

**IBM PCI Token-Ring Adapter and PCI
Wake on LAN Token-Ring Adapter
Installation and Testing Instructions**

October 13, 1997

Note

Before using this information and the product it supports, be sure to read the general information under Appendix H, "Notices" on page H-1, "Electronic Emission Notices for STP Media" on page H-4, and "Electronic Emission Notices for UTP Media" on page H-7.

Second Edition (August 1997)

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CLIENT PROGRAM means that portion of the NetWare network operating system that executes on the personal workstation

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危険： 導入作業を開始する前に、安全に関する小冊子SD21-0030 の「最初にお読みください」(Read This First)の項をお読みください。
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Pericolo: prima di iniziare l'installazione di questo prodotto, leggere le informazioni relative alla sicurezza riportate nell'opuscolo *Attenzione: Informazioni di sicurezza — Prime informazioni da leggere* in cui sono descritte le procedure per il cablaggio ed il collegamento di apparecchiature elettriche.



Perigo: Antes de iniciar a instalação deste produto, leia as informações de segurança *Cuidado: Informações de Segurança — Leia Primeiro*, SD21-0030. Este documento descreve como efectuar, de um modo seguro, as ligações eléctricas dos equipamentos.



Peligro: Antes de empezar a instalar este producto, lea la información de seguridad en *Atención: Información de Seguridad — Lea Esto Primero*, SD21-0030. Este documento describe los procedimientos de seguridad para cablear y enchufar equipos eléctricos.



Perigo: Antes de começar a instalar este produto, leia as informações de segurança contidas em *Cuidado: Informações Sobre Segurança—Leia Isto Primeiro*, SD21-0030. Esse folheto descreve procedimentos de segurança para a instalação de cabos e conexões em equipamentos elétricos.



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위험: 이 제품을 설치하기 전에 반드시 "주의: 안전 정보-시작하기 전에" (SD21-0030-02)에 있는 안전 정보를 읽으십시오.



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Uwaga:

Przed rozpoczęciem instalacji produktu należy zapoznać się z instrukcją:

"Caution: Safety Information - Read This First", SD21-0030.

Zawiera ona warunki bezpieczeństwa przy podłączaniu do sieci elektrycznej i eksploatacji.



Upozornění: než zahájíte instalaci tohoto produktu, přečtěte si nejprve bezpečnostní informace v pokynech „Bezpečnostní informace“ č. 21-0030. Tato brožurka popisuje bezpečnostní opatření pro kabeláž a zapojení elektrického zařízení.



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Related Information

Refer to these publications for additional information:

- *IBM Token-Ring Network Problem Determination Guide*, SX27-3710
- *IBM LAN Technical Reference IEEE 802.2 and NETBIOS API*, SC30-3587

- *IBM Transmission Control Protocol/Internet Protocol Version 2.1 for DOS: Programmer's Reference*, SC31-7046
- *LAN Adapter and Protocol Support Configuration Guide*, S96F-8489
- *MPTS/2 Configuration Guide*, S10H-9693
- *IBM LAN Server Command and Utilities*, S10H-9686
- *Guide to LAN Server Books*, S10H-9688
- *DOS LAN Services and User's Guide*, S10H-9684
- *Microsoft LAN Manager Installation and Configuration Guide*
- *Microsoft Windows NT System Guide*
- *Novell Workstation for DOS and MS Windows*
- Novell NetWare installation and system administration manuals appropriate to the version of Novell NetWare you have installed
- IBM Bulletin Board (919) 543-2307
- FTP Internet Server at lansupport.raleigh.ibm.com
- IBM Networking home page on the World Wide Web:
<http://www.networking.ibm.com>

As of this writing the bulletin board telephone number and Internet Server address are current. If you should find that either the telephone number or the Internet address is not available, check the README file to see whether a new number or address is available. Also, see "IBM PC Company BBS" on page 5-18.

Chapter 1. Introduction

This manual contains the information you need to install and use the IBM PCI Token-Ring Adapter and IBM PCI Wake on LAN Token-Ring adapter. Unless specified, all references in this book to the IBM PCI Token-Ring Adapter also apply to the IBM PCI Wake on LAN Token-Ring Adapter. This chapter describes the adapter, the contents of the adapter kit, and the other materials you will need to install the adapter.

It is important that you are familiar with the computer in which the adapter will be installed and the computer's operating system and network software.

The IBM PCI Token-Ring Adapter

The IBM PCI Token-Ring Adapter is a 32-bit, bus-master, token-ring adapter for the PCI bus architecture. Its unique, high-quality filter design supports connection to a token-ring network that is wired with shielded twisted-pair (STP) or unshielded twisted-pair (UTP) cabling. The adapter can be used in a PCI-compatible slot that operates at speeds between 16 MHz and 33 MHz.

Features of the IBM PCI Token-Ring Adapter include:

- IBM LAN Client Software.
New for the PCI Token-Ring user is IBM LAN Client, which provides programming interfaces to support network applications. It allows a client workstation to communicate with an IBM LAN Server or Novell NetWare Server. It also allows the use of TCP/IP applications and provides for NetBIOS and IEEE 802.2 application programming interfaces. IBM LAN Client has the ability to operate in 32-bit protect mode and requires as little as 2 KB of conventional memory.
- Automatic ring-speed detection.
- Support for a wide variety of network operating systems and network applications.
- Support for full-duplex, token-ring LAN operation.

- Support for microcode update.
- Automatic configuration of I/O, memory, ROM space, and interrupt level by PCI BIOS on power-up.
- Can be plugged into either a half-size or full-size, 5-V or 3.3-V signaling, 32-bit or 64-bit PCI-bus slot.
- Uses less than 2 watts.
- Supports UTP and STP cabling with both an RJ-45 connector and a 9-pin, D-shell connector.

The IBM PCI Wake on LAN Token-Ring Adapter

The IBM PCI Wake on LAN Token-Ring Adapter is designed using the same technology as the IBM PCI Token-Ring Adapter. It provides the necessary functions required for a complete system solution for desktop PCs which incorporate Wake on LAN. It uses the same device drivers and configuration tools as the IBM PCI Token-Ring Adapter. You will not see a difference in the device driver name or the identifiers displayed during installation or status reporting.

The enclosed CD-ROM contains the installation aids, device drivers, and documentation for the IBM PCI Token-Ring Adapter and IBM PCI Wake on LAN Token-Ring Adapter.

Note: When installing the device driver for the IBM PCI Wake on LAN Token-Ring Adapter, select the IBM PCI Token-Ring Adapter device driver.

Prerequisite Operating System PCI Updates

Please check with your operating system supplier for the latest information concerning required updates to support PCI adapters. Some currently available operating systems are not PCI-aware, so the device drivers for the IBM PCI Token-Ring Adapter are written to the PCI architected BIOS or register-level interfaces. Chapter 4, "Manual Installation Instructions for Your Environment" on page 4-1 deals with updates to specific operating system environments.

Number of Adapters Supported

The maximum number of adapters supported is:

Table 1-1. Maximum Number of Adapters Supported

Device Driver	Number of Adapters
Novell ODI Server	16
Novell ODI OS/2 Client	2
Novell ODI DOS Client	1
NDIS 3.x for NT/W95/WFW	unlimited
Banyan	unlimited
NDIS 2.0 OS/2	12
NDIS 2.0 DOS	2
LAN Client	1

Kit Contents

Along with this manual, the adapter kit contains:

- The IBM PCI Token-Ring Adapter or the IBM PCI Wake on LAN Token-Ring Adapter
- Diskettes containing LANAID, LAN Client, device drivers, and diagnostic code
- The 3-connector Wake on LAN and Auxiliary Power cable, part number 76H7254 (IBM PCI Wake on LAN Token-Ring Adapter only)
- The 2-connector Wake on LAN cable, part number 42H2397 (IBM PCI Wake on LAN Token-Ring Adapter only)

If any item is missing or damaged, contact your place of purchase.

A CD-ROM version of the diskettes, with the following functions, is available.

- Install drivers directly from the CD-ROM
- Create environment-specific installation packages (including LANAID)
- Run LANAID, the DOS adapter configuration and device driver installation program
- Create a bootable diagnostic diskette

- [View or print the manuals](#)

Adapter Installation Checklist

To install this adapter, complete the following steps in order. You might want to mark this page for easy retrieval or make a copy to be used for reference.

___ 1. Preparation

In addition to the publications shipped with the adapter, you will need:

The manual provided with your computer

The manual provided with your network operating system or network application

Your operating system and network application software

Check the shipping package contents list on "Kit Contents" on page 1-3.

___ 2. Insert the adapter and connect the cable. See Chapter 2, "Installing the Adapter Hardware" on page 2-1.

___ 3. If you are installing for operation under Windows NT, go to Chapter 4, "Manual Installation Instructions for Your Environment" on page 4-1.

___ 4. For all other network environments, insert Diskette 1, LANAIID and Diagnostics, in drive A and enter **install** from a DOS full screen. See Chapter 3, "Software Installation" on page 3-1 for additional installation details. If you are using the CD-ROM version of this product, insert the CD-ROM in drive D and enter **d:\startcd** from a DOS full screen and follow the instructions on the screen.

Notes:

a. The PCI Token-Ring Adapter comes configured from the factory with the following defaults: AutoSense ON, RPL enabled, and expansion ROM enabled.

b. LANAIID will guide you through the software installation and hardware configuration of your PCI Token-Ring Adapter.

___ 5. Installation is now complete.

Chapter 2. Installing the Adapter Hardware

Before installing the IBM PCI Token-Ring Adapter, be sure to read the following information:

- Chapter 1, "Introduction"
- "Electronic Emission Notices for STP Media" on page H-4
- "Electronic Emission Notices for UTP Media" on page H-7
- "Power Cord Notices for UTP Media" on page H-9
- The safety information concerning adapter installation in your computer manual
- See "Statement of Limited Warranty" on page H-13

Inserting the Adapter

Note: If your adapter has the Wake on LAN feature, install it using the procedure in "Installing the Wake On LAN Adapter" on page 2-2.

To install the adapter in your PC:

- 1** Install the adapter according to the instructions for adapter installation in the manual that came with your PC.
- 2** After installing the adapter and before switching your PC ON, connect the adapter cable to the connector on the adapter and to the network.

Note: Only one data cable can be connected to the PCI Token-Ring Adapter at a time.

For information on adapter cables, see "Adapter Cable" on page 2-5.

Installing the Wake On LAN Adapter

- 1 Switch OFF the PC and all attached devices.

Note: In the U.K., by law, telephone line cables must be disconnected from the PC before the power cord.

- 2 Remove the power cord from the outlet.

Attention

Ensure that your PC is unplugged from the electrical outlet. Power is always supplied to the power connector that attaches to the Wake on LAN adapter, even when the system power switch is OFF.

- 3 Remove all cables from your PC to any connected devices.
- 4 Follow the instructions provided in your PC manual for removing the cover or otherwise accessing the adapter slots and inserting the adapter.
- 5 Two Wake on LAN cables are included with your new adapter. Determine which to connect to your adapter in the following manner.
 - If your PC has a power supply cable marked **P9** or **P12**, then you must use Wake on LAN cable part number 42H2397. This cable has two connectors; one for the Wake on LAN Adapter and one for the system board.
 - If the cable from the power supply is not present, then you must use part number 76H7254. This cable has three connectors; two for the Wake on LAN Adapter and one for the system board.

6 Connect the cables to your new Wake on LAN Adapter as follows:

- Connect one end of the Wake on LAN cable to the system board. If you are using the two-connector cable, part number 42H2397, this connector has two pins as shown in Figure 2-1 on page 2-4. If you are using the three-connector cable, part number 76H7254, this connector has three pins.
- Connect one end of the Wake on LAN cable to your new Wake on LAN Token-Ring PCI Adapter at P3 as shown in item **2** in Figure 2-2 on page 2-5.
- If you are using the three-connector cable, part number 76H7254, connect the third end to the Wake on LAN adapter card at P4 as shown in item **3** in Figure 2-2 on page 2-5.

Otherwise, connect the power supply cable marked P9 or P12 to the adapter card at **P4**. See item **3** in Figure 2-2 on page 2-5.

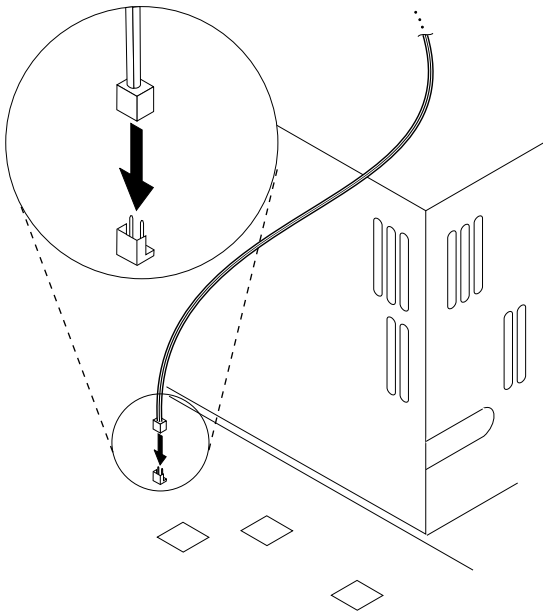


Figure 2-1. Wake on LAN Signal Connector on the System Board

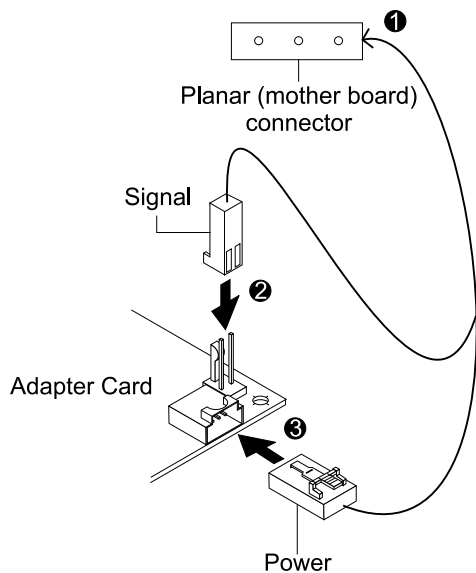


Figure 2-2. Connecting Cables to the Wake on LAN Adapter

- 7 Install all removed covers and reconnect disconnected cables as described in your PC manual. Follow all safety instructions.

Note: In the U.K., by law, the power cord must be connected before the telephone line cable.

Adapter Cable

To connect the IBM PCI Token-Ring Adapter to a token-ring network, you will need one of the cables illustrated in Figure 2-3 on page 2-6. Cables are not included in the adapter package. The network end of the cable must be compatible with the network faceplate or other device to which the adapter will be connected.

Note: No more than one data cable may be connected to the PCI Token-Ring Adapter at a time.

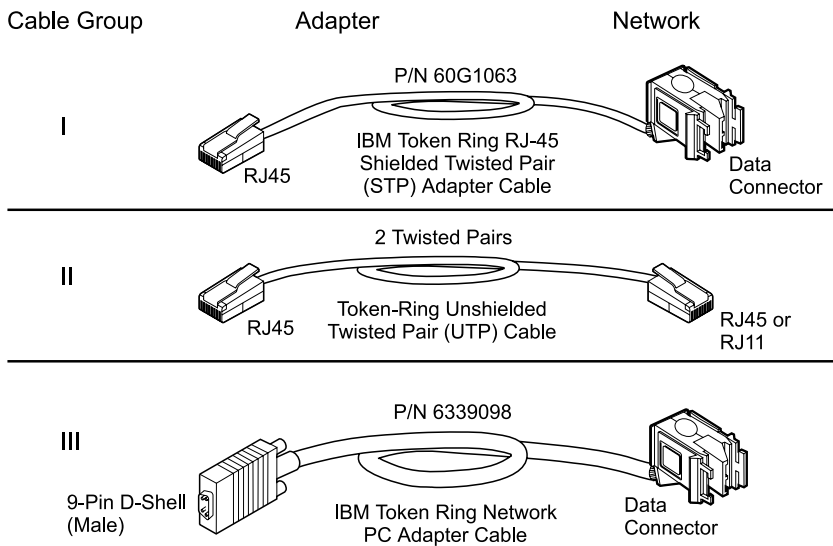


Figure 2-3. STP and UTP Adapter Cables

Chapter 3. Software Installation

When to Use LANAIID

The tool for adapter configuration and software installation in most environments is LANAIID.

Do not use this chapter if:

- You are installing under Windows NT (see page 4-29)
- You are installing on a computer without a hard disk (contact your LAN Administrator)

Use this chapter to:

- Install driver software
- Change adapter defaults
- View current hardware settings

To install the adapter software from the CD-ROM:

Boot into the target operating system and from a DOS command prompt, enter:

```
d:\startcd
```

where **d** is your CD-ROM drive.

- If you are installing the software for Windows 95, the InstallPro Main Menu panel appears. From this panel, you can:
 - Install software quickly without hints and tips
 - Install software with hints and tips
 - Reconfigure or remove software
 - Create diskettes to install on another machine
 - View hardware installation instructions
 - Troubleshoot, diagnose, or test the adapter
 - View product spec sheets
- If you are installing the software for any other supported environment, the installation menu appears. From this menu, you can:

- Create an environment specific installation package (diskettes) or install from CD.
- Create configuration and diagnostics diskette (LANAID)
- View/print the Installation and Testing Instructions manual
- View the README files
- View the Safety Information Manual

To install the adapter software from diskettes:

- 1** If the PCI Token-Ring Adapter version of LANAID is already installed on your computer, skip to step 2. If it is not, install LANAID on your hard disk.

Insert Diskette 1, LANAID and Diagnostics, in drive A and enter (from a DOS full screen) **a:install**. Skip to step 3.

Note: Once installed, LANAID will begin to run automatically.

- 2** Run LANAID.

At a DOS full screen, select the drive and directory where you stored LANAID. Enter **lanaid**.

- 3** On the panel titled LANAID Version 2.x..., the MAC address is shown. Use the pull-down menu to show the MAC addresses of other PCI Token-Ring Adapters, if any are installed. Select the address of the adapter you want to work with now. See "MAC Address" on page 3-3.

- 4** If you want to turn AutoSense off, or change RPL or Expansion ROM parameters, select **Adapter Configuration**. If not, continue with step 5.

- 5** Install the software.

Select **Software Installation** and then select your operating system. Finally, select protocol drivers and installation options.

LANAID will prompt you through installation completion.

MAC Address

The *universally administered address label* contains the adapter's universally administered address. This is the unique MAC address that was encoded in the adapter memory at the factory. See "Understanding the Adapter LEDs and Labels" on page 5-11. If you want the adapter to be known on the network by a locally administered address, you must configure the adapter's device driver or protocol driver to use a locally administered address.

You need to know the MAC address, because the LANAID program identifies each installed adapter by this address. All installed adapters are shown in the list on the Main Menu by their addresses.

Command Line Invocation of LANAID

Note to LAN Administrators: If you want to do automated installations of LAN Client, use the LANAIDC tool. Enter **lanaidc /h** for information. Diskette 1, LANAID and Diagnostics, will boot directly into LANAIDC.

Chapter 4. Manual Installation Instructions for Your Environment

This chapter gives detailed directions for manually installing the adapter drivers.

The following table tells you where to find installation instructions for your environment.

Where to Find the Installation Instructions for Your Environment

Table 4-1 (Page 1 of 2). Installation Instructions

Operating System and Environment	Page
DOS with Windows Version 3.1x	
IBM LAN Client	3-1 (Must use LANAIID)
NetWare Client	4-25
DOS LAN Services	4-24
IBM TCP/IP for DOS (Version 2.1)	4-24
Microsoft LANManager (Version 3.0)	4-27
DOS (without Windows)	
IBM LAN Client	3-1 (Must use LANAIID)
NetWare Client	4-25
DOS LAN Services	4-24
IBM TCP/IP for DOS (Version 2.1)	4-24
Microsoft LANManager (Version 3.0)	4-27
Windows for Workgroups Version 3.11	
NDIS3	4-37
NetWare Client	4-25
NDIS2	4-24
IBM LAN Client	3-1 (Must use LANAIID)
OS/2	
OS/2 (MPTS)	4-17
NetWare Client	4-21
OS/2 (LAPS)	4-14
OS/2 Warp Connect or Server	4-19
NetWare Server	
NetWare Server Version 3.12	4-3
NetWare Server Version 4.10	4-8
Windows NT	
NDIS 3 Driver	4-29
Windows 95	

Table 4-1 (Page 2 of 2). Installation Instructions

Operating System and Environment	Page
NDIS 3 Driver	4-33
Novell Client 32	4-36

Novell NetWare 3.12 Server

Attention:

Before you start this installation, get the latest level of patches from Novell. You can install them at the end of the installation procedure.

If the Novell NetWare server is not installed on your machine, follow these instructions. If it is installed, skip to the instructions in "Server Driver Installation in Existing NetWare 3.12 Server" on page 4-5.

Changes from the usual NetWare installation are necessary because this driver is written to a new specification level that requires new NetWare loadable modules (NLMs). The installation program is not aware of this, though, and these NLMs must be loaded during installation of the server device driver and after the server installation.

1 Refer to Novell's *Installation and Upgrade* manual for installation instructions. Follow the procedure for the installation of Novell NetWare 3.12 until the section titled "Load LAN Drivers" is next.

2 Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A or insert the CD-ROM. Enter the following commands at the server prompt:

For CD-ROM, replace A: with X:, where X is your CD-ROM drive.

```
LOAD A:\NOVELL\NETWARE\NBI31X.NLM
LOAD A:\NOVELL\NETWARE\MSM31X.NLM
LOAD A:\NOVELL\NETWARE\TOKENSM.NLM
```

Note: A message referring to protected-mode BIOS access, might appear before installation of Novell patches.

3 Load the server device driver. Enter the following command at the server prompt:

```
LOAD A:\NOVELL\NETWARE\IBMTRPO.LAN DATARATE=M16
```

The DATARATE must be M16 or M4 if yours is the first station on the ring. The default is AUTO.

Note: See Appendix C, “Novell NetWare Server and LAN Client Driver Parameters” for a complete list of parameters that can be specified on the LOAD IBMTRPO command in the AUTOEXEC.NCF file.

4 In the Novell manual, begin with “Bind the Protocol to the LAN Driver” and continue until you are in the File Server STARTUP.NCF File panel.

5 In addition to the instructions in the Novell manual, add the following line to STARTUP.NCF:

```
Set Minimum Packet Receive Buffers = 48
```

Note: Increase the minimum packet receive buffers by 48 for each additional PCI Token-Ring Adapter that is installed.

6 Perform the instructions in “Create an AUTOEXEC.NCF file.” In addition to the instructions in the Novell manual, add the following lines to the AUTOEXEC.NCF file immediately after the IPX INTERNAL NET statement (replace C:\SERVER.312\ with the location of the NetWare server program):

```
LOAD C:\SERVER.312\NBI31X.NLM
LOAD C:\SERVER.312\MSM31X.NLM
LOAD C:\SERVER.312\TOKENSM.NLM
LOAD C:\SERVER.312\IBMTRPO.LAN NAME=IBMLS1 DATARATE=M16
BIND IPX TO IBMLS1 NET=<unique net number>
```

Make sure that the line containing IBMTRPO.LAN has the complete path name.

Notes:

- a. See Appendix C, “Novell NetWare Server and LAN Client Driver Parameters” for a complete list of parameters that can be specified on the LOAD IBMTRPO command in the AUTOEXEC.NCF file.
- b. If you experience any problems after loading the Novell NLM files, contact Novell to ensure that you have the current version of these files.

Press **Esc** and answer **Yes** to save the new file to disk. Press **Esc** again to return to the server console.

7 Shut down your server by entering **down** and then entering **exit** from the server prompt.

8 Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A or insert the CD-ROM. Enter the following commands at the server prompt:

For CD-ROM, replace A: with X:, where X is your CD-ROM drive. For both diskette and CD-ROM, replace C:\SERVER.312\ with the location of the NetWare server program.

```
COPY A:\NOVELL\NETWARE\NBI31X.NLM C:\SERVER.312
COPY A:\NOVELL\NETWARE\MSM31X.NLM C:\SERVER.312
COPY A:\NOVELL\NETWARE\TOKENSM.NLM C:\SERVER.312
COPY A:\NOVELL\NETWARE\IBMTRPO.LAN C:\SERVER.312
COPY A:\NOVELL\NETWARE\IBMTRPO.LDI C:\SERVER.312
```

9 Go to the Novell server directory and enter **server** at the DOS prompt to restart the server.

10 Install any Novell patches now.

11 Installation is now complete.

Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files are loading successfully. There are no error messages.
- The adapter LEDs indicate normal operation. See “Understanding the Adapter LEDs and Labels” on page 5-11.

Server Driver Installation in Existing NetWare 3.12 Server

If Novell NetWare is already installed in your computer, perform the following steps to install the PCI Token-Ring Adapter server device driver.

1 After installing your adapter, switch ON your computer.

2 Install any Novell patches now.

- 3 Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A or insert the CD-ROM. Enter the following commands at the server prompt:

For CD-ROM, replace A: with X:, where X is your CD-ROM drive.

```
COPY A:\NOVELL\NETWARE\NBI31X.NLM C:\SERVER.312
COPY A:\NOVELL\NETWARE\MSM31X.NLM C:\SERVER.312
COPY A:\NOVELL\NETWARE\TOKENSM.NLM C:\SERVER.312
COPY A:\NOVELL\NETWARE\IBMRPO.LAN C:\SERVER.312
COPY A:\NOVELL\NETWARE\IBMRPO.LDI C:\SERVER.312
```

Note: If you experience any problems after loading the Novell NLM files, contact Novell to ensure that you have the current version of these files.

- 4 In the directory where Novell is installed on your hard disk, enter **server** at the DOS prompt to start the server.

- 5 At the server console prompt, enter **load install**.

- 6 From the Installation Options menu, select **System Options** and press **Enter**.

- 7 Select **Edit STARTUP.NCF File** and press **Enter**. Add the following line to the STARTUP.NCF file:

```
Set Minimum Packet Receive Buffers = 48
```

Note: Increase the minimum packet receive buffers by 48 for each additional PCI Token-Ring Adapter that is installed.

- 8 Press **Esc** and then answer **Yes** to save changes to the STARTUP.NCF file.

- 9 Select **Edit AUTOEXEC.NCF File** and press **Enter**. Edit this file and, after the IPX internal net statement, include the following statements. (Replace C:\SERVER.312\ with the location of the NetWare server program.)

```
LOAD C:\SERVER.312\NBI31X
LOAD C:\SERVER.312\MSM31X
LOAD C:\SERVER.312\TOKENS.M
LOAD C:\SERVER.312\IBMTRPO NAME=IBMLS1 DATARATE=M16
BIND IPX TO IBMLS1 NET=<unique net number>
```

See Appendix C, "Novell NetWare Server and LAN Client Driver Parameters" for a complete list of parameters that can be specified on the LOAD IBMTRPO command in the AUTOEXEC.NCF file.

Press **Esc** and then answer **Yes** to save the new file to disk. Press **Esc** again to return to the server console.

- 10** Shut down your server by entering **down** and then entering **exit** from the server prompt.
- 11** Enter **server** to restart the server.
- 12** Installation is now complete.

Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files are loading successfully. There are no error messages.
- The adapter LEDs indicate normal operation. See "Understanding the Adapter LEDs and Labels" on page 5-11.

Novell NetWare 4.10 Server

Before you start this installation, get the latest level of patches from Novell. You can install them at the end of the installation procedure.

These instructions are for installation of the server device driver in a uniprocessor (non-SMP) server machine only. If you are using Novell SMP, use the instructions from your system vendor.

If the Novell NetWare server is not installed on your machine, follow these instructions. If it is installed, follow the instructions in "Server Driver Installation in Existing NetWare 4.10 Server" on page 4-11.

Changes from the usual NetWare installation are necessary because this driver is written to a new specification level that requires new NetWare loadable modules (NLMs). The installation program is not aware of this, though, and these NLMs must be loaded during installation of the server device driver and after the server installation.

Note: A message referring to protected-mode BIOS access, might appear before installation of Novell patches.

- 1** Refer to Novell's installation and upgrade manual for installation instructions. Follow the procedure for the installation of Novell NetWare 4.10 until the installation program prompts for network drivers.
- 2** In the Choose the Server Drivers - Network Driver panel, press **Ctrl+Esc**. Press **1**, and then press **Enter** to access the system console.
- 3** Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A **or** insert the CD-ROM. Enter the following commands at the server prompt:

For CD-ROM, replace A: with X:, where X is your CD-ROM drive.

```
LOAD A:\NOVELL\NETWARE\TOKENSM.NLM
```

- 4** Press **Ctrl+Esc** to return to the installation program, then press **2**, and then press **Enter**.
- 5** From the Choose the Server Drivers panel, press **Insert** to install an unlisted driver.
- 6** Press **F3** to specify the source drive.
- 7** For diskette, type **novell\netware**; for CD-ROM type **X:\novell\netware**, where **X** is your CD-ROM drive.
- 8** Select **IBMTRPO.LAN** from the list and press **Enter**.

Note: If installing Novell NetWare SFTIII, M16 or M4 must be selected for the DATARATE parameter on both of the SFTIII machines. Do not use AUTO.

- 9** Continue with the installation until the section titled View the STARTUP.NCF File is next. Follow the instructions in this section and be sure to add the following lines to the STARTUP.NCF file (replace C:\NWSERVER\ with the location of the NetWare server program):

```
Set Minimum Packet Receive Buffers = 48
```

Note: Increase the minimum packet receive buffers by 48 for each additional PCI Token-Ring Adapter that is installed. Press **Esc** and answer **Yes** to save the STARTUP.NCF file.

- 10** Continue with the installation until the section titled View the AUTOEXEC.NCF File is next. Follow the instruction in this section and be sure to add the following lines to the AUTOEXEC.NCF file immediately after the IPX INTERNAL NET command (replace C:\NWSERVER\ with the location of the NetWare server program):

```
LOAD C:\NWSERVER\NBI
LOAD C:\NWSERVER\MSM
LOAD C:\NWSERVER\TOKENTSM
```

Press **Esc** and answer **Yes** to save the AUTOEXEC.NCF file.

11 Continue with the server installation until finished and the server console prompt is displayed. Shut down your server (“down” and “exit” in Novell documentation).

12 Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A **or** insert the CD-ROM. Enter the following commands at the server prompt:

*For CD-ROM, replace **A:** with **X:**, where **X** is your CD-ROM drive.*

```
COPY A:\NOVELL\NETWARE\NBI.NLM C:\NWSERVER
COPY A:\NOVELL\NETWARE\MSM.NLM C:\NWSERVER
COPY A:\NOVELL\NETWARE\TOKENSM.NLM C:\NWSERVER
COPY A:\NOVELL\NETWARE\IBMRPO.LAN C:\NWSERVER
COPY A:\NOVELL\NETWARE\IBMRPO.LDI C:\NWSERVER
```

Note: If you experience any problems after loading the Novell NLM files, contact Novell to ensure that you have the current version of these files.

13 Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A **or** insert the CD-ROM. Enter the following commands at the server prompt:

*For CD-ROM, replace **A:** with **X:**, where **X** is your CD-ROM drive (replace C:\NWSERVER\ with the location of the NetWare server program.)*

```
COPY A:\NOVELL\NETWARE\*.NLM C:\NWSERVER
```

14 Go to the Novell server directory and enter **server** at the DOS prompt to restart the server.

15 Install any Novell patches now.

16 Installation is now complete.

Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files are loading successfully. There are no error messages.

- The adapter LEDs indicate normal operation. See “Understanding the Adapter LEDs and Labels” on page 5-11.

Server Driver Installation in Existing NetWare 4.10 Server

If Novell NetWare is already installed in your computer, perform the following steps to install the PCI Token-Ring Adapter server device driver.

- 1** After installing your adapter, switch ON your computer.
- 2** Install any Novell patches now.
- 3** It is recommended that you save a copy of the current NLMs by typing the following lines at a DOS prompt. (Replace C:\NWSERVER\ with the location of the NetWare server program.)

```
MD C:\NWSERVER\OLD_NLM
CD C:\NWSERVER\OLD_NLM
```

Copy the following files from the C:\NWSERVER directory to this new directory:

```
NBI.NLM (if it exists)
MSM.NLM
TOKENTSM.NLM
```

- 4** Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A or insert the CD-ROM. Enter the following commands at the server prompt:

For CD-ROM, replace A: with X:, where X is your CD-ROM drive.

```
COPY A:\NOVELL\NETWARE\NBI.NLM C:\NWSERVER
COPY A:\NOVELL\NETWARE\MSM.NLM C:\NWSERVER
COPY A:\NOVELL\NETWARE\TOKENTSM.NLM C:\NWSERVER
COPY A:\NOVELL\NETWARE\IBMTRPO.LAN C:\NWSERVER
COPY A:\NOVELL\NETWARE\IBMTRPO.LDI C:\NWSERVER
```

This will replace some files that are in the NetWare server directory.

Note: If you experience any problems after loading the Novell NLM files, contact Novell to ensure that you have the current version of these files.

- 5** In the directory where Novell is installed on your hard disk, enter **server** to start the server.
- 6** At the server console prompt, enter **load install**.
- 7** From the Installation Options menu, select **NCF file options (create/edit server startup files)** and press **Enter**.
- 8** Select **Edit STARTUP.NCF file** and press **Enter**. Add the following line to the STARTUP.NCF file:
Set Minimum Packet Receive Buffers = 48
Note: Increase the minimum packet receive buffers by 48 for each additional IBM PCI Token-Ring Adapter that is installed.
- 9** Press **F10** to save changes to the STARTUP.NCF file.
- 10** Select **Edit AUTOEXEC.NCF file** and press **Enter**. After the IPX internal net statement, edit the file to include the following statements. (Replace C:\NWSERVER\ with the location of the NetWare server program.)

```
LOAD C:\NWSERVER\NBI
LOAD C:\NWSERVER\MSM
LOAD C:\NWSERVER\TOKENTSM
LOAD C:\NWSERVER\IBMTRPO NAME=IBMLS1 DATARATE=M16
BIND IPX TO IBMLS1 NET=<unique net number>
```

See Appendix C, "Novell NetWare Server and LAN Client Driver Parameters" for a complete list of parameters that can be specified on the LOAD IBMTRPO command in the AUTOEXEC.NCF file.
Note: If installing Novell NetWare SFTIII, M16 or M4 must be selected for the DATARATE parameter on both of the SFTIII machines. Do not use AUTO.
- 11** Press **F10** to save the changes to the AUTOEXEC.NCF file.

Press **Esc** and answer **Yes** to save the new file to disk. Press **Esc** again to return to the server console.

12 Shut down your server by entering **down** and then entering **exit** from the server prompt.

13 Go to the Novell server directory and enter **server** to restart the server.

14 Installation is now complete.

Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files are loading successfully. There are no error messages.
- The adapter LEDs indicate normal operation. See “Understanding the Adapter LEDs and Labels” on page 5-11.

OS/2 NDIS 2 Device Driver Using LAPS

Installing the IBM OS/2 Fix for PCI Support

You must have OS/2 Version 2.11 or higher.

If your system uses OS/2 Version 3 (Warp), skip to installation step 1. Otherwise, you will need the software fix that supports shared interrupts on PCI system buses. In some computers, if this fix is not installed when the PCI Token-Ring Adapter driver is initialized, the driver might fail to bind to the network.

For OS/2.11, you must obtain an updated OS/2 loader, which is available in the latest OS/2 fix pack. If you have installed an OS/2 fix pack that is level XR_A058 or higher, you already have the fix.

You can obtain OS/2 fix packs and service packs from one of the following sources:

- Phone the IBM Personal Software Products service center (1-800-992-4777 in the United States and 1-800-465-2222 in Canada). For the OS/2 2.11 fix pack, request APAR PJ14230. For the OS/2 service pack, request service pack XR06200.
- The IBM Software Service FTP site
`ftp://service.boulder.ibm.com/ps/products/os2/fixes/v2.1x/`

After you obtain and install the fix, continue with the following steps to install the adapter driver.

Installation

- 1** Insert Diskette 2, NDIS Drivers in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in your CD-ROM drive.
- 2** Enter **laps** at the OS/2 prompt. LAPS is usually located in the \IBMCOM subdirectory on the boot drive.
- 3** Select **Install**. You will be prompted for the source of the .NIF file. Enter **A:** when using diskette; when using CD-ROM, substitute the drive letter of your CD-ROM for A. Select **OK**

once the Installation Complete for PCI Token-Ring Adapter message appears. You will return to the main menu.

- 4** Select **Configure** and then, on the Select a Configuration option menu, make sure that **Configure LAN Transport** is highlighted. Select **Continue**. You will now be in the Configuration Workstation panel.
- 5** From the Network Adapters group box, select **IBM PCI Token-Ring Adapter (IBMTRP.OS2)**. Then, select **Add**.
Note: You can edit parameter settings for this adapter. Select **PCI Token-Ring Adapter** in the Current Configuration box and select **Edit**. See Appendix A, "NDIS 2 Device Driver Parameters."
- 6** In the Protocols list box, select the protocols used by your network application. Highlight each protocol and select **ADD**. If you are not sure which ones to use, select **IBM IEEE 802.2** and **IBM OS/2 NetBIOS** protocol drivers or ask your network administrator.

The protocol drivers you have selected will appear under the adapter driver name in the Current Configuration list box.
Note: You can edit parameter settings for the protocols. Highlight a protocol and select **Edit**.
- 7** Select **OK** when you have completed your selections for the adapter. You will now return to the main menu. Select **Exit** for the changes to take effect.
- 8** Select **Exit** on the IBM logo panel.
- 9** You will see messages regarding updates to the CONFIG.SYS file. Make sure that the correct drive and directory for the CONFIG.SYS file are specified, and click **Continue**.
- 10** Exit the program. Select **OK** when asked if you want CONFIG.SYS, STARTUP.CMD, and PROTOCOL.INI updated.
- 11** Select **Exit** on the Exiting LAPS window.

12 Installation is now complete. Shut down and restart your computer for all changes to take effect.

13 Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files are loading successfully. There are no error messages.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.
- You are able to log on and communicate with the network.

If you experience problems, go to Chapter 5, "Problem-Solving."

OS/2 NDIS 2 Device Driver Using MPTS

MPTS is the new *Multiple Protocol Transport Services*, which replaces LAPS for use under OS/2 Warp Connect and Warp Server.

- 1 Start MPTS by performing either of the following actions:
 - From the OS/2 desktop, double-click the MPTS icon.
 - From an OS/2 window, go into the IBMCOM subdirectory and enter **mpts** at the OS/2 prompt.
- 2 Select **OK** on the MPTS logo panel.
- 3 Select **Install**. You will be prompted for the source of the .NIF file. Enter **A:** when using diskette; if you are using CD-ROM, enter **X:** where **X** is your CD-ROM drive. Select **OK** once the Installation Complete for PCI Token-Ring Adapter message appears. You will return to the main menu.
- 4 Select **Configure** in the MPTS dialog box.
- 5 On the Configure panel, make sure that **LAN adapters and protocols** is preselected and then select **Configure** at the bottom of the panel.
- 6 In the Configuration panel, in the Network Adapters group box, select **IBM PCI Token-Ring Adapter (IBMTRP.OS2)** and select **ADD**.

Note: You can edit parameter settings for this adapter. Highlight **IBM PCI Token-Ring Adapter** in the Current Configuration list box and select **Edit**.
- 7 In the Protocols list box, select the protocols used by your network application. Highlight each protocol and select **ADD**. If you are not sure which ones to use, select **IBM IEEE 802.2** and **IBM OS/2 NetBIOS** protocol drivers or ask your network administrator.

The protocol drivers you have selected will appear under the adapter driver name in the Current Configuration list box.

Note: You can edit parameter settings for the protocols. Highlight a protocol and select **Edit**.

- 8** Select **OK** when you have finished selecting and editing protocols in the LAPS Configuration panel.
- 9** Select **Close** on the Configure panel.
- 10** Select **Exit** in the MPTS dialog box.
- 11** Select **Exit** on the Update CONFIG.SYS panel to update the CONFIG.SYS file.
- 12** Select **OK** when you get the message that the CONFIG.SYS has been successfully updated.
- 13** Select **Exit** on the Exiting MPTS panel.
- 14** Shut down OS/2 and restart your computer to let the changes take effect. Installation is now complete.
- 15** At system startup, check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:
 - The device driver files loaded successfully. There are no error messages.
 - The adapter LEDs indicate normal operation: Green ON, Amber OFF.
 - You are able to log on and communicate with the network.If you experience problems go to Chapter 5, "Problem-Solving."

OS/2 NDIS 2 Device Driver Using Other Installation Programs

Installing the IBM OS/2 Fix for PCI Support

You must have OS/2 Version 2.11 or higher.

If you are using IBM OS/2 Version 3 (Warp), skip directly to step 1. Otherwise, you will need the software fix that supports shared interrupts on PCI system buses. In some computers, if this fix is not installed when the PCI Token-Ring Adapter driver is initialized, the driver might fail to bind to the network.

If you use OS/2 Version 2.11, you must obtain an updated OS/2 loader, which is available in the latest OS/2 fix pack. If you have installed an OS/2 fix pack that is level XR_A058 or higher, you already have the fix.

You can obtain OS/2 fix packs and service packs from one of the following sources:

- Phone the IBM Personal Software Products service center (1-800-992-4777 in the United States and 1-800-465-2222 in Canada). For the OS/2 2.11 fix pack, request APAR PJ14230. For the OS/2 service pack, request service pack XR06200.
- The IBM Software Service FTP site
`ftp://service.boulder.ibm.com/ps/products/os2/fixes/v2.1x/`

Note: After you obtain and install the fix, continue with the following steps to install the adapter driver.

Installation

- 1** Insert Diskette 2, NDIS Drivers, in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in the CD-ROM drive.
- 2** Use your product documentation to install the driver (IBMTRP.OS2). On diskette it is located in the root directory on both the diskette and CD-ROM.

3 Modify the parameters if needed. See Appendix A, “NDIS 2 Device Driver Parameters.”

IBM TCP/IP for OS/2 and Warp Connect are examples of products that provide driver installation programs.

4 Installation is now complete. Shut down and restart your computer for all changes to take effect.

5 Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files load successfully. There are no error messages.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems go to Chapter 5, “Problem-Solving.”

For information concerning NDIS driver error messages, refer to Appendix B, “NDIS 2 Device Driver Messages.”

OS/2 Novell NetWare Requester

Installing the IBM OS/2 Fix for PCI Support

You must have OS/2 Version 2.11 or higher.

If you are using IBM OS/2 Version 3 (Warp), skip directly to step 1. Otherwise, you will need the software fix that supports shared interrupts on PCI system buses. In some computers, if this fix is not installed when the PCI Token-Ring Adapter driver is initialized, the driver might fail to bind to the network.

If you use OS/2 Version 2.11, you must obtain an updated OS/2 loader, which is available in the latest OS/2 fix pack. If you have installed an OS/2 fix pack that is level XR_A058 or higher, you already have the fix.

You can obtain OS/2 fix packs and service packs from one of the following sources:

- Phone the IBM Personal Software Products service center (1-800-992-4777 in the United States and 1-800-465-2222 in Canada). For the OS/2 2.11 fix pack, request APAR PJ14230. For the OS/2 service pack, request service pack XR06200.
- The IBM Software Service FTP site
`ftp://service.boulder.ibm.com/ps/products/os2/fixes/v2.1x/`

Note: After you obtain and install the fix, continue with the following steps to install the adapter driver.

Installation

To install the driver on an OS/2 workstation, perform the following steps:

- 1 Refer to the workstation basics and installation manuals from Novell to begin. When a dialog box titled Requester Installation appears during the installation process, continue with the following step.

2 If you are installing the NetWare OS/2 Requester on a workstation, select **Edit CONFIG.SYS and Copy All Files....** If the NetWare OS/2 Requester is already installed on the workstation and only a driver update is needed, then select **Only Edit CONFIG.SYS....**

3 On the next panel, specify the name of the IBM PCI Token-Ring Adapter driver - IBMTRPO.SYS, do not specify the path or insert driver diskettes at this time.

4 Continue with the installation, following the instructions on the panels.

5 When Installation Complete appears in the Novell NetWare OS/2 Requester window, go to the Configuration menu and select **This workstation....**

6 Click **Edit** to accept the default location for the NET.CFG file.

7 In the edit box titled Current NET.CFG File Contents, type the following lines:

```
link driver IBMTRPO
  SLOT 10001
link support
  BUFFERS 8 4096
```

Notes:

- a. To enable source routing, changes will have to be made to the CONFIG.SYS file. Refer to Novell's *Workstation for OS/2* manual for instructions on how to enable source routing.
- b. The lines in the NetWare Requester section of the CONFIG.SYS file must be in a certain order. Do not reorder the lines in this section of CONFIG.SYS. Refer to the Novell manuals for more information.

8 Click **Save** to complete the Novell NetWare OS/2 Requester installation.

9 Reboot the computer in order to make the changes take effect.

Note: To make changes in the NetWare OS/2 Requester configuration, double-click the Novell icon on the desktop. Double-click the Install icon in the Novell window. Go to the Configuration and select **This workstation...** Make sure that the correct NET.CFG is shown in the next dialog box and click **Edit**. Edit the NET.CFG file in the edit box titled Current NET.CFG File Contents. When the changes are complete, click on **Save**. It is necessary to reboot the computer in order to make the changes take effect.

10 Installation is now complete. Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files loaded successfully. There are no error messages.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, go to Chapter 5, "Problem-Solving."

DOS NDIS 2 Device Driver Using Other Installation Programs

- 1** Insert Diskette 2, NDIS Drivers, in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in the CD-ROM drive.
- 2** Use your product documentation to install the driver (IBMTRP.DOS). This driver is located at **a:\dos** on diskette or at **\dos** on CD-ROM.

3 Modify the parameters, if needed.

4 See Appendix A, "NDIS 2 Device Driver Parameters."

Note: If you use Microsoft Windows for Workgroups and want to configure the NetAddress parameter for the NDIS device driver, remember to enclose the address in double quotes (" "). The NetAddress parameter is used to set a locally administered address for the adapter.

5 Reboot the computer to load the drivers. Look for messages that indicate that the drivers have been installed.

- If the messages indicate that the drivers have been installed, the installation is now complete.
- If error messages are displayed or if you do not see messages that indicate that the drivers have been installed, go to "Start of Troubleshooting Process" on page 5-2.

DOS Novell NetWare Requester (16-bit)

This application is the DOS 16-bit, NetWare Requester environment that supports access to servers running Novell NetWare 3.11 or higher.

important: This driver is not shipped in this kit. You must get it from the World Wide Web at <http://www.networking.ibm.com/nes/nestoken.htm>

To install the IBMTRPO.EXE ODI driver on a DOS computer, perform the following steps:

Note: Consult your Novell NetWare documentation to create these diskettes from a Novell NetWare server.

- 1** Insert the NetWare Client for DOS and MS Windows Disk 1 in drive A.
- 2** At the command prompt, type **a:** and then press **Enter**. Next, type **install** and then press **Enter**.
- 3** Follow the instructions as they appear. In step 5, select the driver for your network board. Scroll down through the list titled *Network Boards*, highlight **Other Drivers**, and then press **Enter**.
- 4** Insert Diskette 3, ODI Drivers and LAN Client (A) in drive A. Specify the location of the NetWare DOS Requester driver for the PCI Token-Ring Adapter and press **Enter**. These files are usually at A:\NOVELL\DOS.
- 5** Highlight **IBM PCI Token-Ring Adapter** in the list and press **Enter**.
- 6** At this time you can change the default parameters. When you finish making any desired changes, press **F10**.
- 7** Follow the instructions presented to finish the installation.

Note: If source routing is required, edit the STARTNET.BAT file that is in the client directory (usually C:\NWCLIENT) and add the following line after the IPXODI statement:
C:\NWCLIENT\ROUTE

8 Reboot the computer for the changes to take effect.

Appendix D, "Novell NetWare DOS and OS/2 ODI Driver Parameters" contains the parameters that can be configured in the NET.CFG file.

DOS LANManager with NDIS 2

- 1** If Microsoft LANManager Version 3.0 or higher is not already installed, install the program now.

Refer to the *Microsoft LANManager Installation and Configuration Guide* for instructions on how to install the program.
- 2** Start the Microsoft LANManager Setup program.

Refer to the *Microsoft LANManager Installation and Configuration Guide* for instructions on how to start the Setup program.
- 3** If Microsoft LANManager has been configured to support other LAN adapters in the computer, the Workstation Configuration window will be displayed. Select the **Add New Config** option on that window.
- 4** Select **Other Driver** in the Network Adapter Drivers window.
- 5** When prompted, insert Diskette 2, NDIS Drivers in the diskette drive and press **Enter**. Do not enter a path name on the prompt window. If you are using the CD-ROM version of this product, insert the CD-ROM in your CD-ROM drive and press **Enter**. Do not enter a path name on the prompt window.

A message will be displayed to indicate when the NDIS device driver (IBMTRP.DOS) has been copied. Press **Enter** to continue.
- 6** Select a protocol in the Network Protocols window. Microsoft LANManager requires the NetBEUI driver for NetBIOS support.
- 7** Follow the instructions on the panels to complete the configuration. See Appendix A, "NDIS 2 Device Driver Parameters" for descriptions of the parameters.

- 8** Reboot the computer to load the IBM PCI Token-Ring Adapter driver and the protocol driver. Look for messages that indicate that the drivers have been installed.

Installation is now complete. Shut down and restart your computer for all changes to take effect.

Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files loaded successfully. There are no error messages.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, go to Chapter 5, "Problem-Solving."

Windows NT Version 3.51 with NDIS 3

Note: Refer to the *Microsoft Windows NT System Guide* for the general procedure regarding installation of network drivers for Windows NT. The following instructions should apply in most circumstances.

- 1** Log on to Windows NT as an administrator.
- 2** Insert Diskette 2, NDIS Drivers, in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in your CD-ROM drive.
- 3** Close any windows that are open.
- 4** Select the **Main** icon.
- 5** Select the **Control Panel** icon. In the Control Panel window, select the **Network** icon.
Note: If the Control Panel icon is not displayed, select **MS-DOS Command Prompt** to display the command-line prompt, and enter **Control** on the command line.
- 6** In the Network Settings dialog box, select **Add Adapter**.
- 7** In the Add Network Adapter dialog box, click the drop-down list for Network Adapter Card. Scroll down the list and select **<Other> Requires disk from manufacturer**. Then, select **Continue**.
Note: This refers to Diskette 2, NDIS Drivers or the CD-ROM.
- 8** When prompted, verify that Diskette 2, NDIS Drivers is inserted in drive A. Enter the path, **A:**. If you are using the CD-ROM version of this product, enter the path, **X:**, where **X** is your CD-ROM drive.
- 9** Select **OK** to accept the drive and path information.
- 10** In the Select OEM Option dialog box, select **IBM PCI Token-Ring Adapter**.

Several work-in-progress panels are displayed, indicating that the driver (IBMTRP.SYS) and its supporting files are being copied to your computer's hard disk.

- 11** In the IBM PCI Token-Ring Adapter dialog box, change the default values of the driver parameters if needed. Use the help button located on the configuration panel for additional information about the parameters.

When you have finished, select **OK**, and then select **Yes** when asked if you have finished entering the parameters.

- 12** The Network Setting panel is displayed again. There should be an entry for the IBM PCI Token-Ring Adapter in the Installed Adapter Cards list box.

- 13** Select **OK** at the top right to complete the installation.

Note: If TCP/IP is installed on the computer and the IP Address and Subnet Mask Address information was not entered during installation, you will now see the TCP/IP configuration panel. Enter all necessary information and select **OK**.

- 14** The message **Your network settings have changed. You will need to exit and restart Windows NT so that the new settings can take effect** will be displayed. Select **Restart now** in order to have Windows NT automatically restart your computer to load the NDIS adapter driver.

- 15** Installation is now complete. Shut down and restart your computer for all changes to take effect.

- 16** Check for the following conditions to determine whether the adapter is working correctly and whether installation has been completed successfully:

- The device driver files loaded successfully. There are no error messages.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, go to Chapter 5,
“Problem-Solving.”

Windows NT 4.0 with NDIS 3 Installation

Refer to the *Microsoft Windows NT System Guide* for the general procedure regarding installation of network drivers for Windows NT. The following instructions should apply in most circumstances.

- 1 Ensure that the network card is physically installed and that Windows NT 4.0 is running.
- 2 Select **Start ► Settings ► Control Panel ► Network**.
- 3 Select the **Adapters** tab.
- 4 Select **Add ► Have Disk**.
- 5 Insert diskette 2, NDIS Drivers, in drive A when prompted Type **a:** and select **OK** (or put the CD-ROM in the CD-ROM drive and type **X:**, where **X** is your CD-ROM drive, and select **OK**).
- 6 The device driver files will be copied at this point.
- 7 Select **IBM PCI Token-Ring Adapter** and then select **OK**.
- 8 The IBM PCI Token-Ring Adapter configuration panel will be displayed. No changes are required to this panel. Make any desired changes (select **Help** if needed) and select **OK**.
- 9 When the Network window appears, select the **Protocols** and **Bindings** tabs to address these topics if necessary. Otherwise, select **Close**.
- 10 Remove any diskettes from the A drive.
- 11 Windows NT 4.0 will prompt you to restart the system. Select the option that allows the restart.

Windows 95 with NDIS 3

Note: Refer to the *Microsoft Windows 95 System Guide* for the general procedure regarding installation of network drivers for Windows 95.

The following procedure applies when you get the message “New Hardware Found” at system startup. Use “Procedure 2 - No New Hardware Found” on page 4-34 if you did not get the message.

Procedure 1 - New Hardware Found

- 1** As Windows 95 starts up you will receive the message “New Hardware Found.”
- 2** Select **Driver from disk provided by hardware manufacturer**, and then select **OK**.
- 3** You will be prompted to insert the manufacturer’s diskette. Insert Diskette 2, NDIS Drivers, in drive A. Type **A:** and select **OK**. If you are using the CD-ROM version of this product, insert the CD-ROM in the CD-ROM drive and type **X:**, where **X** is your CD-ROM drive, and select **OK**.
- 4** Select **IBM PCI Token-Ring Adapter** from the list in the Select Device window and select **OK**. The device driver files will be copied at this point.
- 5** If any additional dialog boxes are presented, enter the appropriate settings required for your network environment, save your changes, and continue with the installation.
- 6** Select **OK** when the Network window is presented.
- 7** You will be prompted to insert the Windows 95 program diskettes or CD-ROM. Follow the instructions.
- 8** When installation has been completed, Windows 95 will present a message to restart the system. Select the option to restart your system. Remove any diskettes in drive A.

9 At system startup, check for the following conditions to determine whether you have successfully installed the adapter:

- The device driver files load successfully. There are no error messages.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.
- You are able to log on and communicate with the network.

If you experience problems, go to Chapter 5, "Problem-Solving."

Procedure 2 - No New Hardware Found

- 1** Make sure that Windows 95 is up and running.
- 2** Select **Start** at the bottom of the desktop.
- 3** Move the pointer to **Settings** and then select **Control Panel**.
- 4** From the Control Panel window, double-click **Network**.
- 5** Select **Add** and then select **Have Disk**.
- 6** When instructed, insert Diskette 2, NDIS Drivers, in drive A. Type **A:** and select **OK**. If you are using the CD-ROM version of this product, insert the CD-ROM in your CD-ROM drive and type **X:**, where **X** is your CD-ROM drive, and select **OK**.
- 7** Select **IBM PCI Token-Ring Adapter** from the list and select **OK**. The device driver files will be copied at this point.
- 8** If any additional dialog boxes are presented, enter the appropriate settings required for your network environment, save your changes, and continue with the installation.
- 9** Select **OK** when the Network window is presented.
- 10** You will be prompted to insert the Windows 95 program diskettes or CD-ROM. Follow the instructions.

- 11** When installation is completed, Windows 95 will present a message to restart the system. Select the option to restart your system. Remove any diskettes in drive A.
- 12** At system startup, check for the following conditions to determine whether you have successfully installed the adapter:
- The device driver files load successfully. There are no error messages.
 - The adapter LEDs indicate normal operation: Green ON, Amber OFF.
 - You are able to log on and communicate with the network.

If you experience problems, go to Chapter 5, "Problem-Solving."

Windows 95 Novell NetWare Client 32

Note: Refer to *Microsoft Windows 95 System Guide* for the general procedure regarding installation of network drivers for Windows 95.

Note: The Novell NetWare Client 32 for Windows 95 is available from Novell.

- 1** When Windows 95 is booted, it will recognize that a new adapter has been installed. Select **Driver from disk provided by manufacturer** and click **OK** in the dialog box.
- 2** When the Install from disk dialog box is displayed, insert Diskette 3, ODI Drivers and LAN Client (A) or the CD-ROM. If using diskette, enter **A:\NOVELL\NETWARE**. If using CD-ROM, enter **X:\NOVELL\NETWARE**, where *X* is your CD-ROM drive.
- 3** Follow the instructions presented until the Novell NetWare Client 32 for Windows 95 is installed.
- 4** Reboot the computer for the changes to take effect.

Notes:

1. To access the configurable parameters for the PCI Token-Ring Adapter in the Novell NetWare Client 32 for Windows 95, click the **Start** button and then select **Control Panel** from the Settings option. In the Control Panel, double-click the Network icon.
Click the **IBM PCI Token-Ring Adapter**, and then click **Properties**. In the window that appears, click the **Advanced** tab to access the configurable IBM PCI Token-Ring Adapter parameters.
2. Refer to Appendix C, "Novell NetWare Server and LAN Client Driver Parameters" for a description of the configurable parameters.

Refer to Novell NetWare Client 32 for Windows 95 documentation for more information.

Windows for Workgroups with NDIS 3

Note: Refer to the *Microsoft Windows For Workgroups System Guide* for the general procedure regarding installation of network drivers for Windows for Workgroups.

- 1** Insert Diskette 2, NDIS Drivers in Drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in your CD-ROM drive.
- 2** Double-click the Network group icon from the Program Manager window.
- 3** Double-click the Network Setup icon.
- 4** Click **Drivers** and then **Add Adapter...**
- 5** Click **Unlisted or updated network adapter** and then **OK**.
- 6** For diskette, enter **A:\WFW**. For CD-ROM, enter **X:\WFW**, where **X** is your CD-ROM drive.
- 7** Click **IBM PCI Token-Ring Adapter, NDIS 2/3**. Click **OK**.
- 8** Click **CLOSE**.
- 9** Click **OK**.
- 10** You will be prompted to reinstall specific network-related files. Reinstall them as needed.
- 11** You will also be prompted to insert the Windows for Workgroups program application diskettes or CD ROM. Follow the instructions.
- 12** Select **OK** for any messages regarding updates to the **SYSTEM.INI** and **PROTOCOL.INI** files.
- 13** When prompted to restart your computer, click **RESTART COMPUTER**.

14 Windows for Workgroups will automatically restart your computer and the driver will be loaded.

15 At system startup, check for the following conditions to determine whether you have successfully installed the adapter:

- The device driver files loaded successfully. There are no error messages.
- The adapter LEDs indicate normal operation. See “Understanding the Adapter LEDs and Labels” on page 5-11.
- You are able to log on and communicate with the network.

If you experience problems, go to Chapter 5, “Problem-Solving.”

Chapter 5. Problem-Solving

This chapter contains procedures that help you troubleshoot problems and optimize performance with an IBM PCI Token-Ring Adapter.

The following sections are presented:

- “Start of Troubleshooting Process” on page 5-2
- “Starting DLS in DOS Memory-Constrained Environments” on page 5-4
- “System PCI Performance Information” on page 5-4
 - “Latency Timer” on page 5-4
 - “ISA Device Impact on PCI Performance” on page 5-5
- “BIOS Updates” on page 5-7
- “EnableTxEofInt Optimization” on page 5-5
- “Other Performance Enhancements” on page 5-6
- “Expansion ROM and PCSETUP” on page 5-7
- “Solving Problems with Driver Installation” on page 5-9
- “Understanding the Adapter LEDs and Labels” on page 5-11
- “Understanding the Adapter Labels” on page 5-14
- “Solving an Adapter Communication Problem” on page 5-15
- “Adapter Diagnostics” on page 5-15
- “Symptoms of Systems Restricted to One IBM PCI Token-Ring Adapter” on page 5-17
- “Shared Interrupts” on page 5-17
- “Adapter Support Information” on page 5-18
 - “IBM Product Support” on page 5-18
 - “IBM PC Company BBS” on page 5-18
 - “World Wide Web” on page 5-18

Start of Troubleshooting Process

If you were not able to complete the installation procedures successfully or the IBM PCI Token-Ring Adapter is not operating correctly, use the following steps to start the troubleshooting process:

- If yours is the first station on the ring, make sure that AutoSense is disabled.
- Use Table 5-1 on page 5-3 to locate the symptom that best describes the problem.

Table 5-1. Symptoms and Recommended Procedures

Symptom	Solution
Problem with loading the drivers	“Solving Problems with Driver Installation” on page 5-9
Problem indicated by the adapter LEDs	“Understanding the Adapter LEDs and Labels” on page 5-11
Problem with the adapter operation	“Adapter Diagnostics” on page 5-15
Memory bandwidth restrictions	“Symptoms of Systems Restricted to One IBM PCI Token-Ring Adapter” on page 5-17
Unable to communicate with the network	“Solving an Adapter Communication Problem” on page 5-15
Error SYS0054 when attempting to start DOS LAN Services	“Starting DLS in DOS Memory-Constrained Environments” on page 5-4

Starting DLS in DOS Memory-Constrained Environments

If you receive the error code of SYS0054 as a result of starting DOS LAN Services with the command:

```
NET START
```

either from the command line or the AUTOEXEC.BAT file, the following commands should be used instead to start DOS LAN Services.

```
NET START NETBIND  
NET START NETBEUI
```

And one of the following, based on the requester being used.

```
NET START FULL  
NET START BASIC  
NET START VIRTUAL
```

These commands can be entered from either the DOS command line or from within a .BAT file such as AUTOEXEC.BAT.

System PCI Performance Information

Most PC systems are tuned for central processing unit (CPU) and display performance benchmarks. The systems are optimized for CPU accesses to memory and video buffers (both subordinate devices). This leaves PCI devices like the IBM PCI Token-Ring Adapter susceptible to being locked out of memory.

Latency Timer

The latency timer limits the amount of time a PCI device can use to transfer data on the bus. This has a small effect on overall adapter and system performance.

On systems that automatically set the latency timer value, no change should be necessary. On systems that require manual configuration, it is suggested that the latency timer value be set to a minimum value of 64 (decimal), or X'40' (hexadecimal).

Refer to your system manual for information about viewing and setting the timer.

ISA Device Impact on PCI Performance

Data transfer on ISA devices is much less efficient than on PCI, EISA, or Micro Channel devices. A system with a video controller or a disk controller (or both) on the ISA bus will leave less bus bandwidth for PCI devices to use.

It is recommended that PCI video and PCI disk adapters, rather than ISA-based adapters, be used in installations requiring high-performance LAN traffic. In many cases, the effect on overall system performance is negligible. However, in some cases, high-speed graphics screen activity or extensive disk activity can restrict PCI memory transfer rates. In extreme cases, this can cause the IBM PCI Token-Ring Adapter to drop frames being transmitted or received, causing retransmission.

EnableTxEofInt Optimization

Transmit Complete interrupts can be disabled with this parameter.

This is not recommended for NetWare "packet burst" mode or other protocols or applications that wait for Transmit Complete interrupts from each transmit request.

Other Performance Enhancements

The default settings for the PCI Token-Ring Adapter have been chosen to maximize interoperability with various PCI systems and network configurations. In many environments, performance can be optimized by a few percent by increasing frame size for client and server. Token rings allow frame sizes as large as 18200 bytes. The larger the frame size, the more efficiently the LAN can operate. The default frame size is less than 4500 bytes for two reasons:

1. To minimize memory used for buffers.
2. To ensure interoperability with network bridges and switches that cannot handle larger frame sizes.

See Appendix A, "NDIS 2 Device Driver Parameters" or Appendix C, "Novell NetWare Server and LAN Client Driver Parameters" for the applicable device driver keywords.

Note: If these values are changed, then the MAXFRAMESIZE used by the protocol stack should be changed as well.

BIOS Updates

BIOS code provides the interface that allows your software to utilize the system's hardware features. A BIOS update is done through software and generally does not require any hardware changes. Some PCI systems will require a BIOS code update to work correctly with high-bandwidth PCI devices like the IBM PCI Token-Ring Adapter. If you suspect that your system needs an update, you should contact your dealer or system manufacturer to determine whether an update is required, as well as to get the appropriate update.

Expansion ROM and PCSETUP

The adapter contains an expansion ROM that performs two functions:

1. It runs a program called PCSETUP, which modifies the BIOS setup for the adapter in specific systems.
2. It will boot (RPL) the operating system from a server, if your system is set up to boot from the LAN instead of from disk.

These functions are both enabled by default, and can be set by the diagnostics diskette or the LAN AID program. When enabled, the expansion ROM will use 2 KB of system memory space per adapter. The expansion ROM is part of the adapter microcode flash memory, and can be updated by diskette.

If the adapter ROM is disabled, or if your system does not support expansion ROM, you might need to install a PCSETUP file to correct a BIOS setup problem. Use the following instructions.

DOS, Novell, Windows, or Windows 95 (adapter driver not in CONFIG.SYS)

1. Insert Diskette 1, LAN AID and Diagnostics,, in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in drive D.

2. Copy A:\DIAGS\PCISSETUP.EXE to the root directory of the disk from which the system boots. If you are using the CD-ROM version of this product, copy D:\DIAGS\PCISSETUP.EXE.

3. Make the following line the first executable line in the AUTOEXEC.BAT file:

```
PCISSETUP
```

DOS, Novell, Windows, or Windows 95 (adapter driver in CONFIG.SYS)

1. Insert Diskette 1, LANAIID and Diagnostics,, in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in drive D.

2. Copy A:\DIAGS\PCISSETUP.DOS to the root directory of the disk from which the system boots. If you are using the CD-ROM version of this product, copy D:\DIAGS\PCISSETUP.DOS.

3. Make the following line the first executable line in the CONFIG.SYS file:

```
DEVICE=PCISSETUP.DOS
```

OS/2

1. Insert Diskette 1, LANAIID and Diagnostics,, in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in drive D.

2. Copy A:\DIAGS\PCISSETUP.OS2 to the root directory of the disk from which the system boots. If you are using the CD-ROM version of this product, copy D:\DIAGS\PCISSETUP.OS2.

3. Make the following line the first executable line in the CONFIG.SYS file:

```
DEVICE=PCISSETUP.OS2
```

Windows NT

1. Insert Diskette 1, LANAIID and Diagnostics,, in drive A. If you are using the CD-ROM version of this product, insert the CD-ROM in drive D.

2. From the File pull-down menu, select **Run**.

3. Type A:\DIAGS\PCISSETNT in the path entry field. Then, select **OK**. PCISSETNT.BAT will install PCISSETUP.SYS as a device driver that will be loaded each time the system is started. If you are using the CD-ROM version of this product, type D:\DIAGS\PCISSETNT and select **OK**.

Solving Problems with Driver Installation

Use this procedure if you are having problems loading the IBM PCI Token-Ring Adapter drivers.

- 1** Ensure that you performed the installation procedures correctly.
- 2** In Table 5-2, locate the row that describes the network operating system or network application on the computer and perform the recommended actions.

Table 5-2 (Page 1 of 2). Investigating Driver Installation Messages

Environment	Message Type and Action
Novell NetWare Server	<ul style="list-style-type: none"> • Message prefix IBMTRPO: See Appendix E, "Novell NetWare Server and LAN Client Driver Messages." This appendix contains explanations and recommended actions for each message. • Novell NetWare messages: Refer to your Novell NetWare documentation to determine the appropriate action
OS/2 with LAPS or MPTS	<p>Check LAPSHIST.LOG, usually found in the subdirectory OS2\Install, and LANTRAN.LOG, usually found in the subdirectory \IBMCOM, for messages. LAN Server users can use the NET ERROR function to view the error log.</p> <ul style="list-style-type: none"> • Message prefix LA1 or reference to IBMTRP: Go to Appendix B, "NDIS 2 Device Driver Messages." • LAPS messages: Refer to the documentation provided with the LAPS program for explanations and appropriate actions.

Table 5-2 (Page 2 of 2). Investigating Driver Installation Messages

Environment	Message Type and Action
Other OS/2 stations	Refer to the documentation provided with the network operating system or network application that you used to install the adapter and protocol driver.
LAN Client	See Appendix E, "Novell NetWare Server and LAN Client Driver Messages."
DOS NDIS 2	See Appendix B, "NDIS 2 Device Driver Messages."

Understanding the Adapter LEDs and Labels

Figure 5-1 and Table 5-3 on page 5-12 describe the LEDs and labels located on the bracket of the IBM PCI Token-Ring Adapter.

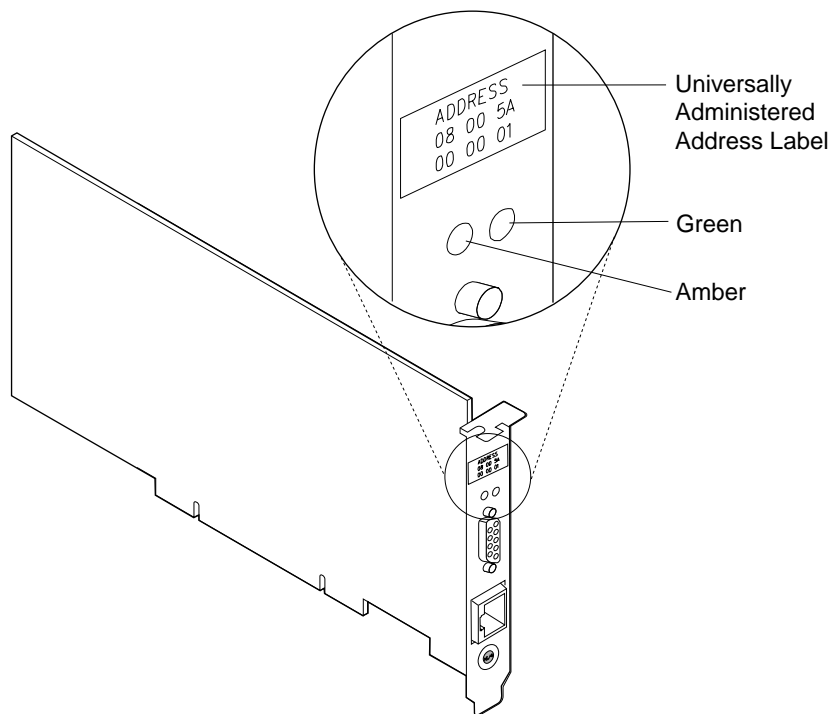


Figure 5-1. The Adapter LEDs and Labels

The LEDs provide information useful for monitoring the status of the adapter and for problem-solving. If the green LED is on and the amber LED is off, the adapter is operating correctly. If the amber LED is blinking and the green LED is on, a problem with the adapter has been detected. Table 5-3 on page 5-12 indicates the sequence that will be displayed when the computer is started and the adapter reaches the open state successfully. Some of those states might be too brief to observe. Table 5-4 on page 5-13 lists LED states that indicate problems.

Table 5-3. Startup Sequence of LED States

Amber	Green	Explanation
Blinking	Blinking	<p>Slow blink</p> <p>The adapter is waiting for initialization.</p> <p>Fast blink (Wake on LAN only)</p> <p>The adapter has detected a wake-up frame and is attempting to wake up the system. If this state persists, it indicates one of the following problems:</p> <ul style="list-style-type: none"> • The attached PC does not have Wake on LAN enabled. <p>To correct this problem, power on the PC and enable the Wake on LAN feature from the power management system configuration menu.</p> • The Wake on LAN cable is not attached correctly. <p>To correct this problem, ensure that the Wake on LAN cable is properly attached.</p>
Off	Off	The adapter initialization is in progress, or the computer is powered off.
Off	Blinking	<p>The adapter did not detect any problems during its self-diagnostic tests and is waiting to open.</p> <p>If this LED state occurs after the adapter has been opened, this state indicates that the adapter has been closed under software control.</p>
Off	On	The adapter is open and operating correctly.

Table 5-4. Problems Shown by Adapter LED States

Amber	Green	Explanation and Action
On	Off	<p>The adapter self-diagnostic tests failed or there is a problem with the adapter.</p> <p>Action: Go to “Adapter Diagnostics” on page 5-15 to test the adapter.</p>
Blinking	Off	<p>The adapter is closed due to an undetected error. One of the following exists:</p> <ul style="list-style-type: none"> • The adapter open failed. • The adapter detected a wire fault. • The adapter failed the auto-removal test. <p>Action: Perform the following procedures, as appropriate:</p> <ol style="list-style-type: none"> 1. Perform “Solving an Adapter Communication Problem” on page 5-15. 2. Verify that the adapter is configured correctly. 3. If other stations on the network are having problems communicating, contact your network administrator.
Blinking	On	<p>The adapter has detected beaconing or a hard error.</p> <p>Action: Go to “Solving an Adapter Communication Problem” on page 5-15.</p>
On	On	<p>The adapter has failed before running the self-diagnostic tests.</p> <p>Action: Go to “Adapter Diagnostics” on page 5-15 to test the adapter.</p>

The following definitions are of terms referred to in the table:

Auto-removal	The state in which a token-ring adapter port removes itself from the network to perform self-tests to verify that it is not the cause of a hard error. If the tests are successful, the port will reattach itself to the network.
Beaconing	The state that a token-ring adapter port enters after it has detected a hard error. The error condition is reported to the other devices on the network. Beaconing can result in the port removing itself from the network (auto-removal) to determine whether it is the cause of the hard error.
Hard error	An error condition on a network that requires removing the source of the error or reconfiguring the network before the network can resume reliable operation.
Initialization	The first step taken to prepare a port for use after the computer has been booted. During initialization, the port runs a series of internal self-diagnostic tests.
Open	The state in which the port has established connection with other devices on the ring.
Wire fault	An error condition caused by a break or a short circuit in the cable segment that connects the port to its access unit, such as an IBM 8230 Token-Ring Network Controlled Access Unit.

Understanding the Adapter Labels

The *green dot label* indicates that the adapter can communicate at 4 Mbps or 16 Mbps over a token ring. (Similar labels appear on token-ring network adapter cables manufactured by IBM.)

The *universally administered address label* contains the adapter's universally administered address. This is the MAC address that was encoded in the adapter memory at the factory. This 12-digit, hexadecimal address is recorded on the label in 2-digit increments from left to right, starting on the first row. In the illustration, the universally administered address is X'08 00 5A 00 00 01' in

non-canonical format, with the most significant bit (MSB) first. The universally administered address is unique and is used by network software to distinguish the adapter from others on the network. If you would prefer the adapter to be known on the network by a locally administered address, you must configure the device driver or protocol driver to use a locally administered address.

Solving an Adapter Communication Problem

Check the following list of possible causes if the adapter is unable to communicate on the network but other stations on the network are able to communicate:

- Verify that the appropriate adapter cable is connected to the adapter and to the network. See “Adapter Cable” on page 2-5 for a description of the compatible adapter cables.
- Verify that the adapter is firmly seated in the expansion slot.
- Verify that the setting for the adapter’s Data Rate option matches the data rate of the network, or that the data rate has been set to AutoSense if yours is not the first station on the ring. Run the software configuration again to determine the current setting.
- Use “Adapter Diagnostics” to run the adapter diagnostics. If the tests are completed successfully, and your computer still is not communicating, contact your network administrator.
- Replace the adapter cable with one that is known to be good.
- Verify that the Expansion ROM is on so that PCSETUP can run.

Adapter Diagnostics

Important

To avoid potentially erroneous results, you should always perform a power-on reboot of your computer before running the IBM PCI Token-Ring Adapter diagnostics.

Use the following procedure to test the IBM PCI Token-Ring Adapter:

- 1** Insert Diskette 1, LAN AID and Diagnostics, in drive A and reboot your computer.

If you are using the CD-ROM version of this product, you must create a diagnostic diskette. Using the utility on the CD-ROM, make a copy of Diskette 1, LAN AID and Diagnostics,.

If the system will not boot with the PCI Token-Ring Adapter installed, but will boot with the adapter removed, then skip to step 4.

- 2** At the DOS 7.0 Boot Menu select option 2, **IBM PCI Token-Ring Extended Diagnostics**.

Note: If there is more than one IBM PCI Token-Ring Adapter installed in your computer, select the specific adapter to be tested. A selection menu is listed identifying each adapter by its universally administered address. Use the cursor keys or the mouse to select the adapter for test.

- 3** Connect the adapter to the network and press the **Test** (Enter) key. There are two test options: wrap test and on-ring test.

The wrap test tests the adapter and cable through the hub or concentrator, or through a wrap plug attached to the cable.

The on-ring test requires that the adapter is connected to a network with other adapters, so the ring speed of the network can be automatically sensed. If the adapter is the only one in the network, the on-ring test will fail.

- 4** If the test indicates there is no adapter in the system, or that diagnostics cannot be run:

- Check that the adapter is correctly seated in the slot.
- Make sure that the LEDs blink alternately yellow and green after you power up your computer.
- See Table 5-3 on page 5-12 for LED states.

- 5** If the wrap test and on-ring test run without errors, the adapter is ready for use. Exit the diagnostic program, and follow the directions for reactivating the computer.

If an error occurs, record any messages that appear, record the LED sequences, and contact your network administrator.

Note: This procedure does not verify that the data rate of the adapter matches the data rate of the LAN segment.

Note: If more than one PCI Token-Ring Adapter is in the machine, and you have not run this diagnostic disk already, the diagnostic will reboot your computer, after updating the disk for the correct number of PCI Token-Ring Adapters.

Symptoms of Systems Restricted to One IBM PCI Token-Ring Adapter

Some systems can support only a single IBM PCI Token-Ring Adapter due to limited PCI-to-memory bandwidth.

Symptoms that might indicate a memory bandwidth restriction are:

- A single adapter can attach to the network but fails if additional adapters are active in the system.
- Adapters connect successfully to the network, but then lose connection when LAN traffic on multiple adapters increases or when other system I/O activity (for example, disk or video) increases.
- A network monitor indicates that one or more adapters are reporting excessive Receive congestion or internal errors. These errors usually indicate that the adapter is attempting to move more data on the network than the system can currently handle.

Shared Interrupts

When multiple PCI adapters share an interrupt, a problem with one adapter can appear as a performance or functional problem with a different adapter. When investigating problems in a system with more than one configured PCI adapter, isolate each adapter on its own interrupt, if possible. Refer to the manual shipped with your computer. Use LANAIID to view the interrupt values of the PCI Token-Ring Adapter.

Adapter Support Information

See the README.1ST file on Diskette 1, LAN AID and Diagnostics. It contains an index of the readme files containing the latest information about this product.

IBM Product Support

1-800-426-7299 Options by IBM HelpCenter
1-800-237-5511 IBM Support Services
1-800-772-2227 IBM Help Center
1-800-565-3344 HelpPC (Canada)

IBM PC Company BBS

For new or updated version of the installation code or the drivers:

United States	(919) 517-0001 (directory 32)
Vancouver	(604) 664-6464
Toronto	(416) 956-7877
Montreal	(514) 938-3022
Winnipeg	(204) 934-2735
Markham	(905) 316-4255
Halifax	(902) 420-0300

You can download the code from the BBS or the Internet. If you are outside the United States or Canada, contact your IBM marketing representative.

World Wide Web

Anonymous ftp to [lansupport.raleigh.ibm.com](ftp://lansupport.raleigh.ibm.com)

On a web browser:

<http://www.networking.ibm.com/nes/nestoken.htm>
<http://www.us.pc.ibm.com/files.html>

Appendix A. NDIS 2 Device Driver Parameters

Table A-1 (Page 1 of 6). DOS and OS/2 NDIS Device Driver Parameters in PROTOCOL.INI

Parameter	Explanation
NetAddress	<p>Use this parameter to specify a locally administered address for the adapter. The address must be enclosed in double quotes (" ") and be unique among all the addresses on the network.</p> <p>The adapter can be known on the network by its universally administered address (the address encoded in the adapter's memory at the factory) or a locally administered address (a unique, user-assigned address).</p> <p>The universally administered address is the default value. That address appears on the IBM PCI Token-Ring Adapter bracket. See Figure 5-1 on page 5-11 for an illustration.</p> <p>Valid values: X'400000000000' to X'7FFFFFFFFFFF'</p>
DataRate	<p>Used for configuring the ring speed of the PCI Token-Ring Adapter. It is recommended for servers that the DataRate be set to M16 or M4, and clients be set to Auto.</p> <p>Valid values:</p> <p>AUTO AutoSense – automatic ring-speed detection.</p> <p>Note: The adapter will not function with AutoSense if the adapter is the first one on the ring.</p> <p>M16 16-Mbps ring speed operation.</p> <p>M4 4-Mbps ring speed operation.</p> <p>The default value is AUTO.</p>

Table A-1 (Page 2 of 6). DOS and OS/2 NDIS Device Driver Parameters in PROTOCOL.INI

Parameter	Explanation
EnableTxEofInt	<p>This parameter specifies whether the Transmit End of Frame Interrupt is enabled.</p> <p>Valid values:</p> <p>Yes Indicates that the interrupt will be recognized by the interrupt handler,</p> <p>No Indicates that the interrupt will not be recognized by the interrupt handler. This value is preferable in some environments (such as a server environment) to reduce the number of times the interrupt handler is invoked. This can result in reduced CPU utilization and increased performance.</p> <p>The default is Yes.</p>
MaxTransmits	<p>This parameter specifies the maximum number of transmit queue entries. The value should be set high enough to accommodate the sum of all MaxTransmits for all protocol drivers using the IBM PCI Token-Ring Adapter concurrently.</p> <p>Valid values: 1 to 128</p> <p>The default value is 4 (DOS), 31 (OS/2).</p>

Table A-1 (Page 3 of 6). DOS and OS/2 NDIS Device Driver Parameters in PROTOCOL.INI

Parameter	Explanation
MaxTxFrameSize	<p>This parameter specifies the maximum frame size that can be transmitted on the LAN. The parameter value serves as an upper limit. The actual maximum frame size might be smaller. The maximum frame size supported by the NDIS device driver is the lesser of the following values:</p> <ul style="list-style-type: none"> • The value of this MaxTxFrameSize parameter • Total Receive Buffer Area (see the MinRcvBufs parameter) • The physical frame size capacity of the network (4500 bytes for 4-Mbps token rings and 18 200 bytes for 16-Mbps token rings) <p>Do not count the 4 bytes of FCS defined for a frame when setting this parameter value.</p> <p>In some environments, performance can be increased by operating server and client at larger frame sizes. Protocol frame size should be adjusted if this parameter is changed.</p> <p>Note: Some token-ring switches support a frame size of 4500 only.</p> <p>Valid values: 14 to 18 000</p> <p>The default value is 4 216 (DOS), 4 500 (OS/2).</p>

Table A-1 (Page 4 of 6). DOS and OS/2 NDIS Device Driver Parameters in PROTOCOL.INI

Parameter	Explanation
MinRcvBufs	<p>This parameter specifies the minimum number of receive buffers that are allocated. The Total Receive Buffer Area for the adapter is calculated using the following formula:</p> <p>Total Receive Buffer Area = MinRcvBufs × RcvBuffSize</p> <p>Note: To receive the maximum length frame that is supported by the attached network, the Total Receive Buffer Area must be larger than the maximum frame size that is allowed for the network, which is 4500 bytes for 4-Mbps token rings and 18 000 bytes for 16-Mbps token rings).</p> <p>A smaller Total Receive Buffer Area will use less system memory but will correspondingly reduce the size of the largest frame that can be received by the NDIS device driver. The maximum frame size supported by the driver can be further limited by the MaxTxFrameSize parameter.</p> <p>Valid values: 1 to 512</p> <p>The default value is 8 (DOS), 20 (OS/2).</p>
RcvBuffSize	<p>This parameter specifies the size of each receive buffer.</p> <p>Valid values: 256 to 18 000</p> <p>The default value is 1120 (DOS), 2252 (OS/2).</p>
FullDuplex	<p>This parameter permits the device driver to activate token-ring full-duplex operation if supported by the network. The MaxTxFrameSize parameter may need to be adjusted separately, depending on network requirements.</p> <p>Valid values:</p> <p>Yes Permits full-duplex operation.</p> <p>No Prohibits full-duplex operation.</p> <p>The default is Yes.</p>

Table A-1 (Page 5 of 6). DOS and OS/2 NDIS Device Driver Parameters in *PROTOCOL.INI*

Parameter	Explanation
LoopBack	<p>Determines whether or not the adapter will copy a frame that it is transmitting if the destination address is recognized by the adapter.</p> <p>Valid values:</p> <p>Yes Indicates that transmit frames whose destination is this adapter will be transmitted and then received by the adapter.</p> <p>No Indicates that transmit frames whose destination is this adapter must be looped back by the protocol stack.</p> <p>The default is No.</p>
TxPriMax	<p>This parameter specifies the value of the maximum token access priority that will be allowed for frames sent on the high-priority transmit channel. High-priority transmit frames whose Frame Control priority value exceeds the value of this parameter will have their token access priority reduced to the value specified by this parameter. Frame Control is a field in the IEEE 802.2 Logical Link Control (LLC) header.</p> <p>Valid values: 0 to 6</p> <p>The default value is 5.</p>
TxPriThresh	<p>This parameter specifies the frame priority value that will be used to transmit on the adapter's high-priority transmit queue. IEEE 802.2 LLC frames that contain a frame priority setting (in the Frame Control field) that is equal to or greater than the value of this parameter are treated as high-priority frames.</p> <p>Valid values: 1 to 6</p> <p>The default value is 3.</p>

Table A-1 (Page 6 of 6). DOS and OS/2 NDIS Device Driver Parameters in PROTOCOL.INI

Parameter	Explanation
LLCOnly	<p>This parameter indicates whether only LLC frames should be copied by the adapter when it is running in promiscuous copy mode. If this parameter is set to YES, then no MAC frames will be copied while in promiscuous copy mode.</p> <p>Valid values:</p> <p>Yes Copy only LLC frames.</p> <p>No Copy all frames on the ring.</p> <p>The default value is No.</p>

```

;Protocol Manager Section
[PROT_MAN]
  Drivename = PROTMAN$

;Section A: Protocol Driver (IBM TCP/IP V1.2 for DOS)
[TCPIP_nif]
  Drivename = TCPIP$
  Bindings = IBMTRP_NIF

;Section B: NDIS Device Driver
[IBMTRP_NIF]
  Drivename = IBMTRP$
  NetAddress = "400000000000"
  DataRate = "M16"
  EnableTxEOFInt = "Yes"
  MaxTransmits = 4
  MaxTxFrameSize = 4216
  MinRcvBufs = 8
  RcvBuffSize = 1120
  FullDuplex = "Yes"
  TxPriMax = 5
  TxPriThresh = 3

```

Figure A-1. Sample PROTOCOL.INI File for a DOS Station Configured for TCP/IP

```
;Protocol Manager Section
[PROT_MAN]
  Drivename = PROTMAN$

;Section A: Protocol Driver (IBM TCP/IP V1.2 for OS/2)
[TCPIP_nif]
  Drivename = TCPIP$
  Bindings = IBMTRP_NIF

;Section B: NDIS Device Driver
[IBMTRP_NIF]
  Drivename = IBMTRP$
  NetAddress = "400000000000"
  DataRate = "M16"
  EnableTxEOFInt = "Yes"
  MaxTransmits = 31
  MaxTxFrameSize = 4500
  MinRcvBufs = 20
  RcvBuffSize = 2252
  FullDuplex = "Yes"
  TxRetries = 3
  TxPriMax = 5
  TxPriThresh = 3
```

Figure A-2. Sample PROTOCOL.INI File for an OS/2 Station Configured for TCP/IP

Appendix B. NDIS 2 Device Driver Messages

This appendix contains messages that can be received from the NDIS device driver. The messages are either displayed or logged to a file.

The term *Port nnnnnnnn* appears in several messages. It is used to identify the adapter's instance and bears *no* relationship to the physical slots in the computer. If this is the only PCI Token-Ring Adapter, the number will be 00000000.

LA10001 IBM PCI Token-Ring Adapter, Version xx

Explanation: Information only.

User Action: None.

LA10002 The IBM PCI Token-Ring Adapter UAA (BIA) is xx.

Explanation: Information only.

User Action: None.

LA10003 The IBM PCI Token-Ring Adapter is using an LAA of xx.

Explanation: Information only.

User Action: None.

LA10004 Revision level xx of the PCI Token-Ring Adapter is incompatible with this driver version.

Explanation: The Revision ID of the PCI Token-Ring Adapter is not one that is supported by this version of the device driver. This correlation is enforced to ensure an appropriate match between the adapter hardware and the device driver software.

User Action: Contact your support personnel for assistance. You might need to upgrade your PCI Token-Ring Adapter, use a different version of the device driver, or do both.

LA10005 **A device driver initialization error occurred (failure code *xx*).**

Explanation: An unexpected error occurred during initialization of the device driver.

User Action: Shut down the computer correctly and switch OFF the power to the machine. Restart the computer by switching it ON again. If the error persists, contact your support personnel.

LA10006 **The configuration parameter *xx* was specified incorrectly. Its default value will be used.**

Explanation: The value of a configuration parameter was incorrectly specified.

User Action: Edit the configuration file (or rerun the configuration program) to specify a value that is of the correct type and within the allowed range. Check the adapter installation instructions for additional information.

LA10007 **The configuration parameter values have forced the internal data blocks to exceed the allowed limit.**

Explanation: The combination of configuration parameters being used requires more than the 64-KB memory area that is available for this adapter instance to hold its internal control information.

User Action: Lower the value of the MaxTransmits or MinRcvBufs parameters from their current setting to reduce the amount of control block storage required by the device driver. Shut down and restart the computer to activate this configuration change.

LA10008 **Unable to register interrupt level *xx* for this adapter.**

Explanation: The hardware interrupt level assigned to this adapter was not able to be registered (*hooked*) by the device driver.

User Action: Check the configuration of your computer, looking for other devices that are assigned the same interrupt level as this adapter. Try removing the conflicting device from the machine and restart the computer to see if the problem goes away. If so, then determine whether the conflicting device can be left out of the machine, or whether the machine can be reconfigured to resolve the conflict. Note that in most PCI machines, the PCI BIOS assigns certain system resources to the devices found in the computer, including the interrupt level.

LA10010 A hardware failure occurred while attempting to open the adapter.

Explanation: An adapter hardware error was detected when opening the adapter for network operation.

User Action: Run the adapter diagnostics program to isolate the problem and contact your support personnel. If no problem was identified by the diagnostics, check that the cable is attached securely to both the adapter and the network interface (wall plate). Switch the computer OFF and then ON again to restart the machine. If the problem persists, contact your support personnel.

LA10011 A possible lobe wire failure was detected while attempting to insert into the network.

Explanation: The adapter is not correctly connected to the token-ring network.

User Action: Check that the cable is securely attached to both the adapter and to the token-ring network. You may need to contact your local network administrator to ensure that the cabling in the building is intact and that the network concentrator to which you are attached is operational. If the error persists, try using a different cable.

LA10012 A signal loss condition was detected while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

LA10013 The lobe wire connected to the adapter is not attached to the network.

Explanation: The adapter is not correctly connected to the token-ring network.

User Action: Check that the cable is securely attached to both the adapter and to the token-ring network. You might need to contact your local administrator to ensure that the cabling in the building is intact and that the network concentrator to which you are attached is operational. If the error persists, try using a different cable.

LA10014 The configured data rate for the adapter does not match that of the network.

Explanation: The operational speed of the token-ring network does not match the configured speed of the adapter.

User Action: Change the setting of the DataRate configuration parameter to match the speed of the network to which the adapter is attached. Your local network administrator should be able to tell you which speed to use.

Setting the DataRate parameter value to "Auto" will allow the adapter to automatically determine the correct speed setting to use when connecting to the network, provided that this is not the only adapter active on the token ring.

Consult the adapter installation instructions for additional information on setting the DataRate parameter.

LA10015 An adapter timeout occurred while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

LA10016 A ring failure condition was detected while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

LA10017 A ring beaconing condition was detected while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

LA10018 A duplicate network address was detected while attempting to insert into the network.

Explanation: The address specified for the NetAddress configuration parameter is being used by another adapter (or ring station) on the network.

User Action: Modify the configuration file to change the NetAddress parameter value being used for this adapter, or remove the NetAddress parameter to allow the adapter's universally administered address to be used.

Contact your local network administrator for assistance with choosing a new NetAddress parameter value, or to possibly have the conflicting adapter removed from the same token-ring network as this adapter.

LA10019 A ring parameter failure occurred while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

LA10020 The adapter was forced to remove itself while attempting to insert into the network.

Explanation: The token-ring network rejected the attempt by this adapter to connect to it.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

LA10021 A hardware failure occurred while attempting to open the adapter.

Explanation: An adapter hardware error was detected when opening the adapter for network operation.

User Action: Run the adapter diagnostics program to isolate the problem and contact your support personnel. If no problem was identified by the diagnostics, check that the cable is attached securely to both the adapter and the network interface (wall plate). Switch the computer OFF and then ON again to restart the machine. If the problem persists, contact your support personnel.

LA10022 A hardware failure occurred while attempting to open the adapter.

Explanation: An adapter hardware error was detected when opening the adapter for network operation.

User Action: Run the adapter diagnostics program to isolate the problem and contact your support personnel. If no problem was identified by the diagnostics, check that the cable is attached securely to both the adapter and the network interface (wall plate). Switch the computer OFF and then ON again to restart the machine. If the problem persists, contact your support personnel.

LA10023 The adapter cannot be opened in AutoSense mode if it is the only active station on the network.

Explanation: The adapter DataRate configuration parameter is set to "Auto" (which is also the default value if the parameter is not specified), but the adapter is the first station to open on the token-ring network.

User Action: This adapter is designed to not open onto the attached token-ring network if it is configured to use AutoSense detection and if it would have been the first active ring station.

The possible remedies are to try to connecting again at a later time when at least one other ring station is active on the network (such as a network server), or to change the configuration value so that the DataRate parameter is set to a specific ring-speed value of M16 or M4 and restart the computer.

Note that setting a specific value of M16 or M4 for the DataRate parameter will cause this adapter to establish the operational speed of the token-ring network if it is still the first active ring station, so consult with your local network administrator if necessary.

Check the adapter installation instructions for additional information on setting the DataRate parameter.

LA10024 The adapter attempted to perform a Remote Program Load but failed monitor contention.

Explanation: The adapter was opened as a Remote Program Load (RPL) client, but was unable to locate an RPL server on the network.

User Action: Make sure that there is an active Remote Program Load server on the network and that it is configured to recognize this adapter's address.

LA10025 A network protocol error occurred while attempting to operate the adapter in full duplex mode.

Explanation: The adapter was unable to successfully communicate with a token-ring switch when attempting to open for full-duplex operation.

User Action: Check that your full-duplex switch is functioning correctly and that the adapter is correctly connected to it. If this problem persists, contact your support personnel.

LA10027 The PCI Token-Ring Adapter opened for token ring, xx Mbps., half duplex.

Explanation: Information only.

User Action: None.

-
- LA10028** **The PCI Token-Ring Adapter opened for token ring, xx Mbps., full duplex.**
Explanation: Information only.
User Action: None.
-
- LA10033** **Adapter analysis code is xx.**
Explanation: Information only.
User Action: None.
-
- LA10034** **Adapter full-duplex operation has now been activated.**
Explanation: Information only.
User Action: None.
-
- LA10042** **A device driver initialization error occurred (failure code xx).**
Explanation: An unexpected error occurred during initialization of the device driver.
User Action: Shut down the computer correctly and switch OFF the power to the machine. Restart the computer by switching it ON again. If the error persists, contact your support personnel.
-
- LA10043** **No adapter instances recognized by this device driver were found in PROTOCOL.INI.**
Explanation: The PROTOCOL.INI file does not have a section defined by the correct 'DriverName = ' line anywhere within it.
User Action: If you intend to run this device driver, make sure to define a valid network configuration in the PROTOCOL.INI file. If you do not intend to run this device driver, remove its 'DEVICE=' statement from the CONFIG.SYS file.
-
- LA10044** **The NDIS 2.0 Protocol Manager could not be opened.**
Explanation: An unexpected error occurred when the program attempted to open the Protocol Manager.
User Action: Check the drive and directory to ensure that the Protocol Manager is located in the path specified in the CONFIG.SYS file. If this error persists, consider reinstalling the NDIS 2.0 network support software.

LA10045 **Could not find the PROTOCOL.INI file image.**

Explanation: An unexpected error occurred when the program attempted to read the PROTOCOL.INI file image through interaction with the Protocol Manager.

User Action: Check the drive and directory to ensure that the Protocol Manager is located in the path specified in the CONFIG.SYS file. Verify that a valid PROTOCOL.INI file exists in the proper location. If this error persists, consider reinstalling the NDIS 2.0 network support software.

LA10046 **The required DRIVERNAME parameter was not found in PROTOCOL.INI.**

Explanation: The parameter specifying the driver name (DRIVERNAME) was not found in the PROTOCOL.INI file. This parameter is required.

User Action: Change PROTOCOL.INI to specify the proper information.

LA10047 **The NetAddress value in PROTOCOL.INI is invalid and will be ignored.**

Explanation: The value specified for the network address parameter in PROTOCOL.INI is not valid for one of the following reasons:

- Invalid local station address
- Too long
- Too short
- Contains non-hexadecimal characters
- Not enclosed in double quotation marks

User Action: Remove or correct the NetAddress configuration parameter value. A valid value for this parameter is 12 characters long and must be enclosed in double quotation marks. For token-ring adapters, the locally administered address must be within the hex range 400000000000 to 7FFFFFFFFFFF.

Make sure not to set the corresponding group address bit, which is the high-order bit in token-ring addressing notation.

LA10048 **An unrecognized parameter xx was found in PROTOCOL.INI.**

Explanation: An unrecognized parameter was found while processing a section of the PROTOCOL.INI file defined for this device driver.

User Action: Correct the parameter name or remove it from PROTOCOL.INI. Refer to the installation manual that came with your adapter for more information on the configuration parameters.

LA10049 **The configuration parameter *xx* was specified incorrectly. Its default value will be used.**

Explanation: An invalid value was specified for an adapter configuration parameter in the PROTOCOL.INI file. A default value has been substituted.

User Action: Change the PROTOCOL.INI file to specify a valid value for the configuration parameter that is in error. Refer to the installation manual that came with the adapter for more information on the allowable settings for this particular parameter.

The device driver has proceeded with its initialization using a predetermined default value for this parameter.

LA10050 **The NDIS 2.0 device driver was not able to register with the Protocol Manager.**

Explanation: An unexpected error occurred when the program attempted to register an adapter with the Protocol Manager.

User Action: Check the drive and directory to ensure that the Protocol Manager is located in the path specified in the CONFIG.SYS file. If this error persists, consider reinstalling the NDIS 2.0 network support software.

LA10051 **The configuration parameter values have forced the internal data blocks to exceed the allowed limit.**

Explanation: The combination of configuration parameters being used requires more than the 64-KB memory area that is available for this adapter instance to hold its internal control information.

User Action: Lower the value of the MaxTransmits or MinRcvBufs parameters in the PROTOCOL.INI file to reduce the amount of control block storage required by the device driver. Shut down and restart the computer to activate this configuration change.

Appendix C. Novell NetWare Server and LAN Client Driver Parameters

For the Novell NetWare Server, the parameters are set on the command line or on the load IBMTRP0 line in the AUTOEXEC.NCF file.

For the LAN Client environment, the parameters are set on the load IBMTRP0 line of the STARTNET.BAT file.

Table C-1 (Page 1 of 4). Novell NetWare Driver Parameters

Parameter	Explanation
DATARATE=	<p>Configures the token-ring data rate for the IBM PCI Token-Ring Adapter. It is recommended for servers that the DATARATE be set to M16 or M4, and clients be set to AUTO.</p> <p>Valid values:</p> <p>AUTO AutoSense – automatic ring-speed detection.</p> <p>Note: The adapter will not function with AutoSense if the adapter is the first one on the ring.</p> <p>M16 16-Mbps ring speed operation.</p> <p>M4 4-Mbps ring speed operation.</p> <p>The default value is AUTO.</p> <p>Note: If using Novell NetWare SFTIII, M16 or M4 must be selected for the DATARATE parameter on both of the SFTIII machines. Do not use AUTO.</p>

Table C-1 (Page 2 of 4). Novell NetWare Driver Parameters

Parameter	Explanation
FRAME=	<p>This string defines the frame type to be used with the IBM PCI Token-Ring Adapter adapter when loading the IBMTRPO LAN driver.</p> <p>Token-Ring drivers can add MSB or LSB following the frame type designation. LSB forces canonical addresses to be passed between the MLID and the upper layers. The MSB designation forces non-canonical addresses to be passed (this is the default for Token-Ring media).</p> <p>Valid values TOKEN-RING or TOKEN-RING_SNAP</p> <p>The default value is TOKEN-RING.</p>
FULLDUPLEX=	<p>This keyword permits the IBMTRPO LAN driver to activate token-ring full-duplex operation supported by the PCI Token-Ring Adapter and the NetWare server environment.</p> <p>Valid values YES, NO</p> <p>The default value is YES.</p>

Table C-1 (Page 3 of 4). Novell NetWare Driver Parameters

Parameter	Explanation
NODE=	<p>This keyword is used to set a locally administered address for the IBM PCI Token-Ring Adapter. A local address must contain 12 hexadecimal characters and can be specified in either most significant bit (MSB) or least significant bit (LSB) format.</p> <p>To specify an MSB node address, the letter M immediately follows the last digit of the node address. To specify an LSB node address, the letter L immediately follows the last digit of the node address. If neither an "M" nor "L" is specified after the last digit of the node address, MSB will be assumed.</p> <p>If a node address is specified in MSB format, the value must be within the range X'400000000000' to X'7FFFFFFFFFFF' (for example, X'400000000002'M). This same address specified in LSB format would be X'020000000080'L with an L optionally appended to the end.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Do not assign the same local address to two or more stations. Severe station communication or network failures can occur when two or more stations are assigned the same address. 2. If you do not assign a locally administered address, the adapter uses the universally administered address permanently encoded in the adapter's memory.
RXBUFFERS=	<p>This keyword defines the number of receive buffers used by the IBMTRPO LAN driver.</p> <p>Valid values 4 to 64</p> <p>The default value is 32. For IBM LAN Client, the default value is 4.</p> <p>Note: Receive buffer size is defined by the server SET command. Refer to your Novell NetWare system administration documentation for more information.</p>

Table C-1 (Page 4 of 4). Novell NetWare Driver Parameters

Parameter	Explanation
SLOT=	This keyword defines the slot number of the corresponding IBM PCI Token-Ring Adapter in the computer. To avoid being prompted to enter a slot number when the IBMTRPO LAN driver is loaded, specify this keyword. One SLOT number is required for each PCI Token-Ring Adapter if you are using more than one.
TXBUFFERS=	<p>This keyword defines the number of transmit buffers used by the IBMTRPO LAN driver.</p> <p>Valid values 1 to 16</p> <p>The default value is 16.</p> <p>Note: Maximum transmit frame size is defined by the server SET command. Refer to your Novell NetWare system administration documentation for more information.</p>

Appendix D. Novell NetWare DOS and OS/2 ODI Driver Parameters

The following parameters can be configured in the NET.CFG file.

Table D-1 (Page 1 of 3). DOS and OS/2 Configurable Driver Parameters in NET.CFG

Parameter	Explanation
FRAME	<p>This keyword defines the frame type used with the network adapter.</p> <p>Valid values:</p> <ul style="list-style-type: none">• TOKEN-RING MSB• TOKEN-RING LSB• TOKEN-RING_SNAP MSB• TOKEN-RING_SNAP LSB <p>The default value is Token-Ring MSB.</p>

Table D-1 (Page 2 of 3). DOS and OS/2 Configurable Driver Parameters in NET.CFG

Parameter	Explanation
NODE ADDRESS	<p>To set a locally administered address for the adapter, type the local address you want to use. The local address must contain 12 hexadecimal characters and can be specified in either MSB (the default), or LSB format. To specify an MSB node address, the letter "M" immediately follows the last digit of the node address. To specify an LSB node address, the letter "L" immediately follows the last digit of the node address.</p> <p>If a node address is specified in MSB format, the characters must be within the range X'400000000000'–X'7FFFFFFFFF'. To specify a node address in MSB format, append an "M" to the end of the address (for example, 40000000001M). This address specified in LSB format would be X'020000000080L'.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Do not assign the same local address to two or more stations. Severe station communication or network failures may occur when two or more stations are assigned the same address. 2. If you do not assign a locally administered address, the adapter uses the universally administered address (the address encoded in the adapter memory at the factory). The universally administered address appears on a label on the PCI Token-Ring Adapter. See Figure 5-1 on page 5-11 for an illustration.
SLOT	<p>This keyword defines the slot number of the corresponding PCI Token-Ring Adapter in the computer. Slots must be assigned sequentially. This assignment is used to avoid conflict with other adapters.</p> <p>Valid values: 10001 or 10002</p> <p>The default value is 10001.</p>

Table D-1 (Page 3 of 3). DOS and OS/2 Configurable Driver Parameters in NET.CFG

Parameter	Explanation
DATARATE	<p>This keyword defines the data-rate setting for the adapter. It is recommended that clients be set to AUTO.</p> <p>Valid values:</p> <p>AUTO AutoSense – automatic ring-speed detection.</p> <p>Note: The adapter will not function with AutoSense if the adapter is the first one on the ring.</p> <p>M16 16-Mbps ring-speed operation.</p> <p>M4 4-Mbps ring-speed operation.</p> <p>The default value is AUTO.</p>
RXBUFFERS	<p>This keyword defines the number of receive buffers used by the driver.</p> <p>Valid values: 9 to 64</p> <p>The default value is 16.</p>
TXBUFFERS	<p>This keyword defines the number of transmit buffers used by the driver.</p> <p>Valid values: 1 to 3</p> <p>The default value is 1.</p>
FULLDUPLEX	<p>This keyword influences whether a full-duplex network connection will be requested by the adapter.</p> <p>Valid values: NO, YES</p> <p>The default value is YES.</p>

Appendix E. Novell NetWare Server and LAN Client Driver Messages

IBMTRPO-xx-202: The PCI Token-Ring Adapter UAA (BIA) is xxx.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-203: The PCI Token-Ring Adapter is using an LAA of xxx.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-204: Revision level xxx of the PCI Token-Ring Adapter is incompatible with this driver version.

Explanation: The Revision ID of the PCI Token-Ring Adapter is not one that is supported by this version of the device driver. This correlation is enforced to ensure an appropriate match between the adapter hardware and the device driver software.

User Action: Contact your customer service center for assistance. You might need to upgrade your PCI Token-Ring Adapter, use a different version of the device driver, or both.

IBMTRPO-xx-205: A device driver initialization error occurred (failure code xxx).

Explanation: An unexpected error occurred during initialization of the device driver.

User Action: Shut down the computer and switch OFF the power to the machine. Restart the computer by switching it ON again. If the error persists, contact your customer service center.

IBMTRPO-xx-206: The configuration parameter xxx was specified incorrectly. Its default value will be used.

Explanation: The value of a configuration parameter was incorrectly specified.

User Action: Edit the configuration file (or rerun the configuration program) to specify a value that is of the correct type and within the allowed range. Check the adapter installation instructions for additional information.

IBMTRPO-xx-207: The configuration parameter values have forced the internal data blocks to exceed the allowed limit.

Explanation: The combination of configuration parameters being used requires more than the 64-KB memory area that is available for this adapter instance to hold its internal control information.

User Action: Lower the value of the TXBUFFERS or RXBUFFERS parameters from their current setting to reduce the amount of control-block storage required by the device driver. Unload and load IBMTRPO to activate this configuration change.

IBMTRPO-xx-208: Unable to register interrupt level xxx for this adapter.

Explanation: The hardware interrupt level assigned to this adapter was not able to be registered (hooked) by the device driver.

User Action: Check the configuration of your computer, looking for other devices that are assigned the same interrupt level as this adapter. Try removing the conflicting device from the machine and restart the computer to see if the problem goes away. If so, then determine whether the conflicting device can be left out of the machine, or whether the machine can be reconfigured to resolve the conflict. Note that in most PCI machines, the PCI BIOS assigns certain system resources to the devices found in the computer, including the interrupt level.

IBMTRPO-xx-210: A hardware failure occurred while attempting to open the adapter.

Explanation: An adapter hardware error was detected when opening the adapter for network operation.

User Action: Run the adapter diagnostics program. See "Adapter Diagnostics" on page 5-15.

IBMTRPO-xx-211: A possible lobe wire failure was detected while attempting to insert into the network.

Explanation: The adapter is not correctly connected to the token-ring network.

User Action: Check that the cable is securely attached to both the adapter and to the token-ring network. You might need to contact your local network administrator to ensure that the cabling in the building is intact and that the network concentrator to which you are attached is operational. If the error persists, try using a different cable.

IBMTRPO-xx-212: A signal loss condition was detected while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

IBMTRPO-xx-213: The lobe wire connected to the adapter is not attached to the network.

Explanation: The adapter is not correctly connected to the token-ring network.

User Action: Check that the cable is securely attached to both the adapter and to the token-ring network. You may need to contact your local network administrator to ensure that the cabling in the building is intact and that the network concentrator to which you are attached is operational. If the error persists, try using a different cable.

IBMTRPO-xx-214: The configured data rate for the adapter does not match that of the network.

Explanation: The operational speed of the token-ring network does not match the configured speed of the adapter.

User Action: Change the setting of the DataRate configuration parameter to match the speed of the network to which the adapter is attached. Your local network administrator should be able to tell you which speed to use. Setting the DataRate parameter value to AUTO will allow the adapter to automatically determine the correct speed setting to use when connecting to the network, provided that this is not the only adapter active on the Token Ring. Consult the adapter installation instructions for additional information on setting the DataRate parameter.

IBMTRPO-xx-215: An adapter timeout occurred while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

IBMTRPO-xx-216: A ring failure condition was detected while attempting to insert into the network.

Explanation: The Token-Ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

IBMTRPO-xx-217: A ring beaconing condition was detected while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

IBMTRPO-xx-218: A duplicate network address was detected while attempting to insert into the network.

Explanation: The address specified for the NetAddress configuration parameter is being used by another adapter (ring station) on the network.

User Action: Modify the configuration file to change the Node parameter value being used for this adapter, or remove the Node parameter to allow the adapter's universally administered address to be used. Contact your local network administrator for assistance with choosing a new Node parameter value, or to have the conflicting adapter removed from the same token-ring network as this adapter.

IBMTRPO-xx-219: A ring parameter failure occurred while attempting to insert into the network.

Explanation: The token-ring network is not functioning correctly.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

IBMTRPO-xx-220: The adapter was forced to remove itself while attempting to insert into the network.

Explanation: The token-ring network rejected the attempt by this adapter to connect to it.

User Action: Contact your local network administrator to determine the status of your network, or try connecting again at a later time.

IBMTRPO-xx-221: A hardware failure occurred while attempting to open the adapter.

Explanation: An adapter hardware error was detected when opening the adapter for network operation.

User Action: Run the adapter diagnostics program. See "Adapter Diagnostics" on page 5-15.

IBMTRPO-xx-222: A hardware failure occurred while attempting to open the adapter.

Explanation: An adapter hardware error was detected when opening the adapter for network operation.

User Action: Run the adapter diagnostics program. See "Adapter Diagnostics" on page 5-15.

IBMTRPO-xx-223: The adapter cannot be opened in AutoSense mode if it is the only active station on the network.

Explanation: The adapter DataRate configuration parameter is set to AUTO (which is also the default value if the parameter is not specified), but the adapter is the first station to open on the token-ring network.

User Action: This adapter is designed to not open onto the attached token-ring network if it is configured to use AutoSense detection and if it would have been the first active ring station.

The possible remedies are to try connecting again at a later time when at least one other ring station is active on the network (such as a network server), or to change the configuration value so that the DataRate parameter is set to a specific ring speed value of M16 or M4 and unload and load IBMTRPO to activate this configuration change.

Note that setting a specific value of M16 or M4 for the DataRate parameter will cause this adapter to establish the operational speed of the Token-Ring network if it is still the first active ring station, so consult with your local network administrator if necessary.

Check the adapter installation instructions for additional information on setting the DataRate parameter.

IBMTRPO-xx-225: A network protocol error occurred while attempting to operate the adapter in full duplex mode.

Explanation: The adapter was unable to successfully communicate with a token-ring switch when attempting to open for full-duplex operation.

User Action: Check that your full-duplex switch is functioning correctly and that the adapter is correctly connected to it. If this problem persists, contact your customer service center.

IBMTRPO-xx-227: The PCI Token-Ring Adapter opened for Token Ring, xxx Mbps, half duplex.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-228: The PCI Token-Ring Adapter opened for Token Ring, xxx Mbps, full-duplex.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-229: The adapter is configured for full-duplex, but could be opened in half duplex mode only.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-233: Adapter analysis code is xxx.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-234: Adapter full-duplex operation has now been activated.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-304: Adapter is disconnected from the media.

Explanation: The media network is not functioning correctly.

User Action: Verify that the cable is securely attached to both the adapter and the token-ring network. Run adapter diagnostics if the problem persists. You might need to contact your local administrator to ensure that the cabling in the building is intact and that the network concentrator to which you are attached is operational. If the error persists, try using a different cable.

IBMTRPO-xx-305: Condition restored. The adapter is connected to the media.

Explanation: Information only.

User Action: None.

Appendix F. Remote Program Load

The Remote Program Load (RPL) function enables a network adapter to boot a computer using files the computer receives from a LAN server. The computer that requests these files is referred to as the *client computer*, and the computer that responds with these files is referred to as the *LAN server*. In order for RPL to take place, two things must occur. First, the RPL feature of the adapter in the client machine initiates the RPL request. Second, a LAN server responds to the RPL request with the files to bring up, or boot the client computer.

The PCI Token-Ring Adapter supports RPL from the following servers:

- IBM OS/2 LAN Server Version 3.0 (CSD level IP07060 or higher)
- IBM OS/2 LAN Server Version 4.0 (CSD level IP08152 or higher)
- IBM OS/2 Warp Server
- Novell NetWare 3.11 or higher

Please read the \RPL\README.RPL file on Diskette 2, NDIS Drivers or on the CD-ROM for any updated information on RPL procedures available after this manual was published.

The following sections describe:

- “Setting Up Your Client Computer for RPL” on page F-2
- “Setting Up Your OS/2 LAN Server to Support RPL from the IBM PCI Token-Ring Adapter” on page F-3
- “Setting Up Your Novell NetWare Server to Support RPL from the IBM PCI Token-Ring Adapter” on page F-5
- “RPL Messages” on page F-9
- “Troubleshooting RPL Problems” on page F-11

Setting Up Your Client Computer for RPL

In order for the RPL process to begin, the RPL feature must be enabled on the adapter installed in the client computer, and the client computer must recognize the RPL feature of the adapter as the first or only bootable device present.

Enabling the RPL Feature on the PCI Token-Ring Adapter

The PCI Token-Ring Adapter is shipped with the RPL feature enabled. You can ensure that it is enabled by running the adapter diagnostics and, at the diagnostics test panel for the adapter, pressing F5 to view or change the RPL setting. You can also check the RPL setting with LAN Aid or LAN AidC.

Making the RPL Feature the First Bootable Device

All IBM PCs support RPL, and many IBM-compatible PCs do also. If your computer is not an IBM PC, refer to your computer's user's manual or contact the manufacturer if you are not sure whether it supports RPL.

On most IBM PCs you can make this adapter the first bootable, or startup, device by choosing **network** as the first startup device in the startup sequence in the configuration utility (usually you enter the configuration utility by pressing F1 when the IBM logo and Configuration Utility program symbol appear during the power-on process). If drive A is the first bootable device, consider making the adapter the second bootable device. Refer to the user's manual for your IBM PC if you need further instructions for altering the startup sequence or entering the configuration utility.

Many non-IBM machines and some older IBM machines do not have a configuration utility, or do not allow a choice of a network-bootable device in the configuration utility. On these machines you can either remove the hard disk or use the RPLENABL.EXE utility program provided with this adapter on Diskette 2, NDIS Drivers or on the CD-ROM, in the \RPL subdirectory to disable the hard disk as a bootable device. Once the hard disk is disabled as a bootable

device, computers which support RPL adapters will attempt to boot from the network as long as no diskette is in the diskette drive.

Once you have successfully selected RPL as the first startup, or boot device, you will see an RPL panel when your client machine is booting. The following is an example of this RPL panel:

```
IBM PCI Token-Ring Adapter RPL
ET-02:15:36
ID-268 0030
BU-0000
AA-0004AC570001
AL-000001 PX10AH
BL-CR1.0243
RM-C800
OP-0000 16

RQ-000F
SF-
SN-
RS-2010
PC-0606
AC-8C00 00002000 8820
AE-000 OP-0011
```

This sample shows all the possible error and status message prefixes. You will normally not see the error status condition prefixes, such as PC-, unless an error condition occurs. These error and status messages are described later in the RPL Messages section.

Setting Up Your OS/2 LAN Server to Support RPL from the IBM PCI Token-Ring Adapter

This manual assumes that you have already set up your OS/2 LAN Server for RPL and installed the DOS or OS/2 RPL image. If you have not, refer to the OS/2 LAN Server documentation and install RPL support before installing RPL support for the PCI Token-Ring Adapter on the OS/2 LAN Server. In summary, at this point you should have already performed the following steps:

- 1 Installed OS/2 LAN Server DOS or OS/2 RPL support.
- 2 Run RIPLINST.EXE if you installed OS/2 RPL support, to install an OS/2 RPL image. The RIPLINST.EXE utility is

normally on diskette 7 of the OS/2 installation diskettes. You must use the OS/2 unpack command to unpack the RIPLINST file before you can run it.

3 Installed any service fixpaks required

LAN Server 3.0: IP07060 or later

LAN Server 4.0: IP08152 or later

Use the OS/2 SYSLEVEL command on your OS/2 LAN Server to check the CSD level.

4 Run any post-service updates for RPL described in the fixpak IPxxxxx.INF file (xxxxx is the fixpak level being applied).

5 Run GETRPL.EXE to update the RPL access profiles (requires the RPL service to be stopped, and you to be logged on with administrator authority).

6 Run NET START RPL to start the RPL service.

Once these steps are complete, run the following steps on the OS/2 LAN Server to add RPL support for the PCI Token-Ring Adapter:

1 Run A:\RPL\CFGRPL.CMD from Diskette 2, NDIS Drivers, or the CD-ROM in an OS/2 window.

2 Run NET STOP RPL to stop the RPL service.

3 Run GETRPL.EXE to update the RPL access profiles (requires the RPL service to be stopped, and you to be logged on with administrator authority).

4 Run NET START RPL to start the RPL service.

5 Create an RPL workstation image for each Client computer with a PCI Token-Ring Adapter installed. This procedure is described in the LAN Server documentation. For the Server Record Identifier use:

Client Operating Environment	Record Identifier
OS/2 2.11	R_221_DTKTRP
OS/2 3.0	R_230_DTKTRP
DOS	R_DTKTRP_NDIS

Setting Up Your Novell NetWare Server to Support RPL from the IBM PCI Token-Ring Adapter

To RPL clients with the PCI Token-Ring Adapter from a NetWare Server you must:

- 1** Power on a NetWare Client machine and logon to the NetWare Server with supervisor authority.
- 2** Copy the RPL.NLM file to the NetWare Server \SYSTEM directory from the \RPL directory on Diskette 2, NDIS Drivers or the CD-ROM.
- 3** Copy the _0249.RPL file to the NetWare Server \LOGIN directory from the \RPL directory on Diskette 2, NDIS Drivers or the CD-ROM.
- 4** Generate a bootable client diskette for this adapter, and run the DOSGEN program located in the \SYSTEM directory on the Novell NetWare Server. For information on running DOSGEN or for more detailed information on setting up unique RPL images for specific adapters, refer to the Novell NetWare documentation.
- 5** Add the following two lines to the AUTOEXEC.NCF file located in the \SYSTEM directory on the NetWare Server:

```
load rpl  
bind rpl to <driver>
```

where <driver> is the token-ring driver loaded on your NetWare Server.

The following steps make up a sample procedure for creating a NetWare Client boot image:

- 1 Prepare a bootable DOS diskette. Perform either step 1a on page F-6 or for a VLM image or 1b on page F-7 for a NETX image:

- a VLM image

Place the following files on the bootable DOS diskette:

COMMAND.COM	AUTOEXEC.BAT	CONFIG.SYS	NET.CFG
LSL.COM	IBMTRPO.EXE	ROUTE.COM	IPXODI.COM
VLM.EXE	CONN.VLM	SECURITY.VLM	NWP.VLM
REDIR.VLM	IPXNCP.VLM	NDS.VLM	FIO.VLM
PRINT.VLM	TRAN.VLM	BIND.VLM	GENERAL.VLM
NETX.VLM			

Your CONFIG.SYS file should have the following statements:

```
REM Use these three if you want to use high memory and
REM XMS memory.
REM DOS=HIGH
REM DEVICE=A:\HIMEM.SYS
REM DEVICE=A:EMM386.EXE NOEMS
FILES=40
BUFFERS=20
LASTDRIVE=Z
```

Your AUTOEXEC.BAT file should have the following statements:

```
PATH A:\
PROMPT $P$G
SET NWLANGUAGE=ENGLISH
LSL
IBMTRPO
ROUTE
IPXODI
REM If you issue commands that reload COMMAND.COM,
REM you must also copy COMMAND.COM
REM to the NetWare Server \system directory and
REM uncomment the COMSPEC command statement below.
REM SET COMSPEC=F:\SYSTEM\COMMAND.COM
VLM
LOGIN yourID
```

b NETX image

Place the following files on the bootable DOS diskette:

```
COMMAND.COM  AUTOEXEC.BAT  LSL.COM      NETX.EXE
IBMTRPO.EXE  ROUTE.COM      IPXODI.COM  NET.CFG
```

Your AUTOEXEC.BAT should have the following statements:

```
PATH A:\
PROMPT $P$G
LSL
IBMTRPO
ROUTE
IPXODI
REM If you issue commands that reload COMMAND.COM,
REM you must also copy COMMAND.COM
REM to the NetWare Server \system directory and
REM uncomment the COMSPEC command statement below.
REM SET COMSPEC=F:\SYSTEM\COMMAND.COM
NETX
F:
LOGIN yourID
```

- 2** Update the diskette with IBMTRPO.EXE from Diskette 3, ODI Drivers and LAN Client (A) or the CD-ROM.

This driver is not shipped with your IBM PCI Token-Ring Adapter. You must get it from the World Wide Web at <http://www.networking.ibm.com/nes/nestoken.htm>.

- 3** Generate the image using DOSGEN (see the Novell documentation for information on creating images and running DOSGEN).

Following is a sample of the NET.CFG file for VLM or NETX clients:

```
Link Driver IBMTRPO
  FRAME TOKEN-RING MSB
  DATARATE AUTO
  PCISLOT 17
  RXBUFFERS 2
  TXBUFFERS 2
```

```
NetWare DOS Requester
  FIRST NETWORK DRIVE = F
  NETWARE PROTOCOL = NDS BIND
```

RPL Messages

ET-00:00:45

Explanation: Elapsed time. A continuously updated field indicating the elapsed time since the RPL feature gained control.

ID-268 BBDF

Explanation: Identification. An indication of which adapter is using the RPL function. 268 indicates an PCI Token-Ring Adapter. BBDF indicates the PCI bus, device, and function number for the PCI slot in which the adapter is inserted.

BU-0000

Explanation: Bring-Up. This field is displayed as X'0000' if the adapter has been successfully initialized and opened. If not, a code other than X'0000' is displayed and the field is highlighted. See "Troubleshooting RPL Problems" on page F-11.

AA-08005A2B0000

Explanation: Adapter Address. The permanently encoded address of the token-ring adapter in your computer. This address is always 12 hexadecimal characters (6 bytes) long.

AL-000001 PX10AH

Explanation: Adapter level. The Engineering Change (EC) level of the code on the token-ring network adapter.

BL-CR1.0243

Explanation: BIOS level (module level). The EC level of the code in the RPL feature.

RM-CC00

Explanation: Memory (Read-Only Memory). Segment address in memory where BIOS has placed the RPL ROM.

OP-0000 04

Explanation: Open Return Code. The first 4 digits are X'0000' and the last 2 digits identify the adapter data rate, if the adapter has been successfully opened and attached to the network. If not, a code other than X'0000' is displayed and the field is flashing. See "Troubleshooting RPL Problems" on page F-11.

RQ-0001

Explanation: Request Count (FIND Frame Count). The number in hexadecimal of FIND frames that have been transmitted. An excessive request count indicates that the LAN server is not present, is congested, or is not correctly configured to RPL this adapter.

SF-0001

Explanation: SEND.FILE.REQUEST Frame Count. The number of SEND.FILE.REQUEST frames that have been transmitted. An excessive SEND.FILE.REQUEST frame count indicates that the LAN server is not responding after having been found.

SN-0023

Explanation: File Response Sequence Number. This value is displayed when the LAN server has responded to the SEND.FILE.REQUEST. It indicates how many times valid FILE.DATA.RESPONSE frames have been received.

RS-0040

Explanation: Ring Status. This field displays a code indicating the status of the network. The field will be highlighted if the operation cannot continue; it will not be highlighted if processing can continue. See "Troubleshooting RPL Problems" on page F-11.

PC-4020

Explanation: Computer error. This field displays an error code indicating that the adapter has difficulty in functioning with the computer. In most cases, the panel will be frozen and this field will be highlighted because the adapter cannot continue. See “Troubleshooting RPL Problems” on page F-11.

AC-0040 0000 0000 0000

Explanation: Adapter Check. The adapter has detected an internal error and cannot continue. Reboot your computer. If this problem persists, record the adapter check code, and contact your network administrator.

AE-nnn XX-0011

Explanation: Adapter Error. The adapter in your computer could not establish communication with the LAN server. The *nnn* indicates the instance number. The reason for this error is indicated by the XX message to the right of AE-nnn. XX can be either BU or OP. The BU and OP messages are described previously in this section.

Troubleshooting RPL Problems

The following chart is helpful if, when using an RPL feature on a client computer, you do not get the expected results.

If other computers on the network need problem determination, you might need one or more of the following documents:

- The operator’s guide for your computer
- The problem determination guide for network-related problems

Table F-1 (Page 1 of 2). Failure Indication Messages

Failure Indication	Action
The computer’s BASIC panel appears, or the computer boots to the hard disk or diskette drive.	Perform the steps in “Setting Up Your Client Computer for RPL” on page F-2.

Table F-1 (Page 2 of 2). Failure Indication Messages

Failure Indication	Action
A Bring-Up Error. The BU field on the Client computer display panel is highlighted.	See list item 1.
An Open Error. The OP field on the Client computer display panel is highlighted.	See list item 2.
A Ring Status Error. The RS field on the Client computer display panel has a value other than zero (0) and is highlighted.	See list item 3.
A PC Error. The PC field on the Client computer display panel is highlighted or is shown with counters not being updated.	See list item 4.
The Client computer display panel shows any response that has not been identified.	Contact your network administrator.

1 Bring-Up Error

The Client computer display panel shows that the elapsed time (ET) field has stopped with only a few seconds of time accumulated, and the bring-up (BU) error field is highlighted.

The RPL feature tried three times and was unable to initialize the adapter for use. The BU error codes and the action to take are listed here:

Hex Value	Cause	Action
0020-002F, 0030-003F	A module on the adapter is not responding correctly.	The adapter appears defective. Run the adapter diagnostics.
0048	Initialize time-out.	The adapter appears defective. Run the adapter diagnostics.
	All others.	Adapter failure. The adapter appears defective. Run the adapter diagnostics. Contact your network administrator if problems persist.

2 Open Error

The open error field (OP) contains an error code. This code might be displayed normally or flashing.

If the error code is flashing, the RPL feature is trying to open the adapter after an unsuccessful attempt.

If the problem persists, record the 4 digits of the flashing OP field. Using Open Error and the Reason Code as the symptom, refer to the *IBM Token-Ring Network Problem Determination Guide* to resolve the problem.

Hex Value	Cause	Action
0011, 0010	No media attached.	Connect the UTP or STP cable to the adapter.
002D	A Client computer is trying to be the first active computer on a token-ring network.	Start your LAN server. If the error persists, reboot the Client computer.
All Others	Adapter open failure.	Refer to the <i>IBM Token-Ring Network Problem Determination Guide</i> .

3 Ring Status Error

A ring error was detected when the RPL feature or bootstrap program was executing. The ring status error field (RS) contains the error code. Locate the error code in the following table to determine the correct action to take. Some values might be displayed that are a combination of the values listed in the table. The x's used in the Hex Value column can be any hexadecimal number between 0 and F.

Hex Value	Cause	Action
Cxxx to Dxxx	<p>No receive signal was detected.</p> <p>The network is beaconing.</p> <p>The adapter is transmitting beacon frames.</p>	Refer to the <i>IBM Token-Ring Network Problem Determination Guide</i> .
2000	This adapter has detected a soft-error condition.	No action required.
08xx	Wire Fault. The adapter has detected a problem in itself or in its lobe.	Refer to the <i>IBM Token-Ring Network Problem Determination Guide</i> .
04xx	This adapter detected an internal hardware error.	Contact your network administrator.
x1xx	Remove received. This adapter removed from the network.	Contact your network administrator for assistance.
0080	Counter overflow. One of the error log counters has incremented past 256.	Restart the computer.
0040 or 0060	Single Station. The adapter has opened and is the only station on the network. This bit resets when another station inserts.	No action is required unless other stations are known to be operating on this network. If other stations are on the network, refer to the <i>IBM Token-Ring Network Problem Determination Guide</i> .
0020	Ring recovery. The adapter is transmitting or receiving claim token frames.	No action is required.
0004	Full Duplex. The adapter is operating in full-duplex mode.	No action is required.

Hex Value	Cause	Action
All others.	Reserved.	Contact your network administrator for assistance.

4 PC Error

The RPL feature has detected a problem with either the software or hardware in the Client computer. Retry the operation by restarting the computer at least once. If the problem persists, locate the error code in the following table to determine the correct action to take.

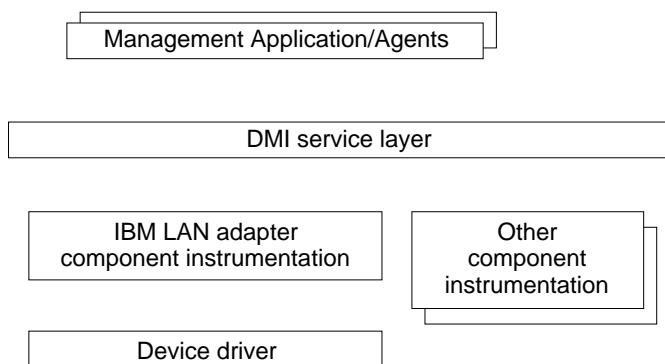
Hex Value	Cause	Action
05xx	An invalid Command Control Block (CCB) code was issued to the Adapter Support Subset. xx = the CCB code.	Check the bootstrap program if it is user-written. If not, contact your network administrator for assistance. Provide the CCB code.
06xx (not highlighted)	PROGRAM.ALERT frames being transmitted. The xx portion of the value represents the alert code. 00 = Unexpected error response frame received. 02 = File not found. 04 = Out of memory space. 06 = Memory overrun. 08 = Unexpected DLC status received.	Restart the computer. If this error persists, contact your network administrator for assistance.
07xx	The adapter failed a wrap test. xx = System Status Block (SSB) return code.	The adapter appears defective. Run the adapter diagnostics. Contact your network administrator if problems persist.

Hex Value	Cause	Action
All others.	A computer hardware or software error has occurred.	Perform the computer diagnostic test procedure or contact your network administrator for assistance.

Appendix G. Desktop Management Interface

The Desktop Management Interface (DMI) is a standard framework for managing the information provided by the components of PC systems. DMI was created by the Desktop Management Task Force (DMTF). The DMTF is a cooperative, industry-wide effort formed to bring management, ease of use, and control to PC systems.

The DMI architecture utilizes a service layer, a local program that collects information from the components of the PC system and passes the information to management applications. The IBM LAN adapter instrumentation couples the adapter's device driver to the service layer.



For additional information about the DMTF or DMI, refer to URL
<http://www.dmtf.org>

LAN Adapter Instrumentation for OS/2

The IBM LAN adapter instrumentation is implemented as a protocol stack in OS/2. Currently, the protocol stack supports NDIS 2 device drivers. The protocol stack implementation allows the instrumentation to get and set attributes for any IBM NDIS 2 device driver without requiring changes to the device driver. The IBM LAN adapter instrumentation for OS/2 is on *Diskette 2, NDIS Drivers*, and *\DMIOS2* on the CD-ROM.

For OS/2 Warp, Version 4, the DMI service layer and its associated browser and agent applications are contained in the base OS. For earlier versions of OS/2, the DMI service layer can be installed separately. Information about acquiring the DMI service layer and its browser and agent applications can be found at URL:

<http://www.networking.ibm.com/sha/shahome.html>

Automatic Installation

The IBM LAN adapter instrumentation can be installed like any other protocol stack by using MPTS. Follow these steps.

1. Start MPTS (double-click the MPTS icon).
2. Select **Configure**.
3. Select **Configure** again.
4. Select **Other protocols....**
5. When prompted for an installation diskette, insert *Diskette 2, NDIS Drivers*. Change from the default directory of A:\ to A:\DMI\OS2, or :X:\DMI\OS2, where X is your CD-ROM, and then press **Enter**. The files will be copied to the system.
6. Bind the IBM LAN adapter instrumentation protocol for the adapters you want managed via DMI, by selecting **Add**. Select **OK** when you have finished.
7. Exit the MPTS installation process.

Note: The installation procedure copies MACDMI2.EXE and MACDMI.MIF to the \IBMCOM\PROTOCOL directory, which is not usually in the PATH statement. You must ensure that these files reside in a directory that is in your PATH statement.

Manual Installation

The IBM LAN adapter instrumentation can be also be installed manually by following these steps.

1. Install the executable (MACDMI2.EXE) and its files by copying MACDMI2.EXE and MACDMI.MIF to a directory included in your PATH statement.

2. Install the protocol driver (MACDMI.OS2) and its files. The following example uses <install_dir> to represent the install directory.

- a. Copy MACDMI.OS2, MACDMI.NIF, MDM.MSG and MDMH.MSG to <install_dir>.
- b. Ensure that <install_dir> is in your DPATH statement.
- c. Update your CONFIG.SYS file to contain the entry:

```
DEVICE=C:<install_dir>\MACDMI.OS2
```

- d. Add a section to your system's PROTOCOL.INI file for the IBM LAN adapter instrumentation:

```
[MACDMI]  
DRIVERNAME = MACDMI$
```

- e. Add a bindings entry to the system's PROTOCOL.INI file to indicate which NDIS 2 drivers you want to be managed by DMI. An example of a complete PROTOCOL.INI entry would be:

```
[MACDMI]  
DRIVERNAME = MACDMI$  
Bindings = IBMTRP_nif, IBMTRP2_nif
```

Starting the IBM LAN Adapter Instrumentation

The IBM LAN adapter instrumentation, MACDMI2.EXE, can be started at an OS/2 command prompt, with the RUN command in CONFIG.SYS or with the START command. The OS/2 DMI service layer must be started before the instrumentation.

The first time the instrumentation runs, it will install the IBM LAN adapter components into the OS/2 service layer's database. The instrumentation displays messages indicating the status of the procedure.

If you want to change the LAN adapter that is to be managed, go into MPTS and bind the IBM LAN adapter instrumentation protocol to the adapters you want managed. The next time the instrumentation is started, it will install any necessary additional LAN adapter components into the OS/2 service layer's database.

IBM LAN Adapter Instrumentation Messages

Look in LANTRAN.LOG for error messages from MACDMI.OS2. Use the OS/2 Help Facility to get additional information on any MDMxxxxx error messages reported by MACDMI2.EXE or MACDMI.OS2. For example: enter **help MDM0041**.

Managing IBM LAN Adapters Locally

Once the OS/2 DMI service layer and the IBM LAN adapter instrumentation have been started, the management information file (MIF) browser can be used to view and set LAN adapter attributes. The MIF browser icon is located in the IBM SystemView Agent folder along with SystemView Agent documentation. The MIF browser provides a hierarchical representation of the groups and attributes of each manageable component in the system.

LAN Adapter Instrumentation for NT

The IBM LAN adapter instrumentation is implemented as a ring-3 executable program in NT. The executable program supports NDIS 3 device drivers. The instrumentation allows users to retrieve attributes for any IBM NDIS 3 device driver without requiring changes to the device driver. The IBM LAN adapter instrumentation for NT is on *Diskette 2, NDIS Drivers*, or \DMI\NT on the CD-ROM.

Information about acquiring the Win32 DMI service layer and its browser and agent applications can be found at URL:

<http://www.networking.ibm.com/sha/shahome.html>

Installation

Copy all the files from A:\DMI\NT or \DMI\NT on the CD-ROM, to the desired directory on your system.

Starting the IBM LAN Adapter Instrumentation

The IBM LAN adapter instrumentation for NT, MACDMINT.EXE, can be started like any other executable file. The NT DMI service layer must be started before the instrumentation.

The first time the instrumentation runs, it will install the IBM LAN adapter components into the NT service layer's database. The instrumentation displays messages indicating the status of the procedure.

The instrumentation will manage all the LAN adapters in the system.

IBM LAN Adapter Instrumentation Messages

The IBM LAN adapter instrumentation will display messages.

Managing IBM LAN Adapters Locally

Once the Win32 DMI service layer and the IBM LAN adapter instrumentation have been started, the MIF browser can be used to view LAN adapter attributes. The MIF browser icon is located in the IBM SystemView Agent folder along with SystemView Agent documentation. The MIF browser provides a hierarchical representation of the groups and attributes of each manageable component in the system.

SNMP Management of IBM LAN Adapters

The IBM LAN adapters can be managed by any application using standard SNMP operations. SNMP management is accomplished by utilizing the SNMP agent and DMI subagent supplied with the IBM SystemView Agent. The DMI subagent translates a MIB variable into the corresponding DMI MIF attribute. In order to manage the IBM LAN adapters using SNMP, follow the steps outlined below for the end station and the manager's station.

These are the files necessary to use SNMP to manage IBM LAN adapters. The files are all located on *Diskette 2, NDIS Drivers* in the \DMI\SNMPMGRS directory, or in the \DMI\SNMPMGRS directory on the CD-ROM.

- MACDMI.MAP—mapping file fragment, correlates SNMP object identifier (OID) to DMI component. Used in the end station.
- MACDMI.MIB—SNMP MIB file that describes the manageable attributes of the IBM LAN adapters. Used by most SNMP manager platforms.
- MACDMI.DEF—MIB definition file that describes attributes of IBM LAN adapters. Used by NetView for Windows.

End Station Setup

Add the contents of the MACDMI.MAP file to the existing entries in the DMISA.MAP mapping file. The mapping file provides the correlation between the SNMP OIDs and the DMI components. The mapping file is located in the directory <sva_path>\BIN\AGENT, where <sva_path> is an environment variable defined during installation.

Note: Some earlier versions of the SystemView Agent defined the <netview_path> environment variable for installation.

Start these programs for an **OS/2 end station**: SNMP agent (SNMPD.EXE), DMI subagent (DMISA.EXE), and the LAN adapter instrumentation (MACDMI2.EXE).

Start these programs for an **NT end station**: SNMP agent (SNMPD.EXE), DMI subagent (DMISA32.EXE), and the LAN adapter instrumentation (MACDMINT.EXE).

Manager Station Setup

The general steps to set up any SNMP management platform are:

1. Copy the MIB/DEF file to the appropriate directory (where all the other MIB/DEF files are located).
2. Load the MIB/DEF file into the manager's database.

The specific setup instructions for two SNMP management platforms are described below.

- NetView for AIX

The MIB Browser operates directly on the MIB file (MACDMI.MIB). Copy MACDMI.MIB to the \usr\OV\snmp_mibs directory. To load the MIB: start NetView for AIX, select **OPTIONS** and then the **LOAD/UNLOAD MIB** option.

To view the LAN adapter attributes, select **TOOLS** and then the **MIB Browser** option. Use the **Down Tree** option to traverse the MIB tree and locate the LAN adapter attributes. The path through the MIB tree is:

```
internet->private->enterprises->ibm->
  ibmArchitecture->ibmDmi->mibsFromMifs->
    ibmLanAdapter->dmtfGroups
```

Click on **Start Query** to obtain the value of a MIB attribute.

- NetView for Windows

The MIB Browser operates on the MIB definition file (MACDMI.DEF) that defines the structure of the MIB. The default path for this file is the <install_dir>\BIN\DEF_FILE directory. The default <install_dir> is NVWIN.

Copy MACDMI.DEF to the <install_dir>\BIN\DEF_FILE directory and copy MACDMI.MIB to the <install_dir>\BIN\MIBS directory.

To view the LAN adapter attributes, use the MIB Browser function and the **Load MIB Tree** option to load the MIB definition file (MACDMI.DEF). This will display the tree of MIB attributes that represent the LAN adapter. Double-click any MIB attribute to obtain its value. Double-click a second time to graph the value. This is useful for attributes such as Ring Utilization.

Appendix H. Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service in this publication is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program, or service. Evaluation and verification of operation in conjunction with other products, programs, or services, except those expressly designated by IBM, are the user's responsibility.

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Safety

Telecommunications Safety Requirements in the United Kingdom

This IBM product is made to high safety standards. It complies inherently with telecommunications safety standard BS 6301. It is not designed to provide protection from excessive voltages appearing externally at its interfaces. Therefore, when this product is connected to a public telecommunications network via any other equipment, and you connect to this product items not supplied by IBM United Kingdom Ltd., you must comply with mandatory telecommunications safety requirements.

Statement of Compliance with the United Kingdom Telecommunications Act 1984

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connections to the public telecommunications systems in the United Kingdom.

Electronic Emission Notices (Wake-on LAN Only)

This section is the Federal Communications Commission (FCC) Document of Conformity. for the IBM PCI Wake on LAN Token-Ring Adapter only. The other FCC notices in this section to not apply to the IBM PCI Wake on LAN Token-Ring Adapter. All other notices in this appendix apply to both the PCI Token-Ring Adapter and the IBM PCI Wake on LAN Token-Ring Adapter.

**IBM PCI Wake on LAN Token-Ring Adapter, P/N 86H1879,
when using Shielded Twisted Pair Cable Media or when using
Unshielded Twisted Pair Cable and a Shielded Power Cord**

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:

International Business Machines Corporation
Old Orchard Road
Armonk, NY 10504
Telephone 1-919-543-2193

Notices for STP Media

Electronic Emission Notices for STP Media

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

Notices for STP Media

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled: *Digital Apparatus*, ICES-003 of Industry Canada.

Avis de conformité aux normes d'Industrie Canada

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel brouiller: *Appareils numériques*, NMB-003 édictée par Industrie Canada.

European Norm (EN) Statement

This product is in conformity with the protection requirements of EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. IBM cannot accept responsibility for any interference caused by using other than recommended cables and connectors.

Hinweis zur Elektromagnetischen Verträglichkeit (EMVG)

Dieses Gerät ist berechtigt in Übereinstimmung mit dem deutschen EMVG vom 9.Nov.92 das EG-Konformitätszeichen zu führen.

Der Aussteller der Konformitätserklärung ist die

IBM UK Ltd
PO Box 30
Spango Valley,
Greenock,

Notices for STP Media

Scotland PA16 0AH.

Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse B.

Japanese Voluntary Control Council for Interference (VCCI) Statement

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

Notices for UTP Media

Electronic Emission Notices for UTP Media

In order to be compliant with FCC Class B, EN55022 Class B, and VCCI Class B emissions standards, as stated in “Electronic Emission Notices for STP Media” on page H-4 when using this adapter with UTP cabling, you **MUST** use a shielded power cord as described in “Power Cord Notices for UTP Media” on page H-9 to attach your PC to the AC outlet. Otherwise, the following statements apply for this adapter.

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

Notices for UTP Media

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled: *Digital Apparatus*, ICES-003 of Industry Canada.

Avis de conformité aux normes d'Industrie Canada

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouiller: *Appareils numériques*, NMB-003 édictée par Industrie Canada.

European Norm (EN) Statement

This product is in conformity with the protection requirements of EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

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

Operation of this product in a domestic/residential environment may cause radio interference, which the user may be required to take measures to suppress.

Hinweis zur Elektromagnetischen Verträglichkeit (EMVG)

Dieses Gerät ist berechtigt in Übereinstimmung mit dem deutschen EMVG vom 9.Nov.92 das EG-Konformitätszeichen zu führen. Der Aufsteller der Konformitätserklärung ist die

IBM UK Ltd
PO Box 30
Spango Valley,

Notices for UTP Media

Greenock,
Scotland PA16 0AH.

Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse A. Für diese Klasse von Geräten gilt folgende Bestimmung nach dem EMVG:

Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind. (Auszug aus dem EMVG vom 9.Nov.92, Para.3, Abs.4)

Dieses Genehmigungsverfahren ist von der Deutschen Bundespost noch nicht veröffentlicht worden.

Japanese Voluntary Control Council for Interference (VCCI) Statement

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

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

Power Cord Notices for UTP Media

When using the PCI Token-Ring Adapter in a Class B environment with UTP cable media, you must use a shielded power cord to attach your PC to the AC outlet in order to be Class B compliant.

Shielded power cords used in the United States and Canada are listed by Underwriters Laboratories (UL) and certified by the Canadian Standards Association (CSA). Always purchase a shielded power cord with the UL or CSA rating located on the packaging or power cord itself. These shielded power cords are readily available

Notices for UTP Media

at your local electronic distributors. IBM makes the shielded power cord P/N 6952304 available through your IBM Marketing Representative for use at 115 volts in the United States and Canada. If purchasing other than the IBM P/N, use a UL-listed or CSA-certified shielded power cord consisting of a minimum 18 AWG, type SVT or SJT, three-conductor line cord, a maximum of 15 feet in length, and a NEMA WD-1 5-15P type attachment plug rated at 15 amperes, 125 volts.

For PCs intended to be operated at 230 volts in the United States and Canada, use IBM shielded line cord P/N 1838578, available through your IBM Marketing Representative or purchase a UL-listed or CSA-certified line cord consisting of a minimum 18 AWG, type SVT or SJT, three-conductor cord, a maximum or 15 feet in length, and a NEMA WD-1 6-15P type attachment plug rated at 15 amperes, 250 volts.

For all PCs intended to be operated at 230 volts outside the United States and Canada, use the shielded line cord specific to your country as shown in the following table. These shielded power cords are available through your country IBM Marketing Representative.

Table H-1 (Page 1 of 2). Power Cords Listed by Country

IBM Power Cord Part Number	Used in These Countries
13F9948	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa

Notices for UTP Media

Table H-1 (Page 2 of 2). Power Cords Listed by Country

IBM Power Cord Part Number	Used in These Countries
13F9988	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
14F0006	Denmark
14F0024	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0042	Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Dubai, Fiji, Ghana, Hong Kong, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0060	Liechtenstein, Switzerland
14F0078	Chile, Ethiopia, Italy, Libya, Somalia
14F0096	Israel
1838578	Thailand
6952304 (115v useage) 1838579 (230v useage)	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Cominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

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Extended Services	OS/2
Extended Services for OS/2	SAA
IBM	Systems Application Architecture
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Glossary of Terms and Abbreviations

This glossary defines terms and abbreviations used in this manual. It includes terms and definitions from the *IBM Dictionary of Computing* (New York; McGraw-Hill, Inc., 1994).

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committee drafts, and working papers being developed by ISO/IEC JTC1/SC1.

The following cross-references are used in this glossary:

Contrast with. This refers to a term that has an opposed or substantively different meaning.

See. This refers the reader to multiple-word terms in which this term appears.

See also. This refers the reader to terms that have a related, but not synonymous, meaning.

Synonym for. This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

A

access priority. The maximum priority that a token can have for the adapter to use it for transmission.

adapter address. Twelve hexadecimal digits that identify a LAN adapter.

address. (1) In data communication, the IEEE-assigned unique code or the unique locally administered code assigned to each device or workstation connected to a network. (2) A character, group of characters, or a value that identifies a register, a particular part of

storage, a data source, or a data sink. The value is represented by one or more characters. (3) To refer to a device or an item of data by its address. (4) The location in the storage of a computer where data is stored. (5) In word processing, the location, identified by the address code, of a specific section of the recording medium or storage.

APAR. Authorized program analysis report.

ARP. Address Resolution Protocol.

attach. To make a device a part of a network logically.

Note:

Not to be confused with *connect*, which implies physically connecting a device to a network.

attaching device. Any device that is physically connected to a network and can communicate over the network.

auto-removal. The removal of a device from data-passing activity without human intervention. This action is accomplished by the adapter in the device, and can be initiated by a network management program.

available memory. In a personal computer, the number of bytes of memory that can be used after memory requirements for the operating system, device drivers,

and other application programs have been satisfied.

B

beaconing. An error-indicating function of token-ring adapters that assists in locating a problem causing a hard error on a token-ring network.

BIA. Burned-In Address. The address of a LAN adapter card, burned into the card and unique to the card.

BIOS. Basic Input/Output Services. See also *NetBIOS*.

block size. (1) The minimum size that frames are grouped into for retransmission. (2) The number of data elements (such as bits, bytes, characters, or records) that are recorded or transmitted as a unit.

buffer. (1) A portion of storage used to hold input or output data temporarily. (2) A routine or storage used to compensate for a difference in data rate or time of occurrence of events, when transferring data from one device to another.

bus. (1) In a processor, a physical facility on which data is transferred to all destinations, but from which only addressed destinations may read in accordance with appropriate conventions. (2) A network configuration in which nodes are interconnected through a bidirectional transmission medium. (3) One or more conductors used for transmitting signals or power.

C

CPU. Central processing unit.

CRC. See *cyclic redundancy check (CRC)*.

CSD. corrective service diskette.

cable segment. A section of cable between components or devices on a network. A segment may consist of a single patch cable, multiple patch cables connected together, or a combination of building cable and patch cables connected together. See *LAN segment, ring segment*.

computer architecture. The organizational structure of a computer system, including hardware and software.

configuration. (1) The arrangement of a computer system or network as defined by the nature, number, and chief characteristics of its functional units. More specifically, the term may refer to a hardware configuration or a software configuration. (2) The devices and programs that make up a system, subsystem, or network. (3) See also *system configuration*.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with *attach*.

control block. (1) A storage area used by a computer program to hold control information. (2) In the IBM

Token-Ring Network, a specifically formatted block of information provided from the application program to the Adapter Support Interface to request an operation.

cyclic redundancy check (CRC). Synonym for *frame check sequence (FCS)*.

D

data rate. See *data transfer rate, line data rate*.

data transfer rate. The average number of bits, characters, or blocks per unit of time passing between equipment in a data-transmission session. The rate is expressed in bits, characters, or blocks per second, minute, or hour.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.

default value. A value assumed when no value has been specified.

device driver. The code needed to attach and use a device on a computer or a network.

diagnostics. Modules or tests used by computer users and service personnel to diagnose hardware problems.

DLS. DOS LAN Services

DOS. See *IBM Personal Computer Disk Operating System (DOS)*.

duplex. In data communication, pertaining to a simultaneous two-way independent transmission in both directions. Synonymous with *full-duplex*. Contrast with *half-duplex*.

E

EISA. Extended Industry Standard Architecture.

enabled. (1) On a LAN, pertaining to an adapter or device that is active, operational, and able to receive frames from the network. (2) Pertaining to a state of a processing unit that allows the occurrence of certain types of interruptions. (3) Pertaining to the state in which a transmission control unit or an audio response unit can accept incoming calls on a line.

F

FCS. See *frame check sequence (FCS)*

frame. (1) The unit of transmission in some LANs, including the IBM Token-Ring Network and the IBM PC Network. It includes delimiters, control characters, information, and checking characters. On a token-ring network, a frame is created from a token when the token has data appended to it. On a token bus network (IBM PC Network), all frames including the token frame

contain a preamble, start delimiter, control address, optional data and checking characters, end delimiter, and are followed by a minimum silence period. (2) A housing for machine elements. (3) In synchronous data link control (SDLC), the vehicle for every command, every response, and all information that is transmitted using SDLC procedures. Each frame begins and ends with a flag.

frame check sequence (FCS).

(1) A system of error checking performed at both the sending and receiving station after a block check character has been accumulated. (2) A numeric value derived from the bits in a message that is used to check for any bit errors in transmission. (3) A redundancy check in which the check key is generated by a cyclic algorithm. Synonymous with *cyclic redundancy check (CRC)*.

FTP. File Transfer Protocol.

full-duplex. Synonym for *duplex*.

G

group address. In a LAN, a locally administered address assigned to two or more adapters to allow the adapters to copy the same frame. Contrast *locally administered address* with *universally administered address*.

H

half-duplex. In data communication, pertaining to transmission in only one direction at a time. Contrast with *duplex*.

hard error. An error condition on a network that requires that the source of the error be removed or that the network be reconfigured before the network can resume reliable operation. See also *beaconing*. Contrast with *soft error*.

I

IBM Personal Computer Disk Operating System (DOS). A disk operating system based on MS-DOS.

IDE. Integrated drive electronics.

IEEE. Institute of Electrical and Electronics Engineers.

IEEE 802.2. Data Link protocol standard for use with IEEE 802.3 (Ethernet), 802.4 (Token Bus), and 802.5 (Token Ring) standards.

initialize. In a LAN, to prepare the adapter (and adapter support code, if used) for use by an application program.

insert. To make an attaching device an active part of a LAN.

interrupt. (1) A suspension of a process, such as execution of a computer program, caused by an external event and performed in such a way that the process can be resumed. (2) To stop a process in such a way that it can be resumed. (3) In data communication, to take an action at a receiving station that causes the sending station to end a transmission. (4) A means of passing processing control from one software or microcode module or routine to another, or of requesting a particular software, microcode, or hardware function.

interrupt level. The means of identifying the source of an interrupt, the function requested by an interrupt, or the code or feature that provides a function or service.

I/O. Input/output.

IP. Internet Protocol.

IPX. (1) Internet Packet Exchange. (2) Internetwork Packet Exchange.

ISA. Industry Standard Architecture.

K

KB. (1) For processor storage and real and virtual memory, 1024 bytes. (2) For disk storage capacity and transmission rates, 1000 bytes.

L

LAN. See *local area network (LAN)*.

LANAID. LAN Adapter Installation and Diagnostic program. A LAN adapter installation and configuration program used in environments that do not support Plug-and-Play.

LAN Client. IBM LAN adapter environment that minimizes the amount of DOS conventional memory (below 1 MB) used by drivers and protocol stacks.

LAN segment. (1) Any portion of a LAN (for example, a single bus or ring) that can operate independently but is connected to other parts of the establishment network via bridges. (2) An entire ring or bus network without bridges. See *cable segment, ring segment*.

LAPS. LAN Adapter and Protocol Support.

LED. Light-emitting diode.

line data rate. The rate of data transmission over a telecommunications link.

link. (1) The logical connection between nodes including the end-to-end link control procedures. (2) The combination of physical media, protocols, and programming that connects devices on a network. (3) In computer programming, the part of a program, in some cases a single instruction or an address, that

passes control and parameters between separate portions of the computer program. (4) To interconnect items of data or portions of one or more computer programs. (5) In SNA, the combination of the link connection and link stations joining network nodes.

LLC. Logical link control.

local area network (LAN). A computer network located on a user's premises within a limited geographical area.

Note: Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation.

locally administered address. An adapter address that the user can assign to override the universally administered address. Contrast with *universally administered address*.

LSB. Least significant bit.

LSL. Link support layer.

M

Mbps. Megabits per second.

MBps. Megabytes per second.

medium. A physical carrier of electrical or optical energy.

media access control (MAC) protocol. In a local area network,

the part of the protocol that governs communication on the transmission medium without concern for the physical characteristics of the medium, but taking into account the topological aspects of the network, in order to enable the exchange of data between data stations.

MHz. Megahertz.

MPTS. Multiple Protocol Transport Services.

MSB. Most significant bit.

N

NDIS. Network driver interface specification.

NetBIOS. Network Basic Input/Output System. An operating system interface for application programs used on IBM personal computers that are attached to the IBM Token-Ring Network. See also *BIOS*.

NLM. NetWare loadable module.

network administrator. A person who manages the use and maintenance of a network.

network architecture. The logical structure and operating principles of a computer network. See also *systems network architecture (SNA)* and *Open Systems Interconnection (OSI) architecture*.

Note: The operating principles of a network include those of services, functions, and protocols.

node. (1) Any device, attached to a network, that transmits and/or receives data. (2) An endpoint of a link, or a junction common to two or more links in a network. (3) In a network, a point where one or more functional units interconnect transmission lines.

node address. The address of an adapter on a LAN.

O

OEM. Original equipment manufacturer.

open. (1) To make an adapter ready for use. (2) A break in an electrical circuit. (3) To make a file ready for use.

Open Systems Interconnection (OSI). (1) The interconnection of open systems in accordance with specific ISO standards. (2) The use of standardized procedures to enable the interconnection of data processing systems.

Note: OSI architecture establishes a framework for coordinating the development of current and future standards for the interconnection of computer systems. Network functions are divided into seven layers. Each layer represents a group of related data processing and communication functions that can be carried out in a standard way to support different applications.

Open Systems Interconnection (OSI) architecture. Network

architecture that adheres to a particular set of ISO standards that relates to Open Systems Interconnection.

Open Systems Interconnection (OSI) reference model. A model that represents the hierarchical arrangement of the seven layers described by the Open Systems Interconnection architecture.

option. (1) A specification in a statement, a selection from a menu, or a setting of a switch, that may be used to influence the execution of a program. (2) A hardware or software function that may be selected or enabled as part of a configuration process. (3) A piece of hardware (such as a network adapter) that can be installed in a device to modify or enhance device function.

P

packet. (1) In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. (2) Synonymous with *data frame*. Contrast with *frame*.

parameter. (1) A variable that is given a constant value for a specified application and that may denote the application. (2) An item in a menu or for which the user specifies a value or for which the system provides a value when the menu is interpreted. (3) Data

passed between programs or procedures.

path. (1) In a network, any route between any two nodes. (2) The route traversed by the information exchanged between two attaching devices in a network. (3) A command in IBM Personal Computer Disk Operating System (PC DOS) and IBM Operating System/2 (OS/2) that specifies directories to be searched for commands or batch files that are not found by a search of the current directory.

PC. Personal computer.

PCI. Peripheral Component Interconnect.

Peripheral Component Interconnect (PCI). The PCI Local Bus is a high performance 32-bit or 64-bit bus. It is intended for use as an interconnect mechanism between highly integrated peripheral controller components, peripheral add-in boards, and processor/memory systems.

power-on self-test (POST). A series of diagnostic tests that are run automatically each time the computer's power is turned on.

protocol. (1) A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. (2) In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network

components. (3) A specification for the format and relative timing of information exchanged between communicating parties.

R

RAM. Random access memory. (A)

RARP. Reverse Address Resolution Protocol.

register. (1) A storage area in a computer's memory where specific data is stored. (2) A storage device having a specified storage capacity such as bit, byte, or computer word, and usually intended for a special purpose.

remove. (1) To take an attaching device off a network. (2) To stop an adapter from participating in data passing on a network.

ring segment. A ring segment is any section of a ring that can be isolated (by unplugging connectors) from the rest of the ring. A segment can consist of a single lobe, the cable between access units, or a combination of cables, lobes, and/or access units. See *cable segment*, *LAN segment*.

ROM. Read only memory. (A)

S

SCSI. Small computer system interface.

segment. See *cable segment*, *LAN segment*, *ring segment*.

shielded twisted pair. A transmission medium of two twisted conductors with a foil or braid shell.

SMP. System Modification Program

soft error. An intermittent error on a network that causes data to have to be transmitted more than once to be received. A soft error affects the network's performance but does not, by itself, affect the network's overall reliability. If the number of soft errors becomes excessive, reliability is affected. Contrast with *hard error*.

station. (1) A communication device attached to a network. The term used most often in LANs is an *attaching device* or *workstation*. (2) An input or output point of a system that uses telecommunication facilities; for example, one or more systems, computers, terminals, devices, and associated programs at a particular location that can send or receive data over a telecommunication line. See also *attaching device*, *workstation*.

STP. See *shielded twisted pair*.

system. In data processing, a collection of people, machines, and methods organized to accomplish a set of specific functions.

Systems Application Architecture (SAA). An architecture developed by IBM that consists of a set of selected software interfaces, conventions, and protocols, and that serves as a common framework for application development, portability, and use across different IBM hardware systems.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

Note: The layered structure of SNA allows the ultimate origins and destinations of information, that is, the end users, to be independent of and unaffected by the specific SNA network services and facilities used for information exchange.

T

TCP/IP. Transmission Control Protocol/Internet Protocol. A set of communication protocols that support peer-to-peer connectivity functions for both local and wide area networks.

telephone twisted pair. One or more twisted pairs of copper wire in the unshielded voice-grade cable commonly used to connect a telephone to its wall jack. Also referred to as “unshielded twisted pair” (UTP).

threshold. (1) A level, point, or value above which something is true or will take place and below which it is not true or will not take place.

(2) In IBM bridge programs, a value set for the maximum number of frames that are not forwarded across a bridge due to errors, before a “threshold exceeded” occurrence is counted and indicated to network management programs. (3) An initial value from which a counter is decremented to zero, or a value to which a counter is incremented or decremented from an initial value. When the counter reaches zero or the threshold value, a decision is made and/or an event occurs.

token. A sequence of bits passed from one device to another on the token-ring network that signifies permission to transmit over the network. It consists of a starting delimiter, an access control field, and an end delimiter. The access control field contains a bit that indicates to a receiving device that the token is ready to accept information. If a device has data to send along the network, it appends the data to the token. When data is appended, the token then becomes a frame. See *frame*.

token ring. A network with a ring topology that passes tokens from one attaching device (node) to another. A node that is ready to send can capture a token and insert data for transmission.

token-ring network. (1) A ring network that allows unidirectional data transmission between data

stations by a token-passing procedure over one transmission medium so that the transmitted data returns to and is removed by the transmitting station. The IBM Token-Ring Network is a baseband LAN with a star-wired ring topology that passes tokens from network adapter to network adapter. (2) A network that uses a ring topology, in which tokens are passed in a sequence from node to node. A node that is ready to send can capture the token and insert data for transmission. (3) A group of interconnected token rings.

twisted pair. A transmission medium that consists of two insulated conductors twisted together to reduce noise.

U

universally administered address. The address permanently encoded in an adapter at the time of manufacture. All universally administered addresses are unique. Contrast with *locally administered address*.

unshielded twisted pair (UTP).
See *telephone twisted pair*.

UTP. See *unshielded twisted pair (UTP)* See also *telephone twisted pair*.

W

W. Watt.

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