

- Document your interim (workaround) solution. The cause of the problem can sometimes be found by comparing the circumstances in which the problem occurs with the circumstances in which the problem does not occur.

- In the event of a system failure, obtain a full memory dump. If the directory **/var/adm/crash** exists, the HP-UX utility **/sbin/savecore** automatically executes during reboot to save the memory dump. HP recommends that you create the **/tmp/syscore** directory after successfully installing this product. Send the output of the system failure memory dump to the HP representative.

If the equipment is not covered by an HP service contract, there may be a charge for time and materials.

SCSI Sense Codes

The following example shows a typical SCSI error message.

```
 [+6708 72410001 002a9858 0:7] scsi disk: CHECK CONDITION on
disk 0:6:5:0
        Read of logical block 509856, count 128
        disk sd45a, block 254920, 65536 bytes
        Valid = 1, Error code = 0x70
        Segment number = 0x00, Filemark = 0, EOM = 0, ILI = 0
        Sense key = 0x1, "RECOVERED ERROR"
        Information = 0x00 0x07 0xc7 0xe4
[+6709 72410001 002a9a10 0:7] scsi disk:      Additional sense
length = 0x0a
        Command-specific information = 0x00 0x00 0x00 0x00
        Additional sense = 0x18, Qualifier = 0x01
        Field replaceable unit code = 0xea
        SKSV = 1, C/D = 0, BPV = 0, Bit pointer = 0
        Field pointer = 0x0003
```

The status (CHECK CONDITION) and sense key (RECOVERED ERROR) are interpreted. The Additional sense and Qualifier codes require interpretation. Use both codes to locate the interpretation. In the example, the Additional sense (0x18) and Qualifier (0x01) codes are interpreted as “recovered data with error correction and retries applied.” and list all possible status and sense key codes. interprets the Additional sense and Qualifier codes contained in SCSI error messages reported by the console.

SCSI Status Codes

SCSI Status Code	Name
0x00	good
0x02	check condition
0x04	condition met
0x08	busy
0x10	intermediate
0x14	intermediate - condition met
0x18	reservation conflict
0x22	command terminated
0x28	queue full

SCSI Sense Keys

Sense Key	Name
0	no sense
0x1	recovered error
0x2	not ready
0x3	medium error
0x4	hardware error
0x5	illegal request
0x6	unit attention
0x7	data protect
0x8	blank check
0x9	vendor-specific
0xa	copy aborted
0xb	aborted command
0xc	equal

SCSI Sense Keys (Continued)

Sense Key	Name
0xd	volume overflow
0xe	miscompare
0xf	reserved

SCSI Additional Sense and Qualifier Codes

Additional Sense Code	Qualifier Code	Description
0x00	0x00	no additional sense information
0x00	0x01	filemark detected
0x00	0x02	end-of-partition/medium detected
0x00	0x03	setmark detected
0x00	0x04	beginning of partition/medium detected
0x00	0x05	end-of-data detected
0x00	0x06	i/o process terminated
0x00	0x11	audio play operation in progress
0x00	0x12	audio play operation paused
0x00	0x13	audio play operation successfully completed
0x00	0x14	audio play operation stopped due to error
0x00	0x15	no current audio status to return
0x01	0x00	no index/sector signal
0x02	0x00	no seek complete
0x03	0x00	peripheral device write fault
0x03	0x01	no write current
0x03	0x02	excessive write errors
0x04	0x00	logical unit not ready, cause not reportable
0x04	0x01	logical unit in process of becoming ready
0x04	0x02	logical unit not ready, initializing command required
0x04	0x03	logical unit not ready, manual intervention required

SCSI Additional Sense and Qualifier Codes (Continued)

Additional Sense Code	Qualifier Code	Description
0x04	0x04	logical unit not ready, format in progress
0x05	0x00	logical unit does not respond to selection
0x06	0x00	reference position found
0x07	0x00	multiple peripheral devices selected
0x08	0x00	logical unit communication failure
0x08	0x01	logical unit communication time-out
0x08	0x02	logical unit communication parity error
0x09	0x00	track following error
0x09	0x01	tracking servo failure
0x09	0x02	focus servo failure
0x09	0x03	spindle servo failure
0x0a	0x00	error log overflow
0x0c	0x00	write error
0x0c	0x01	write error recovered with auto reallocation
0x0c	0x02	write error - auto reallocation failed
0x10	0x00	id crc or ecc error
0x11	0x00	unrecovered read error
0x11	0x01	read retries exhausted
0x11	0x02	error too long to correct
0x11	0x03	multiple read errors
0x11	0x04	unrecovered read error - auto reallocate failed
0x11	0x05	l-ec uncorrectable error
0x11	0x06	circ unrecovered error
0x11	0x07	data resynchronization error
0x11	0x08	incomplete block read
0x11	0x09	no gap found
0x11	0x0a	miscorrected error
0x11	0x0b	unrecovered read error - recommend reassignment
0x11	0x0c	unrecovered read error - recommend rewrite the data

SCSI Additional Sense and Qualifier Codes (Continued)

Additional Sense Code	Qualifier Code	Description
0x12	0x00	address mark not found for id field
0x13	0x00	address mark not found for data field
0x14	0x00	recorded entity not found
0x14	0x01	record not found
0x14	0x02	filemark or setmark not found
0x14	0x03	end-of-data not found
0x14	0x04	block sequence error
0x15	0x00	random positioning error
0x15	0x01	mechanical positioning error
0x15	0x02	positioning error detected by read of medium
0x16	0x00	data synchronization mark error
0x17	0x00	recovered data with no error correction applied
0x17	0x01	recovered data with retries
0x17	0x02	recovered data with positive head offset
0x17	0x03	recovered data with negative head offset
0x17	0x04	recovered data with retries and/or circ applied
0x17	0x05	recovered data using previous sector id
0x17	0x06	recovered data without ecc - data auto-reallocated
0x17	0x07	recovered data without ecc - recommend reassignment
0x17	0x08	recovered data without ecc - recommend rewrite
0x18	0x00	recovered data with error correction applied
0x18	0x01	recovered data with error correction and retries applied
0x18	0x02	recovered data - data auto-reallocated
0x18	0x03	recovered data with circ
0x18	0x04	recovered data with lec
0x18	0x05	recovered data - recommend reassignment
0x18	0x06	recovered data - recommend rewrite
0x19	0x00	defect list error
0x19	0x01	defect list not available

SCSI Additional Sense and Qualifier Codes (Continued)

Additional Sense Code	Qualifier Code	Description
0x19	0x02	defect list error in primary list
0x19	0x03	defect list error in grown list
0x1a	0x00	parameter list length error
0x1b	0x00	synchronous data transfer error
0x1c	0x00	defect list not found
0x1c	0x01	primary defect list not found
0x1c	0x02	grown defect list not found
0x1d	0x00	miscompare during verify operation
0x1e	0x00	recovered id with ecc
0x20	0x00	invalid command operation code
0x21	0x00	logical block address out of range
0x21	0x01	invalid element address
0x22	0x00	illegal function
0x24	0x00	invalid field in cdb
0x25	0x00	logical unit not supported
0x26	0x00	invalid field in parameter list
0x26	0x01	parameter not supported
0x26	0x02	parameter value invalid
0x26	0x03	threshold parameters not supported
0x27	0x00	write protected
0x28	0x00	not ready to ready transition (medium may have changed)
0x28	0x01	import or export element accessed
0x29	0x00	power on, reset, or bus device reset occurred
0x2a	0x00	parameters changed
0x2a	0x01	mode parameters changed
0x2a	0x02	log parameters changed
0x2b	0x00	copy cannot execute since host cannot disconnect
0x2c	0x00	command sequence error
0x2c	0x01	too many windows specified

SCSI Additional Sense and Qualifier Codes (Continued)

Additional Sense Code	Qualifier Code	Description
0x2f	0x00	commands cleared by another initiator
0x30	0x00	incompatible medium installed
0x30	0x01	cannot read medium - unknown format
0x30	0x02	cannot read medium - incompatible format
0x30	0x03	cleaning cartridge installed
0x31	0x00	medium format corrupted
0x32	0x00	no defect spare location available
0x32	0x01	defect list update failure
0x33	0x00	tape length error
0x36	0x00	ribbon, ink, or tower failure
0x37	0x00	rounded parameter
0x39	0x00	saving parameters not supported
0x3a	0x00	medium not present
0x3b	0x00	sequential positioning error
0x3b	0x01	tape position error at beginning-of-medium
0x3b	0x02	tape position error at end-of-medium
0x3b	0x03	tape or electronic vertical forms unit not ready
0x3b	0x04	slew failure
0x3b	0x05	paper jam
0x3b	0x06	failed to sense top-of-form
0x3b	0x07	failed to sense bottom-of-form
0x3b	0x08	reposition error
0x3b	0x09	read past end of medium
0x3b	0x0a	read past beginning of medium
0x3b	0x0b	position past end of medium
0x3b	0x0c	position past beginning of medium
0x3b	0x0d	medium destination element full
0x3b	0x0e	medium source element empty
0x3d	0x00	invalid bits in identify message

SCSI Additional Sense and Qualifier Codes (Continued)

Additional Sense Code	Qualifier Code	Description
0x3e	0x00	logical unit has not self-configured yet
0x3f	0x00	target operating conditions have changed
0x3f	0x01	microcode has been changed
0x3f	0x02	changed operating definition
0x3f	0x03	inquiry data has changed
0x40	0x00	ram failure
0x40	nn	diagnostic failure on component nn
0x41	0x00	data path failure
0x42	0x00	power-on or self-test failure
0x43	0x00	message error
0x44	0x00	internal target failure
0x45	0x00	select or reselect failure
0x46	0x00	unsuccessful soft reset
0x47	0x00	scsi parity error
0x48	0x00	initiator detected error message received
0x49	0x00	invalid message error
0x4a	0x00	command phase error
0x4b	0x00	data phase error
0x4c	0x00	logical unit failed self-configuration
0x4e	0x00	overlapped commands attempted
0x50	0x00	write append error
0x50	0x01	write append position error
0x50	0x02	position error related to timing
0x51	0x00	erase failure
0x52	0x00	cartridge fault
0x53	0x00	media load or eject failed
0x53	0x01	unload tape failure
0x53	0x02	medium removal prevented
0x54	0x00	scsi to host system interface failure

SCSI Additional Sense and Qualifier Codes (Continued)

Additional Sense Code	Qualifier Code	Description
0x55	0x00	system resource failure
0x56	0x00	reserved
0x57	0x00	unable to recover table of contents
0x58	0x00	generation does not exist
0x59	0x00	updated block read
0x5A	0x00	operator request or state change input (unspecified)
0x5A	0x01	operator medium removal request
0x5A	0x02	operator selected write protect
0x5A	0x030	operator selected write permit
0x5B	0x00	log exception
0x5B	0x01	threshold condition met
0x5B	0x02	log counter at maximum
0x5B	0x03	log list codes exhausted
0x5C	0x00	rpl status change
0x5C	0x01	spindles synchronized
0x5C	0x02	spindles not synchronized
0x5D	0x00	reserved
0x5E	0x00	reserved
0x5F	0x00	reserved
0x60	0x00	lamp failure
0x61	0x00	video acquisition error
0x61	0x01	unable to acquire video
0x61	0x02	out of focus
0x62	0x00	scan head positioning error
0x63	0x00	end of user area encountered on this track
0x64	0x00	illegal mode for this track
0x65	0x00	reserved
0x66	0x00	reserved
0x67	0x00	reserved

SCSI Additional Sense and Qualifier Codes (Continued)

Additional Sense Code	Qualifier Code	Description
0x68	0x00	reserved
0x69	0x00	reserved
0x6A	0x00	reserved
0x6B	0x00	reserved
0x6C	0x00	reserved
0x6D	0x00	reserved
0x6E	0x00	reserved
0x6F	0x00	reserved

5 10/100Base-TX Resources

In addition to this manual, use the following resources to maintain and administer PCI 10/100Base-TX/9000.

HP-UX Manual Reference Pages

While installing, configuring, or troubleshooting 10/100Base-TX, you may need to refer to any of the following online manual reference pages (man pages) for useful HP-UX operating system or 10/100Base-TX 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)* 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 10/100Base-TX 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.
- *route(1M)* adds and deletes entries to the network routing table.
- *sam(1M)* configures networking software.

- *swinstall(1M)* loads software filesets onto 10.x systems.
- *swverify(1M)* verifies software installation.

Error Messages

PCI 10/100Base-TX 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.

Logging Messages

HP 100Base-TX/9000 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, run the command:

```
nettladm
```

See the *nettladm(1M) man page for information on using the GUI version, or the nettl(1M)* manual (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.

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

  The `-v` option enables the reporting of available cause and action descriptions for each log message. A sample 10/100Base-TX log message using the `-v` option is shown below.

  ```
  ******100 Mb/s LAN/9000 Networking**********************

  Fri May 16 PDT 1997 15:08:07.091398 DISASTER
  Subsys:LAN100 Loc:00000
  ```

```
<6011> HP PCI 10/100Base-T driver detected bad cable
connection between the adapter in slot 2 and the hub
or switch.
```

- To examine just the log messages in the log file.

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

- To check network logging and tracing status.

  ```
  nettl  -status
  ```

- To start 10/100Base-TX tracing to the file */tmp/tracefile.TRC0*. *nettl(1m) adds the .TRC0 postfix for you.*

  ```
  nettl -traceon all   -entity PCI100bt  -file
  /tmp/tracefile
  ```

- To stop 100Base-TX tracing.

  ```
  nettl    -traceoff     -entity PCI100bt
  ```

- To format the 10/100Base-TX trace file into the file */tmp/traceout*.

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

Refer to the *netfmt(1M)* man page for further information about this card and how to create a filter for trace formatting.

Manual Installation and Configuration

If you want to manually install and configure your 10/100Base-TX/9000 product, refer to the detailed instructions in the *Installing and Administering LAN/9000 Software* manual.

You may need some of the following 10/100Base-TX/9000-specific information when you follow those steps:

- HP 9000 PCI driver keyword: `btlan`
- The driver for the PCI 10/100Base-TX card has a floating major number (that is, a major number assigned dynamically by the operating system).

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. To check the 10/100Base-TX version number, execute *what vmunix* and look for the keyword, *vtlan1*.

  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**, and **/etc/rc.config.d/netconf** files.

- Execute the *dmesg* command and record messages about the status of the 10/100Base-TX card.

- Execute the *lanscan -v* command and record the output.

- Execute the *display* command of the *lanadmin* diagnostic on the 10/100Base-TX interface and record the output.

- Record the troubleshooting flowchart number and step 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. 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 10/100Base-TX/9000 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.

6 Troubleshooting 10/100Base-TX/9000

This chapter provides guidelines for troubleshooting 10/100Base-TX. It contains the following sections:

- Troubleshooting Overview.
- Diagnostic Flowcharts.

Performance Troubleshooting

This section is intended to provide system administrators or advanced users with detailed information on how to troubleshoot performance related problems with the PCI 100BT product. Below, a few key terms are defined to help in understanding the troubleshooting information.

Key Terms:

Transmit Threshold:

The transmit threshold value determines how many bytes must be in the PCI 100BT transmit FIFO before transmission of the bits onto the ethernet cable will begin.

Transmit Underrun:

A transmit underrun error occurs when the PCI 100BT transmitter encounters an empty transmit FIFO during the transmission of bits onto the ethernet cable.

Memory Subsystem Latency:

The memory subsystem latency is defined to be the amount of time it takes to move data from system memory to an I/O device. This time includes the arbitration delay for the I/O device and for each bus bridge between the system memory controller and the I/O device.

Arbitration Delay:

The time it takes an I/O device, or bus bridge to acquire the I/O bus for data transfer.

Transmit FIFO:

The transmit FIFO is a buffer on the PCI 100BT card used to hold data transferred from system memory to the PCI 100BT card.

The PCI 100BT product is currently optimized to achieve the best single card performance. In order to achieve this performance the PCI 100BT product has set the Transmit Threshold to an aggressive value. The Transmit Threshold is set so that transmission will begin after 512 bytes

are in the transmit FIFO.

While the current Transmit Threshold value allows the PCI 100BT product to achieve it's best performance, it also increases the probability of Transmit Underrun errors. A large number of Transmit Underrun errors (more than 1 out of every 1000 packets) can cause a noticeable drop in networking performance.Transmit Underrun errors may occur when there is sufficient bus contention from competing I/O devices. These errors can be monitored in two ways:

1. Examine the output from the **`netstat -I`** ***`interface`*** command. If the number of output errors is high (more than 1 out of every X packets) then the system is most likely suffering from transmit underruns on the specified network interface and corrective action must be taken to resolve the problem.
2. Turn on nettl errors and warnings for the network interface being monitored. The following command will turn on disasters, errors and warnings for the network interface with Instance number 1. (NOTE: It is highly recommended to always keep disasters and errors enabled).

   nettl -log 0xe -e PCI100bt -C 1

The nettl log file (by default is called /var/adm/nettl.LOG00) should then be monitored for the following message:

```
HPPCI 10/100Base-T driver encountered a Transmit Underflow
```

If a significant number of these messages occur, and the timestamps for each of the messages are within 30 seconds of each other, then the specified networking interface will suffer a noticeable performance drop. Corrective action must be taken to resolve this problem.

Corrective Action

The PCI 100BT product supports 3 levels of Transmit Threshold. These 3 levels are modified via the -S option of the lanadmin command as follows:

```
lanadmin -S TransmitThreshold nmid
```

where:

a TransmitThreshold of 1024 is somewhat aggressive

a TransmitThreshold of 512 is most aggressive

a TransmitThreshold of 1500 is conservative

In all of the cases above after setting the Transmit Threshold mode as specified, the lanadmin command will echo the current speed of the interface as follows; this output may be ignored (output shown for 100 Mbits/s operation):

```
old speed= 100000000
new speed= 100000000
```

After issuing the `lanadmin -S` you must wait at least 5 seconds before attempting to use the specified network interface.

If the desired Transmit Threshold setting needs to be effective in all subsequent reboots, you must create an SD script and include it in the **/sbin/init.d** directory so that it gets executed on each reboot.

Troubleshooting Overview

10/100Base-TX problems can be caused by problems in a variety of hardware and software components. The problem impacting your system may originate in another part of the 10/100Base-TX network.

As with any troubleshooting, a systematic approach is helpful. The following two tables and the following flowcharts provide a logical sequence of steps to follow when troubleshooting 10/100Base-TX/9000. Using the diagnostic flowcharts provided in this chapter, identify whether the problem is with 10/100Base-TX/9000 or any of the connections to the hub or switch, or whether it is in some other part of the network, verify your assumptions and, if it is limited to 10/100Base-TX/9000 software or hardware, correct the problem.

NOTE

To quickly isolate and diagnose 10/100Base-TX/9000 problems, follow the steps in the troubleshooting flowcharts, beginning with Flowchart 1, and stay with the flowcharts until the problems are resolved. Continue sequentially through flowcharts 2, 3, 4, 5, 6, and 7, referring back to flowchart 1 (*ping*) until you have corrected the problems.

If you cannot solve the problem on your own, contact your HP representative. Use the guidelines at the end of chapter 3 to help you effectively communicate what is wrong. The 10/100Base-TX product uses diagnostic tools compatible with the HP LAN/9000 Link product.

Diagnostic Flowcharts

Below is a summary of the types of network tests in the diagnostic flowcharts. Follow the flowcharts in sequence beginning with flowchart 1. Continue sequentially through flowcharts 2, 3, 4, 5, 6, 7, 8, and 9, referring back to flowchart 1 (*ping*), as indicated at the end of each flowchart, until you have corrected the problem.

Table 6-1 Flowchart Descriptions

Flowchart	Description
1	Network Level Loopback Test
2	10/100Base-TX Connections/LED Test
3, 4, and 5	Configuration Test
6	Network Level Loopback Test
7	Link Level Loopback Test
8	Transport Level Loopback Test (using ARPA)
9	Bridge/Gateway Loopback Test

Network Level Loopback Test: Checks roundtrip communication between Network Layers on the source and target host using the *ping(1M)* command.

10/100Base-TX Connections/LED Test: Checks that all the hardware connections between your system and the 10/100Base-TX network are connected and operational.

Configuration Test: Verifies the configuration of the network interface on a host using the *lanscan(1M)*, *netfmt -vf*, *lanadmin(1M)*, and *ifconfig(1M)* commands.

Network Level Loopback Test (cont): Checks *arp* entries using the *arp(1M)* command.

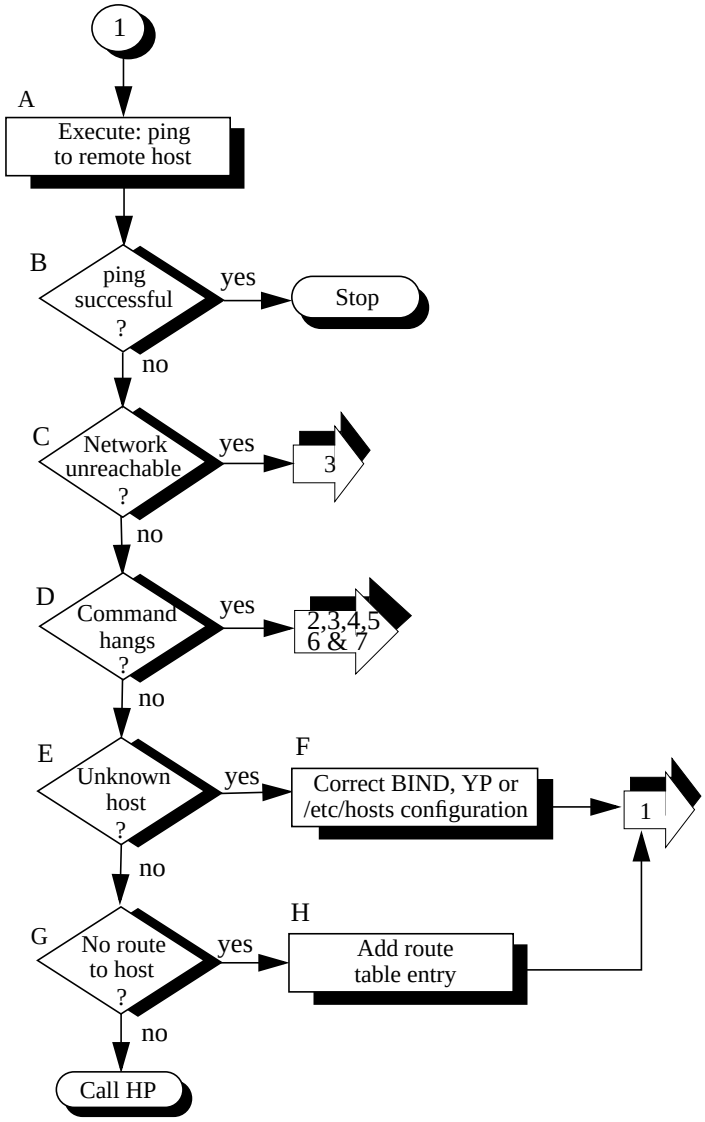
Link Level Loopback Test: Checks roundtrip communication between Link Levels on the source and target host using the *linkloop(1M)* diagnostic.

Transport Level Loopback Test: Checks roundtrip communication between Transport Layers on the source and target host using ARPA services *telnet* and *ftp* commands.

Bridge/Gateway Loopback Test: Checks general network connections through a gateway.

Flowchart 1: Network Level Loopback Test

Figure 6-1 Flowchart 1: Network Level Loopback Test



Flowchart 1 Procedures

A. **Execute: ping to remote host.** Using *ping(1M)*, send a message to the remote host to which you are having problems connecting. For example:

```
ping spiff
```

B. **ping successful?** A message is printed to *stdout* for each *ping* packet returned by the remote host. If packets are being returned, your system has network level connectivity to the remote host. Note what percentage of the total packets are lost, if any. Losing ten percent or more may indicate the network or remote host is extremely busy. You may also find it useful to note the round-trip transmission times. Periodically high transmission times may indicate that the network or remote host is extremely busy. Consistently high transmission times may indicate the local host is extremely busy. If a message is not returned after executing *ping*, *ping* is not successful. Do **Cntrl C** to stop the *ping* output.

C. **Network unreachable?** If yes, go to flowchart 3 to display connection status using the *lanscan(1M)* command.

D. **Command hangs.** If a message is not returned after executing *ping*, go to flowcharts 2 through 7, referring back to flowchart 1 (*ping*) until you have corrected the problem.

E. **Unknown host?** If you receive this message, go to step F.

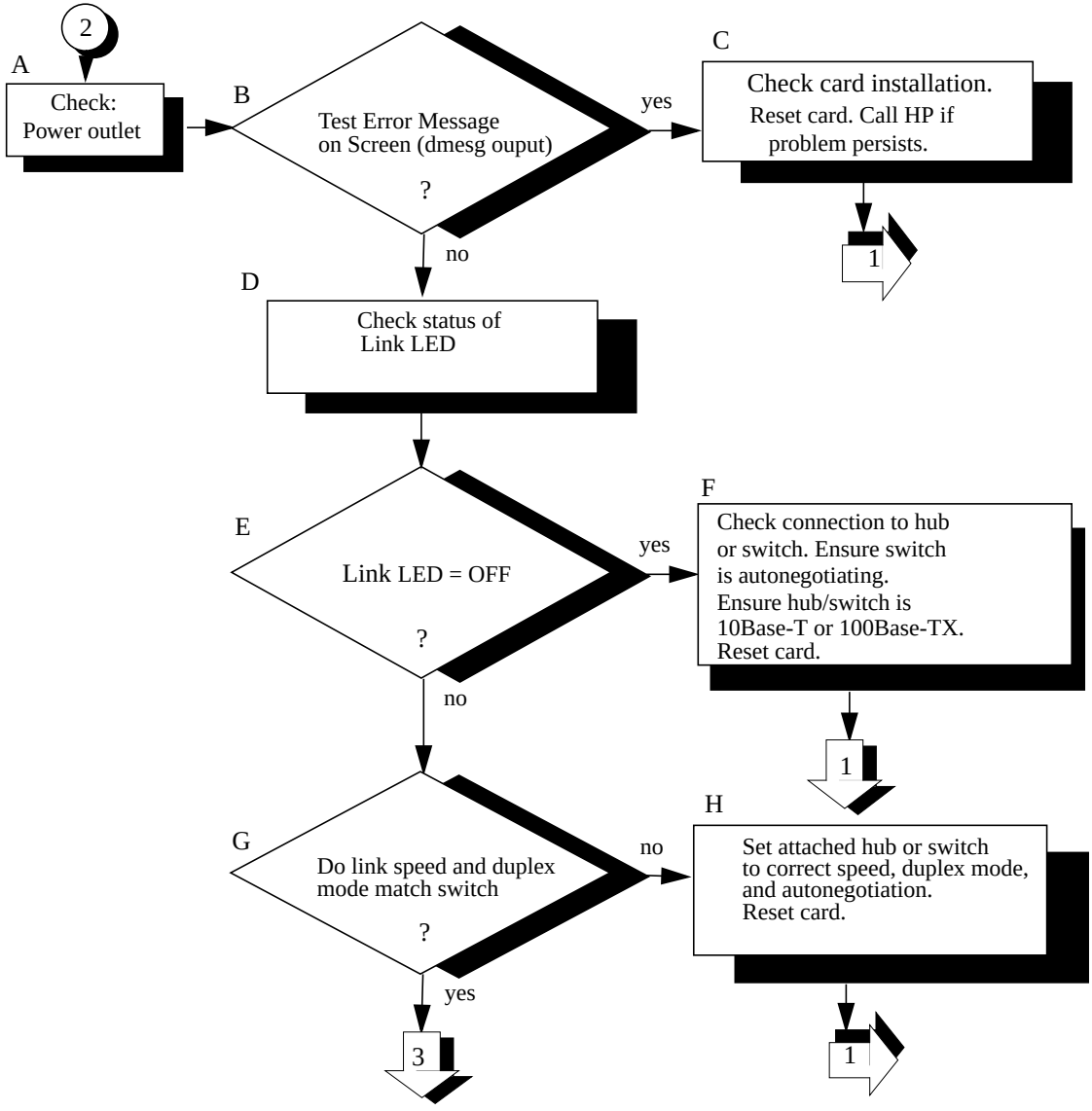
F. **Correct BIND, YP or hosts configuration**. Add the missing host name and start again with flowchart 1.

G. **No route to host?** If `Error= Sendto: No route to host`, go to Step H. Otherwise, call your HP representative for help.

H. **Add route table entry.** Using *route*, add a route table entry for that host. Refer to the *route(1M)* online man page for more details. Start again with flowchart 1.

Flowchart 2: 10/100Base-TX Connections/LED Test

Figure 6-2 Flowchart 2: 10/100Base-TX Connections/LED Test



Flowchart 2 Procedures

A. **Check Power outlet.** Ensure the power cord is plugged in to a live outlet.

B. **Test Error Message on Screen? At the HP-UX prompt, type the dmesg command, and look for an error message. Does the dmesg output show an error message from btlan?** If not, go to step D.

Note: even if the Test LED is OFF, a card problem is still possible if either of the following two messages appear:

```
btlan: Error: Motherboard failed to complete reset.
```

```
btlan: Error: Motherboard failed selftest;error code= 0x?
```

C. **Check card installation. If dmesg reported an error message from btlan, reset card according to Steps D through G in Flowchart 4. If problem persists, call HP.** Go back to flowchart 1.

D. Check status of Link LED.

E. **Link LED = OFF?** If it is off, proceed to step F.

If Link LED = ON, proceed to step G.

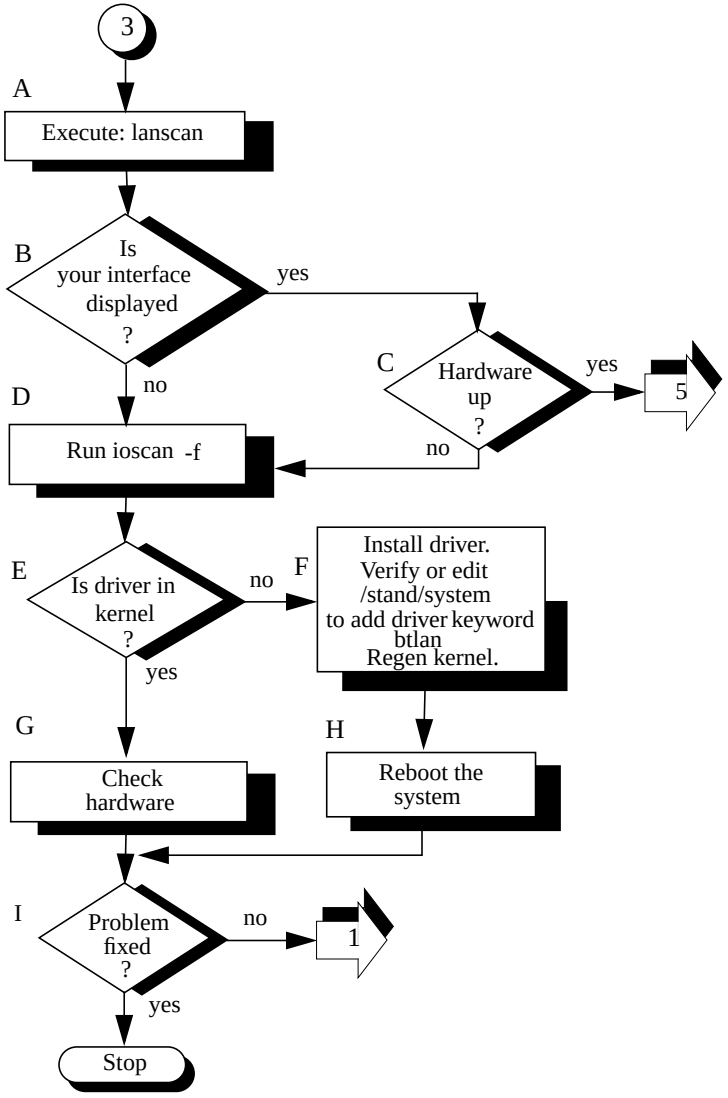
F. If Link LED = OFF, check connection to hub or switch. Ensure switch is *not* autonegotiating. Ensure hub or switch is 10Base-T or 100Base-TX. Reset card according to Steps D through G in Flowchart 4. Go back to flowchart 1.

G. **Do link speed and duplex mode match switch?** If they do, proceed to flowchart 3.

H. **If Link speed and duplex mode do not match what you expect, set attached hub or switch to the correct link speed and duplex mode, and enable autonegotiation. Reset card according to Steps D through G in Flowchart 4.** Go back to flowchart 1.

Flowchart 3: Configuration Test

Figure 6-3 Flowchart 3: Configuration Test



Flowchart 3 Procedures

NOTE Check that your 10/100Base-TX connectors to the card and hub (or wall plug) are fully connected before beginning this flowchart.

A. **Execute: lanscan.** Enter the *lanscan* command to display information about LAN cards that are successfully bound to the system. See the *lanscan* online manpage for more detailed information.

B. **Is your interface displayed?** *lanscan shows* information about every LAN card in the system backplane. The Hardware Path of one of the entries should correspond to the PCI 10/100Base-TX card slot multiplied times 4. For example, a hardware path of 32 corresponds to an PCI 10/100Base-TX card in slot 8.

C. Hardware up.The hardware state is operational if up is displayed for the 10/100Base-TX card under the Hardware State heading. If it is, continue to flowchart 5. If not, go to D.

D. **Run ioscan.** *ioscan* will scan the system hardware and list the results. If you execute ioscan -f, output

similar to the following will be displayed:

```
Class       I  H/W Path     Driver      S/W State H/W Type  Description
=============================================================================
bc          0              root        CLAIMED   BUS_NEXUS
bc          1  8            ccio        CLAIMED   BUS_NEXUS I/O Adapter
bc          2  10           ccio        CLAIMED   BUS_NEXUS I/O Adapter
ext_bus     0  10/0         c720        CLAIMED   INTERFACE GSC built-in
                                                   Fast/Wide SCSI Interface
bc          3  10/4         bc          CLAIMED   BUS_NEXUS Bus Converter
tty         0  10/4/0       mux2        CLAIMED   INTERFACE MUX
lanmux      2  10/4/4       lanmux0     CLAIMED   INTERFACE HP J2146A - 80
lan         1  10/4/4.1     lan3        CLAIMED   INTERFACE
ba          0  10/8         GSCtoPCI    CLAIMED   BUS_NEXUS PCI Bus Bridge
lan         2  10/8/1/0     btlan CLAIMED   PCI (10110009)
lan         3  10/8/2/0     btlan CLAIMED   PCI (10110009)
ba          1  10/12        bus_adapter CLAIMED   BUS_NEXUS Core I/O Adapt
ext_bus     2  10/12/0      CentIf      CLAIMED   INTERFACE Built-in Paral
                                                   Interface
ext_bus     1  10/12/5      c720        CLAIMED   INTERFACE Built-in SCSI
target      3  10/12/5.2    tgt         CLAIMED   DEVICE
disk        2  10/12/5.2.0  sdisk       CLAIMED   DEVICE    TOSHIBA CD-ROM
XM-5401TA
target      3  10/12/5.7    tgt         CLAIMED   DEVICE
ct1         1  10/12/5.7.0  sct1        CLAIMED   DEVICE    Initiator
lan         0  10/12/6      lan2        CLAIMED   INTERFACE Built-in LAN
ps2         0  10/12/7      ps2         CLAIMED   INTERFACE Built-in Keyboar
processor   0  32           processor   CLAIMED   PROCESSOR Processor
processor   1  34           processor   CLAIMED   PROCESSOR Processor
```

E. **Is driver in kernel?** If the driver has not been generated into the kernel, *ioscan* output will be:

```
ioscan -f

Class       I  H/W Path  Driver    S/W State H/W Type
Description

=============================================================
====
unknown    -1  10/4/4      UNKNOWN   UNCLAIMED INTERFACE
```

The class and driver fields alone will indicate "unknown" status if the kernel has not been generated. If the driver has not been generated, continue to step H. If the driver is in the kernel, go to step G.

F. **Verify or edit /stand/system and regen kernel.** Verify/edit */stand/system* contains the *btlan* keyword. If not, see "Creating a New Kernel" in chapter 3 of the *Installing and Administering LAN/9000 Software* manual for instructions on how to edit **/stand/system** to create a new kernel.

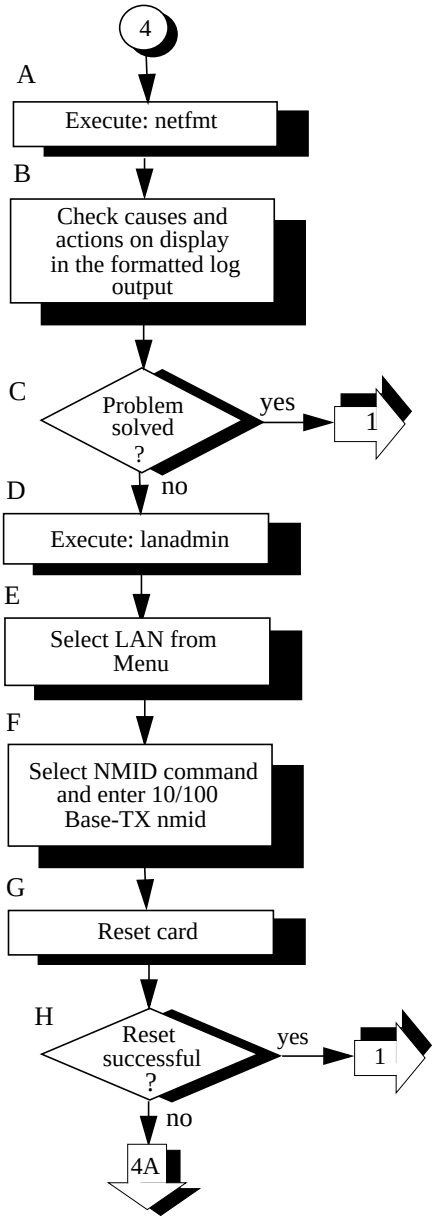
G. **Check hardware.** Verify that the network card is seated correctly and that it is operational.

H. **Reboot the system.**

I. **Problem fixed?** If you have found the 10/100Base-TX card problem, stop. If not, start again with flowchart 1.

Flowchart 4: Configuration Test

Figure 6-4 **Flowchart 4: Configuration Test**



Flowchart 4 Procedures

A. **Execute: netfmt.** Use the *netfmt* command to view log data (error and disaster messages). An example command is shown below.

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

B. **Check causes and actions on display in the formatted log output.** Use the time stamp to find the proper logs. Ensure that you are looking at the 10/100Base-TX information.

C. **Problem solved.** If yes, go to flowchart 1. If not, continue with step D.

D. **Execute lanadmin**. Run *lanadmin(1M).* For a complete description of this command, refer to the *lanadmin(1M)* on-line manual page.

E. **Select LAN from Menu. Select lan** from the menu to enter LAN Interface Diagnostic.

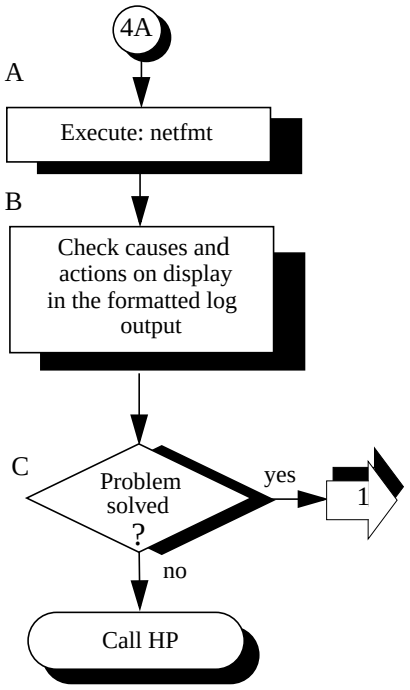
F. **Select the NMID command and enter the 10/100Base-TX NMID**. You can use the lanscan command to find the current NMID for 10/100Base-TX. The NMID you enter becomes the current device to be tested.

G. **Reset the card according to Steps D through G in Flowchart 4**. Using the reset command in lanadmin re-executes the LAN card self-test.

H. **Reset successful?** The reset is successful if no errors are displayed as a result of the reset command. If the self-test was successful, the problem may be that you are not connected to the 10/100Base-TX network. Correct the problem and verify the resolution by continuing with flowchart 1. Otherwise, go to flowchart 4A.

Flowchart 4A: Configuration Test

Figure 6-5 **Flowchart 4A: Configuration Test**



Flowchart 4A Procedures

A. **Execute: netfmt.** Use the *netfmt* command to view log data (error and disaster messages). An example *netfmt* command is shown below:

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

Extend the search to LOG01 as information may have rolled (overflowed) into this file from LOG00.

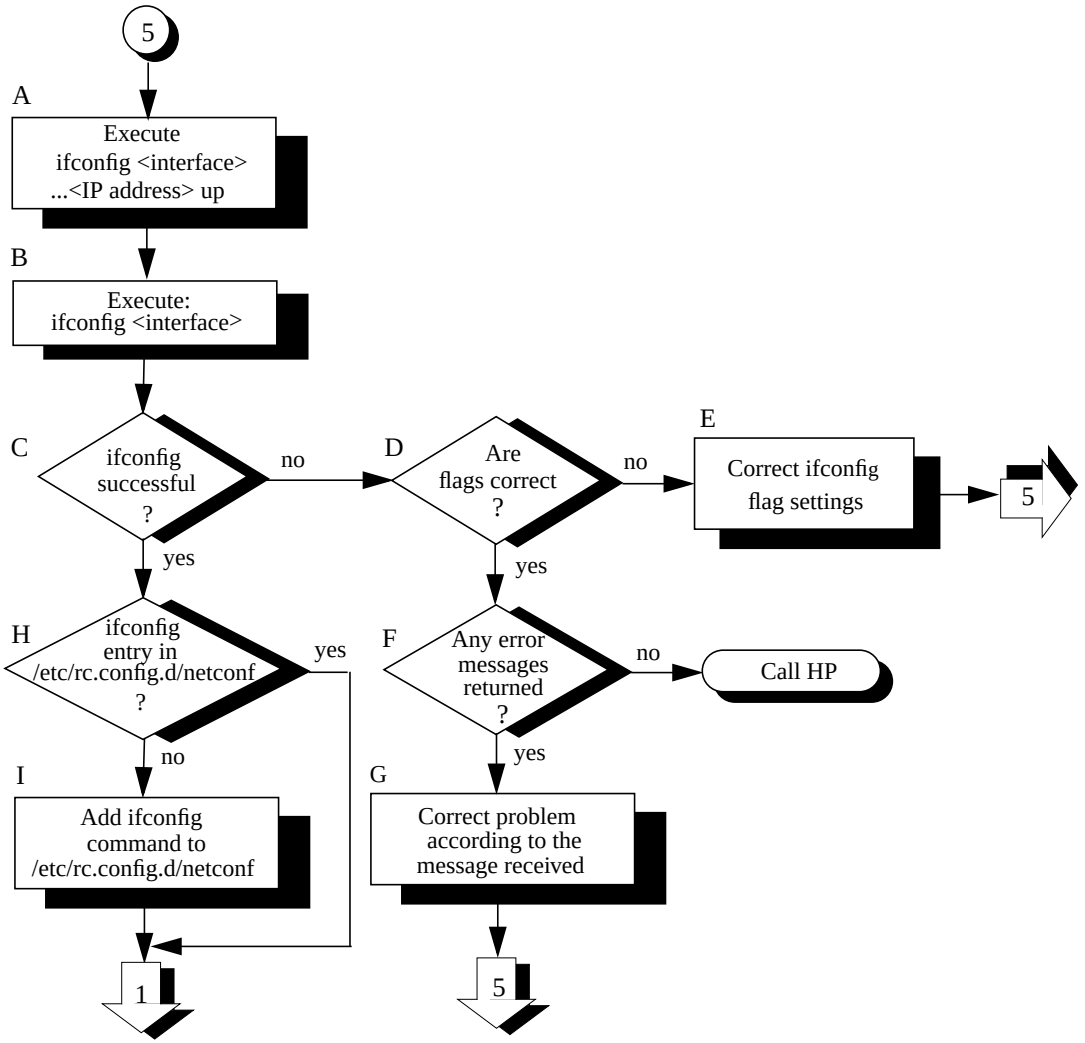
B. **Check causes and actions on display in the formatted log output.** Use the time stamp to find the proper logs. Ensure that you are looking at the

10/100Base-TX information.

C. **Problem solved.** If yes, go to flowchart 1. If not, contact your HP representative.

Flowchart 5: Configuration Test

Figure 6-6 Flowchart 5: Configuration Test



Flowchart 5 Procedures

A. **Execute: ifconfig <interface> <IP address> up.**

Execute *ifconfig* on the interface you want to configure in order to ensure that the interface is enabled. For example, to configure the 10/100Base-TX interface *lan1*, enter:

```
ifconfig lan1 192.6.1.17 up
```

For more examples of the *ifconfig* command, refer to the *ifconfig(1M)* online man page.

B. **Execute: ifconfig <interface>.** Execute *ifconfig* without the up parameter again on the interface you want to test to check the flag setting for the up parameter. For example, to check the 10/100Base-TX interface *lan1*, enter:

```
ifconfig lan1
```

C. **ifconfig successful?** *ifconfig* is successful if the output shows the correct Internet address and the flags: <UP,BROADCAST, NOTRAILERS, RUNNING>.

Note: Make sure the UP flag is displayed.

D. Are flags correct? If flags are not correct, use the ifconfig command to correct them. If they are correct, go to step F.

E. **Correct ifconfig flag settings.** If *ifconfig* returns an incorrect flag setting, re-execute the command with the proper setting. For more information, refer to the *ifconfig(1M)* online man page. Start again with flowchart 5, as necessary.

F. **Any error message returned?** If *ifconfig* is not successful, and an error message appears, go to Step G. If no error messages appear, contact your HP representative.

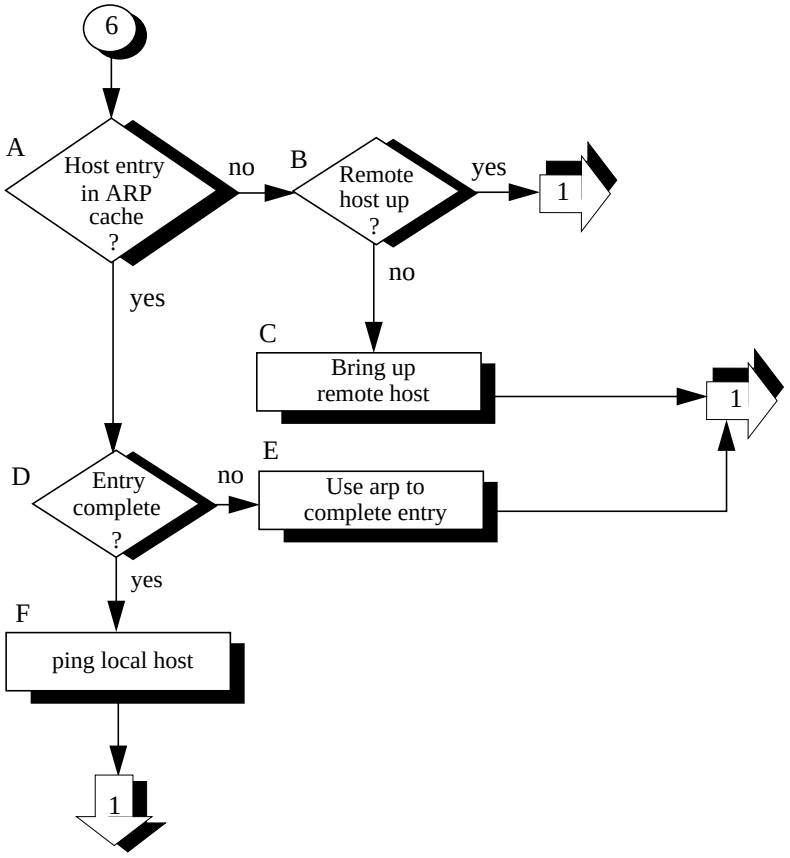
G. **Correct problem according to the message received.** If you received an error message, make the appropriate corrections stated in the message and then begin this procedure again.

H. **ifconfig entry in /etc/rc.config.d/netconf?** Check that there is an entry in the */etc/rc.config.d/netconf* file for your 10/100Base-TX card.

I. **Add ifconfig command to /etc/rc.config.d/netconf file.** Add the *ifconfig* command to */etc/rc.config.d/netconf*, and *reboot*. For more information, refer to the *ifconfig(1M)* online man page. Go to flowchart 1 to verify that the problem has been solved.

Flowchart 6: Network Level Loopback Test

Figure 6-7 **Flowchart 6: Network Level Loopback Test**



Flowchart 6 Procedures

A. **Host entry in ARP cache?** Using *arp*, check that an entry exists for the remote host in your system's ARP cache. For example:

```
arp spiff
```

B. **Remote host up?** If there is no ARP cache entry for the remote host, first check that the remote host is up. If not, the remote host has not broadcast an ARP message, and that probably is why there is no entry in the ARP cache.

C. **Bring-up remote host.** Have the node manager of the remote host bring that system up and start again with flowchart 1.

D. **Entry complete?** Perhaps there is an ARP cache entry, but it is wrong or not complete. If the entry is complete, go to step F.

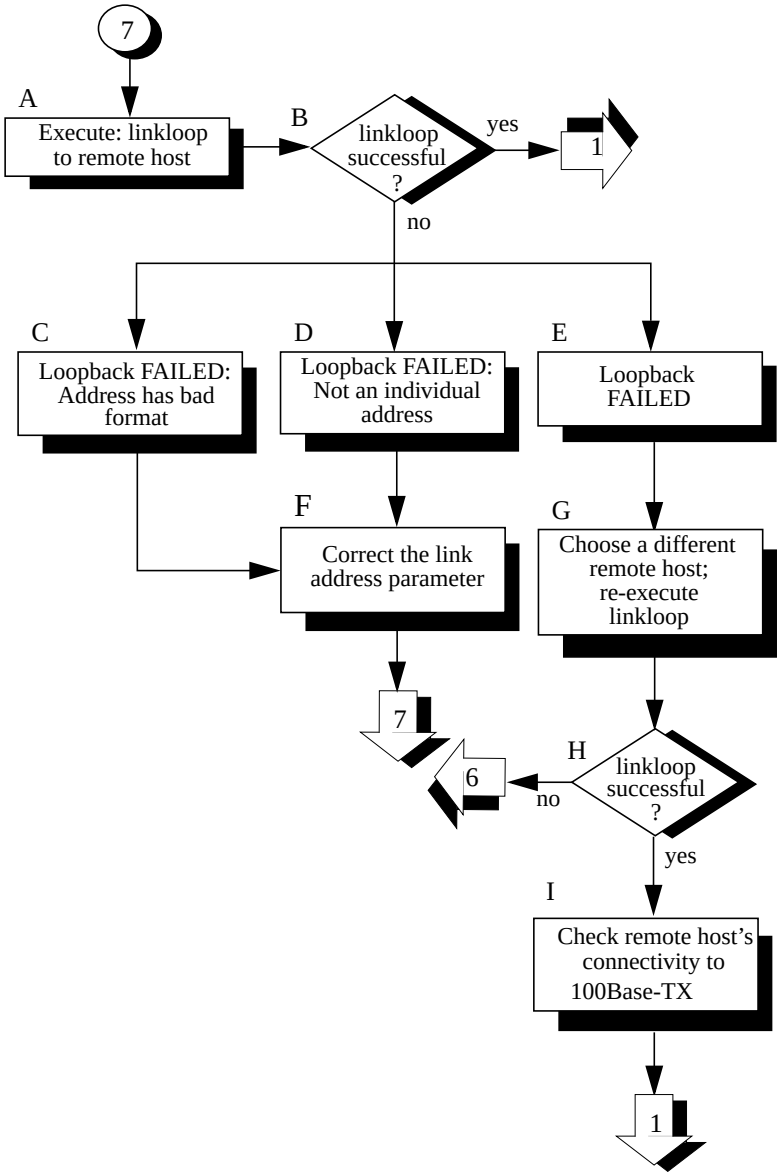
E. **Use arp to complete entry.** Using *arp*, enter the correct Station Address. For more information, refer to the *arp(1M)* online man page. Start again with flowchart 1.

F. **ping local host.** Using *ping*, do an internal loopback on your own system. In other words, *ping* your own system.

If the internal loopback is successful, your system is operating properly to the Network Layer (OSI Layer 3). In addition, you know an ARP cache entry for the remote host exists on your system. Start again with Flowchart 1.

Flowchart 7: Link Level Loopback Test

Figure 6-8 Flowchart 7: Link Level Loopback Test



Flowchart 7 Procedures

A. **Execute: linkloop to remote host.** Enter the NMID of your 10/100Base-TX card and link level address (station address) of the remote host in hexadecimal form (preceded by "0x"). Execute *lanscan (1M) on the local system* to find the NMID and obtain the link level address (station address) of the remote host. For more information on *linkloop*, refer to the *linkloop(1M)* online man page.

B. **linkloop successful?** If the test was successful, go to flowchart 1 to verify that the problem is solved. Network connectivity is o.k. through the Link Layer (OSI Layer 2). If not successful, note which error was returned and continue with this flowchart.

C. **Loopback failed: Address has bad format.** The link level address is not correct. Go to F.

D. **Loopback failed: Not an individual address.** The link level address is not correct. The first hexadecimal digit has its high order bit set (if the value is equal to or greater than 8, it is set). This means it is a multicast or broadcast address, which is not allowed. The address must be unique to one remote host. Go to F.

E. **Loopback failed.** The remote host did not respond. Go to G.

F. **Correct the link address parameter.** Change the link level address to an allowed value and start again with flowchart 7.

G. **Choose a different remote host; re-execute linkloop.** Restart flowchart 7 using a different remote host.

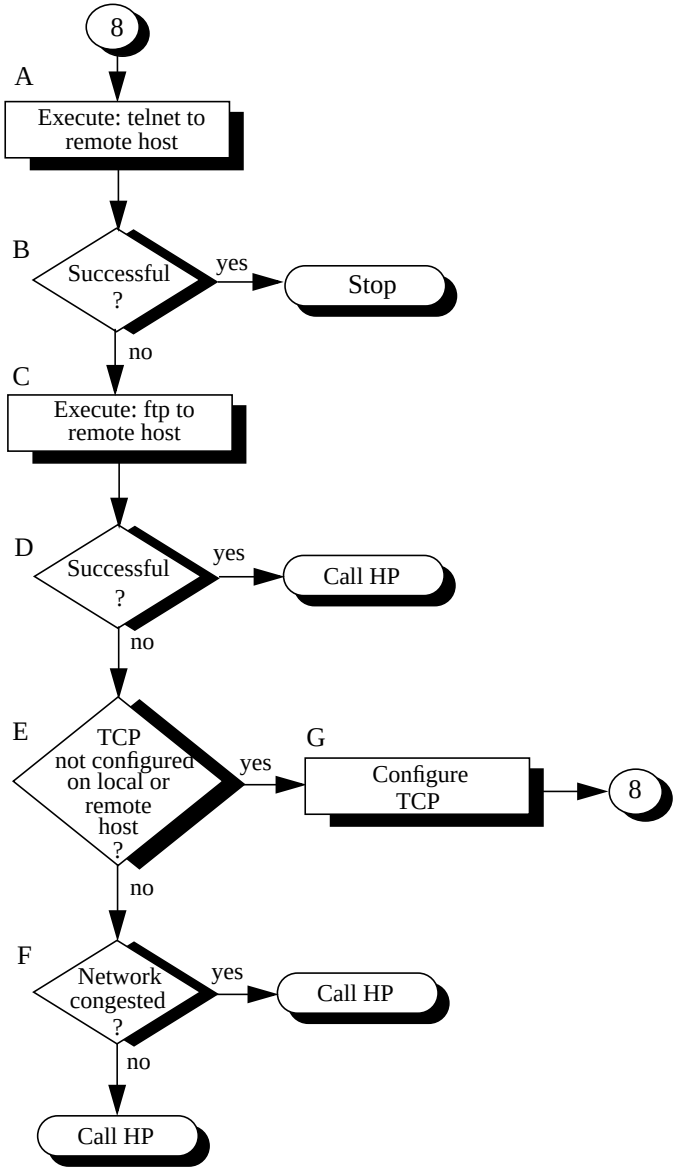
H. **linkloop successful?** If the test was successful, go to step I. Network connectivity is o.k. through the Link Layer (OSI Layer 2). If not successful, the problem may be with the remote system. Go to flowchart 6.

I. **Check remote host's connectivity to 10/100Base-TX.** Contact the node manager of the remote host. Check that the host is configured correctly and that its network interface is up. If necessary, use

flowchart 1 to verify configuration of the remote host.

Flowchart 8: Transport Level Loopback Test (using ARPA)

Figure 6-9 **Flowchart 8: Transport Level Loopback Test (using ARPA)**



Flowchart 8 Procedures

A. **Execute: telnet to remote host.** Try to establish a *telnet* connection to the remote host.

B. **Successful?** If your *telnet* attempt was successful, stop. The connection is o.k. through the Transport Layer (OSI Layer 4).

C. **Execute: ftp to remote host.** Unlike *telnet*, *ftp* does not go through a pseudoterminal driver (pty) on your system. This step tests to see if the pty is why *telnet* failed.

D. **Successful?** If *ftp* is successful, you likely have a problem with a pty on your system. Contact your HP representative.

E. **TCP not configured on local nor remote host?** Neither *telnet* or *ftp* will work if TCP is not configured on either side of the connection. Check the */etc/protocols* file on both hosts to be sure TCP is installed and configured.

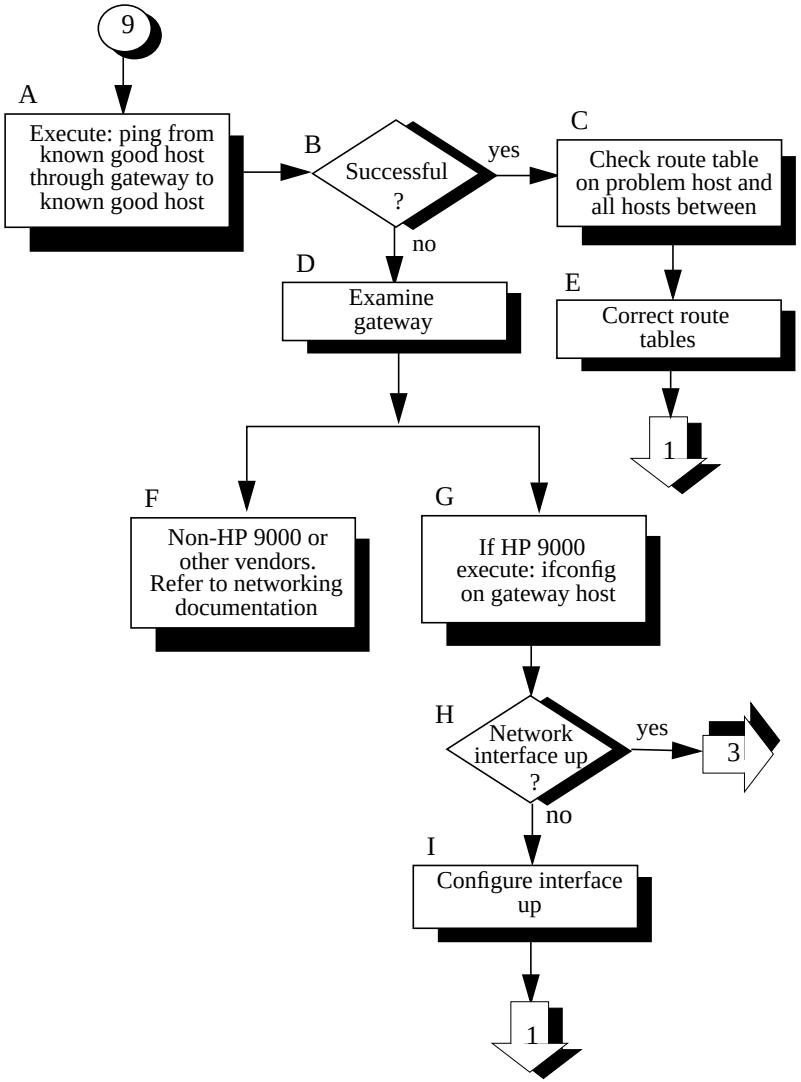
F. **Network congested?** If TCP is installed on both hosts, do a file transfer to another remote host on the network. Use *netstat(1)* to check for lost packets.

If network congestion is not the cause, more detailed diagnostics are required. Again, contact your HP representative.

G. **Configure TCP.** If necessary, install TCP on either or both hosts. Start again with this flowchart.

Flowchart 9: Bridge/Gateway Loopback Test

Figure 6-10 **Flowchart 9: Bridge and Gateway Loopback Test**



Flowchart 9 Procedures

A. **Execute: ping from known good host through gateway to known good remote host.** This will test gateway connectivity to the remote network.

B. **Successful?** If the executing *ping* returned successfully, the problem may exist in the routing table for the problem host. Go to C.

C. **Check route table on problem host and all hosts in between.** Execute *netstat -r* to examine a route table.

D. **Examine gateway.** If the gateway is an HP 9000, go to G. If it is not, go to F.

E. **Correct route tables.** Ensure that the proper IP/Internet addresses are assigned in the *Destination* and *Gateway* fields. If you are using subnetting, make sure that the destination is what you expect: a network or a host. Go to flowchart 1 to verify that the problem is solved.

F. **Non-HP 9000 or other vendors. Refer to networking documentation**. Refer to the documentation that came with the gateway for additional diagnostics.

G. **If HP 9000, execute ifconfig on gateway host.** Execute *ifconfig* for all network interfaces on the gateway.

H. **Network interface up?** If the output from *ifconfig* does not include the *UP* parameter, the network interface is down. Execute *netstat -i* to check the status of the network interfaces. An asterisk (*) indicates that the interface is down. If the network interface is down, go to I.

If the network interfaces are UP, start again with flowchart 3. Using flowchart 3, test all network interfaces on the gateway.

I. **Configure interface up.** Execute *ifconfig* on each interface to bring it up. Start again with flowchart 1. Using flowchart 1, test all network interfaces on the

gateway.

A 10/100Base-TX Interface Card Statistics

LAN Interface Status Display

This appendix contains descriptions of the RFC 1213 MIB II statistics fields for LAN interface cards which are displayed on the screen with the *display* command in *lanadmin* LAN Interface Test Mode. A description of each field follows the display.

```
                    LAN INTERFACE STATUS DISPLAY
                     Tue, Nov 30,1999 11:45:17

Network Management ID           = 5
Description                     = btlan Hewlett-Packard
                                  10/100Base-TX Full-Duplex
                                  Hw Rev 0
Type (value)                    = ethernet-csmacd(6)
MTU Size                        = 1500
Speed                           = 100000000
Station Address                 = 0x80009d40d69
Administration Status (value)   = up(1)
Operation Status (value)        = down(2)
Last Change                     = 0
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                           = 3
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

For more detailed information about the fields described below, refer to RFC 1213.

Field	Description
Network Management ID	A unique ID assigned by the system for the network management of each network interface.
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. 10/100Base-TX can have one of the following values: *ethernet-csmacd(6)*, or *iso88023-csmacd(7*). The following values are for other networking products.
MTU Size	The size of the largest datagram which can be sent/received on the interface specified in octets. This value is 1500.
Speed in bits per second	The speed of the 10/100Base-TX card, 10 Mbit/s or 100 Mbit/s.
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 desired state of the interface. This parameter is set to `up(1)` and is not configurable. It will have one of the following values: up(1) — Ready to pass packets down(2) — Not operative testing(3) — In test mode

Operation Status The current operational state of the interface. This value is the same as the hardware status displayed by *lanscan(1M)*. It will have one of the following values.

up(1)	Ready to pass packets
down(2)	Not operative (card is down)
testing(3)	In test mode

Last Change The value of SysUpTime 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, to prevent their being delivered to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.

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 which 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 their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.

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

Field	Description
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 in 10-Base-T mode. For 100Base-TX mode, excessive collisions indicate the number of 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 framer 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.

Create a Record or Map of Your Internetwork

Be sure to create or update a record of your network and internetwork before attempting 10/100Base-TX installation. You may wish to create a map showing how pieces of your internetwork are related. Your records should include:

- Approximate dimensions of the building or room containing the 10/100Base-TX network.
- Location of, routers, bridges, and gateways
- Location of nodes and node connections.
- Location of network segments and subnets within each segment
- Hostname of each node.
- Internet Address and Alias of each node (in the case of gateways, each 10/100Base-TX card has its own Internet Address and Alias).
- Hardware Path of each card in the system including 10/100Base-TX cards. You can use this information as part of a disaster recovery plan.
- Version number of the operating system installed on each node.

B Hardware Reference Information

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

Basic Troubleshooting Tips

Listed below are some tips on troubleshooting common hardware problems. Refer to this information when you are trying to identify 10/100Base-TX hardware problems.

- Check the network cables. Make sure the network cable connections are secure and that the cables are not damaged. If you find any connections that are loose, or cables that are damaged, fix the problem and then see if your computer can communicate on the network
- Check the Link LED on the LAN card bulkhead. If the Link LED is ON and there still is a fault, at the HP-UX command line, type: `dmesg` and view the output on your screen to see if any error messages exist.

The possible causes of a fault condition could be:

- Defective cable
- Cable not connected to active hub or switch
- Defective card

Connector Information

This section includes pin usage information for the RJ-45 twisted pair connector. Connectors on LAN adapters adhere to appropriate standards agreed upon by various standards bodies and are widely available.

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.

CAUTION The unshielded twisted-pair cables you use with the PCI 10/100Base-TX card must comply with the IEEE 802.3u 100Base-TX standards in order to meet emissions requirements. These standards support cabling up to 100 meters only.

PCI 10/100Base-TX Card Twisted-Pair Connector

The same connector on the card is used for either 10Base-T or 100Base-TX operation. The operating mode is determined by the setting of the hub or switch to which the card is connected.

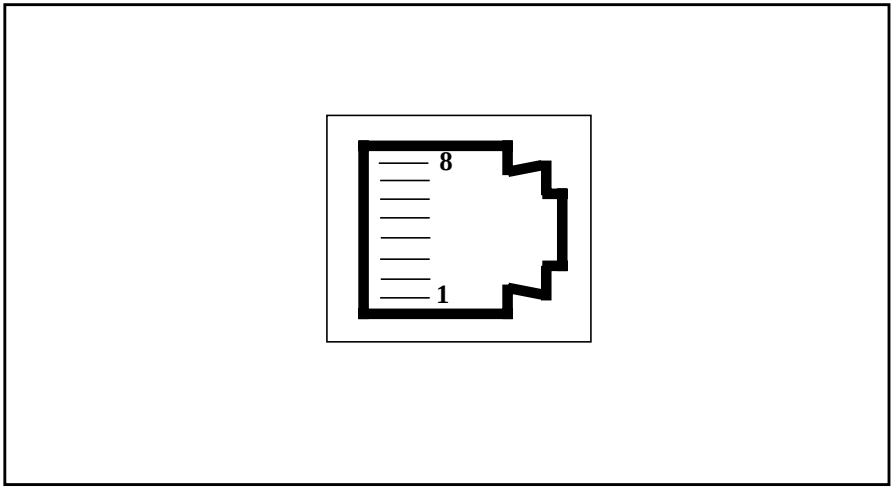
Connector Pin Usage for 10-Mbit/s Twisted-Pair Connector

Use unshielded twisted-pair cables that comply with the IEEE 802.3 Type 10Base-T standard.

Table B-1 IEEE 802.3 Type 10Base-T Standard

Pins	Signal
1	(transmit +)
2	(transmit -)
3	(receive +)
6	(receive -)

Figure B-1 Pin Layout of RJ-45 Connector on PCI Card



Available HP Cables:

- HP 92268A - 4 meter with attached 8-pin connectors.
- HP92268B - 8-meter with attached 8-pin connectors.
- HP 92268C - 16-meter with attached 8-pin connectors.
- HP 92268D - 32-meter with attached 8-pin connectors.
- HP 92268N- 300-meter (no connectors supplied).

Connector Pin Usage for 100-Mbit/s Twisted-Pair Connector

Use Category 5 unshielded twisted-pair cables that comply with the IEEE 802.3u 100Base-TX standard.

Table B-2 IEEE 802.3u 100Base-TX Standard

Pins	Signal TX End Node
1	TX:1+
2	TX:1-
3	RX:1+
6	RX:1-
4	Unused
5	Unused
7	Unused
8	Unused

Available HP Cables:

- HP 92268A - 4 meter with attached 8-pin connectors.
- HP92268B - 8-meter with attached 8-pin connectors.
- HP 92268C - 16-meter with attached 8-pin connectors.
- HP 92268D - 32-meter with attached 8-pin connectors.
- HP 92268N- 300-meter (no connectors supplied).

Cable Lengths:

The maximum length of the cable from the hub to each node for 100Base-TX is 100 meters. The cable must be category 5 UTP for 100Base-TX operation. For additional information on cable lengths and number of nodes supported by 10/100Base-TX, refer to the *IEEE 802.3u Specification* and *Fast Ethernet, Dawn of a New Network* by Howard W. Johnson (published 1996 by Prentice Hall PTR, Upper Saddle River, New Jersey 07458. Phone 800-382-3419. The ISBN number is 0-13-352643-7).

Glossary

10Base-T: A 10 Mbit/s communication method specified in the IEEE 802.3u-1995 standard.

100Base-T: A 100 Mbit/s communication method specified in the IEEE 802.3u-1995 standard. The official name for Fast Ethernet.

100Base-TX: A specific implementation of 100Base-T designed to operate over Category 5 UTP cabling.

Address: A specific location in memory, designated either numerically or by a symbolic name.

Alias: Name of the interface that corresponds to a given Internet address on a system. Refer to the network map in appendix B for example usage.

Asynchronous Data Transfer: One of the ways data is transferred over the SCSI bus. It is slower than synchronous data transfer.

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.

Autosensing: The ability of the 10/100Base-TX card to detect a static speed of a hub or switch and automatically configure itself to operate accordingly. This does not require the two-way information exchange and negotiation process of full autonegotiation.

BIOS (Basic Input/Output System): Software that provides basic read/write capability. Usually kept as firmware (ROM based). The system BIOS on the main board of a computer is used to boot and control the system. The SCSI BIOS on the host adapter acts as an extension of the system BIOS.

Bit A binary digit. The smallest unit of information a computer uses. The value of a bit (0 or 1) represents a two-way choice, such as on or off, true or false.

Bus A collection of wires in a cable or copper traces on a circuit board used to transmit data, status, and control signals. EISA, PCI, and SCSI are examples of buses.

Bus Mastering A high-performance way to transfer data. The host adapter controls the transfer of data directly to and from system memory without bothering the computer's microprocessor. This is the fastest way for multi-tasking operating systems to transfer data.

Byte A unit of information consisting of eight bits.

CSMA/CD: Carrier sense multiple access with collision detection. The media access method implemented in IEEE 802.3u-1995.

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

Chain A topology in which every device is connected to two others, except for two-end devices that are connected to only one other.

CISPR (Committee, International and Special, for Protection in Radio) An international committee on radio frequency interference.

Configuration Refers to the way a computer is set up; the combined hardware components (computer, monitor, key board, and peripheral devices) that make up a computer system; or the software settings that allow the hardware components to communicate with each other.

CPU (central processing unit)

The "brain" of the computer that performs the actual computations. The term Micro Processor Unit (MPU) is also used.

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

Device Driver A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.

Differential A hardware configuration for connecting SCSI devices. It uses a pair of lines for each signal transfer (as opposed to single-ended SCSI which references each SCSI signal to a common ground).

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

DMA (direct memory access) A method of moving data from a storage device

directly to RAM, without using the CPU's resources.

DMA Bus Master A feature that allows a peripheral to control the flow of data to and from system memory by blocks, as opposed to PIO (Programmed I/O) where the flow is byte by byte.

EEPROM (electronically erasable programmable read-only memory) A memory chip typically used to store configuration information. See NVRAM.

EISA (Extended Industry Standard Architecture) An extension of the 16-bit ISA bus standard. It allows devices to perform 32-bit data transfers.

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

External SCSI Device A SCSI device installed outside the computer cabinet. External SCSI devices are connected in a chain using shielded cables.

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

FCC Federal Communications Commission.

File

A named collection of information, usually stored on a disk.

Firmware Software that is permanently stored in ROM. In the case of BIOS, it can be accessed during boot time without the aid of an operating or file system.

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.

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.

Hard Disk A rigid disk permanently sealed into a drive cartridge. A hard disk can

store very large amounts of information.

Hardware Path: An identifier assigned by the system according to the physical location (slot) of the card in the hardware backplane. On Series 800 systems, the I/O subsystem identifies each LAN card by its hardware path.

Host The computer system in which a SCSI host adapter is installed. It uses the SCSI host adapter to transfer information to and from devices attached to the SCSI bus.

Host Adapter A circuit board and/or integrated circuit device that provides a SCSI bus connection to the computer system.

Hostname: Name of system on the network. Refer to the network map in appendix B for example usage.

Hub: A network interconnection device that allows multiple devices to share a single logical link segment. Hubs are generally either 10 Mbit/s or 100 Mbit/s devices. Use either a 10Base-T or 100Base-TX hub with the 10/100Base-TX card.

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. For example, the 800 committees study local area network technologies. The 802.3 committee produced the standard for a CSMA/CD local area network, which has been adopted by ANSI.

IEEE 802.3u-1995 network: A 10 or 100 megabit-per-second 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.

Internal SCSI Device A SCSI device installed inside the computer cabinet. These devices are connected in a chain using an unshielded ribbon cable.

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 glossary entry.

IRQ (interrupt request channel) A path through which a device can get the immediate attention of the computer's CPU. The PCI bus assigns an IRQ path for each SCSI host adapter.

ISA (Industry Standard Architecture) A type of computer bus used in most PCs. It allows devices to send and receive data 16 bits at a time.

KByte (kilobyte) A measure of computer storage equal to 1024 bytes.

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 Bus A way to connect peripherals directly to the computer processor's data path. It bypasses the slower ISA and EISA buses. PCI is a local bus standard.

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

Logical Unit A subdivision, either logical or physical, of a SCSI device. Most devices have only one logical unit, but up to sixteen are allowed for a 16-bit SCSI bus and eight for an 8-bit SCSI bus.

LUN (logical unit number) An encoded three-bit number for the logical unit.

LVD (low-voltage differential) A robust design methodology that improves power consumption, data integrity, cable lengths, and support for multiple devices while providing a migration path for increased I/O performance.

Mainboard A large circuit board that holds RAM, ROM, the microprocessor, custom integrated circuits, and other components that make a computer work. It also has expansion slots for host adapters and other plug-in boards.

Main Memory The part of a computer's memory that is directly accessible by the CPU (usually synonymous with RAM).

Major Number: Unique value that identifies an individual hardware device.The number for the 10/100Base-TX card floats.

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.

MByte (megabyte) A measure of computer storage equal to 1024 kilobytes.

Motherboard See mainboard. In some countries, the term motherboard is not appropriate.

Multi-tasking The initiation and control of more than one sequence of operations. This allows programs to operate in parallel.

Multi-threading The simultaneous accessing of data by more than one SCSI device. This increases the aggregate data throughput.

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): On HP-UX 10.x, it was a unique ID assigned by the system for the network management of each network interface. Replaced on HP-UX 11.x by the PPA or physical point of attachment

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.

NVRAM (Non-Volatile Random Access Memory) An EEPROM (Electronically Erasable Read Only Memory chip) used to store configuration information.

Operating System A program that organizes the internal activities of the computer and its peripheral devices. An operating system performs basic tasks such as moving data to and from devices, and managing information in memory. It also provides the user interface.

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

Parity Checking A way to verify the accuracy of data transmitted over the SCSI bus. One bit in the transfer is used to make the sum of all the 1 bits either odd or even (for odd or even parity). If the sum is not correct, an error message appears. SCSI uses odd parity.

PCI: Peripheral component interconnect. A local bus specification that allows connection of integrated peripheral controller components, peripheral add-in boards, and processor/memory systems. It bypasses the slower ISA and EISA busses.

Peripheral Devices A hardware device (such as a video monitor, disk drive, printer, or CD-ROM) used with a computer and under the computer's control. SCSI peripherals are controlled through a SCSI host adapter.

Pin-1 Orientation The alignment of pin 1 on a SCSI cable connector and the pin 1 position on the SCSI connector into which it is inserted. External SCSI cables are keyed to ensure proper alignment, but internal SCSI ribbon cables may not be.

PIO (programmed input/output) A way the CPU can transfer data to and from memory via the computer's I/O ports. PIO can be faster than DMA, but requires CPU time.

Port Address Also Port Number. The address through which commands are sent to a host adapter board. This address is assigned by the PCI bus.

Port Number See Port Address.

PPA: Physical point of attachment.

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

Queue Tags A way to keep track of multiple commands while allowing increased throughput on the SCSI bus.

RAM (Random Access Memory) Generally, the computer's primary working memory in which program instructions and data are stored and are accessible to the CPU. Information can be written to and read from RAM. The contents of RAM are lost when the computer is turned off.

RISC Core Symbios SCSI chips contain a RISC (Reduced Instruction Set Computer) processor, programmed through microcode scripts.

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

ROM (Read-Only Memory) Memory from which information can be read but not changed. The contents of ROM are not erased when the computer is turned off.

SCAM (SCSI Configured AutoMatically) A method to automatically allocate SCSI IDs via software when SCAM compliant SCSI devices are attached.

SCSI (small computer system interface) A specification for a high-performance peripheral bus and command set. The original standard is now referred to as SCSI-1.

SCSI-2 The current SCSI specification that adds features to the original SCSI-1 standard.

SCSI-3 The next SCSI specification, that adds features to the SCSI-2 standard.

SCSI Bus A host adapter and one or more SCSI peripherals connected by cables in a linear chain configuration. The host adapter may exist anywhere on the chain, allowing connection of both internal and external SCSI devices. A system may have more than one SCSI bus by using multiple host adapters.

SCSI Device Any device conforming to the SCSI standard that attaches to the SCSI bus by means of a SCSI cable. This includes SCSI host adapters and SCSI peripherals.

SCSI ID A unique identification for each SCSI device on the SCSI bus. Each SCSI bus has fifteen available SCSI IDs numbered 0 through 15 for Wide SCSI or 0-7 for 8-bit SCSI. The host adapter is assigned ID 7, which gives it priority to control the bus.

SDMS (SCSI Device Management System) A Symbios software product that manages SCSI system I/O.

Single-Ended SCSI A hardware specification for connecting SCSI devices. It references each SCSI signal to a common ground, as opposed to differential SCSI and low-voltage differential SCSI, which use a separate return for each signal.

Subnetwork: Small discrete physical networks connected via gateways which share the same network address space. Refer to the *Installing and Administering LAN/9000 Software* manual 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 the *Installing and Administering LAN/9000 Software* manual 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 Mbit/s or 100 Mbit/s) while others allow port speeds to be configured or autonegotiated.

Synchronous Data Transfer

One of the ways data is transferred over the SCSI bus. Transfers are clocked with fixed-frequency pulses.

System BIOS Controls the low level POST (Power On Self Test) and basic operation of the CPU and computer system.

Termination The electrical connection required at each end of the SCSI bus, composed of a set of resistors.

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

Ultra SCSI A standard for SCSI data transfers. It allows a transfer rate of up to 20 MBytes/sec over an 8-bit SCSI bus, and up to 40 MBytes/sec over a 16-bit SCSI bus. STA (SCSI Trade Association) supports using the term “Ultra SCSI” over the older term “Fast-20.”

Ultra2 SCSI A standard for SCSI data transfers. It allows a transfer rate of up to 40 MBytes/sec over an 8-bit SCSI bus, and up to 80 MBytes/sec over a 16-bit SCSI bus. STA (SCSI Trade Association) supports using the term “Ultra2 SCSI” over the older term “Fast-40.”

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

VCCI Voluntary Control Council for Interference.

VHDCI Very High Density Cable Interconnect.

Wide SCSI A SCSI-2 feature allowing 16 or 32-bit transfers on the SCSI bus. This dramatically increases the transfer rate over the standard 8-bit SCSI bus.

Wide Ultra SCSI The SCSI Trade Association term for SCSI bus width 16 bits, SCSI bus speed maximum data rate 40 MBytes/sec.

Wide Ultra2 SCSI The SCSI Trade Association term for SCSI bus width 16 bits, SCSI bus speed maximum data rate 80 MBytes/sec.