Installing and Administering Token Ring/9000

Edition 4

Manufacturing Part Number: J1644-90018
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United States

Regulatory/Safety Statements

FCC EMI Statement (USA Only)

The Federal Communications Commission (in 47 CFR 15.19, 15.21 and 15.105) has specified that the following notices be brought to the attention of the users of this product.

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

Safety Precautions

WARNING **Before installing this product, refer to the installation instructions, including any safety precautions, for the Hewlett-Packard workstation or server product on which this product will be installed.**

This product has two connectors, an RJ-45 and a 9-pin D-shell connector. It is important that the user connects to one or the other, but never to both at the same time.

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Preface

This manual describes how to install, configure, and troubleshoot the Token Ring board and software products on PCI, Model 712, HP 9000 EISA, and Series 800 HP-PB systems.

The manual is organized according to the sections listed below. Where appropriate, some sections are further divided into various sub-sections. If you are using PCI Token Ring, you can skip sections titled Model 712, HP 9000 EISA, or Series 800 HP-PB. Non-PCI users can skip sections titled PCI.

Chapter 1	"Installing Token Ring" describes how to install Token Ring software and hardware.
Chapter 2	"Configuring Token Ring" describes the steps to configure Token Ring software.
Chapter 3	"Token Ring Resources" provides references to other useful tools for installing, configuring, and maintaining HP Token Ring software.
Chapter 4	"Troubleshooting Token Ring" provides flowcharts to help diagnose Token Ring software and hardware problems.
Appendix A	"Token Ring Interface Card Statistics" defines the terms listed in the *lanadmin(1M)* command display.
Appendix B	"Token Ring Network Map" provides an example Token Ring network map and worksheet.
Appendix C	"Token Ring Hardware Path" provides detailed information about the hardware path on all systems.
Glossary	"Glossary" provides definitions of Token Ring terms used in this manual.

Information About the PCI Token Ring Board

Benefits and Features

On HP-UX 10.20 systems, PCI Token Ring software supports the following:

- 100/16/4 Mb/s hardware (A5783A) on all HP 9000 workstations with a PCI bus.

On HP-UX 11.x systems, PCI Token Ring software supports the following:

- 16/4 Mb/s hardware (A4930A) on V-Class servers.
- 100/16/4 Mb/s hardware (A5783A) on all HP 9000 workstations and servers with a PCI bus.

Hardware is customer-installable on all platforms except V-Class and Superdome. Refer to the hardware installation sections in Chapter 1 of this manual.

Notes about New Hardware and Software

A new PCI Token Ring adapter (A5783A) was introduced on April 1, 1999. It replaced the previous adapter (A4930A). The A5783A adapter is supported on all HP 9000 servers and workstations with a PCI bus. The A4930A was supported on V-Class only, and was removed from the CPL on June 1, 1999.

The main differences between the A5783A and the A4930A are:

- Hardware and corresponding software have the same product numbers.
- Support for all PCI-based servers and workstations.
- Support for speeds of 4 or 16 Mb/s on IBM and Cisco MAU/Switches, or 100 Mb/s on Olicom/Madge switches.
- Customer-configurable on all platforms.
- Customer-installable on all platforms except V-Class and Superdome.
- The DB9/RJ45 Loopback connector is not supported.
- The maximum number of active PCI Token Ring cards supported on Superdome is 10 on 16-way, 20 on 32-way, and 40 on 64-way. On V-Class, the maximum number is 4. For all other platforms, the

maximum number is equal to the number of slots in the system.

In the PCI sections of this document, the phrase “the software product(s)” is used to refer to one or more of the following PCI Token Ring software product numbers:

- J1644AA
- A4930A
- A5783A

Note that for 11i, the software bundle tags were changed to TokenRing-00.

If the A4930A hardware is present, the A4930A or TokenRing-00 software bundle should be installed.

If the A5783A hardware is present, the A5783A or TokenRing-00 software bundle should be installed.

If the system has both cards, then both software bundles should be installed.

The continued use of J1644AA is discouraged. Use A4930A or A5783A software in its place.

1 Installing Token Ring

This chapter describes the procedures to load Token Ring hardware and software onto your system.

Overview of Token Ring Installation

Installation of Token Ring includes:

Step 1: Checking Token Ring installation prerequisites.

Step 2: Installing Token Ring hardware.

Step 3: Loading Token Ring software.

Step 4: Setting a Card's Configuration by following the procedures in Chapter 2, "Configuring Token Ring."

NOTE Prior to installing Token Ring, HP recommends that you create a network map or update the existing map of your Token Ring network. Refer to Appendix B, "Token Ring Network Map," for an example Token Ring network map.

Step 1: Checking Token Ring Installation Prerequisites

Model 712, HP 9000 EISA, or Series 800 HP-PB Systems

Please note that the EISA bus version of Token Ring has been obsoleted as of July 1999. Installation information about this product is included here for the sake of completeness.

1. Check that the */usr/bin*, */usr/sbin* and */sbin* directories are in your PATH using the command:

   ```
   echo $PATH
   ```

2. Check that the operating system has been upgraded to 10.x or 11.x software, as appropriate.

   To obtain this information, execute the command:

   ```
   uname -a
   ```

3. Verify that you have a lobe cable to connect your Token Ring card to your Trunk Access Unit (TAU). (The cable and TAU do not come with the HP Token Ring product.)

4. **Model 712**: Verify that the slot for the Model 712 card in the system backplane is empty.

   HP 9000 EISA: Verify that the system backplane contains an EISA system interface. If you have a Series 715/33 or 720 model, be sure that you ordered and installed the EISA system interface; for all other HP 9000 EISA, the EISA system interface is preinstalled. The EISA interface should also contain an available empty EISA slot for the Token Ring card.

   Series 800 HP-PB: Verify that the system backplane contains an available empty HP-PB slot for the Token Ring card.

5. Verify that you have an IP/Internet address, alias, and subnet mask (optional) for your new Token Ring card. After you have obtained this information, fill out the Network Card Configuration Worksheet in your *Token Ring Quick Installation Guide*.

A summary of the major characteristics of each Token Ring card is shown in the table below.

Table 1-1 Token Ring Card Summary

Category	EISA (discontinued)	M712	HP-PB	PCI
Bus	EISA	HP GSC	HP-PB	PCI
STP Connection	DB-9	DB-9	DB-9	DB-9
UTP Connection	RJ45	RJ45 with Media Filter (Provided)	RJ45 with Media Filter	RJ45 with Media Filter
Speed	16Mbps UTP/STP 4Mbps UTP/STP	16Mbps UTP/STP 4Mbps UTP/STP	16Mbps STP 4Mbps STU/UTP	100Mbps 16Mbps 4Mbps
Default Speed	No speed	0Mbps	4Mbps	must config
Configure Speed	eisa_config	SAM or lanadmin	Jumper on card	lanadmin -or- config file -or- SAM
LED on Card	No	No	Yes	Yes
Card Self-Test	Yes	Yes	Yes	Yes

6. Verify that you have super-user status.
7. **Model 712**: Verify that you have the *HP A4011A/B Token Ring Adapter Installation and Configuration* manual.

   HP 9000 EISA: Verify that you have the *EISA Token Ring Network Adapter* manual.

Series 800 HP-PB: Verify that you have the *HP-PB Token Ring Network Adapter* manual.

Prior to loading the Token Ring product onto your system, check that you have met the following hardware and software prerequisites:

PCI Systems

You can install PCI Token Ring from your application media during a normal system operation where the following requirements have been met.

Hardware Requirements

On HP-UX 10.20 systems, A5783A is supported on all HP 9000 workstations with the PCI bus.

On HP-UX 11.x systems, A5783A is supported on all HP 9000 servers and workstations with the PCI bus. A4930A is supported on V-Class servers only.

Although V-Class and Superdome systems have a PCI bus, they do not permit user installations. If you need to install PCI Token Ring on these machines, please contact Hewlett-Packard for service.

OS Platform and Version Compatibility

HP-UX CORE B.10.20 or B.11.00 or later.

Software Requirements

The system must have standard HP-UX 10.20 or 11.x core products, including Streams and LAN/9000 software, installed on it.

Please refer to the Release Notes document for required patch information.

The major characteristics of the PCI Token Ring card are listed in Table 1-1.

Other Requirements

The system is already booted up for operation.

Single-user state is not required.

No additional reboot is required after the installation as the PCI Token

Ring software/hardware installation procedure causes a system reboot.

We recommended that you reboot after configuring `/etc/rc.config.d/pcitrconf`, but you can execute `/sbin/rc2.d/S315pcitr start` to prevent a reboot.

After reboot, check `what(1)` string on the kernel. Execute:

```
what /stand/vmunix | grep Token
```

You should see the following on HP-UX 10.20 systems:

```
A5783A/J1644AA HP PCI Token Ring <version> (<release>)
<date>
```

You should see the following on HP-UX 11.x systems:

```
A5783A/A4930A/J1644AA HP PCI Token Ring <version>
(<release>) <date>
```

Please refer to the Release Notes document for the current values of "<version>", "<release>" and "<date>".

Disc Space Required for Installation

This product requires 700 K bytes in addition to the current disc space being utilized.

Step 2: Installing Token Ring Hardware

Follow the steps below to install the Token Ring board.

Model 712, HP 9000 EISA, or Series 800 HP-PB Systems

1. At the HP-UX prompt, execute the following command and wait for the system to respond with the message "Halted, you may now cycle power" on the Model 712 and HP 9000 EISA, or "OK TO PRESS RESET BUTTON" on the Series 800 HP-PB.

   ```
   shutdown   -h
   ```

2. Observe antistatic precautions by following the guidelines as described in the related hardware manual.

3. **Model 712:** Install the card following the instructions in the *HP A4011A/B Token Ring Adapter Installation and Configuration Guide*.

   HP 9000 EISA: Install the card in the slot you specified when running the `eisa_config` utility in "Configuration for (older) EISA Cards" in Chapter 2.

   If you have a S715/33, S720, or S730 model, remove the EISA system interface, insert the card into the card guide on the EISA interface, and place the whole unit back into the system following the instructions in the *EISA Token Ring Quick Installation* guide and the *EISA Token Ring Network Adapter* manual. If you have any other model, the EISA interface is not removable.

   Series 800 HP-PB: Set the ring speed on the card and install the card following the instructions in the *HP-PB Token Ring Network Adapter* manual.

NOTE For systems with multiple slots, always install cards in the lowest available slot. HP recommends installing add-on LAN cards in the lower slots in the system backplane and then the add-on Token Ring cards in the higher slots in the system backplane.

4. Attach the port of the Token Ring lobe cable to the card. Attach the other end of the cable to the Trunk Access Unit (TAU). Refer to the list below for valid cable types for each system.

Table 1-2 Valid Cable Types

System Type	Cable Type
Model 712	DB-9 or RJ45 with media filter
HP 9000 EISA	RJ45 or DB-9
S800 HP-PB	DB-9 or RJ45 with media filter

5. Power up the system to complete the process. The Token Ring card will run a self-test automatically. Any error messages will appear on the terminal display or system console.
6. When the system is up and running, log in as `root`.
7. **HP 9000 EISA only**: Execute the *dmesg* command to verify the status of the Token Ring card. The following message should appear:

   "`TOKEN1 STATUS: Opening adapter. . . .opened successfully`"
8. Execute *ioscan -f* to make sure the hardware path and driver are listed. Refer to flowchart 2A in Chapter 4, "Troubleshooting Token Ring," for examples of *ioscan* output. Refer to Appendix A, "Token Ring Interface Card Statistics," for information on how to interpret the hardware path information.
9. Proceed to Chapter 2, "Configuring Token Ring," to configure the card. You'll also set the ring speed for the Model 712 using SAM.

PCI Systems

This section describes the installation procedure for a PCI Token Ring board. The following system classes are customer-installable:

- A-Class
- B-Class
- C160 and higher
- J2240, J5000, J6000, and J7000
- L-Class
- N-Class

Although V-Class and Superdome systems have a PCI bus, they do not permit user installations. If you need to install PCI Token Ring on these machines, please contact Hewlett-Packard for service.

If the level of detail in this document is not sufficient, please refer to your system's hardware user's guide for additional information about inserting or removing circuit cards.

Photos of an A-Class system are included here for clarity. Your particular hardware may vary from what is shown.

NOTE A new feature called "Online Addition and Replacement" or "OLAR" is supported in 11i. This feature allows the PCI Token Ring card to be added or replaced without the need to power down or reboot the system. See the section "Online Addition and Replacement (OLAR) of PCI Token Ring Adapter" for additional information.

Step 1. Exit all running programs and shut down the system by using this command:

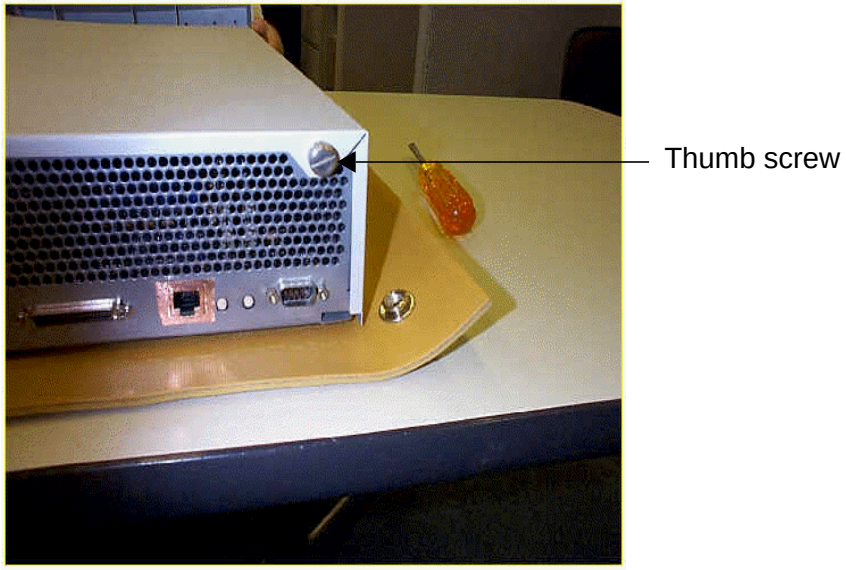
```
/sbin/shutdown -h
```

Step 2. Wait until the system responds with "OK to press reset" or "Halted, you may now cycle power," and then power off the system.

Step 3. Disconnect all attached cables and wires with the system placed on an anti-static, grounded surface if possible (see photo on following page).

Step 4. Remove the appropriate cover or panel to expose the available system

card slot(s). In the example of the A-Class system shown on the following page, you must remove the two thumb-screws identified in the photo, then remove the chassis cover.



Step 5. Locate an open card slot.

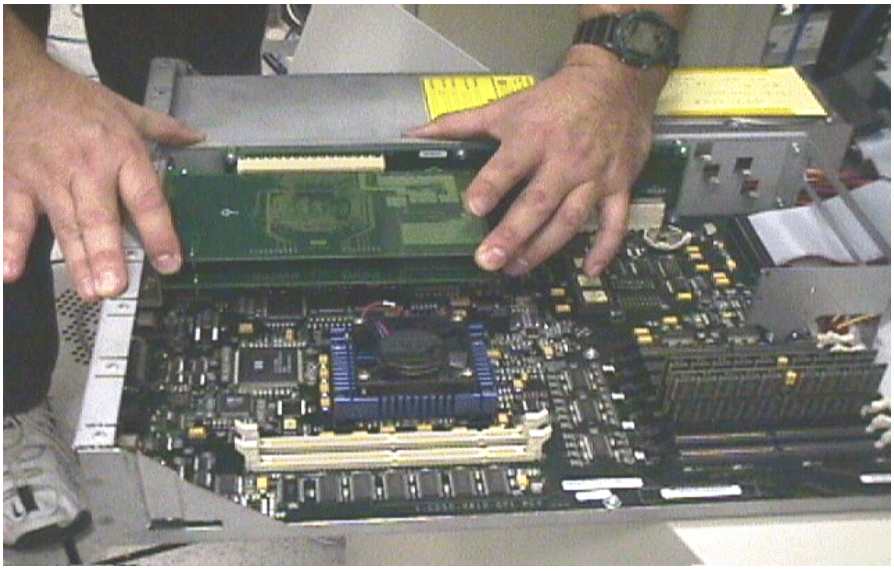
Step 6. If the slot has a cover plate over the chassis opening, remove it and keep the attachment screw for use later.

Step 7. Attach the grounding strap to your wrist or ankle.

Step 8. Remove the PCI Token Ring card from its antistatic plastic bag.

Step 9. Align the connector on the card with the slot connector.

Step 10. Press the card firmly into place, making sure that the connector is fully inserted.



Step 11. Make sure the screw hole in the card's bulkhead lines up with the hole in the chassis assembly. Use the screw you saved from step 6 to attach the card's bulkhead to the chassis.

Step 12. Replace the cover or panel that was removed in step 4.

Step 13. Re-attach all of the cables and wires.

Step 14. Connect the A.C. power cable.

Step 15. Power on the system.

Step 16. Continue with the section "Step 3: Loading Token Ring Software."

Online Addition and Replacement (OLAR) of PCI Token Ring Adapter

This section is a summary of OLAR concepts that apply to OLAR-capable adapters. For more information on OLAR planning and preparation as well as detailed step-by-step procedures for adding or replacing an adapter, refer to Chapter 2 of the *Configuring HP-UX for Peripherals* manual (part number B2355-90698). This document may be ordered from HP, or you may view, download, and print it from the following website: `http://docs.hp.com`.

The letters O, L, A, and R stand for On Line Addition [and] Replacement. HP-UX 11i systems (L-Class, N-Class, and Superdome) are capable of allowing OLAR-capable adapters to be added or replaced without the need to shut down or reboot. The system hardware uses the per-slot power control combined with operating system support to enable this feature.

Certain classes of hardware are not intended for access by users. At this time, these include V-Class and Superdome systems. HP recommends that these systems be opened only by a qualified HP engineer. Failure to observe this requirement can invalidate any support agreement or warranty to which the owner might be entitled.

NOTE If you plan to use OLAR, you may need to update your system firmware. For details about specific platforms, please refer to the *Readme Before Installing or Updating to HP-UX 11i* document provided with your system.

Important Terms and Concepts of OLAR

The addition or replacement of an OLAR-compatible card may be done in either one of two ways:

1. Using the SAM utility.
2. Issuing command-line commands using `rad`.

Table 1-3 Important Terms

Term	Meaning
OLAR	All aspects of the OLAR feature including On-line Addition (OLA) and On-line Replacement (OLR).
Power Domain	A grouping of 1 or more interface card slots that are powered on or off as a unit. (Note: Multi-slot power domains are not currently supported.)
target card / target card slot	The adapter that will be added or replaced using OLAR, and the slot in which it resides.
affected card / affected card slot	The adapters and the slots in which they reside that are in the same power domain as the target slot.

During a card replacement operation, SAM performs a *Critical Resource Analysis*, which checks the target card for critical resources that would be lost when the card is shut down.

Planning and Preparation

For the most part, SAM prevents you from performing OLAR procedures that would adversely affect other areas of the server. This is not true when using `rad`.

On-line Addition When adding an interface card, the first issue that must be resolved is whether the new card is compatible with the system. Each OLAR-capable PCI slot provides a set amount of power. The replacement card cannot require more power than is available.

The card must also operate at the slot's maximum bus frequency. A PCI card must run at any frequency lower than its maximum capability, but a card that can only operate at 33 MHz will not work on a bus running at 66 MHz. `rad` provides information about the bus frequency and power available at a slot, as well as other slot-related data.

On-line Replacement When replacing an interface card, you must

replace the card with an identical card. This is referred to as *like-for-like* replacement and should be strictly adhered to. Using a similar but not identical card may cause unpredictable results. For example, a newer version of the target card, which is identical in terms of hardware, may contain an updated firmware version that could potentially conflict with the current driver.

When the replacement card is added to the system, the appropriate driver for that card must be configured in the kernel before beginning the operation. SAM ensures the correct driver is present. If you have any question about the driver's presence, or if you are not certain that the replacement card is identical to the existing card, you can use `ioscan` together with `rad` to investigate.

NOTE

If the PCI Token Ring card has a universally administered MAC address configured when the online replacement is performed, the new card's universally administered MAC address will be used. SNA users who plan to use online replacement with PCI Token Ring card on L-Class, N-Class, and Superdome platforms will be affected. Online replacement will require changing the configuration file for SNAplus2 to use the new universally administered MAC address.

Step 3: Loading Token Ring Software

This section assumes that the board has been installed using the instructions found in the previous section (Step 2). Follow the steps below to load Token Ring software using the HP-UX *swinstall* program.

Model 712, HP 9000 EISA, or Series 800 HP-PB Systems

1. Log in as `root`.
2. Insert the software media (tape or disk) into the appropriate drive.
3. Run the *swinstall* program using the command:

   `swinstall`

   This opens the Software Selection Window and Specify Source Window.
4. Change the Source Host Name if necessary, enter the mount point of the drive in the Source Depot Path field, and activate the **OK** button to return to the Software Selection Window. Activate the Help button to get more information.

   The Software Selection Window now contains a list of available software bundles to install.
5. Highlight the Token Ring software for your system type.
6. Choose `Mark for Install` from the "Actions" menu to choose the product to be installed.
7. Choose `Install` from the "Actions" menu to begin product installation and open the Install Analysis Window.
8. Activate the **OK** button in the Install Analysis Window when the Status field displays a Ready message.
9. Activate the **Yes** button at the Confirmation Window to confirm that you want to install the software. *swinstall* displays the Install Window.

   View the Install Window to read processing data while the software is being installed. *swinstall* loads the fileset, runs the control scripts for the fileset, and builds the kernel. When the Status field indicates

Ready, activate the **OK** button and the Note Window opens. Estimated time for processing: 3 to 5 minutes.

10. Activate the **OK** button on the Note Window to reboot the system.

    The user interface disappears and the system reboots.

11. When the system reboots, check the log file in */var/adm/sw/swinstall.log* and */var/adm/sw/swagent.log* to make sure the installation was successful.

12. **HP 9000 EISA only:** Go to "Configuration for (older) EISA Cards" in Chapter 2.

PCI Systems

Preparation

You can install PCI Token Ring software from your application media during a normal system operation where:

1. The system is already booted up for operation.
2. The system is up during the installation.
3. Single-user state is not required.

For patch requirements for 10.20 and 11.0, refer to the Release Notes. A core LAN products patch is required prior to installing the software and an additional patch is required prior to using SAM.

Installation using "swinstall"

1. Log in as `root`.
2. Insert the software media (tape or disk) into the appropriate drive.
3. Run the *swinstall* program using the command:

   ```
   swinstall
   ```

   This opens the Software Selection Window and Specify Source Window.

4. Change the Source Host Name if necessary, enter the mount point of the drive in the Source Depot Path field, and activate the **OK** button to return to the Software Selection Window. Activate the Help button to get more information.

The Software Selection Window now contains a list of available software bundles to install.

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   View the Install Window to read processing data while the software is being installed. *swinstall* loads the fileset, runs the control scripts for the fileset, and builds the kernel. When the Status field indicates Ready, activate the **OK** button and the Note Window opens. Estimated time for processing: 3 to 5 minutes.
10. Activate the **OK** button on the Note Window to reboot the system.

    The user interface disappears and the system reboots.

Follow-up

1. We recommended that you do a reboot after configuring `/etc/rc.config.d/pcitrconf`, but you can execute `/sbin/rc2.d/S315pcitr start` to prevent a reboot.
2. After reboot, check `what(1)` string on the kernel. Execute:

   ```
   what /stand/vmunix | grep Token
   ```

   You should see the following on HP-UX 10.20 systems:

   ```
   A5783A/J1644AA HP PCI Token Ring <version> (<release>)
   <date>
   ```

   You should see the following on HP-UX 11.x systems:

   ```
   A5783A/A4930A/J1644AA HP PCI Token Ring <version>
   (<release>) <date>
   ```

   Refer to the Release Notes for "<version>", "(<release>)" and "<date>" information.

Step 4: Setting a Card's Configuration

Please refer to Chapter 2, "Configuring Token Ring," for information about configuring the Token Ring card.

2 Configuring Token Ring

This chapter describes how to configure the various Token Ring products.

Configuration for (older) EISA Cards

NOTE The information in this section applies only to HP 9000 EISA Token Ring. The EISA bus version of Token Ring has been obsoleted as of July 1999. Configuration information for this product is included here for older systems who may still need to configure this product.

Follow the steps below to set the EISA card link speed to the ring speed.

1. Run the *eisa_config* utility in interactive mode using the command:

   ```
   eisa_config
   ```

   The screen display shows a slot number, configuration (CFG) file, and contents description for each EISA card.

2. Verify that *eisa_config* displays either !HWPC000 at slot 0 for the S720/730 EISA system board or !HWPC010 at slot 0 for the S750 EISA system board.

NOTE If you inserted the hardware card into the EISA interface prior to installing the Token Ring software using the *swinstall* utility, **`eisa_config`** may automatically recognize the card. If so, you should proceed to Step 4 below.

   Add the Token Ring card configuration file (!MDG0002) to the EEPROM memory chip on the EISA interface using the *add* command, followed by the slot number of the first available empty slot for the card, after the EISA prompt. In the example below, 1 is the slot number chosen for the EISA Token Ring interface:

   ```
   add   !MDG0002   1
   ```

   HP recommends that you use the lowest empty slot.

3. Execute the *show board* command followed by the slot number of the card to display the board's basic attributes. In the example below, 1 indicates the slot number of the EISA Token Ring interface.

   ```
   show board 1
   ```

In the display, function names are prefaced with F1 and F2, and choice options are prefaced with CH1, CH2, and so forth.

To set the cable connector type, execute the *change* command followed by the slot number of the card, F1 for cable connector type, and the choice option of the type you wish to set. For example, to set the cable connector type of the card in slot 1 to a RJ45 connector, you must execute the command:

```
change 1 F1 CH2
```

Use CH1 for a DB9 connector (the default); use CH2 for a RJ45 connector.

You MUST configure the card link speed to match the ring speed. To set the card link speed, execute the *change* command followed by the slot number of the card, F2 for the ring speed function, and the choice option of the speed you wish to set. For example, to set the card link speed of the card in slot 1 to 16 Mbit/s, you must execute the command:

```
change 1 F2   CH2
```

Use CH2 if the ring speed is 16 Mbps; use CH3 if the ring speed is 4 Mbps.

Do not change the interrupt level (F3). The setting is CH1 (Level-sensitive).

4. To save the new card configuration, execute the command:

   ```
   save
   ```

   No switches or jumpers have to be changed.

5. To leave the *eisa_config* utility, execute the command:

   ```
   quit
   ```

   If you have not encountered any error before issuing the *quit* command, ignore all messages displayed by `eisa_config` upon exiting.

NOTE

You can also use the `eisa_config` utility to reconfigure the connector type and the ring speed for your EISA Token Ring card. You must reboot the system when you are done with `eisa_config` for the changes to take effect.

Configuration Using SAM

Using SAM with Model 712, HP 9000 EISA, or Series 800 HP-PB Systems

Using SAM, configuring Token Ring can be divided into three procedures:

- Step 1: Configuring the Token Ring link.

  Follow this step to add the IP/Internet address, alias, and, if this Token Ring card is on a subnet, the subnet mask for your card, and to configure the ring speed (Model 712) and advanced options such as station address, MTU size, source routing, and the Internet broadcast address. The procedure will automatically initialize the Token Ring link and enable your node to connect to the Token Ring network.

- Step 2: Configuring network connectivity.

  Follow this step to add remote aliases and remote host IP/Internet addresses for network connectivity, and also to specify default gateway information.

- Step 3: Verifying the installation.

  Follow this step to verify the installation.

Step 1: Configuring the Token Ring link

NOTE Make sure the Token Ring card and software are installed in the system before you use SAM to configure the software.

Log in as `root`. Refer to the information on the Network Card Configuration Worksheet as you do the following:

1. At the HP-UX prompt, type: `sam`
2. Double click *Networking and Communications* at the SAM main window.
3. Double click *Network Interface Cards* at the Networking and

Communications window.

4. Highlight the Token Ring interface card that you want to configure from the object list. If the card is not displayed, then go to Chapter 1, "Installing Token Ring," and check that your hardware has been properly installed.

   Model 712: The SAM object list *always* shows the name of the built-in LAN (IEEE802.3/Ethernet) as *lan0*, and the networking card in the slot in the backplane as *lan1*, whether it is an Ethernet or Token Ring card. If the ring speed has not been set, the card status may be "Disabled" or "Not configured."

   HP 9000 EISA: The SAM object list always shows the name of the built-in LAN (IEEE802.3/Ethernet) as *lan0*, and the first networking card in an EISA slot as *lan1*, whether it is Ethernet or Token Ring. The networking cards installed in other slots are named sequentially (*lan2*, *lan3*, etc.), according to the order of the occupied slots.

   Series 800 HP-PB: If the system includes the pre-installed Token Ring option, it is *lan0*. If the system does not contain a built-in Token Ring card and your card is the first Token Ring card added to the system, it is *lan1*.

5. Verify that the hardware path is correct for your Token Ring card.

   Model 712: The hardware path will be 5/0/7.

   HP 9000 EISA: The last number of the hardware path should match the backplane slot number of the card. For example, if the hardware path is 4/0/3, then the card should be in slot 3.

   Series 800 HP-PB: The hardware path should equal 4 times the hardware module number in which the card has been installed. For example, if the hardware path is 32, then the card should be in hardware module 8.

6. Choose `Configure` from the "Actions" menu to open the Configure LAN Card window. Enter the information about the Token Ring card. To do so, press the **Tab** key to move through the data entry fields.

NOTE SAM displays the **`Card Name`**, **`Hardware Path`**, and **`Station Address`** fields with the appropriate values. These fields cannot be modified.

   a. Verify that the type of your card is Token Ring.

b. Model 712 only: Enter the ring speed. It must match the speed of the ring.

NOTE EISA Token Ring speed is configured in the `eisa_config` utility. S800 HP-PB Token Ring speed is physically configured on the card.

c. Enter the Internet address for your Token Ring card.

   Upon exiting the `Internet Address` field, SAM checks to make sure that the IP/Internet address you entered is correctly formatted and is not currently in use.

d. Optionally, choose `Add Aliases` to open the Add Aliases window to assign aliases for the local host.

   You must complete this step if you have more than one network card installed in your system. You can also modify or remove alias names for your card on this menu.

   Activate the **OK** button to perform the task and return to the Configure LAN Card window.

e. Optionally, at the Configure LAN Card window, you may enter the subnetwork mask for your subnetwork

f. Optionally, enter comments about your card.

g. Optionally, choose “Advanced Options” to open the “Configure Advanced Options” window. You can change or configure your station address, the Internet broadcast address, the maximum transmission unit (MTU) size, and/or source routing on this screen.

   For HP-PB and EISA Token Ring, you can install patches to increase the MTU size to 4500. Refer to Table 3-2 for a list of patches.

   Activate the SAM on-line help for additional information on these options.

   Activate the **OK** button to perform the task and return to the Configure LAN Card window.

7. Activate the **OK** button at the Configure LAN Card window to configure and enable your Token Ring card.

If the software is correctly configured, SAM displays the Network Card Configuration object list with the status **Enabled** for your card; otherwise, SAM displays an error message.

8. At the Network Interface Card menu, select **Exit** from the "File" menu.
9. Choose **Exit SAM** from the "File" menu at the Networking and Communications window.

   If you have moved or removed any Token Ring cards from the system, HP recommends that you verify the IP/Internet address of every card in the backplane before leaving SAM.

10. Verify that the Token Ring device files have been created correctly by executing the HP-UX commands:

    ```
    cd /dev
    ls -l lan*
    ```

    If the Token Ring device file has not been created, execute the script:

    ```
    /usr/sbin/hptoken_init devfile
    ```

Refer to Chapter 3, "Token Ring Resources," for descriptions of Token Ring device files. If you want to configure your system for network connectivity, continue with the next section, "Step 2: Configuring Network Connectivity". If not, continue to "Step 3: Verifying the Installation."

Step 2a: Configuring network connectivity on systems running HP-UX version 10.20 and earlier

Your system may not be able to communicate with other systems (for example, PCs, workstations, and servers) until you configure system-to-system connections by adding an entry in */etc/hosts* for the remote system. You can use SAM to do this 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 configure 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 on-line 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. If a gateway is required, SAM displays fields for entering gateway information for this remote system connection. Use the SAM on-line help system for information about gateways.

   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 Address window.

5. Activate the **OK** button to enable your system to communicate with this system and return to the Internet Addresses 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 and 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 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 Token Ring product, continue to "Step 3: Verifying the Installation."

Step 2b: Configuring network connectivity on systems running HP-UX version 10.30 and later

Your system may not be able to communicate with other systems (for example, PCs, workstations, and servers) until you configure system-to-system connections by adding an entry in */etc/hosts* for the remote system. You can use SAM to do this 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 *Hosts* and then *Local Hosts File* item to configure 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 Host to File` window to add the internet address and system name of a remote system.

   Use the SAM on-line 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. If a gateway is required, SAM displays fields for entering gateway information for this remote system connection. Use the SAM on-line help system for information about gateways.

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 **Configure Aliases** to open the Configure 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 Host to File window.

5. Activate the **OK** button to enable your system to communicate with this system and return to the Hosts window.

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. 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 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 Token Ring product, continue to "Step 3: Verifying the Installation."

Step 3a: Verifying the installation on systems running HP-UX version 10.20 and earlier

Once your Token Ring software is installed, fully configured and running, you should run the following commands to verify hardware and software installation. Refer to the on-line man pages for complete descriptions of the commands listed below.

1. To check that the link is working, run the *linkloop* command.

   In this *linkloop* example, *5* is the Network Management ID (NMID) of your Token Ring card and *0x100090000222* is the station address of a local or remote node. (You can obtain the NMID and the local station address from the *lanscan* command.)

   ```
   linkloop  -i 5 0x100090000222
   ```

   Token Ring installation is verified if *linkloop* succeeds to the local station address. You can further verify the link by doing the following steps.

2. To check that the network connection is working, enter the *ping* command at the HP-UX prompt. In this example, 191.2.1.2 is the configured IP/Internet address of the remote system.

   ```
   ping  191.2.1.2
   ```

3. To view information about the station address, hardware state, and network interface state of your Token Ring card, enter the *lanscan* command at the HP-UX prompt as shown below:

   ```
   lanscan
   ```

4. To show the number of packets sent or received, and any link errors, enter the *netstat -i* command at the HP-UX prompt as shown below:

   ```
   netstat  -i
   ```

5. To show the status of the Token Ring interface, enter the *lanadmin* diagnostic command at the HP-UX prompt as shown below:

```
lanadmin
```

After entering the utility, enter the following *lanadmin* menu commands in sequence to show the status of the Token Ring device with the *NMID* of 5.

```
lan
nmid 5
display
```

To exit the utility, enter:

```
quit
```

Refer to Appendix A for a description of the *lanadmin* display fields.

Step 3b: Verifying the installation on systems running HP-UX version 10.30 and later

As of 10.30, there were a number of changes in the various commands that may be used to verify the installation of a Token Ring board. This section provides information about these changes.

- Data Link Provider Interface (DLPI)

  As of 10.30, several changes were made to the DLPI driver to support the Streams-based networking stack.

  PPA number. The PPA number for DLPI is no longer equivalent to the network management identifier (nmid). The PPA number has been changed to be the same as the card instance number.

  Source routing. Token Ring source routing is no longer enabled/disabled via lanconfig. The *lanconfig* command is not supported in 10.30. Token Ring source routing is now enabled/disabled via the *lanadmin* command with the rif/-rif options.

  Impact. The PPA change will potentially have the greatest impact. Applications that assume the nmid is the PPA number need to make changes to use the card instance number instead. The other changes only affect drivers that require support through Hewlett-Packard's common DLPI implementation.

- lanscan

  As of 10.30, LAN drivers do not maintain interface state. In 10.20, *lanscan* displayed the interface state of each networking device. This

can no longer be done in 10.30. Therefore, the Network Interface State field has been removed. Instead, the *netstat* command can be used to determine the state of the interface:

```
$ netstat -i

Name   Mtu   Network      Address         Lpkts     Opkts
lo0    4136  127.0.0.0    127.0.0.1       128       164
lan0   1500  15.13.136.0  15.13.136.73    103838    20238
lan1*  1500  none         none            0         0
```

The asterisk (*) after lan1 indicates that it is DOWN.

Until 10.20, *lanscan* displayed the interface unit number in the Network Interface NameUnit field. In 10.30, *lanscan* displays the Physical Point of Attachment number (PPA#). This is the same as the card instance number if the HP-supported common DLPI is used.

The driver-specific major number is replaced by the DLPI major number in both normal and extended display. This number is the same for HP drivers that use the HP-supported common DLPI. For third party drivers and HP drivers that provide their own DLPI, this need not be true. The field, HP-DLPI Support, indicates whether the HP-supported common DLPI is used.

Two new options have been added: -m is used to display the MAC type and -p is used to display the PPA#. The -n option functions as it did in 10.20.

Driver-specific information will be displayed after the extended station address and encapsulation. Included in the driver-specific information are the driver name, which is stored in the hwift name field, and, for the HP-PB and built-in FDDI interfaces, the driver-specific major number.

The purpose of displaying the driver name is to distinguish a 100VG interface from a non-VG interface.

The executables that parse the *lanscan* output will have to be changed. See the *lanscan* manpage for details.

The PPA# is no longer equal to the NMID as it was in 10.20. Programs that get the NMID from *lanscan* and expect it to be the same as PPA# should be changed to get the PPA# instead.

Network management tools and some driver start-up scripts that use NMID must be changed. Any tool that depends on PPA# to be the same as NMID needs to be changed. See the -p option for details.

- ifconfig

  Another way of finding the interface state is by using ifconfig:

  ```
  $ ifconfig lan0
  ```

  lan0: flags=843<UP,BROADCAST,RUNNING,MULTICAST>...
  inet 15.13.136.73 netmask fffff800 broadcast 15.13.143.255

  ```
  $ ifconfig lan1
  ```

  ```
  lan1: flags=842<BROADCAST,RUNNING,MULTICAST>...
  inet 0.0.0.0 netmask 0
  ```

  Interface names. Interface names used for *ifconfig* commands and /etc/rc.config.d/netconf statements can have a logical instance number appended to the card name (for example, lan0:1). The new syntax is:

  ```
  name X[: logical_instance ]
  ```

  where:

  name is the class of interface, such as lan (Ethernet LAN, Token Ring, FDDI, or Fibre Channel links), snap (IEEE802.3 with SNAP encapsulation), atm (ATM), du (Dial-up), ixe (X.25), and mfe (Frame Relay).

  X is the Physical Point of Attachment (PPA). This is a numerical index for the physical card in its class. For LAN devices, the *lanscan* command will display the name and PPA number concatenated (such as lan0) in the Net-Interface NamePPA column.

- lanadmin

  lanadmin uses PPA# instead of NMID.

  lanadmin supports a new option -B on|off to enable/disable source routing with Token Ring. -b displays the state of source routing. Similar functionality was provided by *lanconfig* until (and including) 10.20.

  Executables that rely on NMID have to be changed. Also, if you use lanconfig to enable/disable Token Ring source routing, you must now use lanadmin. See the lanadmin manpage for details. Also, driver start-up scripts must be changed if they rely on NMID to be used by lanadmin.

- linkloop

  linkloop uses PPA# instead of NMID.

Executables that rely on NMID have to be changed. See the *linkloop* manpage for details.

- lanconfig

  As of 10.30, lanconfig no longer exists. Instead, *lanadmin* can be used to enable/disable Token Ring source routing.

  The Token Ring rif option (source routing) is now part of the *lanadmin* command.

  To disable source routing:

  ```
  /usr/sbin/lanadmin -B off <PPA_number>
  ```

  To enable source routing:

  ```
  /usr/sbin/lanadmin -B on <PPA_number>
  ```

  To display the current setting:

  ```
  /usr/sbin/lanadmin -b <PPA_number>
  ```

  By default, source routing is enabled on Token Ring devices. Use the *lanscan* command to determine the PPA numbers for LAN devices.

Using SAM with PCI Systems

A SAM patch is required to configure PCI Token Ring. Refer to the Release Notes.

Configuration is done using the *Networking and Communications Network Interface Card*'s screen. Please refer to "Manual Installation and Configuration" in Chapter 3 for details on performing manual configuration.

NOTE Use either SAM or manual configuration, not both.

1. Select the Token Ring link to be configured.
2. Note that setting incorrect parameters can render your network inoperable and will prevent the Token Ring link from connecting to the network. Exercise caution while modifying parameters.
3. Enabling autosense will allow the link to sense the speed and duplex setting of the network and configure itself. See items 1.f and 1.g in the

"Manual Configuration for PCI Systems" section in Chapter 3 before enabling autosense.

4. If autosense is enabled, the only remaining configuration items are IP configuration, station address, and MTU. Skip to step (6) below.

   For 100 Mb/s operation, select autosense, as it cannot be enabled otherwise. 100 Mb/s can only be enabled on A5783A when using autosense and when the adapter is connected to a 100 Mb/s port. Also, software A5783A revision B.11.00.04 or later must be installed.

   On-line diagnostics (IPR 9904 and later) may be used to distinguish between A4930A (4/16 PCI Token Ring) and A5783A (4/16/100 PCI Token Ring).

   Alternatively, *ioscan(1M)* can be used to distinguish between A4930A and A5783A if revision B.11.00.06 or later is installed.

   Also, note caveats 1.a through 1.g in the "Manual Configuration for PCI Systems" section in Chapter 3.

5. If autosense is disabled, speed and duplex must be configured. Setting the speed to "0" (zero) is not supported.

6. IP address, subnet mask alias, and enabling DHCP configuration is the same as in other links.

7. "Advanced Options":

   - If setting the station address, please note that PCI Token Ring does not support changing the station address to another globally administered address. Only locally administered addresses are supported. The only global addresses supported are:

     - The card's own MAC address.

     - An address of all zeroes, which is treated the same as the card's unique address.

   - The MTU must be set to a non zero value for the link to function. See 1.e in the "Manual Configuration for PCI Systems" section in Chapter 3.

     SAM may set the default MTU to "0" (zero) when configuring a card for the first time. *The user must check and correct this.*

SAM does not support setting the RIF option for PCI Token Ring in 11.x. (PCI Token Ring does not support boot time configuration of RIF in 10.20.) This needs to be manually configured as detailed in the "Manual

Configuration for PCI Systems" section in Chapter 3.

SAM configuration of any parameter will overwrite RIF information. RIF configuration should be done manually after SAM configuration of other parameters.

Setting Speed and Duplexity

Speed changes may be set by editing `pcitrconf`, using SAM, or by using `lanadmin(1M)`. To enable 100 Mb/s operation with A5783A connected to a 100 Mb/s port, use `lanadmin -X AUTO_ON`. Refer to the following table for `lanadmin` parameter values.

lanadmin supports the "-X <option>" to change speed and duplex mode.

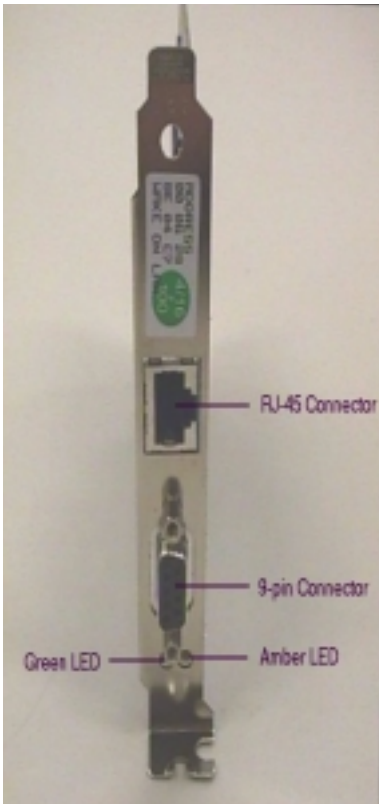
Table 2-1 lanadmin "-X" options

-X <option>	Speed and Duplex Mode Meaning
4HD	4 Mb/s - Half duplex
16HD	16 Mb/s - Half duplex
4FD	4 Mb/s - Full duplex
16FD	16 Mb/s - Full duplex
AUTO_ON	Autosense and 100 Mb/s operation

Please refer to earlier warnings about incompatible settings.

Status Light Emitting Diodes (LEDs)

The bulkhead of each Token Ring board contains two connectors and two Light Emitting Diode indicators (LEDs). Below is an example of the PCI Token Ring board.



The following table shows the functional status of the board as indicated by the “Error” (Amber) and “Link” (Green) LEDs.

Table 2-2 Status LEDs

*	Amber - “Error”	Green - “Link”	Explanation
X	Blinking	Blinking	The adapter is waiting for initialization.
	Off	Off	The adapter initialization is in progress or the system is not powered on.
	Off	Blinking	The adapter did not detect any problems during self-diagnostic tests and is waiting to open. NOTE: If this state occurs after the adapter has been opened, this indicates that the adapter has been closed via software control / cable disconnect.
	Off	On	The adapter is open/operating correctly.
X	On	Off	The adapter self-diagnostic tests failed or there is a problem with the adapter.
	Blinking	Off	The adapter is closed due to an undetected error. One of the following is possible: * The adapter open failed. * The adapter detected a wire fault. * The adapter failed auto-removal test.
	Blinking	On	The adapter has detected beaconing or a hard error.
X	On	On	The adapter has failed before running its self-diagnostics.

NOTE: Only those items with an “X” in the “*” column are possible prior to configuration.

3 Token Ring Resources

To maintain and administer Token Ring, use the following resources:

- HP-UX Manual Reference Pages.
- Logging Messages.

- Manual Installation and Configuration.
- Token Ring Device Files.
- Contacting Your HP Representative.

HP-UX Manual Reference Pages

While installing, configuring, or troubleshooting Token Ring, you may need to refer to any of the following on-line manual reference pages (man pages) for useful HP-UX operating system or Token Ring 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.
- **eisa_config(1M)** interprets information stored in configuration files and uses it to configure system resources needed to properly interact with EISA cards on HP 9000 EISA workstations. You should also use *eisa_config* to set the EISA Token Ring card link speed and cable connector type.
- **hosts**(4) contains 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 including Token Ring.
- **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 trace packets as they enter and exit the Token Ring driver.
- **ping(1M)** verifies network connectivity through the Network Layer (OSI Layer 3) and reports the round-trip time of communications

between the local and remote hosts.

- **rad(1M)** performs OLAR functions without any comprehensive checks.
- **route(1M)** adds and deletes entries to the network routing table about gateways.
- **sam(1M)** configures networking software and sets the ring speed on Model 712 and configures the PCI Token Ring link.
- **swinstall(1M)** loads software file sets onto 10.x and 11.x systems.

Logging Messages

Token Ring uses the *nettl(1M)* logging and tracing facility supplied with HP-UX. Although this utility is also documented in *manpages* and other documents, it is included here for the user's convenience.

You may access the logging and tracing utility using either the graphical user interface (GUI) version (*nettladm*) or the command line interface (*nettl/netfmt*)

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 below. Refer to the *nettladm(1M)* man page for information on using the GUI version.

```
nettladm
```

Listed below are some example commands using the command line interface. Refer to the *nettl(1M)* and *netfmt(1M)* manual (man) pages for information on using the command line interface

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

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

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

```
**********802.5 Networking**********
Timestamp        :Mon Dec 12PST 1994  03:40:10.555252
Process ID       :750                 Subsystem   :TOKEN
User ID (UID)    :0                   Log Class   :DISASTER
Device ID        :1                   Path ID     :0
Connection ID    :0                   Log Instance:0
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

<1317> Token Ring driver encountered a lobe error on
interface unit <1>; reset or reboot

(Disaster) Verify the physical connections from your system to the ring. Then
use the lanscan(1M) command to find the NMID of the Token Ring card. Use the
lanadmin(1M) command to reset the card. Reboot if necessary. If rebooting is
ineffective, follow the troubleshooting flowcharts in the documentation in
sequence until the problem is solved. The HP internal error code is <-1>.
```

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

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

  A sample Token Ring log message using just the `-f` option is shown below.

```
**********802.5 Networking**********
Timestamp        :Mon Dec 12PST 1994  03:40:10.555252
Process ID       :750                 Subsystem   :TOKEN
User ID (UID)    :0                   Log Class   :DISASTER
Device ID        :1                   Path ID     :0
Connection ID    :0                   Log Instance:0
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

<1317> Token Ring driver encountered a lobe error on interface unit <1>; reset
or reboot
```

- To check network logging and tracing status:

  ```
  nettl -status
  ```

- For non-PCI systems, to start Token Ring tracing to the file */tmp/tracefile.TRC0:*

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

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

- For PCI systems, to start Token Ring tracing:

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

- For non-PCI systems, to stop Token Ring tracing:

  ```
  nettl -traceoff -entity token
  ```

- For PCI systems, to stop Token Ring tracing:

  ```
  nettl -traceoff -entity pcitr
  ```

- To format the Token Ring 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 command and how to create a filter for trace formatting.

Messages Logged on a Cable Disconnect/Re-connect (PCI Token Ring)

The NetTL message logged for cable disconnect is different for 16/4 Mb/s and 100 Mb/s operation:

In 4/16 Mb/s, the message logged is:
```
“Cable disconnected/faulty”
class ERROR #2009
```

In 100 Mb/s, the message logged is:
```
“Internal error after beacon auto removal process”
class ERROR #2010
```

In either case, when the cable is re-connected, the following message will be seen:
```
“Link back online”
class INFO #4001
```

Starting with B.11.00.06, the above messages have changed. The cable disconnect message will be logged as an ERROR message to the nettl subsystem, as follows:

```
The PCI Token Ring adapter driver detected a possibly
faulty/disconnected cable at <hardware path>.
```

On a cable re-connect, an INFORMATIVE message will be logged to the nettl subsystem, as follows:

```
The PCI Token Ring adapter driver detected that the link has
been re-established at <hardware path>.
```

Manual Installation and Configuration

For Non-PCI Systems

HP recommends that you install your Token Ring software using *swinstall* and configure it using SAM.

Follow the steps below to manually install and configure your Token Ring product. Refer to detailed instructions in the *Installing and Administering LAN/9000 Software* manual for additional information. The section for manually configuring a PCI system follows this one.

1. Complete all the prerequisites in "Step 1: Checking Token Ring Installation Prerequisites" in Chapter 1.
2. Install the Token Ring software using swinstall and regenerate the kernel (refer to "Step 3: Loading Token Ring Software" in Chapter 1). Follow the detailed instructions in Chapter 3, "Manually Configuring LAN/9000" in the *Installing and Administering LAN/9000 Software* manual if you need to manually create a new kernel. You may need some of the following Token Ring-specific information when you follow those steps.
   - Model 712 driver keyword: token3
   - HP 9000 EISA driver keyword: token
   - Series 800 HP-PB driver keyword: token2
3. Install the hardware. Refer to instructions in "Step 2: Installing Token Ring Hardware" in Chapter 1.
4. Verify the Token Ring device files. To do so, refer to instructions in the next section, "Token Ring Device Files (obsolete)".
   - Model 712 device major number: 160
   - HP 9000 EISA device major number: 102
   - Series 800 HP-PB device major number: 103
5. Edit the Token Ring configuration files: */etc/rc.config.d/netconf* and */etc/rc.config.d/hptokenconf*.

   This step is equivalent to configuration using SAM. Token Ring configuration is kept in the *netconf* and *hptokenconf* files. See "Editing

/etc/rc.config.d/netconf" in Chapter 3 of the *Installing and Administering LAN/9000 Software* manual for details. Note that for Token Ring, the encapsulation method is not configurable.

The Internet configuration information in the *netconf* file should be similar to the information displayed in the example below.

```
IP_ADDRESS[1]=192.20.20.122

SUBNET_MASK[1]=255.255.255.0

LANCONFIG_ARGS[1]="rif"

INTERFACE_NAME[1]=lan1

BROADCAST_ADDRESS[1]=192.20.20.255
```

The valid value for LANCONFIG_ARGS is "rif" or "-rif."

The Token Ring-specific link configuration information in the *hptokenconf* file should be similar to the information displayed in the example below.

```
HP_TOKEN_INTERFACE_NAME[0]=lan1

HP_TOKEN_STATION_ADDRESS[0]=0x10009090c8EE

HP_TOKEN_MTU[0]=4170

HP_TOKEN_RING_SPEED[0]=
```

Note that HP_TOKEN_RING_SPEED is used for the M712 only. Valid values are 16000000 or 4000000.

For HP-PB and EISA Token Ring, you can install patches to increase the MTU size to 4500. Refer to Table 3-2 for a list of patches.

6. Activate your configuration. You can reboot the system to activate the configuration or execute the *ifconfig or lanadmin* commands manually or startup the scripts `/sbin/rc2.d/S340net` and the proper script for your interface (e.g. `/sbin/init.d/hptoken` for HP-PB). When you configure Token Ring using SAM, SAM executes these commands for you. Using the *netconf* and *hptokenconf* examples above, you will execute:

   ```
   lanadmin -A 0x10009090C8EE 5

   ifconfig lan1192.20.20.122 netmask 255.255.255.0\
       broadcast 192.20.20.255
   ```

   This example assumes the NMID of the Token Ring link is 5 (use

lanscan(1M) to find the NMID). *lanadmin(1M)* sets the station address and the MTU size (if different from the default). *ifconfig(1M)* configures the IP address and masks.

7. Refer to the *Installing and Administering LAN/9000 Softwar*e manual for the edits required to */etc/hosts*, */etc/services*, */etc/networks*, and */etc/protocols*.

Manual Configuration for PCI Systems

At this point, it is assumed that you have already installed the PCI Token Ring board into the backplane of your system. If this has not yet been done, please refer to the appropriate section of Chapter 1 for instructions about doing this before continuing with this section.

1. If you have A5783A hardware, install A5783A or TokenRing-00 software bundle. If you have A4930A hardware, install A4930A or TokenRing-00 software bundle. If you have both, install both software bundles.
2. Execute *lanscan(1M)* to determine the PPA numbers of the Token Ring interfaces.
3. If a PCI Token Ring interface has not been configured, *lanscan* will show its MAC address as all zeroes. This is ok.
4. Determine which interfaces you want enabled.

   Important!

   Starting with B.11.00.02, you may choose to configure the card and IP manually or by using SAM. It is recommended that once a method has been chosen, that method be followed whenever new PCI Token Ring cards are configured or existing cards are reconfigured on the system.

   For 10.20 and 11.0, a patch is required prior to using SAM. See the current Release Notes for patch information.

NOTE 100 Mb/s operation is supported on B.10.20.00 or later and B.11.00.04 or later and when the requirements shown below are met.

1. Edit `/etc/rc.config.d/pcitrconf` and specify the parameters for each interface that is to be enabled. Follow the instructions in the file

on how to configure each interface.

Please note that setting incorrect parameters can render your network inoperable and will prevent the Token Ring link from connecting to the network. Please exercise caution while modifying parameters.

Please note the following:

a. Starting with B.11.00.01, the parameter names in `pcitrconf` have changed. On B.10.20.00 or later, *only* new names may be used. Refer to the following table for a list of old and new names. Use of the new names is encouraged but the old names will work during the transition period. Refer to the instructions in the comment section of the file.

Table 3-1 Old vs New Parameter Names

Old Name	New Name
PCITR_SPEED	PCITR_RING_SPEED
PCITR_FDX	PCITR_DUPLEX
PCITR_MACADDR	PCITR_STATION_ADDRESS

NOTE Using old names will result in a warning in `/etc/rc.log` during each boot.

b. The interface name can be found from `lanscan(1M)`.

c. Not all interfaces need to be configured, only those that are going to be used.

d. Either autosense or speed/FDX (full duplex), but not both, can be specified. If both are specified, autosense will override speed/FDX.

e. Although Token Ring supports an MTU of 18000 bytes for a speed of 16 Mb/s (and 100 Mb/s), most switches do not go that high. Switches vary in the amount of buffering provided. Some support MTU's as low as 4540 bytes. MAUs support 18000, but they do not support full duplex (FDX). Consult your switch manual before configuring the MTU.

Also note that HP-PB (J2166A) and EISA (J2165A and J2638AA) currently support an MTU of 4170 bytes. If PCI Token Ring is to be connected to a network containing HP-PB Token Ring, it is best to set PCI Token Ring's MTU at 4170.

The following patches or patches that supersede them allow MTUs of up to 4500 bytes on HP-PB and EISA Token Ring:

Table 3-2 Patches Required to Increase MTU Size

	10.20	**11.0**
HP-PB	PHNE_17536	PHNE_17355
EISA	Not available	PHNE_17942

No patches are required for 11i.

f. In a shared ring (stations are connected by a MAU), the first station to enter the ring should not use autosense. The remaining stations can use autosense. If autosense is not used, the speed should match the first station. FDX cannot be enabled in a shared ring environment.

To configure 100 Mb/s operation, enable autosense. 100 Mb/s operation is supported only when all of the following requirements are met:

1. A5783A is used.

   On-line diagnostics (IPR 9904 and later) may be used to distinguish between A4930A (4/16 PCI Token Ring) and A5783A (4/16/100 PCI Token Ring) in 11.x. Starting with B.11.00.06, `ioscan(1M)` can also be used to distinguish between the two.

2. The adapter is connected to a 100 Mb/s port.
3. Software A5783A revision B.10.20.00 or later or B.11.00.04 or later is installed.
4. Autosense is enabled.

NOTE If full-duplex is enabled and the requirements of g.1 through g.3 above are satisfied, the adapter will sense and configure itself to 100 Mb/s operation regardless of the speed setting. This is not supported.

A 100 Mb/s switch port cannot support 4/16 Mb/s operation. Manually setting 4 or 16 Mb/s when A5783A is connected to a 100 Mb/s switch port is not supported.

Connecting A4930A to a 100 Mb/s switch port is not supported.

Starting with B.11.00.06, a new option has been added to `/etc/rc.config.d/pcitrconf`: `PCITR_RIF`. This can be used to enable/disable source routing on a per interface basis and can be set to ENABLE or DISABLE. The default is ENABLE. Note that SAM support for this option is not yet available.

SAM configuration of any parameter will overwrite RIF information. RIF configuration should be done manually after SAM configuration of other parameters.

2. Configure the interfaces in `/etc/rc.config.d/netconf` if necessary. Reboot after modifying `pcitrconf` and `netconf`. Alternatively, execute `/sbin/rc2.d/S315pcitr start` after modifying `pcitrconf` and `netconf`, but before executing `/sbin/rc2.d/S340net start` or using `ifconfig(1M)`.

   When configuring `pcitrconf` and `netconf`, please note that white space is not permitted on either side of the equals symbol (“=”) within the configuration files.

Token Ring Device Files (obsolete)

Prior to 10.30, device files were used to identify the Token Ring driver and card. Information about device files is included here for those systems that may still be using older versions of HP-UX.

Each driver/card was associated with a device file. By convention, device files were kept in a directory called */dev*, with each device file having a name and device number to uniquely identify the above characteristics. For each Token Ring card that is bound successfully to the I/O subsystem at boot-up, the system created device files by default: */dev/lanX*. The card instance number was concatenated to the device file names.

Using Device Files

Once a system is re-booted, log on and follow the steps below to verify the Token Ring device files. If the major numbers or minor numbers are not correct, delete the device file entries from your */dev* directory and recreate them with the correct numbers using the *insf(1M)* command.

1. Execute the *lanscan* command.
2. Obtain a listing of the LAN device files.

   ```
   ls -l /dev/lan*
   ```

3. Compare the *lanscan* output with the device file listing to verify that the major and minor numbers are correct.

   When looking at the device file listing, the fifth column is the major number. The sixth column is the minor number, *0xnn0000* where *nn* is the byte for the card instance number.

Series 800 Device Files Example

This example is for a Series 800 Model F20.

The *lanscan* command provides the following output. (The HP DLPI

Support field has been removed from this output.)

```
Hardware Station      Crd Hardware Net-Interface     NM  MAC     Mjr
Path     Address       In# State    NameUnit  State  ID  Type    Num
44.1    0x080009266C3F   0   UP       lan0     UP    4   ETHER   185
48      0x10009090C8EE   1   UP       lan1     UP    5   802.5   103
```

To Create Device Files Manually

For PCI Token Ring

Device files do exist for PCI Token Ring, but are not to be used/modified/created by users.

All Other Token Ring

To create device files manually for a Token Ring device, run the *mknod* command. For example:

`/usr/sbin/mknod /dev/lan1 c 103 0x010000`.

In the example above:

- The number 1 in "*/dev/lan1*" is the card instance number.
- The letter *c* is for character device.
- The 103 is the major number.
- The 01in 0x010000 is the card instance number (Crd In# in *lanscan(1M)* output): 1 = 01, 2 =02.
- A detailed explanation of the *mknod(1M)* command is provided in the man page.

The Token Ring device file created by the example command should be as follows:

```
crw-rw-rw- 1  root  sys 103 0x010000Jan 28 08:58  /dev/lan1
```

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 as shown in the Network Card Configuration Worksheet in *Token Ring Quick Installation Guide*.

  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 Token Ring version number, execute: *what /stand/vmunix | grep Token*.

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

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

- Prepare copies of the `/etc/hosts`, `/etc/rc.config.d/netconf`, and `hptokenconf` or `/etc/rc.config.d/pcitrconf` files.

- For PCI Token Ring only, execute `/sbin/rc2.d/S315pcitr start` and record the output.

- For HP 9000 EISA only: Run the *show board* command of the *eisa_config* utility on the Token Ring card and record the output.

- Execute the *dmesg* command and record messages about the status of the Token Ring card.

- Execute the *lanscan(1M)* command to display information about the hardware path, station address, card instance number, hardware state, network interface state, network management ID, MAC type, and device major number.
- Execute the *display* command of the *lanadmin* diagnostic on the Token Ring 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 with the *-f* option 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 Token Ring 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 selective dump must be taken. For HP-UX 10.x, use the HP-UX utility *savecore(1M)* to save a core dump. For HP-UX 11.x, use *savecrash(1M)*. Send the output to your HP representative.

4 Troubleshooting Token Ring

This chapter provides guidelines for troubleshooting Token Ring. It contains the following sections:

- Troubleshooting Overview.
- Diagnostic Flowcharts.

Troubleshooting Overview

Token Ring 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 Token Ring network.

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

If you cannot solve the problem on your own, contact your HP representative. Use the guidelines at the end of this chapter to help you effectively communicate what is wrong.

NOTE

To quickly isolate and diagnose Token Ring problems, follow the steps in the troubleshooting flowcharts in sequence, beginning with flowchart 1, and stay with the flowcharts until the problems are resolved.

Diagnostic Flowcharts

Below is a summary of the types of network tests in the diagnostic flowcharts. To diagnose your problem, first check the connections and configuration on your system (flowcharts 1 through 4). If this does not solve your problem, use flowcharts 5, 6, 7, 8, and 9 to test/verify connectivity with a remote system.

Table 4-1 List of Flowcharts

Flowchart	Description
1	Token Ring Connections Test
2, 2A, 3, 3A, 4	Configuration Test
5, 6	Network Level Loopback Test
7	Transport Level Loopback Test (using ARPA)
8	Link Level Loopback Test
9	Bridge/Gateway Loopback Test

Token Ring Connections Test: Checks that all the hardware connections between your system and the Token Ring network are connected and operational.

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

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

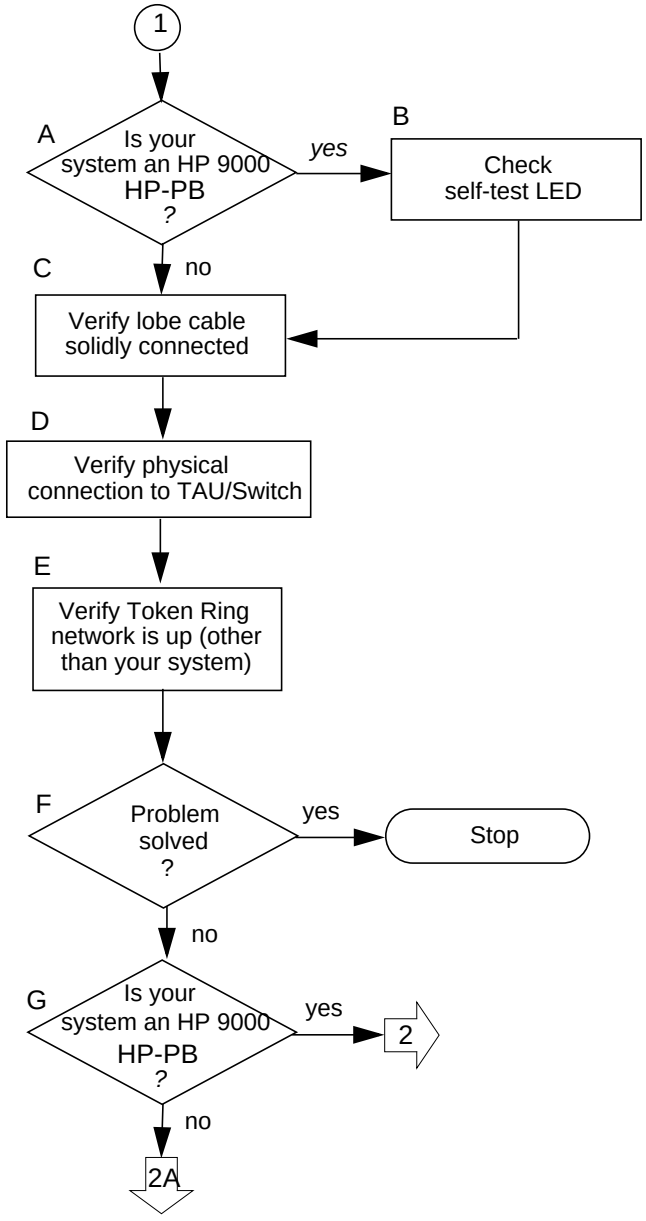
Transport Level Loopback Test: Checks round trip communication between Transport Layers on the source and target hosts using ARPA services *telnet* and *ftp* commands.

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

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

Flowchart 1: Token Ring Connections Test

Figure 4-1 **Flowchart 1**



Flowchart 1 Procedures

A. **Is your system an HP 9000 HP-PB?** Follow the flowchart path that corresponds to your system.

B. **Check self-test LED.** If card operation is normal, the LED will turn on briefly during power up and then turn off. If the LED never comes on or stays on after a normal boot-up process, there is a card problem. If the LED is blinking, the ring speed may have been incorrectly configured or there may be a network error external to the card. Refer to the *HP-PB Token Ring Network Adapter* manual for more detailed information.

C. **Verify lobe cable solidly connected.** Without powering down the system, make sure the connector on your cable is solidly connected to the card. If the connector has become disconnected, plug it in and continue.

D. **Verify physical connection to TAU or Switch.** Make sure that your Token Ring cable is fully connected to the TAU or Switch and that the TAU or Switch state is UP.

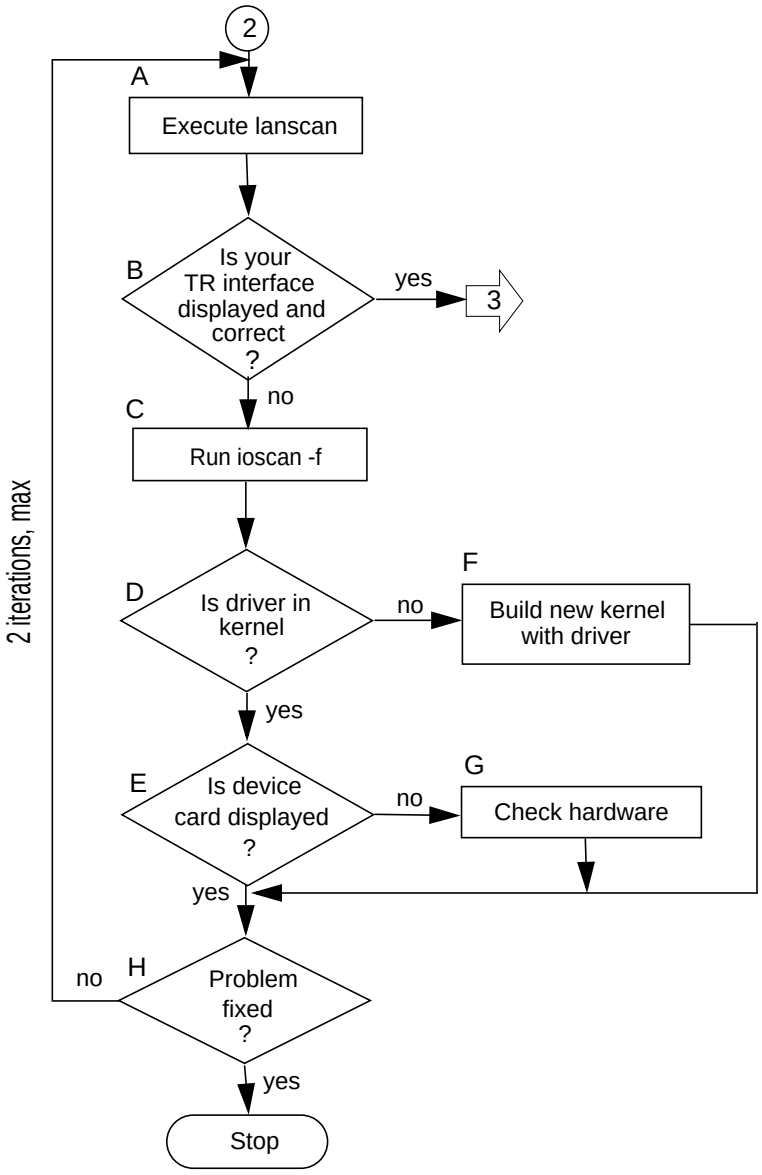
E. **Verify Token Ring network is UP (other than your system).** Make sure that the status of the Token Ring network is UP by checking the status of some of the other systems on the network, i.e. ask your co-workers if their systems are operational.

F. **Problem solved?** If so, stop. If not, continue to G.

G. **Is your system an HP 9000 HP-PB?** Go to the flowchart corresponding to your system. For Series 800 HP-PB systems, continue to flowchart 2. Otherwise, continue to flowchart 2A.

Flowchart 2: Configuration Test (Series 800 HP-PB)

Figure 4-2 **Flowchart 2**



Flowchart 2 Procedures

NOTE Before proceeding to flowcharts 2 through 4, the Configuration Test flowcharts, be sure that your connectors to the card, wall plug, and TAU/Switch are fully connected.

A. **Execute lanscan.** Execute *lanscan* to display information about Token Ring cards that are successfully bound to the system. For example, to check the cards on HP-UX, enter: `lanscan.`

B. **Is your Token Ring interface displayed and correct?** *lanscan* is successful if the output shows information about every networking card in the hardware backplane whether the card state is UP or DOWN. The Hardware Path of one of the entries should correspond to your Token Ring card. Token Ring cards are identified by the MAC type 802.5.

C. **Run ioscan -f.** *ioscan -f* will scan the system hardware and list the results. LAN output similar to the following will be displayed:

```
Class  I  H/W Path Driver   S/W State H/W Type  Description
===================================================================
lan     1  16       token2   CLAIMED    INTERFACE HP J2166A - 802.5 Token Ring LAN
```

The hardware path is four times the module number of the location where the card is installed.

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

```
Class  I  H/W Path Driver   S/W State H/W Type  Description
===================================================================
UNKNOWN 1  16              UNCLAIMED  UNKNOWN   HP J2166A - 802.5 Token Ring LAN
```

E. **Is device card displayed?** If the device card is broken, no entry for the hardware path in which the card is inserted will be displayed.

F. **Build new kernel with driver.** See “Creating a New Kernel” in the *Installing and Administering LAN/9000 Software* manual for instructions on how to create a new kernel. Refer to “Manual Installation and Configuration” in Chapter 3 of this manual for Token Ring-specific information.

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

H. **Problem fixed?** If so, stop. If not, start again with flowchart 2. After two iterations, if the problem still exists, call your HP representative.

Figure 4-3

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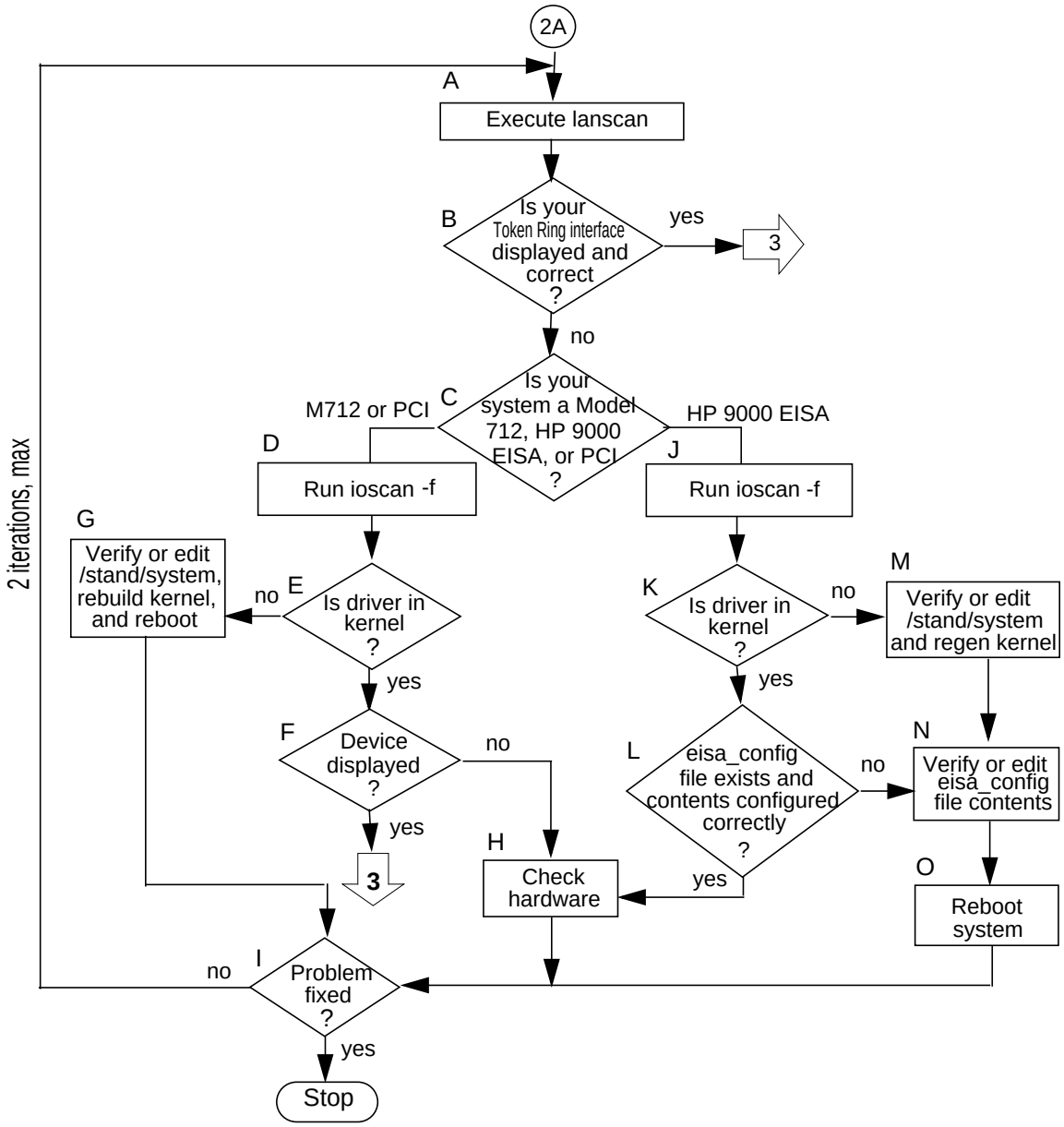
Flowchart 2A: Configuration Test (non HP-PB)

Figure 4-4 Flowchart 2A



Flowchart 2A Procedures

A. **Execute lanscan.** Execute *lanscan* to display information about Token Ring cards that are successfully bound to the system. For example, to check the cards on HP-UX, enter: `lanscan`.

B. **Is your Token Ring interface displayed and correct?** *lanscan* is successful if the output shows information about every networking card in the hardware backplane whether the card state is UP or DOWN. The Hardware Path of one of the entries should correspond to your Token Ring card. Token Ring cards are identified by the MAC type 802.5.

C. **Is your system a Model 712, HP 9000 EISA, or PCI?** Follow the flowchart corresponding to your system.

D. **Run ioscan -f.** *ioscan -f* will scan the system hardware and list the results. LAN output similar to the following will be displayed:

```
Class    I  H/W Path  Driver  S/W State  H/W Type     Description
============================================================
lan      0  2/0/2     lan2     CLAIMED   INTERFACE    Built-in LAN
lan      1  5/0/7     token3   CLAIMED   INTERFACE
```

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

```
Class    I  H/W Path  Driver  S/W State  H/W Type  Description
============================================================
unknown  1  5/0/7       ?     UNCLAIMED  INTERFACE
```

The hardware path is 5/0/7 for the Token Ring card above.

F. **Device displayed?** If the device card is broken, no entry for the hardware path in which the card is inserted will be displayed.

G. **Verify or edit /stand/system, rebuild kernel, and reboot.** Verify or edit */stand/system* contains the *token3* or *pcitr* keyword. If not, see "Creating a New Kernel" in the *Installing and Administering LAN/9000 Software* manual for instructions on how to edit */stand/system* to create a new kernel. Refer to Chapter 3, "Token Ring Resources," in this manual for Token Ring-specific information.

H. **Check hardware.** Verify that the network card is seated correctly and that it is operational. Refer to the hardware manual to verify hardware/card operation.

I. **Problem fixed?** If so, stop. If not, start again with flowchart 2A. If the problem still exists after two iterations, you may not have set the Ring Speed of the card. In that case, continue to flowchart 3.

J. **Run ioscan -f.** *ioscan* will scan the system hardware and list the results. LAN output similar to the following will be displayed:

```
Class   I  H/W Path  Driver   S/W State H/W Type    Description
=====================================================================
lan     1  4/0/1     token1   CLAIMED   INTERFACE  HP J2165A 802.5 Token Ring
LAN
```

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

```
Class      I  H/W Path  Driver    S/W State  H/W Type  Description
=====================================================================
unknown    -1  4/0/1              UNCLAIMED  UNKNOWN
```

The last number of the hardware path is the slot number of the location where the card has been installed.

L. **eisa_config file exists and contents configured correctly?** Check that the EISA Token Ring file exists by running `eisa_config`. If the file is OK, go to H. If it is not, go to N.

M. **Verify or edit /stand/system and regen kernel.** Verify or edit */stand/system* contains the *token* and *eisa* keywords. If not, refer to Chapter 3, "Token Ring Resources," in this manual or "Creating a New Kernel" in the *Installing and Administering LAN/9000 Software* manual for instructions on how to edit */stand/system* to create a new kernel.

N. **Verify or edit eisa_config file contents.** Run *eisa_config* and verify that the connector type (F1) and ring speed (F2) configurations are correct. Do not change the interrupt (F3) configuration. Refer to the *eisa_config(1M)* man page or "Configuration for (older) EISA Cards" in Chapter 2 for detailed information about this command.

O. **Reboot system.** Reboot the system to activate the `eisa_config` changes.

Figure 4-5

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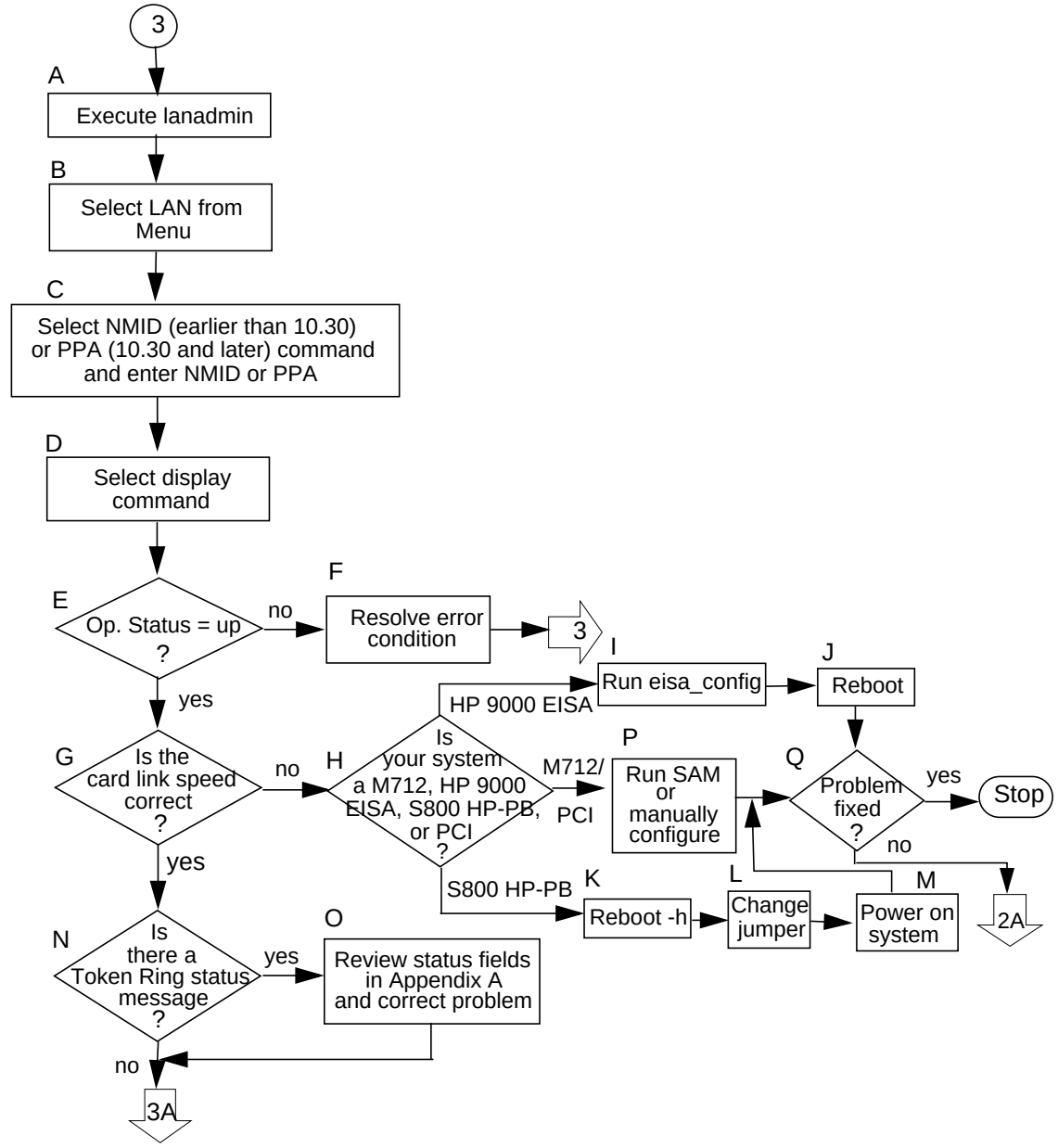
Flowchart 3: Configuration Test

Figure 4-6 Flowchart 3



Flowchart 3 Procedures

A. **Execute lanadmin.** Access the *lanadmin(1M)* program by entering: `lanadmin`.

   For a complete description of the *lanadmin* command, refer to the *lanadmin(1M)* on-line man page.

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

C. **For HP-UX versions earlier than 10.30, select the NMID command and enter the Token Ring NMID.** Select the NMID command to display the current Network Management ID. Then enter the Network Management ID of the Token Ring device file such as 5. You can use the *lanscan* command to find the NMID for your Token Ring. The device represented by the NMID that you enter becomes the current device to be tested. If you receive an error, look at the UNIX error code.

   For HP-UX versions 10.30 or later, select the PPA command and enter the Token Ring PPA.

D. **Select display command.** A display of the Token Ring card status and statistics will appear on the screen. The Token Ring display shows a link type of `iso8825-tokenRing(9)`.

E. **Op. Status = UP?** If the card operation status is UP, continue to step G. If the card is not UP, continue to step F. NOTE: If speed is incorrect for PCI Token Ring, operation status may be down.

F. **Resolve error condition.** If the error code is Errno=(6,22,16), the NMID used by *lanadmin* does not correspond to an active LAN card. Using the NMID command in lanadmin, enter a valid NMID and start again from step C.

   If the operation status=DOWN, the LAN card is currently inoperative. Reset the card, using the reset command in *lanadmin*, to re-execute the LAN card self-test. If the test is successful, start again with this flowchart to display LAN card statistics.

   Another possibility is a bad cable. Check cable(s).

G. **Is the card link speed correct?** Check the Speed field in the *lanadmin* status display to verify that the speed matches the speed of the Token Ring network. Refer to Appendix A for definitions of the *lanadmin* status fields.

H. **Is your system a M712, HP 9000 EISA, S800 HP-PB, or PCI?** Follow the flowchart corresponding to your system.

I. **Run eisa_config.** Follow the instructions in "Configuration for (older) EISA Cards" in Chapter 2 to set the card link speed.

J. **Reboot.** Execute *reboot* at the HP-UX prompt to activate the new configuration.

K. **Reboot -h.** Execute *shutdown -h* at the HP-UX prompt to shut down your system.

L. **Change jumper.** After you have shut down and powered off your system, follow the instructions in the *HP-PB Token Ring Network Adapter Installation and Service Manual* for setting the Data Rate Selection Jumper.

M. **Power on system.**

N. **Is there a Token Ring status message?** Check the error statistics and ring functional status in the *lanadmin* status display. Refer to Appendix A for interpretation.

O. **Review status fields in Appendix A and correct problem.** Look up the message and take the appropriate action to correct the problem.

   For PCI Token Ring, check the NetTL logs.

P. **Run SAM.** Use SAM to set the link speed, following the steps below:

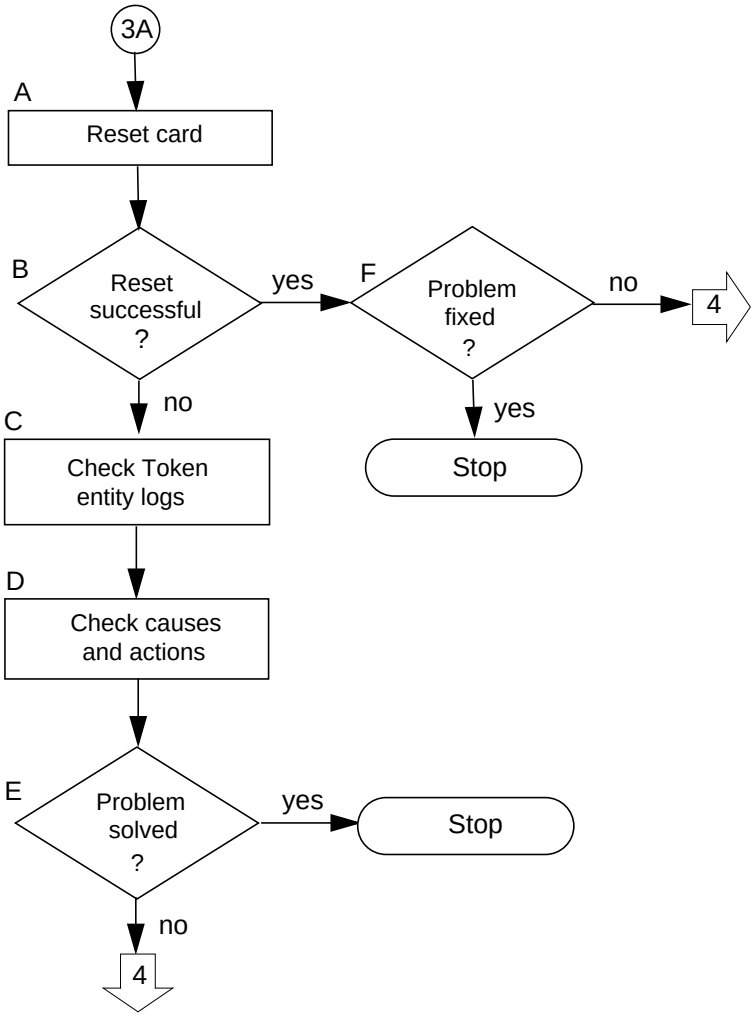
   - Double click *Networking and Communications* at the SAM main window.
   - Double click *Network Interface Card*s at the Networking and Communications window.
   - After the Network Interface Cards window is displayed, highlight the Token Ring card and select Configure from the "Actions" menu.
   - Set the ring speed fields to the speed of your network (4 or 16 Mbps). If connected to a 100 Mb/s switch port and autosense is enabled, A5783A will operate at 100 Mb/s.
   - Exit SAM.
   - Wait a minute or two for the configuration change to take effect.

   For PCI Token Ring, SAM or manual configuration may be used.

Q. **Problem fixed?** If so, stop. If not, start again with flowchart 2A. After two iterations, if the problem still exists, call your HP representative.

Flowchart 3A: Configuration Test

Figure 4-7 Flowchart 3A



Flowchart 3A Procedures

A. **Reset card.** Use the *reset* command in *lanadmin* to reset the card. This re-executes the LAN card self-test.

B. **Reset successful?** If the self-test was successful, the problem may be that you are not connected to the Token Ring network.

C. **Check Token entity logs.** Use the *netfmt -v -f /var/adm/nettl.LOG00* command to check the Token entity logs created at the time of the error. Refer to "Logging Messages" in Chapter 3 or the *netfmt(1M)* on-line man page for more information.

   For PCI Token Ring, the entity is *pcitr*.

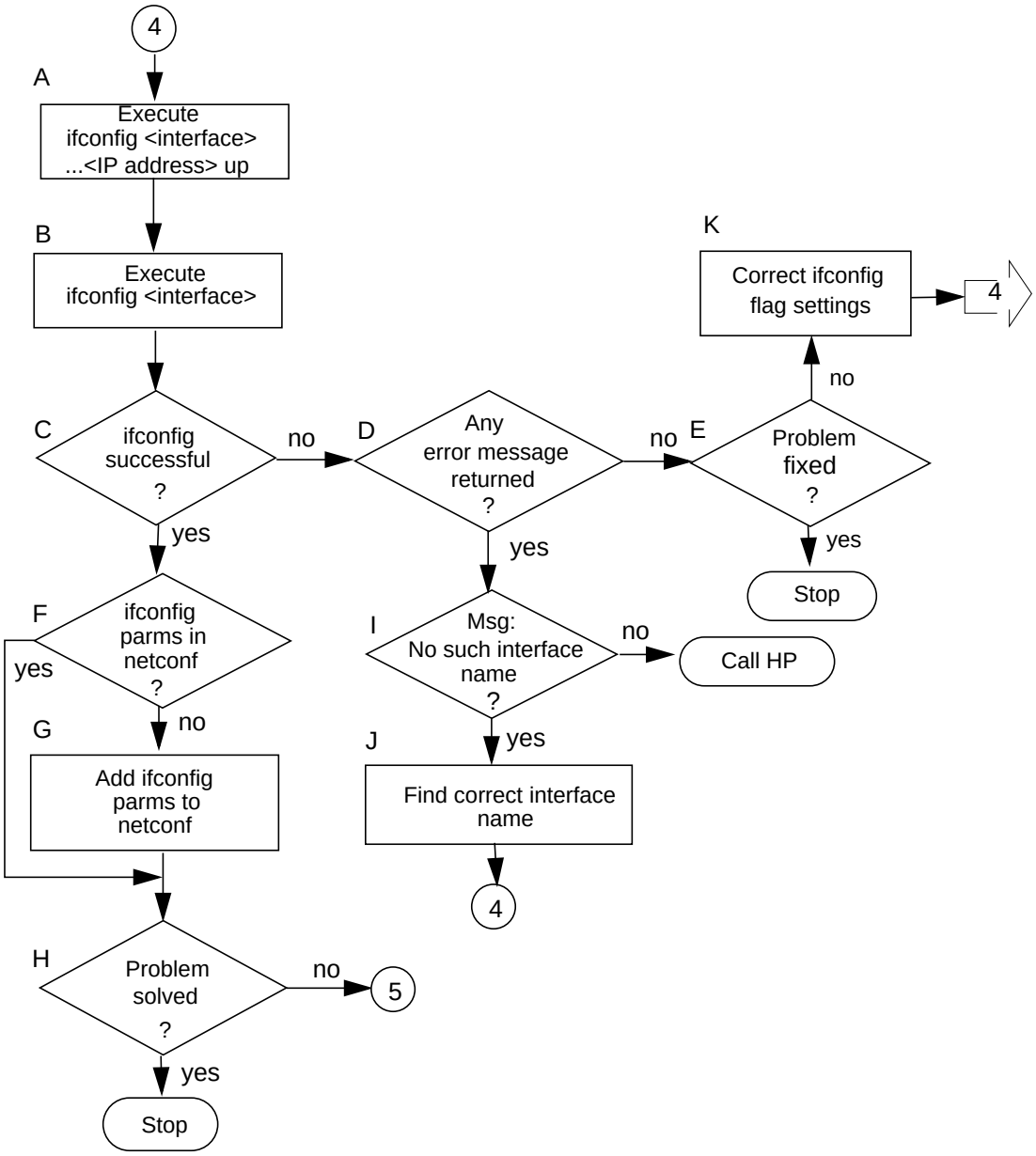
D. **Check causes and actions.** Refer to the description of the displayed log messages for proper actions.

E. **Problem solved?** If so, stop. If not, go to flowchart 4.

F. **Problem fixed?** If so, stop. If not, go to flowchart 4.

Flowchart 4: Configuration Test

Figure 4-8 Flowchart 4



Flowchart 4 Procedures

A. **Execute ifconfig <interface> <IP address> up.** Execute *ifconfig* on the interface you want to test to be sure that the interface is enabled. For example, to check Token Ring interface *lan1*, enter:

```
ifconfig lan1 192.6.1.17 up
```

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

B. **Execute ifconfig <interface>.** Execute *ifconfig* again on the interface you want to test to check the flag setting is up. For example, to check Token Ring 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>.

For PCI Token Ring, the flags are: <UP, BROADCAST, RUNNING, MULTICAST>.

Note: Make sure the UP flag is displayed. *Running* is always displayed in ifconfig(1M). It indicates only that there is OS support for the interface.

D. **Any error message returned?** If *ifconfig* is not successful, check whether an error message appears.

E. **Problem fixed?** If so, stop. If not, go to K.

F. **ifconfig parms in /etc/rc.config.d/netconf?** Check that the Token Ring parameters for *ifconfig(1M)* are in the */etc/rc.config.d/netconf* file for your Token Ring network interface. Refer to the *Installing and Administering LAN/9000 Software* manual for information on *netconf*. Refer to Chapter 3, “Token Ring Resources,” in this manual for a Token Ring example of this command.

G. **Add ifconfig parms to /etc/rc.config.d/netconf file.** Add the *ifconfig* command to */etc/rc.config.d/netconf*. For more information, refer to the instructions in the *netconf* file under Internet Configuration Parameters.

H. **Problem resolved?** If so, stop. If not, recheck your connections to the wall plug and TAU. If the problem is still unresolved, go to flowchart 5.

I. **Msg: No such interface name?** The network interface name passed to *ifconfig(1M)* does not exist on the system.

J. **Find correct interface name.** Check spelling and names of the network interfaces on the system using the *lanscan(1M)* command. Using the correct interface name, start again with flowchart 4.

K. **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)* on-line man page. Start again with flowchart 4, as necessary.

Figure 4-9

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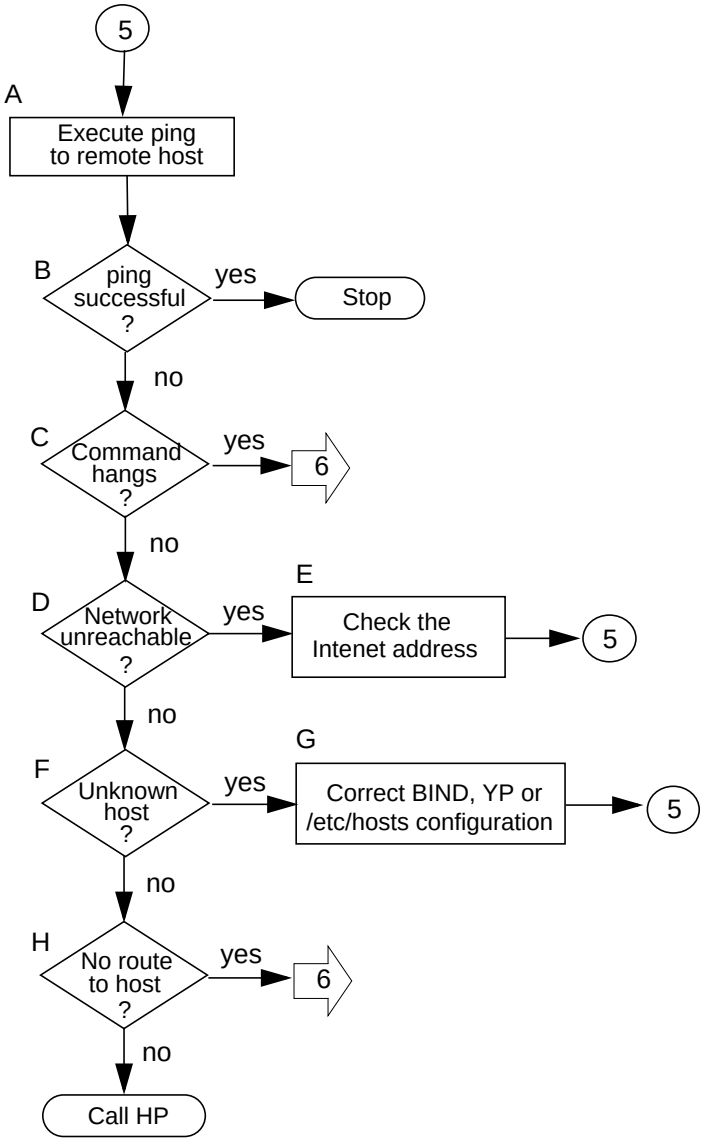
Flowchart 5: Network Level Loopback Test

Figure 4-10 Flowchart 5



Flowchart 5 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 bunny
```

B. **ping successful?** A message is printed on *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.

You may find it useful to 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. **Command hangs?** Use Cntrl C to exit from *ping(1M)*.

D. **Network unreachable?** If so, check the status of the local Token Ring interface first using lanscan(1M).

E. **Check the Internet address.** Check the remote host Internet address. It should have the same network number as the local Internet address. To bring up the interface, issue *ifconfig(1M)*, e.g., *ifconfig lan1 192.6.1.17 up*.

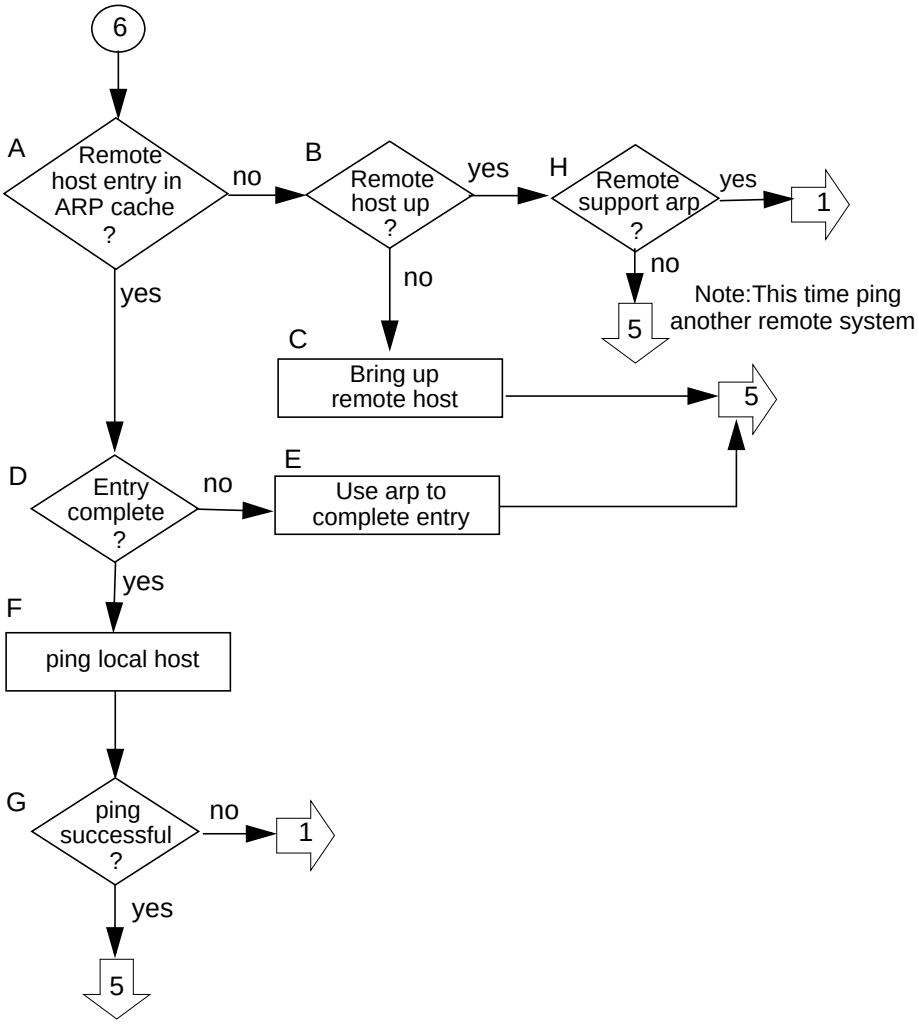
F. **Unknown host?** Error= Unknown host hostname (alias)?

G. **Correct BIND, YP or /etc/hosts configuration.** Add the missing host name and start again with flowchart 5.

H. **No route to host?** Error= Sendto: No route to host? If so, go to flowchart 6. Otherwise, call your HP representative.

Flowchart 6: Network Level Loopback Test

Figure 4-11 Flowchart 6



Note: This time ping from remote host to local host.

Flowchart 6 Procedures

A. **Remote 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 likely 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.

D. **Entry complete?** Perhaps there is an ARP cache entry, but it is wrong or not complete.

E. **Use arp to complete entry.** Using *arp*, enter the correct Host Name and Station Address. For more information, refer to the *arp(1M)* on-line man page.

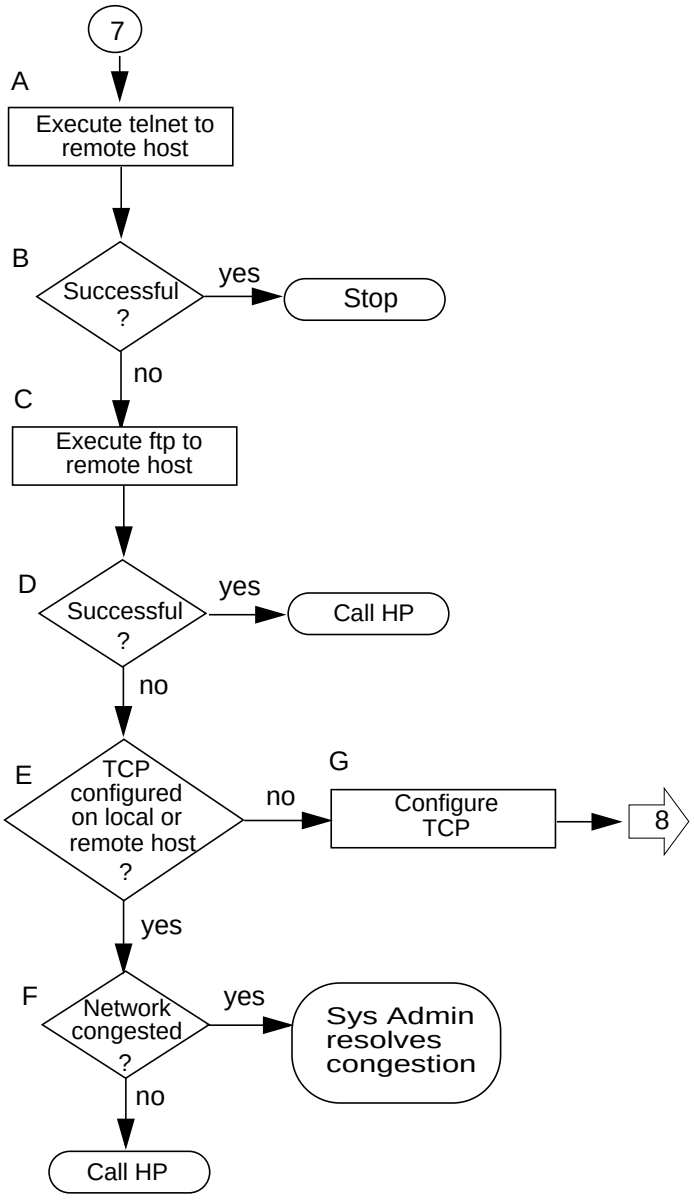
F. **ping local host.** Using *ping,* do an internal loopback on your own system. In other words, *ping* your own system.

G. **ping successful?** 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. If this is true, the network interface or software on the remote host is suspect. Start again with flowchart 5, but this time *ping* from the remote host to your system. If the *ping* in Step F was not successful, go to flowchart 1 to check your hardware installation.

H. **Remote support arp?** Have the node manager of the remote host check whether the remote host supports arp(1M). If so, go to flowchart 1 to check the hardware installation. If not, go to flowchart 5 and this time ping another remote host that supports arp(1M).

Flowchart 7: Transport Level Loopback Test (using ARPA)

Figure 4-12 **Flowchart 7**



Flowchart 7 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 ok through the Transport Layer (OSI Layer 4).

C. **Execute ftp to remote host.** Unlike *telnet, ftp* does not go through a pseudo terminal 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 configured on local or 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 so, the system administrator should determine the cause of the congestion. First, determine if there is a problem with any one of the nodes; there may be a hardware problem causing the congestion. Bridges or switches may be added so that the number of nodes in each loop is reduced. This should reduce the congestion.

   If not, call HP support for help in resolving the problem.

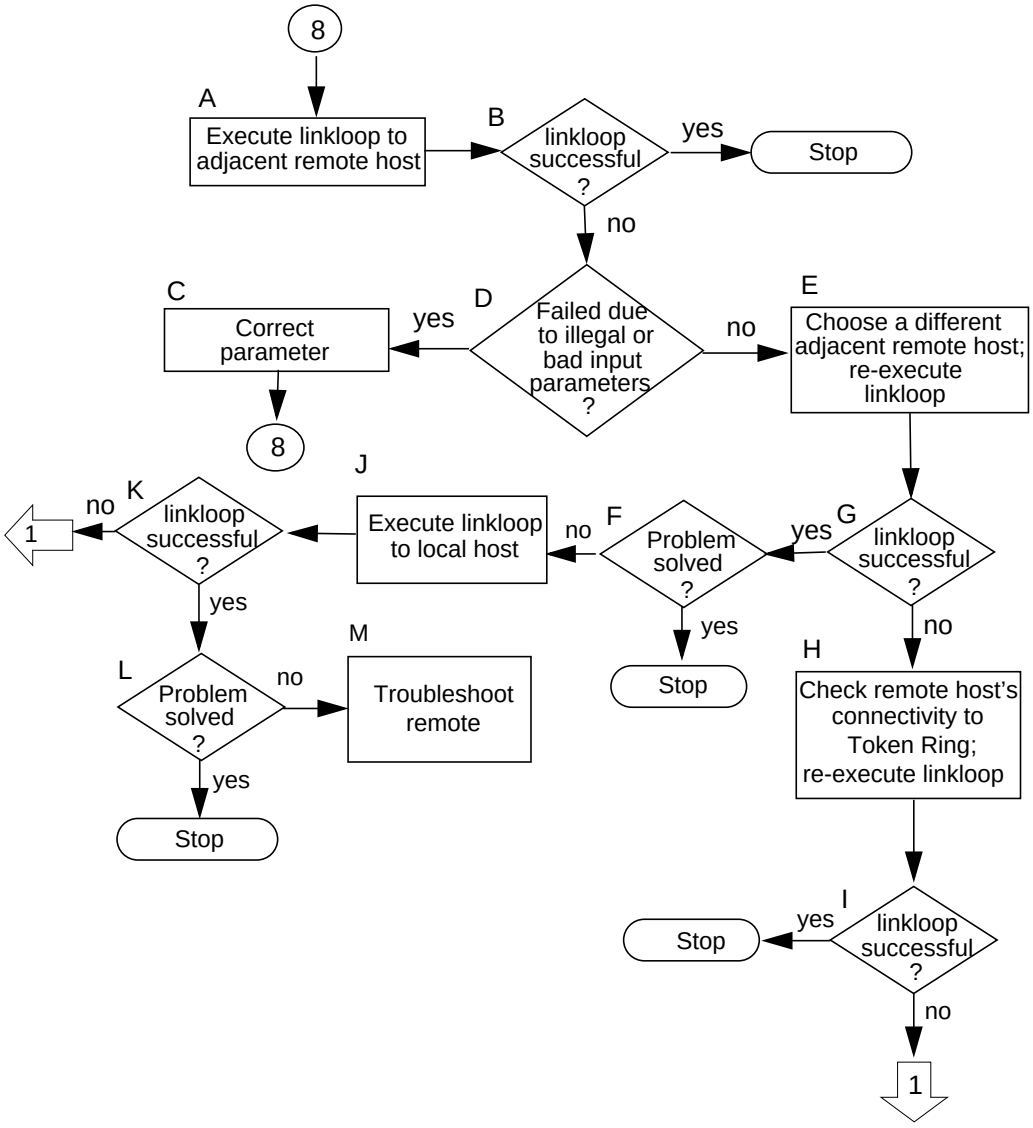
   If TCP is installed on both hosts, do a file transfer to another remote host on the network. Use *netstat* to check for lost packets.

G. **Configure TCP.** If necessary, configure TCP on either or both hosts.

   Check for the presence of *inetd* and a properly configured */etc/inetd.conf*.

Flowchart 8: Link Level Loopback Test

Figure 4-13 Flowchart 8



Flowchart 8 Procedures

A. Execute linkloop to adjacent remote host. Enter the link level address (station address) of the adjacent remote host in hexadecimal form (preceded by "0x"). Execute *lanscan (1M)* to find the link level address (station address) on the remote host or obtain it from your network map. For more information on *linkloop*, refer to the *linkloop(1M)* on-line man page.

B. **linkloop successful?** If so, stop. Network connectivity is okay through the Link Layer (OSI Layer 2). If not, note which error was returned and continue with this flowchart.

C. **Correct parameter.** Correct the input parameter to *linkloop(1M)* according to the linkloop message. Refer to the linkloop(1M) man page for more information.

D. **Failed due to illegal or bad input parameters?** If the message indicates a failure, go to C. If not, continue to E.

E. **Choose a different adjacent remote host; re-execute linkloop.** Redo linkloop(1M) using a different remote host.

F. **Problem solved?** If so, stop. If not, go to J.

G. **linkloop successful?** If so, stop. Network connectivity is okay through the Link Layer (OSI Layer 2). If not, go to flowchart 5 to verify network level connectivity. The problem may be with the remote system.

H. **Check remote host's connectivity to Token Ring; re-execute linkloop.** Contact the node manager of the remote host. Check that the host is configured correctly and that its network interface is up. Re-execute linkloop. If necessary, verify configuration to the remote host.

I. **linkloop successful?** If so, stop, Network connectivity is okay through the Link Layer (OSI Layer 2). If not, go to flowchart 1.

J. **Execute linkloop to local host.** If *not* in 100Mb/s or FDX modes, execute the *linkloop(1M)* command specifying the local Token Ring station address. For example:
`linkloop -i NMID <station address>`

K. **linkloop successful?** If so, the Token Ring link is verified. If not, go to flowchart 1 to verify the hardware.

L. **Problem solved?** If so, stop. If not, the problem may be with the

remote system.

M. **Troubleshoot remote.** Execute linkloop to adjacent remote host. Enter the link level address (station address) of the adjacent remote host in hexadecimal form (preceded by “0x”). Execute lanscan (1M) to find the link level address (station address) on the remote host or obtain it from your network map. For more information on linkloop, refer to the linkloop(1M) on-line man page.

NOTE Starting with B.10.20.01 and B.11.11.02, linkloop(1M) to itself, through a switch, will work even if the card is in full duplex mode.

Figure 4-14

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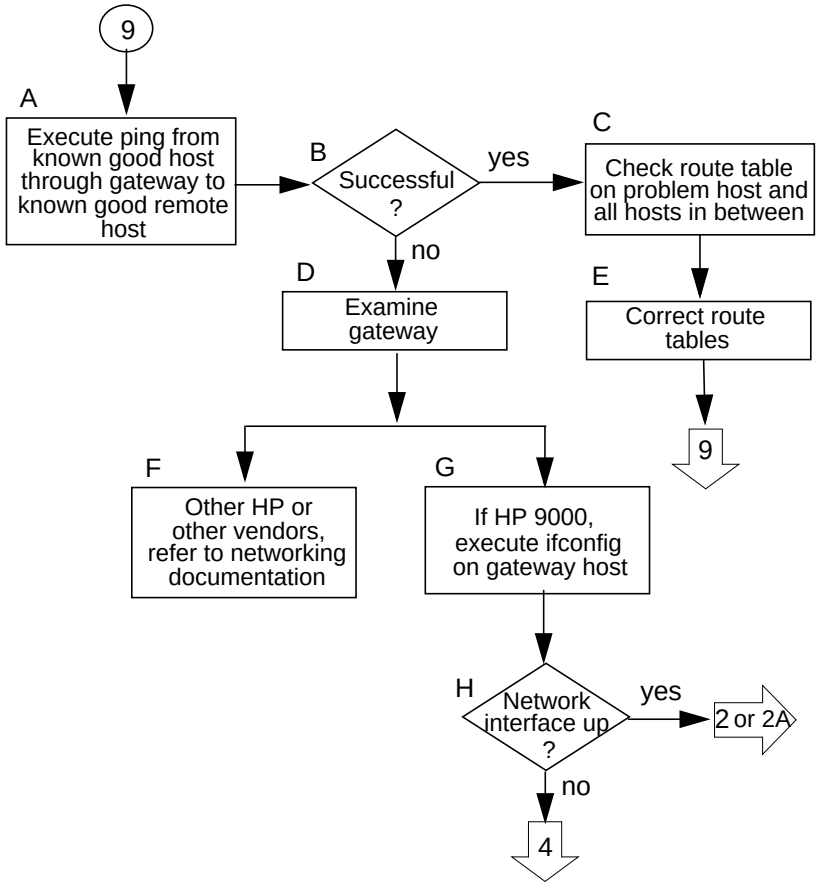
Flowchart 9: Bridge/Gateway Loopback Test

Figure 4-15 Flowchart 9



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.

F. **Other HP 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. Go to H.

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 flowchart 4 to bring it up.

   If the network interfaces are UP, start again with flowchart 2 if S800 HP-PB or 2A if HP 9000 EISA. Using flowchart 2 or 2A, test all network interfaces on the gateway.

A Token Ring Interface Card Statistics

lanadmin

This appendix contains descriptions of the IEEE 802.5 Token Ring MIB statistics fields for Token Ring 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. Here is an example collected from a S800.

```
                    LAN INTERFACE STATUS DISPLAY
                   Thu, Nov 21,1991    11:16:22
Network Management ID          = 5
Description                    = lan1 Hewlett-Packard LAN ...
Type (value)                   = iso88025-tokenring(9)
MTU Size                       = 4170
Speed                          = 16000000
Station Address                = 0x10009060c8ee
Administration Status (value)  = up(1)
Operation Status (value)       = up(1)
Last Change                    = 5917
Inbound Octets                 = 1862255299
Inbound Unicast Packets        = 18765
Inbound Non-Unicast Packets    = 7644729
Inbound Discards               = 0
Inbound Errors                 = 0
Inbound Unknown Protocols      = 0
Outbound Octets                = 1304687
Outbound Unicast Packets       = 18721
Outbound Non-Unicast Packets   = 19
Outbound Discards              = 0
Outbound Errors                = 0
Outbound Queue Length          = 0
Specific                       = 655369

Token Ring-like Functional Group

Index                          = 5
Commands                       = 1
Ring Status                    = 0
Ring State                     = 1
Ring Open Status               = 11
Ring Speed                     = 4
Up Stream Node Address         = 0x000000000000
Active Monitor Participation   = 1
Functional Address Mask        = 0xc00000000000
```

```
Token Ring-like Statistics Group

Index                       = 5
Line Errors                 = 0
Burst Errors                = 0
AC Errors                   = 0
Abort Transmission Errors   = 0
Internal Errors             = 0
Lost Frame Errors           = 0
Receive Congestions         = 0
Frame Copied Errors         = 0
Token Errors                = 0
Soft Errors                 = 0
Hard Errors                 = 0
Signal Loss                 = 0
Transmit Beacons            = 0
Ring Recovery               = 0
Lobe Wire Faults            = 0
Remove Station              = 0
Single Station on Ring      = 0
Frequency Errors            = 0
```

NOTE The “Token Ring-like Functional Group” and “Token Ring-like Statistics Group” sections shown in the listing above are not implemented in PCI Token Ring.

IEEE 802.5 Token Ring MIB

For more detailed information about the fields described below, refer to RFC 1156 and RFC 1231.

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 protocol(s) immediately below the network layer in the protocol stack. It will have one of the following values (for Token Ring, it is always `iso88025-tokenRing(9)`):

Table A-1

other (1)	None of the following
regular1822 (2)	
hdh1822(3)	
ddn-x25(4)	
rfc877-x25(5)	
ethernet-csmacd(6)	
iso88023-csmacd(7)	
iso88024-tokenBus(8)	
iso88025-tokenRing(9)	
iso88026-man(10)	
starLan(11)	
proteon-10Mbit(12)	

Table A-1

proteon-80Mbit(13)	
hyperchannel(14)	
fddi(15)	
lapb(16)	
sdlc(17)	
ds1(18)	T-1
el(19)	European equivalent of T-1
basicISDN(20)	
primaryISDN(21)	Proprietary serial
proPointToPointSerial(22)	
ppp(23)	
softwareLoopback(24)	
eon(25)	CLNP over IP [11]
ethernet-3Mbit(26)	
nsip(27)	XNS over IP
slip(28)	generic SLIP
ulta(29)	ULTRA technologies
ds3(30)	T-3
sip(31)	SMDS
frame-relay(32)	

MTU Size

NIO and EISA Token Ring support up to 4500 MTU. The default is set at 4170 but may be changed using *lanadmin* to the desired value of 4500, or less.

PCI Token Ring MTU can go up to 18000 Bytes.

Please refer to the latest Release Notes for software patches that may be required to support particular

configurations of this product.

Speed — An estimate of the current bandwidth of the interface in bits per second. For interfaces which do not vary in bandwidth or for those where no accurate estimates can be made, this object contains the nominal bandwidth.

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

Operation Status — The current operational state of the interface. It will have one of the following values.

Table A-2 Interface Operational States

up(1)	Ready to pass packets
down(2)	Not operative (bad card or cable)
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. This is not implemented in PCI Token Ring.

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). This is not implemented in PCI Token Ring.

Token Ring-Like Functional Group

NOTE This is not implemented in PCI Token Ring.

Field	Description
Index	The value of this object identifies the 802.5 interface for which this entry contains management information. The value of this object for a particular interface has the same value as the Network Management ID object for the same interface.
Commands	When this entry is set to open(2), the station should go into the open state. The progress and success of the open is given by the values of Ring State and Ring Open Status. When this entry is set to reset(3), then the station should do a reset. On a reset, all MIB counters should retain their values, if possible. Other side effects are dependent on the hardware chip set. When this entry is set to close(4), the station should go into the stopped state by removing itself from the ring. Setting this object to a value of *no-op(1)* has no effect. When read, this object always has a value of no-op(1).
Ring Status	The current interface status. You can use this to diagnose fluctuating problems that can occur on a token ring, after a station has successfully been added to the ring. Before an open is completed, this object has the value for the 'no status' condition. The Ring State and Ring Open Status entries provide information when the station cannot even enter the ring. The object's value is a sum of values, one for each currently applicable condition. The following values are defined

for various conditions:

Table A-3 Ring Status Conditions

0	No problems detected
32	Ring Recovery
64	Single Station
256	Remove Received
512	Reserved
1024	Auto-Removal Error
2048	Lobe Wire
4096	Transmit Beacon
8192	Soft Error
16384	Hard Error
32768	Signal Loss
131072	No status, Open not completed

Ring State The current interface state with respect to entering or leaving the ring.

Table A-4 Interface State

1	opened
2	closed
3	opening
4	closing
5	openFailure
6	ring Failure

Ring Open Status The entry indicates the success, or the reason for failure, of the station's most recent attempt to enter the

ring.

Table A-5 Status of Station Entry Attempt

1	noOpen
2	badParam
3	lobeFailed
4	signal loss
5	insertion Timeout
6	ringFailed
7	beaconing
8	duplicateMAC
9	requestFailed
10	removeFailed
11	open (last open successful)

Ring Speed The bandwidth of the ring.

NOTE This is currently implemented incorrectly in PCI Token Ring.

Table A-6 Ring Bandwidth

1	unknown
2	oneMegabit
3	fourMegabit
4	sixteenMegabit

Up Stream Node Address
The MAC address of the up-stream neighbor station on the ring. Currently not supported.

NOTE This is implemented correctly in PCI Token Ring.

Active Monitor Participation

If this entry contains a value of true(1), then this interface will participate in the active monitor selection process. If the value is false(2), then it will not. Setting this object might not have an effect until the next time the interface is opened.

Functional Address Mask

The bit mask of all Token Ring functional addresses for which this interface will accept frames.

Token Ring-Like Statistics Group

NOTE This is not implemented in PCI Token Ring.

Field	Description
Index	The value of this object identifies the 802.5 interface for which this entry contains management information. The value of this object for a particular interface has the same value as the Network Management ID object for the same interface.
Line Errors	This counter is incremented when a frame or token is copied or repeated by a station, the E bit is zero in the frame or token and one of the following conditions exists: 1) there is a non-data bit (J or K bit) between the SD and the ED of the frame or token, or 2) there is an FCS error in the frame.
Burst Errors	This counter is incremented when a station detects the absence of transitions for five half-bit timers (burst-five error).
AC Errors	This counter is incremented when a station receives an AMP or SMP frame in which A is equal to C is equal to 0, and then receives another SMP frame with A is equal to C is equal to 0 without first receiving an AMP frame. It denotes a station that cannot set the AC bits properly.
Abort Transmission Errors	This counter is incremented when a station transmits an abort delimiter while transmitting.
Internal Errors	This counter is incremented when a station recognizes an internal error.
Lost Frame Errors	This counter is incremented when a station is transmitting and its TRR timer expires. This condition denotes a condition where a transmitting station in

strip mode does not receive the trailer of the frame before the TRR timer goes off.

Receive Congestions
: This counter is incremented when a station recognizes a frame addressed to its specific address, but has no available buffer space indicating that the station is congested.

Frame Copied Errors
: This counter is incremented when a station recognizes a frame addressed to its specific address and detects that the FS field A bits are set to 1 indicating a possible line hit or duplicate address.

Token Errors
: This counter is incremented when a station acting as the active monitor recognizes an error condition that needs a token transmitted.

Soft Errors
: The number of Soft Errors that interface has detected. It directly corresponds to the number Report Error MAC frames that this interface has transmitted. Soft errors are those which are recoverable by the MAC layer protocols.

Hard Errors
: The number of times this interface has detected an immediately recoverable fatal error. It denotes the number of times this interface is either transmitting or receiving beacon MAC frames.

Signal Loss
: The number of times this interface has detected the loss of a signal condition from the ring.

Transmit Beacons
: The number of times this interface has transmitted a beacon frame.

Ring Recovery
: The number of Claim Token MAC frames received or transmitted after the interface has received a Ring Purge MAC frame. This counter signifies the number of times the ring has been purged and is being recovered back into a normal operating state.

Lobe Wire Faults
: The number of times the interface has detected an open or short circuit in the lobe data path. The card will be closed and the Ring State will signify this condition. Be sure to check the Token Ring cable connections.

Remove Station The number of times the interface has received a Remove Ring Station MAC frame request. When this frame is received the interface will enter the close state and Ring State will signify this condition.

Single Station on Ring The number of times the interface has sensed that it is the only station on the ring. This will happen if the interface is the first one up on a ring, or if there is a hardware problem.

Frequency Errors The number of times the interface has detected that the frequency of the incoming signal differs from the expected frequency by more than that specified by the IEEE 802.5 standard.

B Token Ring Network Map

Map Description

This section contains information that will help you create a network map.

An accurate network map is essential for administering a Token Ring network. Such a map should include:

- Approximate dimensions of the building or room containing the Token Ring network.
- Location of nodes and node connections.
- Hostname of each node.
- Internet Address, Station Address, and Alias of each node (in the case of gateways, each Token Ring card has its own Internet Address, Station Address, and Alias).
- Hardware Path of each Token Ring card.
- Version number of the operating system installed on each node.

If you are installing Token Ring/9000, use the Token Ring Network Card Configuration Worksheet in the Quick Installation Guide to gather configuration information. Figure B-1 shows an example network map. Table B-1 shows a sample network map worksheet that you can use to list information about systems on your network such as those shown on the map.

Figure B-1 Network Map

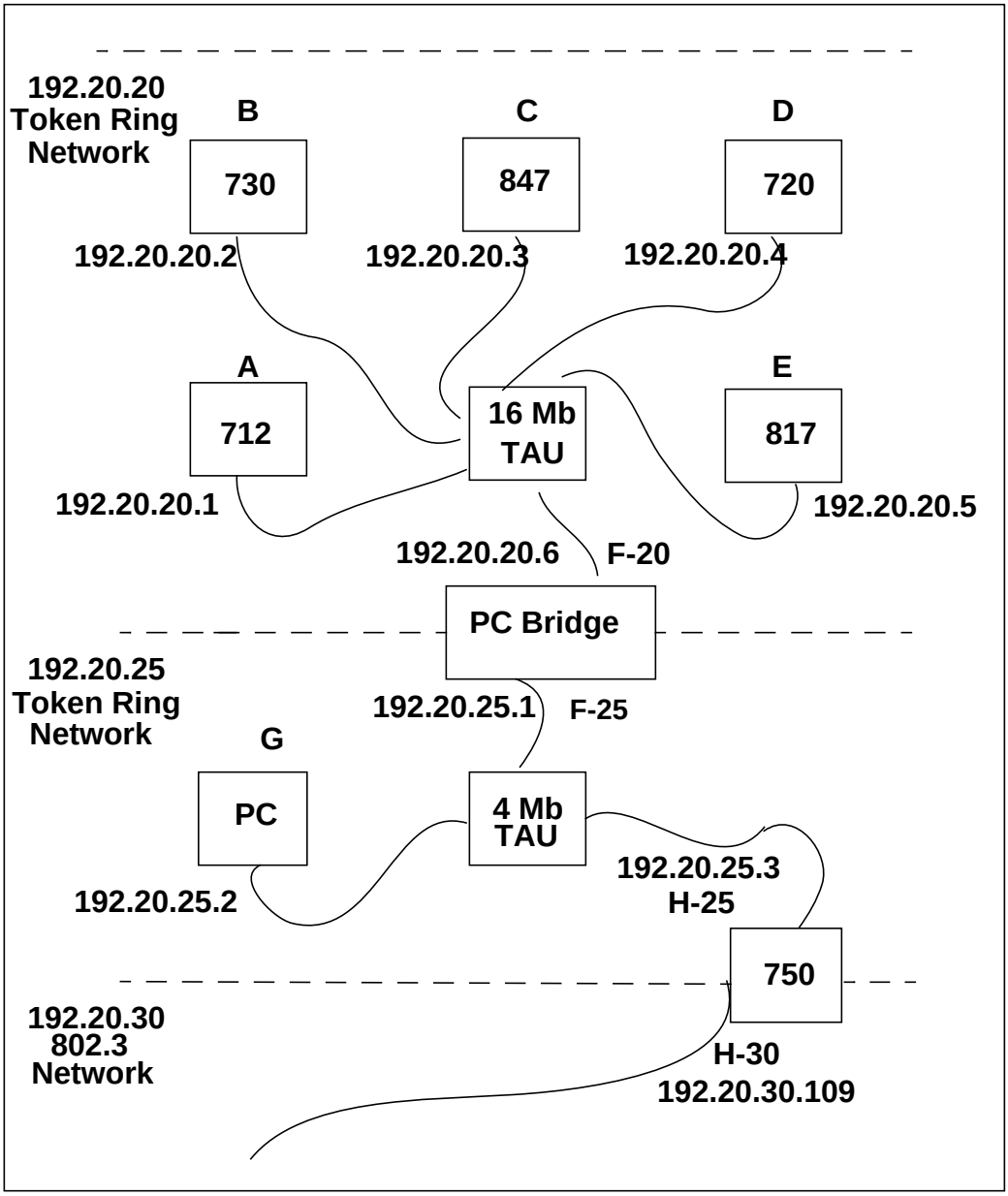


Table B-1 Network Map Worksheet

Hostname	Internet Address Alias	Internet Address	Station Address	Hardware Path	Operating System
A	A	192.20.20.1	100090 09030D	5/0/7	9.03
B	B	192.20.20.2	0000F6 080102	4/1/0	9.0
C	C	192.20.20.3	100090 090C856	44	10.0
D	D	192.20.20.4	0000F6 070102	4/1/0	10.0
E	E	192.20.20.5	100090 80D756	44	9.0
F	F-20 F-25	192.20.20.6 192.20.25.1	101090 900841 101090 907000	EISA slot 1 EISA slot 2	DOS DOS
G	G	192.20.25.2	101090 900801	EISA slot 1	DOS
H	H-25 H-30	192.20.25.3 192.20.30.109	0000F6 060543 0000F6 080082	4/1/0 4/2/0	10.0 10.0

C Token Ring Hardware Path

Following is a description of hardware paths used by the I/O subsystem to identify Token Ring cards and device files associated with the cards. Refer to these descriptions as necessary when completing Token Ring installation, administration, and diagnostic procedures.

Hardware Path

The I/O subsystem identifies each Token Ring card by its hardware path. The hardware path is assigned by the system according to the physical location (slot) of the card in the hardware backplane. Below are definitions of the hardware path on each system type.

Table C-1 Hardware Path

Series 800 HP-PB	Model 712	HP 9000 Add-on EISA
For Series 800 HP-PB systems, the hardware path is determined by multiplying the slot number by 4.	For Model 712 systems, the hardware path is composed of three parts: an I/O module identifier, a slot identifier, and a card functionality identifier. The module identifier for a Core I/O card is always 5, the slot number for a Core I/O card is always 0, and the functionality identifier is 7.	For Series 700 systems, the hardware path is composed of three parts: an I/O module identifier, a 0, and a slot identifier. For add-on EISA cards, the module ID is 4, the slot number is a value from 1 through 4.
For example: **48** specifies the hardware path of the HP-PB card in slot 12.	For example: **5/0/7** specifies the hardware path of the Model 712 card.	For example: **4/0/3** specifies the hardware path for an add-on EISA card in slot 3.

Use the *lanscan(1M)* command to display the hardware path of each Token Ring card that is bound successfully to the I/O subsystem when the system is booted-up.

Glossary

Access Method: A technique for determining which node will be the next with the right to transmit over a shared medium.

Adapter: Hardware that contains the input/output logic needed for a product to interact with a computer bus, such as the EISA bus. An adapter is also called a controller board or an I/O card.

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.

ANSI: The American National Standards Institute, a non-profit organization, made up of various expert committees, that publishes standards for use by national industries. ANSI has adopted the IEEE standards for local area networks.

Beaconing: A condition during which 802.5 MAC frames are transmitted on the token ring. This condition occurs when a hardware problem is detected on the ring. The station that detects the error beacons other stations on the ring to inform them of the problem.

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

Configuration: The arrangement of a computer system or network as defined by the nature, number, and the chief characteristics of its functional units. More specifically, the term configuration may refer to a hardware configuration or a software configuration.

Device Files: Files kept in the /dev directory that identify the LAN driver, card, and data link protocol. Each device file has a name and device number to uniquely identify the above characteristics.

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

EISA Extended Industry Standard Architecture: A computer bus that connects EISA cards to the main system bus.

EISA backplane: The I/O card that contains the EISA bus, which connects EISA adapters to the main system bus.

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

Hardware Path: An identifier assigned by the system according

to the physical location (slot) of the card in the hardware backplane. On Series 700 and 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.

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. The 802.5 committee produced the standard for a Token Ring local area network which has been adopted by ANSI.

IEEE 802.3 network: A 10-megabit-per-second LAN, described by the ANSI/IEEE 802.3 Standard for Local Area Networks, which uses a CSMA/CD network access method.

IEEE 802.5 network: A 16- or 4-megabit-per-second LAN 802.5 network which has a token passing network access method and a ring or star configuration.

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.

LAN: See Local Area Network.

LED: Light Emitting Diode, a semiconductor chip that emits light when activated. LEDs are commonly used as visible indicators to inform users that various components in a computer system or other electronic device are functioning.

Lobe Cable: Used interchangeably with adapter cable; lobe cables attach at one end to a token ring adapter in the system and at the other end to a wall jack or TAU.

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.

MIB: Management Information Base. A virtual data base of managed objects contained within the SNMP agent. The MIB is not a physically distinct database, but rather it is a concept that includes configuration and status values normally available on the agent system. MIB I includes objects dealing with IP internetworking routing variables. MIB II or link-specific MIB extensions, now an Internet standard, add new objects to the MIB I groups and also adds two new groups.

The new groups add media devices and network devices to the SNMP capabilities.

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

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.

Remote: Not directly connected or processed at another location.

Ring Speed: For Token Ring it is user selectable and can be set to 4000000 or 16000000 bits per second.

Station: Short for workstation, computer, or terminal that provides computational services and is attached to a local area

network. Also called a node.

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.

System Administrator: The person who oversees network maintenance/operation.

Trunk Access Unit (TAU): A central hub is used to connect to a token ring network.

Token: A small bit pattern that circulates around a network. Ownership of the token enables a node to transmit over the network medium.

Token Ring An IEEE 802.5 network. See IEEE.

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

Index