Using
HSC 10/100Base-TX and FX/9000

Versions B.11.00.04 and B.10.20.07

J3622-90011
HP 9000 Networking
E0699

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Preface

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

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

The manual is organized as follows:

Chapter 1	“Installing and Configuring 10/100BASE-TX" describes how to install and configure 10/100BASE-TX software and hardware.
Chapter 2	“Configuring Network Connectivity Using SAM" describes the steps to configure remote connectivity automatically using the System Administration Manager (SAM).
Chapter 3	“10/100BASE-TX Resources" provides references to other useful tools for installing, configuring, and maintaining HP 10/100BASE-TX software.
Chapter 4	“Troubleshooting 10/100BASE-TX" 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.
Appendix C	“Hardware Regulatory Statements” includes regulatory statements for the USA, Japan, and the European community.

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1 Installing and Configuring HSC 10/100Base-TX/9000

Announcements

This document contains information on the HSC 10/100Base-TX/9000 LAN card for use with the HP-UX 10.20 and 11.0 operating systems. The HSC Fiber card (FX) presently operates only at 100Mbits/s.

Part numbers for the HSC 10/100Base-TX card for the HP 9000 server and workstation are as follows:

Cards:

- J3514A Option 001= 2-port interface for K-class servers
- J3515A = 1-port + AUI interface for D-class servers and B, C, and J-class workstations
- J3516A = 2-port interface for D-class servers and B, C, and J-class workstations
- J3850A = 1-port interface T-class servers

The HSC 10/100Base-TX/9000 LAN software includes the following products and filesets:

Product: 100BT-GSC-KRN
Fileset: 100BT-KRN

Product: 100BT-GSC-RUN
Fileset: 100BT-RUN
Fileset: 100BT-INIT

Product: 100BT-GSC-FMT
Fileset: 100BT-FORMAT

ServiceGuard is not supported on the AUI port of the J3515A HSC 10/100Base-TX card (1-port card with AUI).

As of this release, the HSC 10/100Base-TX/9000 card is supported on HP 9000 D-, K-, and T-class servers and B-, C-, and J-class workstations.

Introduction

The HSC 10/100Base-TX and 100Base-FX/9000 product provides the means for interfacing various types of HP 9000 servers and workstations 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.

IEEE 802.3u 100Base-TX LANs have topologies very similar to 10Base-T LANs; however certain aspects of the topology such as the maximum permitted cable lengths are more stringent for 100Base-TX than for 10Base-T. The category 5 UTP cable used in 100Base-TX networks between devices such as an HP computer and a 100Base-TX hub must be less than 100 meters long.

For more information on network topologies and associated specifications for 100Base-TX networking, refer to the IEEE 802.3u specification. Also, a useful practical reference is *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).

Compatibility and Installation Requirements

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

- Following is the supported configuration for the HP 9000 T-class server:

  - On the HP 9000 T-class server running HP-UX 11.0, the maximum number of HSC 10/100Base-TX/9000 cards supported is two. If an HSC FDDI card is also being used, then the limit is one HSC 10/100Base-TX/9000 card.
  - On the HP 9000 T-class server running HP-UX 10.20, the maximum number of HSC 10/100Base-TX/9000 cards supported is one. It is recommended that you use HP-UX 11.0 for best performance. Use of an HSC FDDI card in conjunction with the HSC 10/100Base-TX/9000 card on HP-UX 10.20 is not supported.
  - There should be one processor in the T-class server per HSC card (any type of HSC card, for example, HSC FDDI). There are a maximum 12 processors in the T-class.
    Examples:
    Supported on a machine with 8 processors:
    2 HSC 10/100Base-TX/9000 cards and
    6 HSC SCSI cards
    Not supported on a machine with 8 processors:
    2 HSC 10/100Base-TX/9000 cards and
    7 HSC SCSI cards

- Both full and half-duplex modes are supported. Ensure that your hub or switch is set to the desired duplex mode.
- The HSC 10/100Base-TX/9000 card supports 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 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.

  The HSC 100Base-FX/9000 (fiber) card operates only at 100Mbits/s, in either full or half-duplex mode, but the fiber card does not support autonegotiation.
- The HSC 10/100Base-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 btlan4, and the Hardware Type Description will be PCI (10110009)--builtin #1 or PCI (10110009)--builtin #2 if you are on a 2-port HSC 100Base-TX card.

Required Software Revisions for Operating HSC 100Base-FX Cards

Specific revisions of the HSC 10100Base-TX media product J3620BA or J3623BA may be required in order to correctly operate either the HSC 100Base-TX or 100Base-FX cards. Older revisions will only operate the HSC 100Base-TX cards.

For operation of the HSC 100Base-FX cards, only version 3.10 (or later) of the J3620BA/J3623BA software driver should be used. This version is expected to start shipping as part of these products as of April, 1998 for HP-UX 10.20 and June, 1998 for HP-UX 11.0. The 100Base-FX cards will not operate properly with previous revisions of the driver.

If you already have received and installed copies of product J3620BA or J3623BA on a system, the way to determine the driver revision is to perform the command:

```
what /stand/vmunix
```

In the output from the above command there should be a line with content similar to the following:

```
btlan4.c GSC 100BT Patch: PHNE_13940 $Revision 3.10 S S
Date: 98/02/23 14:50:48
```

If the value listed after “Revision” in the string above is at least 3.10, then you should not encounter any problems in using the HSC 100-FX cards. Otherwise, you may need to obtain a newer version of J3620BA or J3623BA.

If you have obtained a new copy of J3620BA or J3623BA, the overall product version number may be checked either by looking at the cover of the associated Release Note or by using the swlist command and looking

at the version associated with the “J3623BA” or “J3623BA” entry. If the version is at least B.10.20.05 (10.20) and B.11.00.02 (11.0), the driver will be the correct revision to operate the HSC 100Base-FX cards.

Required and Optional Patches

Except where noted, the following patches are required in order to use the HSC 10/100Base-TX card:

HP-UX 11.0-based computers:

- PHKL_18123 -- a patch for PCI services which is highly recommended (but not mandatory) for HSC 10/100Base-TX (servers on HP-UX 11.0 only)
- PHNE_17113 -- LAN cumulative patch required for manual configuration. (HP-UX 11.0 only)

HP-UX 10.30-based computers:

- PHKL_12156 -- a patch for PCI services which is required in order to support HSC 10/100Base-TX (servers on HP-UX 10.30 only).

HP-UX 10.20-based computers:

- PHCO_17871 --a patch for SAM to support HSC 10/100Base-TX on HP-UX 10.20.
- PHKL_16751 -- a patch for PCI services which is required in order to support HSC 10/100Base-TX (servers on HP-UX 10.20 only).
- PHKL_16750 -- a patch for PCI services which is required in order to support HSC 10/100Base-TX (workstations on HP-UX 10.20 only).
- PHNE_17000 (servers) and PHNE_16999 (workstations) -- LAN cumulative patch required for manual configuration. (HP-UX 10.20 only)

The patch numbers listed above are current as of this release note. Please contact the Worldwide Enterprise Response Center if you need to ensure that you have the latest patches.

Manual Speed and Duplex Mode Configuration

Because the HSC 10/100Base-TX/9000 LAN card supports 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, the degree of the advantage is application-dependent.

The HSC 10/100Base-TX card supports 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 HSC 10/100Base-TX card. If the switch supports autonegotiation on the ports connected to the cards, this should be enabled as explained in the section called “Autonegotiation and Autosensing.”

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

To list the current speed and duplex mode of the HSC 10/100Base-TX/9000 card, 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 10.30 or 11.0)
lanadmin -x nmid (HP-UX 10.20)

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 10.30 and 11.0)
lanadmin -X mode nmid (on HP-UX 10.20)

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 10.30 and 11.0)
lanadmin -X auto_on nmid (turns autonegotiation on for HP-UX 10.20)

The **ppa** is the physical point of attachment on HP-UX 10.30 or 11.0. On HP-UX 10.20, use the **nmid** or Network Management ID of the card. You can get the **ppa** (**nmid**) from the output of the lanscan command.

Example:

If the **ppa** (**nmid** on HP-UX 10.20) 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 directory:

`/etc/rc.configid/hpgsc100conf`

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 HSC 10/100Base-TX/9000 product provides the means for interfacing various types of HP 9000 Series 800 computers to either a 10Base-T or 100Base-TX network. Refer to the Release 100Base-TX, which 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

NOTE The HSC 100 Base-FX/9000 (fiber) card only operates at 100 Mbits/s. Also, the fiber card does not support auto-sensing or autonegotiation.

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).

Some Fast Ethernet devices on the market today such as hubs and some 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 some switches). However, switches that support autonegotiation are starting to be offered.

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

If the HSC 10/100Base-TX/9000 card is connected to a device that does not support autonegotiation, or a device that has autonegotiation disabled, the HSC card 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 HSC 10/100Base-TX card 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 Happens During Card Initialization Sequence?

Following is an overview of the initialization sequence for the HSC 10/100Base-TX card:

Initialization of an HSC 10/100Base-TX card happens during system bootup only, and it is driven by the `btlan4` driver for the card. At boot time, the card does a self-test of the DEC chipset which should verify the major component parts. It then puts the card in loopback mode and sends a packet. The loopback effectively tests HSC DMA, DEC 21140AE DMA, DEC 21140AE, NS83840A, and NS83223 interrupts, transmits and receives of the chips.

Whenever initialization fails, it prints a message on the console identifying the failure. You can later retrieve initialization messages after the system is fully booted up by using the *dmesg* command.

Finally, the driver tries to establish a good data link between the card and the hub or switch. If there is no cable connection, or if the cable connection is bad, or if the hub or switch is not compatible, that is, not 10Base-T or 100Base-TX capable, no LEDS will be lit. Also, a message indicating the detection of a bad cable connection is printed on the console as well as logged in NETTL logs. The link LED must be lit to indicate proper functioning. The link LED is lit only when the card is connected properly to a 10/100 Mbit/s switch or hub.

What Manuals are Available

The following documents summarize installation, configuration, verification and troubleshooting of the HSC 10/100Base-TX/9000 LAN link:

HSC 10/100Base-TX and 100Base-FX/9000 Quick Installation

Using HSC 10/100 Base-TX and FX/9000 on Instant Information CDROM or on www.docs.hp.com.

Software Availability in Native Languages

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

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 100Base-TX Resources

In addition to this manual, use the following resources to maintain and administer HSC 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 and later systems.
- *swverify(1M)* verifies software installation.

Error Messages

HSC 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 GSC 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 GSC100bt  -file
  /tmp/tracefile
  ```

- To stop 100Base-TX tracing.

  ```
  nettl    -traceoff     -entity GSC100bt
  ```

- 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 HSC driver keyword: `btlan4`
- The driver for the HSC 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.

4 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 HSC 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 HSC 100BT transmit FIFO before transmission of the bits onto the ethernet cable will begin.

Transmit Underrun :

A transmit underrun error occurs when the HSC 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 HSC 100BT card used to hold data transferred from system memory to the HSC 100BT card.

The HSC 100BT product is currently optimized to achieve the best single card performance. In order to achieve this performance the HSC 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.

NOTE

Note: When using the HSC 10/100Base-TX card in an HP 9000 T-series system, if both of the ports on the card are being used, each port should have its associated Transmit Threshold set to a minimum of 1024 for best overall performance.

While the current Transmit Threshold value allows the HSC 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. On systems running HP-UX 10.20, 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. On systems running HP-UX 11.00, examine the **`lanadmin`** output to obtain the output error rate.
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 gsc100bt -C 1
```

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

```
HPHSC 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 HSC 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` (HP-UX 10.20)

`lanadmin -S TransmitThreshold PPA` (HP-UX 10.30 and 11.00)

where:

a TransmitThreshold of 512 is most aggressive

a TransmitThreshold of 1024 is somewhat 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.

The current Transmit Threshold level will be displayed in the mib description string in **`lanadmin`**.

Performance Tuning

For the HP-UX 10.20 version of the product, it is highly recommended to use the **`nettune`** command to change the **`ip_intrqmax`** value to 256 when running multiple HSC 100Base-TX ports simultaneously. This will allow the HSC 100Base-TX ports to obtain their maximum receive performance.

The following command can be used to adjust the ip_intrqmax value:

```
nettune -s ip_intrqmax 256
```

This will change the value of ip_intrqmax from its default value of 50 to 256.

There is no similar capability for the HP-UX 10.30 and 11.0 releases of this product.

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 4-1 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.

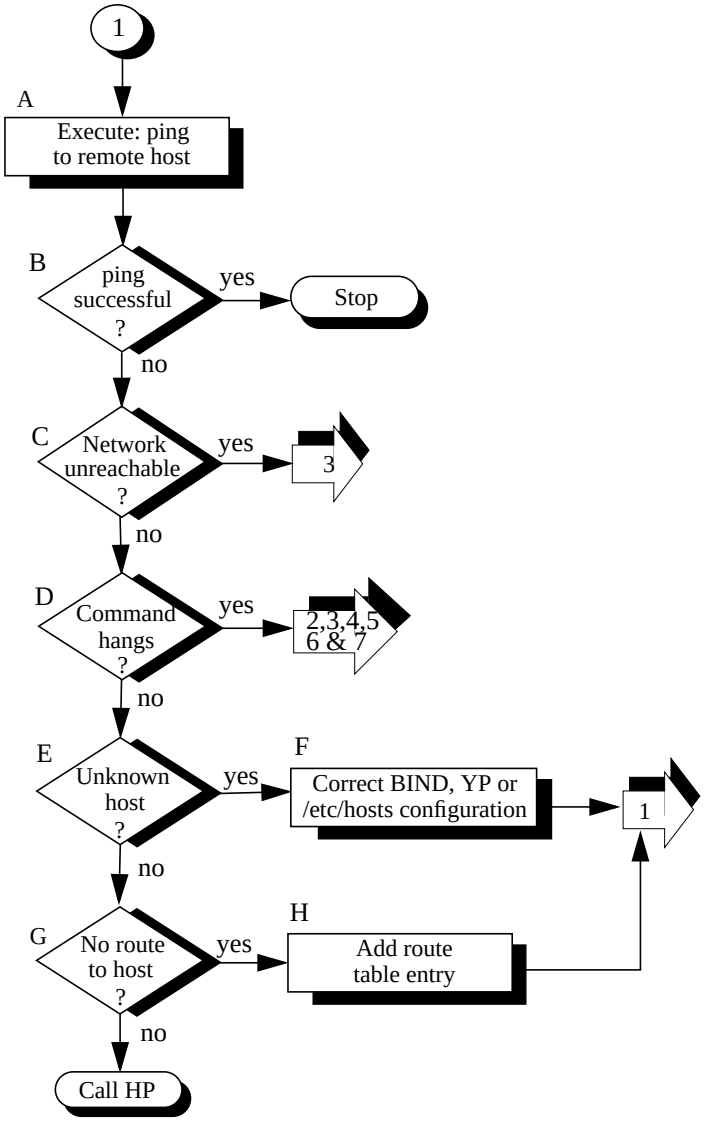
Link Level Loopback Test: Checks roundtrip communication between Link Levels on the source and target host using the *linkloop(1M)* diagnostic.

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 4-1 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.

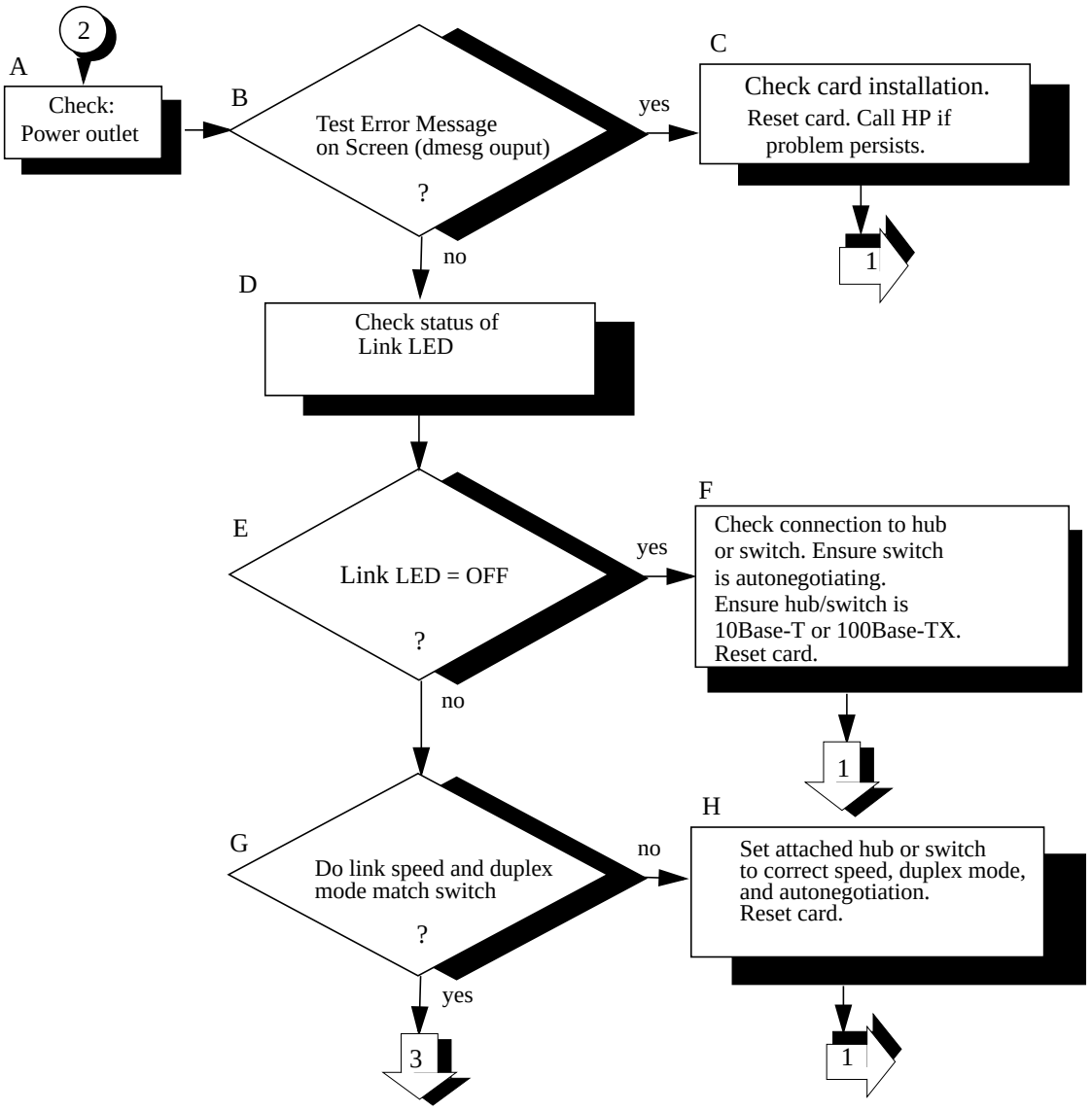
F. **Correct BIND, YP or hosts configuration**. Add the missing host name and start again with flowchart 1.

G. **No route to host?** If `Error= Sendto: No route to hos`t, 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 4-2 **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 btlan4?** 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:

```
btlan4: Error: Motherboard failed to complete
reset.
```

```
btlan4: Error: Motherboard failed selftest;error
code= 0x?
```

C. **Check card installation. If dmesg reported an error message from btlan4, 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.

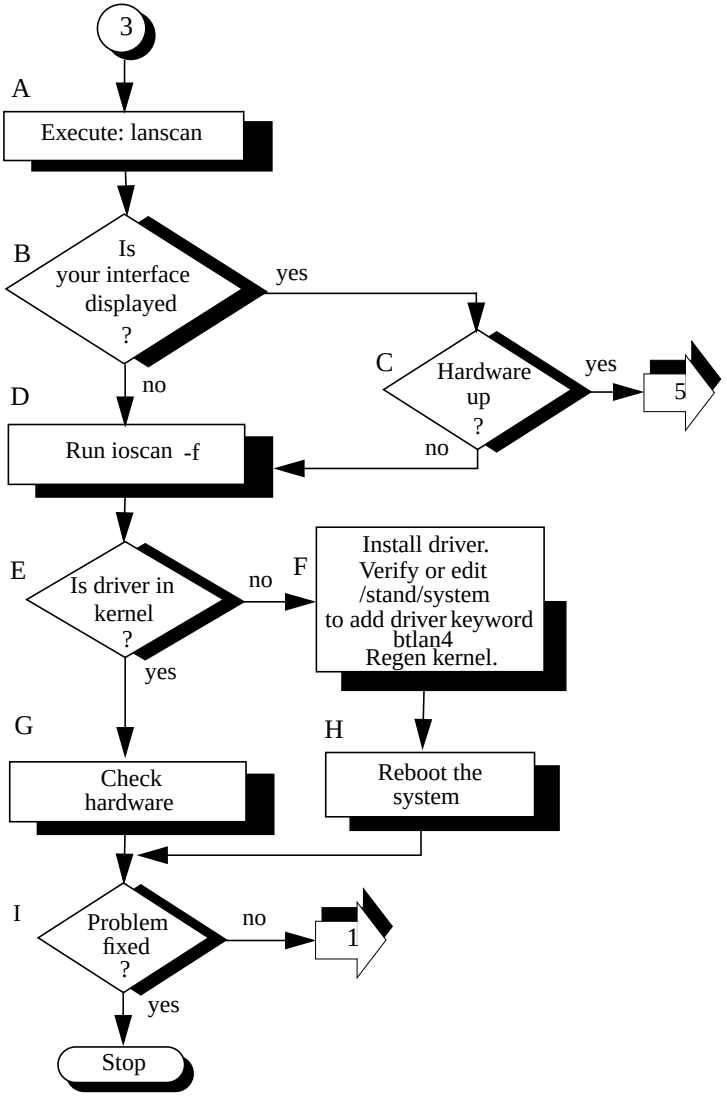
F. If Link LED = OFF, check connection to hub or switch. Ensure switch is *not* autonegotiating. Ensure hub or switch is 10Base-T or 100Base-TX. Reset card according to Steps D through G in Flowchart 4. Go back to flowchart 1.

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 4-3 Flowchart 3: Configuration Test



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 HSC 10/100Base-TX card slot multiplied times 4. For example, a hardware path of 32 corresponds to an HSC 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
ba          0  8/4          GSCtoPCI    CLAIMED     BUS_NEXUS    PCI Bus Bridge
- GSCtoPCI
lan         4  8/4/1/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #1
lan         5  8/4/2/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #2
ba          1  8/8          GSCtoPCI    CLAIMED     BUS_NEXUS    PCI Bus Bridge
- GSCtoPCI
lan         6  8/8/1/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #1
lan         7  8/8/2/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #2
ba          2  8/12         GSCtoPCI    CLAIMED     BUS_NEXUS    PCI Bus Bridge
- GSCtoPCI
lan         8  8/12/1/0     btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #1
lan         9  8/12/2/0     btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #2
bc          2  10           ccio        CLAIMED     BUS_NEXUS    I/O Adapter
ext_bus     0  10/0         c720        CLAIMED     INTERFACE    GSC built-in Fa
st/Wide SCSI Interface
target      0  10/0.6        tgt         CLAIMED     DEVICE
disk        0  10/0.6.0      sdisk       CLAIMED     DEVICE       HP      C2490WD
target      1  10/0.7        tgt         CLAIMED     DEVICE
ctl         0  10/0.7.0      sctl        CLAIMED     DEVICE       Initiator
bc          3  10/4          bc          CLAIMED     BUS_NEXUS    Bus Converter
tty         0  10/4/0        mux2        CLAIMED     INTERFACE    MUX
lanmux      0  10/4/4        lanmux0     CLAIMED     INTERFACE    HP J2146A - 802
.3 LAN
lan         1  10/4/4.1      lan3        CLAIMED     INTERFACE
ba          3  10/8          GSCtoPCI    CLAIMED     BUS_NEXUS    PCI Bus Bridge
- GSCtoPCI
lan         2  10/8/1/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #1
lan         3  10/8/2/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -
- Built-in #2
ba          4  10/12         bus_adapter CLAIMED     BUS_NEXUS    Core I/O Adapte
r
ext_bus     1  10/12/5       c720        CLAIMED     INTERFACE    Built-in SCSI
target      2  10/12/5.2     tgt         CLAIMED     DEVICE
target      3  10/12/5.7     tgt         CLAIMED     DEVICE
ctl         1  10/12/5.7.0   sctl        CLAIMED     DEVICE       Initiator
lan         0  10/12/6       lan2        CLAIMED     INTERFACE    Built-in LAN
ps2         0  10/12/7       ps2         CLAIMED     INTERFACE    Built-in Keyboa
rd/Mouse
processor   0  32           processor   CLAIMED     PROCESSOR    Processor
processor   1  34           processor   CLAIMED     PROCESSOR    Processor
memory      0  49           memory      CLAIMED     MEMORY       Memory
```

```
ba          0  8/4          GSCtoPCI    CLAIMED     BUS_NEXUS    PCI Bus Bridge - GSCtoPCI
lan         4  8/4/1/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -- Built-in #1
lan         5  8/4/2/0      btlan4      CLAIMED     INTERFACE    PCI(10110009) -- Built-in #2
```

If there are multiple HSC 100BT cards installed in the system then the output above will be duplicated with only the H/W Path column changing to reflect the correct hardware path information.

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 *btlan4* 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.

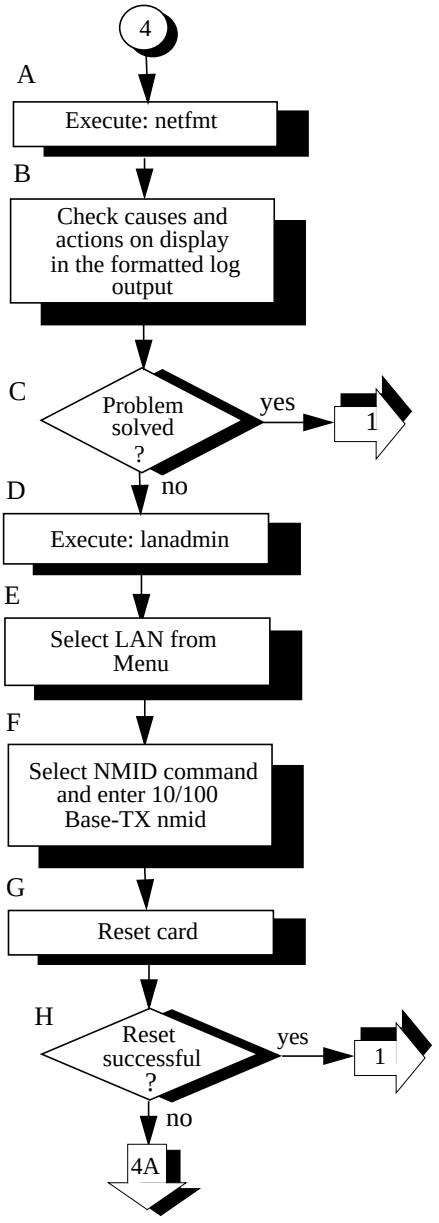
G. **Check hardware.** Verify that the network card is seated correctly and that it is operational.

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 4-4 **Flowchart 4: Configuration Test**



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.

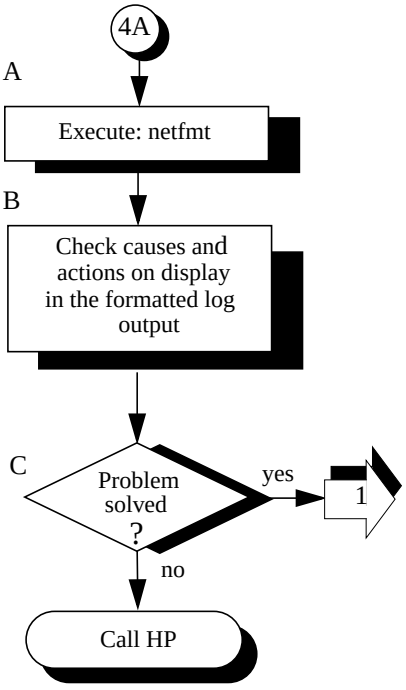
F. **Select the NMID or PPA (HP-UX 10.30 or 11.00) command and enter the 10/100Base-TX NMID or PPA**. You can use the **lanscan** command to find the current NMID or PPA (HP-UX 10.30 or 11.00) for 10/100Base-TX. The NMID or PPA you enter becomes the current device to be tested.

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 4-5 Flowchart 4a: Configuration Test



Flowchart 4A: Configuration Test

Flowchart 4 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
```

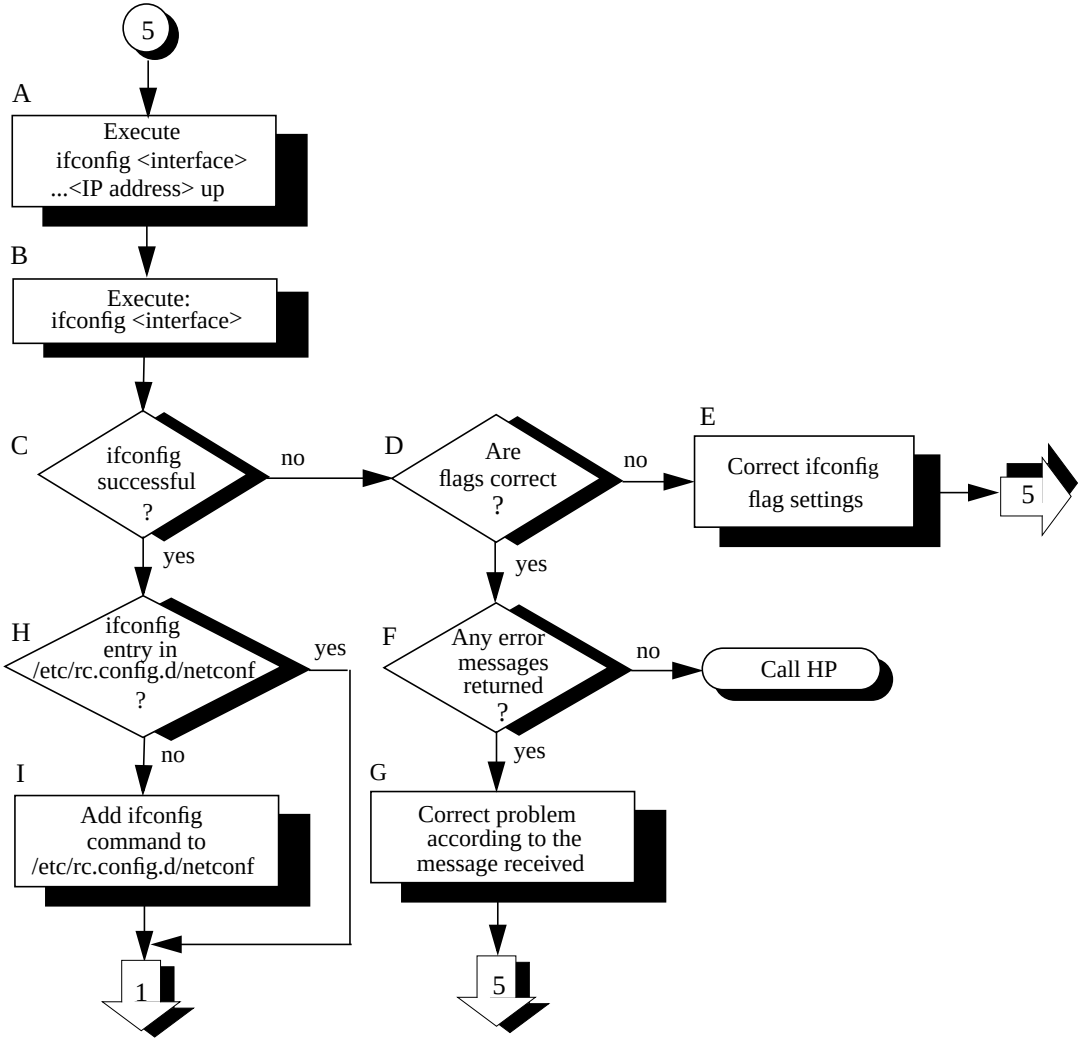
Extend the search to LOG01 as information may have rolled (overflowed) into this file from LOG00.

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 4-6 Flowchart 5: Configuration Test



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.

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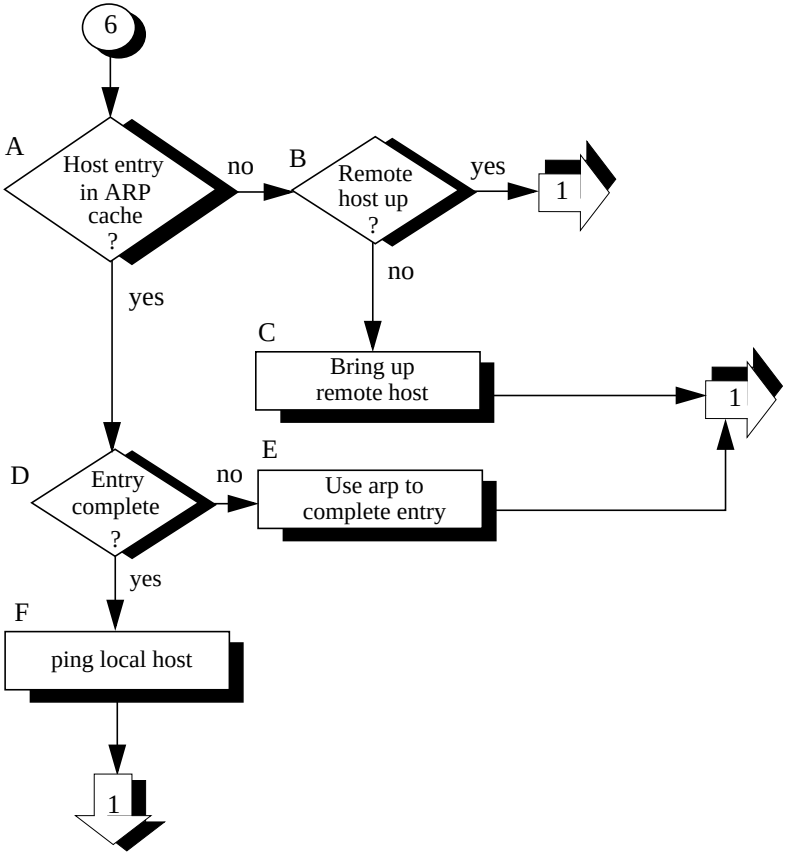
Flowchart 6: Network Level Loopback Test

Figure 4-7 **Flowchart 6: Network Level Loopback Test**



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.

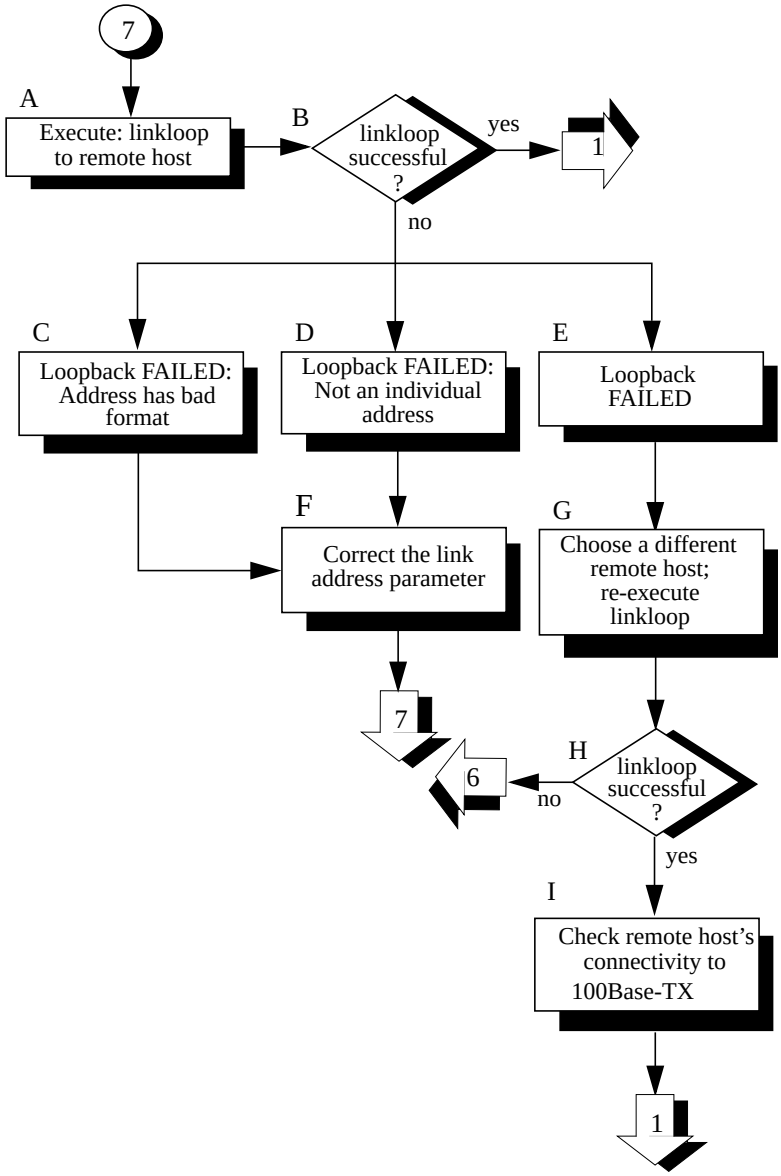
E. **Use arp to complete entry.** Using *arp*, enter the correct Station Address. For more information, refer to the *arp(1M)* online man page. Start again with flowchart 1.

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 4-8 Flowchart 7: Link Level Loopback Test



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.

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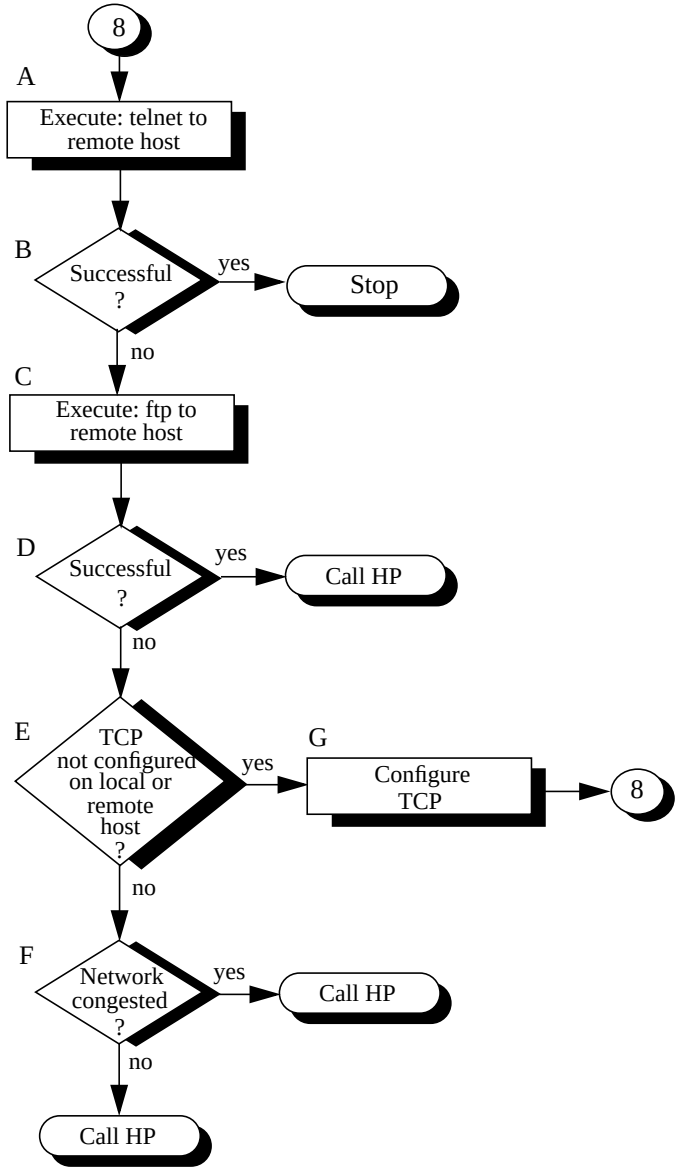
Flowchart 8: Transport Level Loopback Test (using ARPA)

Figure 4-9 **Flowchart 8: Transport Level Loopback Test (using ARPA)**



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.

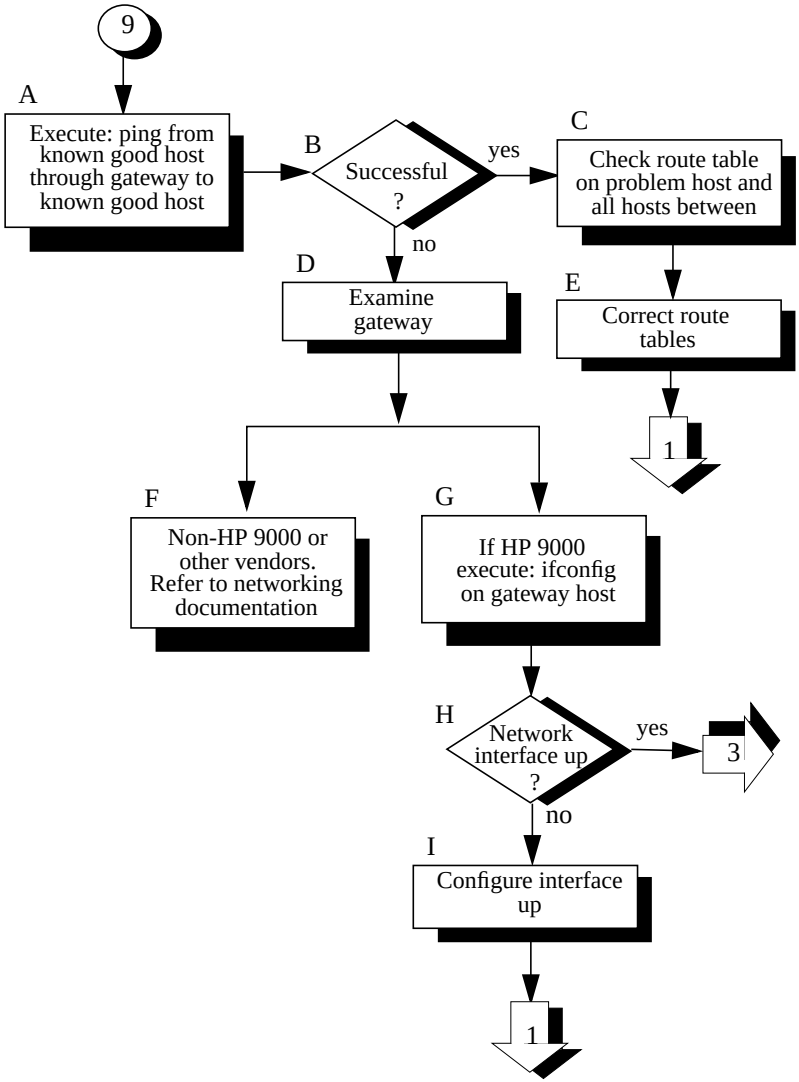
F. **Network congested?** If TCP is installed on both hosts, do a file transfer to another remote host on the network. Use *netstat(1)* to check for lost packets.

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 4-10 Flowchart 9: Bridge and Gateway Loopback Test



Flowchart 9: Bridge/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, Aug 20,1996 11:45:17

Network Management ID           = 5
Description                     = btlan4 Hewlett-Packard
                                  10/100Base-TX Full-Duplex
                                  Hw Rev 0. TT = 512|1024|1500
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.
- Check that the speed and duplex settings of both devices connected to each network cable are the same.

The possible causes of a fault condition could be:

- Defective cable
- Cable not connected to active hub or switch
- Defective card
- Mismatched speed or duplex setting between the card and the hub or switch.

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 HSC 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.

HSC 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.

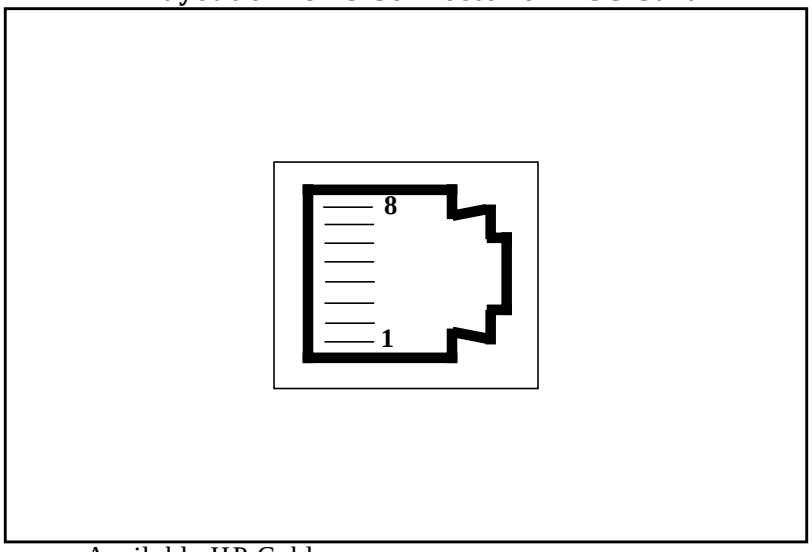
Connector Pin Usage for 10-Mbit/s Twisted-Pair Connector

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 2	(transmit +) (transmit -)
3 6	(receive +) (receive -)

Figure B-1 Pin Layout of RJ-45 Connector on HSC 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 2	TX:1+ TX:1-
3 6	RX:1+ RX:1-
4 5	Unused Unused
7 8	Unused 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).

HSC 10/100Base-TX Card

Specifications.

Physical

Dimensions (J3514, J3850A):	5.59 in by 3.22 in
Weight (J3514, J3850A):	135 grams
Dimensions (J3515):	13.41 in by 4.82 in
Weight (J3515):	220 grams
Dimensions (J3516):	13.41 in by 4.82 in
Weight (J3516):	240 grams

Electrical

DC Voltage (J351x):	4.75-5.25V
Typical Current (J351x):	1.8A
Maximum Current (J351x):	2.0A
DC Voltage (J3850A):	+5V @ 980mA max
DC Voltage (J3850A):	+3.3V @ 210mA max
Total Power (J3850A):	5.6W

Environmental

Operating temperature:	0^{o} C to 55^{o} C (J3514) 0^{o} C to 45^{o} C (J3515 and J3516)
Storage temperature	-40^{o} C to $+70^{o}$ C
Relative humidity:	15% to 80% at 40^{o}C non-condensing

Cable Interfaces

- Base-T: The 10-Mbit/s twisted-pair port is compatible with IEEE 802.3u-1995 Type 10Base-T.
- Base-TX: The 100-Mbit/s twisted-pair port is compatible with IEEE 802.3u-1995 standard.
- Base-FX: The 100-Mbit/s interface is through duplex SC style connectors that connect to 62.5 micron multimode fiber optic cables..

Communications Standards

- IEEE 802.3u-1995 Type 10Base-T (10Mbit/s).
- IEEE 802.3u-1995 standard (100-Mbit/s)

Electromagnetic

FCC part 15 Class A	USA, Canada, and Latin America
CISPR-22 Class A/EN55022 Class A EN55082-1	International and Europe Europe
VCCI Class A	Japan

C Hardware Regulatory Statements

This section contains hardware regulatory statements for the HSC 100Base-TX product (J3514A, J3515A, J3516A, and J3850A) use in the United States, Japan, and the European community. Refer to your *HSC 10/100Base-TX and FX9000 Quick Install* card for product installation instructions.

FCC Statement (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

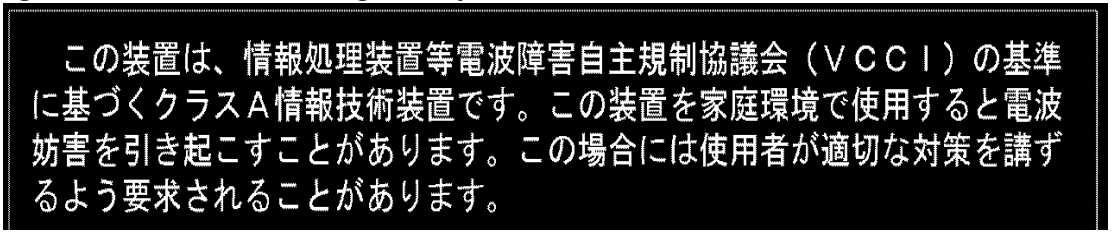
Warning: This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

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

VCCI (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.

Figure C-1 VCCIRegulatory 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.

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.

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.

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.

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.

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

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

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

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

Full-Duplex Mode: A mode of media utilization whereby data can flow in both directions simultaneously across the multiple

wire pairs of a physical link. While full-duplex operation is not defined per se in the IEEE 802.3u-1995 specification, the specification does define a mechanism for this mode to be autonegotiated between devices on each end of a link. Full-duplex mode is typically found on switches.

HSC: High speed connect bus.

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

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

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.

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.

LAN: See Local Area Network.

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

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

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.

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

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

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.

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

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

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

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.

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

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