16/4 Token-Ring PCI Management Adapter



User's Guide

Note

Before using this information and the product it supports, be sure to read “Safety Information” on page 79 and “Appendix G. Notices” on page 77.

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This edition applies to the IBM 16/4 Token-Ring PCI Management Adapter.

You can submit comments online to `http://www.ibm.com/networking/support/feedback.nsf/docsoverall`

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About this manual

This manual contains the information you need to install and use the IBM 16/4 Token-Ring PCI Management Adapter.

Also on the CD-ROM are the installation aids, device drivers, and documentation for the adapter.

Who should read this manual

This manual is intended for use by network administrators and other end users of the IBM 16/4 Token-Ring PCI Management Adapter who install token-ring adapter hardware and software.

How this manual is organized

"Chapter 1. Introduction to the IBM 16/4 Token-Ring PCI Management Adapter" on page 1 describes the adapters covered in this manual, gives a checklist for installation, and describes some of the features of the adapters.

"Chapter 2. Installing the adapter hardware" on page 5 describes the procedure for installing the adapter into your computer.

"Chapter 3. Software installation" on page 7 describes the procedure for software installation for a number of network operating environments.

"Chapter 4. Problem solving" on page 35 describes troubleshooting procedures and fixes that might be needed for your environment.

"Appendix A. CD-ROM content and software packages" on page 47 describes the files that are on the adapter CD-ROM.

"Appendix B. NDIS 2 device driver parameters" on page 51 lists the NDIS 2 parameters, describes their usage, and lists their values.

"Appendix C. NDIS 2 device driver messages" on page 57 lists the NDIS 2 system messages, explains the meaning, and lists user actions.

"Appendix D. Novell NetWare Server driver parameters" on page 63 lists the Novell and LAN Client parameters, describes their usage, and lists their values.

"Appendix E. Novell NetWare Server messages" on page 69 lists the Novell and LAN Client messages, explains the meaning, and lists user actions.

"Appendix F. Novell NetWare DOS ODI driver parameters" on page 75 lists the Novell parameters, describes their usage, and lists their values.

"Appendix G. Notices" on page 77 lists the legal notices required for the IBM 16/4 Token-Ring PCI Management Adapter.

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Related publications

Refer to these publications for additional information:

- *IBM Token-Ring Adapter Features*
- *ISO/IEC 8802-5:1998 Base Standard 4/16 HDX and related amendments*
- *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 adapter books and other documentation are available on the IBM Networking Web site:

`http://www.ibm.com/networking`

Chapter 1. Introduction to the IBM 16/4 Token-Ring PCI Management Adapter

This chapter describes the adapter, the contents of the adapter kits, 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 16/4 Token-Ring PCI Management Adapter is a 32-bit, bus-master, token-ring adapter for the PCI bus architecture. The 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 PCI-compatible slots that operate at speeds up to 33 MHz.

Features of this adapter include:

- Adapter management capability that is provided by SNMP.
- Desktop Management Interface (DMI) provided by the LAN Adapter Management Agent. For an end-to-end management solution, you can use the agent in conjunction with the Nways® Workgroup Manager Version 1.1 or later and Nways Manager for AIX® Version 1.2 or later.
- Automatic ring-speed detection.
- Support for a wide variety of network operating systems and network applications.
- Support for full-duplex (FDX), 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.
- Designed for use with either a half-size or full-size, 5-V or 3.3-V signaling, 32-bit or 64-bit PCI-bus slot.
- The IBM 16/4 Token-Ring PCI Management Adapter uses less than 1 watt of power.

See *IBM Token-Ring Adapter Features* for information regarding the following features:

- Preboot Execution Environment (PXE)
- Remote Program Load (RPL)
- LAN Adapter Management Agent
- Route Switching
- Class of Service
- Redundant NIC (RNIC)
- Tivoli® Management Agent

Adapter installation checklist

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

1. Prepare for installation. You will need the following items:
   - The manual provided with your computer
   - The manual provided with your network operating system or network application

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- Your operating system and network application software

2. Check the shipping package contents list “Package contents”.
3. Install the adapter hardware. See “Chapter 2. Installing the adapter hardware” on page 5.
4. Install the adapter software. See “Chapter 3. Software installation” on page 7.

   After the software is installed, installation is complete.

Environment limitations on number of adapters

There is a limit to the number of adapters that can be accommodated in certain operating environments. The limits are listed in the following table.

Table 1. Environment limitations

Device Driver	Maximum Number of adapters
Novell ODI OS/2® Client	2
Novell ODI DOS Client	1
NDIS 2.0 DOS	1

Package contents

The IBM 16/4 Token-Ring PCI Management Adapter comes with the following features:

- Automatic Configuration and Power Interface (ACPI)/PCI power management feature
- Wake on LAN feature

These features are described in the following sections.

Automatic Configuration and Power Interface (ACPI)

If your computer supports ACPI, then it has built-in energy-saving capabilities. When ACPI is enabled (usually through the computer BIOS settings), the operating system is allowed to control the power management features of your computer. Not all operating systems support ACPI BIOS mode. Refer to your operating system documentation to determine if ACPI is supported. Refer to your computer system documentation to determine if ACPI BIOS is offered and the method by which it can be enabled. The adapter implements the PCI Bus Power Management Interface Specification Version 1.0 that works together with ACPI. Under control of the operating system, the adapter (and the entire system) can be placed in various power-saving modes and be dynamically configured to look for network protocol-specific events. Upon detection of these events, the adapter can signal a wake-up condition which will bring the system to a fully-powered (operational) state.

Some systems might need to be configured through BIOS settings (configuration/setup utilities) to allow PCI devices to wake a system. Refer to your computer system documentation for automatic power-on feature settings (or PCI wake-up features).

Wake on LAN

Adapters that support this feature can turn on a system that is powered off. The adapter uses an auxiliary 3-volt power pin that is available on the PCI bus beginning with PCI version 2.2. No additional auxiliary power cables are required. The 3-volt PCI auxiliary power pin supplies power to the adapter. A control register on the adapter determines whether the adapter is powered on by the 3-volt auxiliary

power source. This register is controlled by the system BIOS. If the BIOS enables the control register bit, then the adapter always has a source of power, even when the system is powered off (system power cord is connected to a live power outlet). When the system is powered off, the adapter automatically inserts into the network and looks for a special frame. This frame is commonly referred to as a *magic packet*. Upon detection of the magic packet, the adapter signals the system to turn on the power supply, thus turning on the computer system. The magic packet is a frame sent by another computer system usually running an application that provides remote system management.

Attention: Some PCs with multiple PCI slots that support Wake on LAN and 3.3-volt auxiliary power may not have an adequate 3.3-volt power supply to power more than just a few of the slots with auxiliary 3.3 volts. Check with your PC supplier to determine the number of PCI slots that can be concurrently populated, and still meet the current limit of 375 mA per slot (for auxiliary 3.3 volts). This limit is specified in the PCI Bus Power Management Interface Specification Revision 1.1.

Chapter 2. Installing the adapter hardware

This chapter describes how to install the IBM 16/4 Token-Ring PCI Management Adapter.

Installing the adapter

Your adapter comes configured from the factory with RPL/PXE and expansion ROM enabled.

Before you begin to install this adapter, be sure to read “Safety Information” on page 79.

To install your adapter, perform the following procedure:

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.
3. Remove all cables from your PC. Label each cable for easier reconnection at the end of this procedure.
4. Follow the instructions provided in your PC manual for removing the cover or otherwise accessing the adapter slots and inserting the adapter.
5. Install the adapter according to the instructions for adapter installation in the manual that came with your PC.
6. Secure the adapter in the PCI slot with the retaining screw or other bracket lockdown mechanism.
7. Reinstall all removed covers.
8. Connect the token-ring cable to the adapter and to the network. See “Selecting adapter cables” for a description of the correct token-ring cables to use.
9. Reconnect all cables to your computer and then connect the power cord. Follow all safety instructions.

   Note: In the U.K., by law, the power cord must be connected before the telephone line cable.
10. The hardware installation is complete. See “Chapter 3. Software installation” on page 7.

Selecting adapter cables

To connect your adapter to a token-ring network, you will need one of the cables shown in Figure 1 on page 6. These cables are not included with the adapter.

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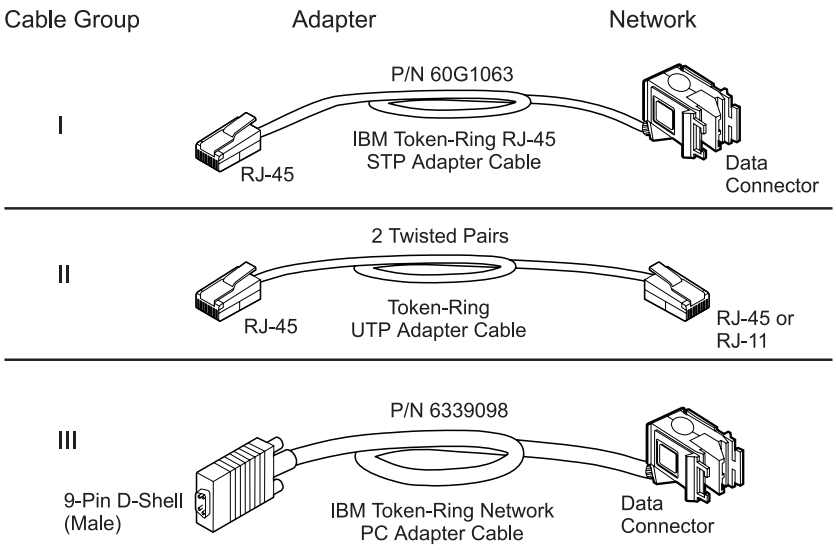


Figure 1. STP and UTP cables

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 adapter at a time.

Your adapter can use any of these cables.

Chapter 3. Software installation

This chapter describes how to install the driver software for your token-ring adapter. To install the software, perform the following procedures:

1. Get the latest level of LAN driver updates for your operating system to ensure that your code is at the latest level.
2. Make sure that your adapter has already been installed in your computer. If it has not, follow the instructions in “Chapter 2. Installing the adapter hardware” on page 5.
3. Get the driver for your environment. There are three places to find the driver. We recommend the first one listed here. All three methods will place the driver in a directory according to the structure in Table 2 on page 8.
   - Method A: Get the driver from a software package on the IBM Networking Web site. This will ensure that you get the latest driver.
     a. Go to *x*:\startcd.htm (where *x* is your CD-ROM drive).
     b. Select your adapter from the section IBM Networking Web site - current information.
     c. Select **Downloads** and select the appropriate software package for your environment.
     d. Run the package to expand the files. The driver will be placed in the directory listed in Table 2 on page 8.

     Note: You can also access the Web site directly at `http://www.ibm.com/networking/support`.
   - Method B: Use the driver shipped on this CD-ROM directly with your network operating system’s installation software. Note the directory containing the driver (see Table 2 on page 8).
   - Method C: Get the driver from a software package shipped on this CD-ROM.
     a. Go to *x*:\startcd.htm (where *x* is your CD-ROM drive).
     b. Select your adapter from the section CD-ROM - release date information.
     c. Select **Downloads** and choose the appropriate software package for your environment.
     d. Execute the package to expand the files. The driver will be placed in the directory listed in Table 2 on page 8.
4. Install the driver. Use Table 3 on page 9 to find the location of the installation instructions for your environment. We recommend that you install the latest service pack for your operating environment before installing the adapter software.

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Table 2. Driver file directory structure

Operating System	Directory
Windows NT® 4.0	\(root)
Windows NT 3.51	\win32
Windows® 95 Retail	\win32
Windows 95 OSR2	\(root)
Windows 98	\(root)
Windows 2000	\(root)
Windows for Workgroups	\WFW
Novell NetWare Server and 32-bit Client	\NOVELL\NETWARE
Novell NetWare DOS Requester (16-bit)	\NOVELL\DOS
Novell NetWare OS/2 Requester (16-bit)	\NOVELL\OS2
OS/2	\OS2
DOS	\DOS

Table 3. Installation instructions

Environment	Page
DOS with Windows Version 3.1x	
NetWare Requester	22
DOS LAN Services	21
IBM TCP/IP for DOS (Version 2.1)	21
Windows for Workgroups with NDIS	33
DOS (without Windows)	
NetWare Requester	22
DOS LAN Services	21
IBM TCP/IP for DOS (Version 2.1)	21
NetWare Requester	22
NDIS2	21
OS/2	
OS/2 (MPTS)	19
NetWare Requester	20
OS/2 Warp Connect or Server	20
NetWare Server	
NetWare Server Version 3.12	9
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Novell Client	18
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Novell Client for Windows 95	32
Managed Driver Upgrade (Windows NT, Windows 95, Windows 98, Windows 2000)	33

Novell NetWare 3.12 Server

Before you start this installation, get the latest level of LAN driver updates for NetWare 3.12 from Novell's support Web site at `http://support.novell.com`. You will install them during the following procedure.

If Novell NetWare Server is not installed on your machine, use the following instructions. If it is installed, see the instructions in "Server driver installation in existing NetWare 3.12 Server" on page 11.

Server driver installation in new NetWare 3.12 Server

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. Create a diskette containing the extracted files from the NETWAREP.EXE package file on the adapter CD-ROM.
2. 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.
3. Insert the diskette that you created in step 1 into drive A. Enter the following commands at the server prompt:

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

   Note: A message referring to *protected-mode BIOS access* might appear before installation of Novell patches. It is for information only, and can be ignored.
4. Load the server device driver. Enter the following command at the server prompt:

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

   It is recommended for servers that the DataRate be set to M16 or M4, and clients be set to Auto.

   Note: See "Appendix D. Novell NetWare Server driver parameters" on page 63 for a complete list of parameters that can be specified in the **LOAD IBMTRPO** command in the AUTOEXEC.NCF file.
5. Follow the instructions in the Novell manual, beginning with "Bind the Protocol to the LAN Driver" and continue until you are in the file server STARTUP.NCF file panel.
6. 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 adapter that is installed.
7. Perform the instructions in "Create an AUTOEXEC.NCF file" 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\TOKENTSM.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 D. Novell NetWare Server driver parameters” on page 63 for a complete list of parameters that you can specify 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.

8. Shut down your server by entering **down** and then entering **exit** from the server prompt.
9. Make sure that the diskette you created in step 1 is inserted in drive A. Enter the following commands at the server prompt. You might be prompted to perform a file overwrite; it is OK to overwrite these files.

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

10. Go to the Novell server directory and enter **server** at the DOS prompt to restart the server.
11. Install the patches obtained earlier now. Make sure to select the V3.31 ODI LAN Updates for Hardware if given the opportunity.
12. 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. See “Understanding the adapter LEDs and labels” on page 41.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

For information concerning NetWare Server error messages, see “Appendix E. Novell NetWare Server messages” on page 69.

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 adapter server device driver.

1. Create a diskette containing the extracted files from the NETWAREP.EXE file on the adapter CD-ROM.
2. Install the patches obtained earlier now. Make sure to select the V3.31 ODI LAN Updates for Hardware if given the opportunity. Return to the server console when the installation is complete.
3. Make sure that the diskette you created in step 1 is inserted in drive A. Enter the following commands at the server prompt. You might be prompted to perform a file overwrite; it is OK to overwrite these files.

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

Note: If you experience any problems after loading the Novell NLM files, check the Novell Web site 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**.
8. 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 adapter that is installed.
9. Press **Esc** and then answer **Yes** to save changes to the STARTUP.NCF file.
10. 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.)

    It is recommended for servers that the DataRate be set to M16 or M4, and clients be set to Auto.

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

    See “Appendix D. Novell NetWare Server driver parameters” on page 63 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.
11. Shut down your server by entering **down** and then entering **exit** from the server prompt.
12. Enter **server** to restart the server.
13. Shut down and restart the computer to apply the changes.
14. 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. See “Understanding the adapter LEDs and labels” on page 41.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

For information concerning NetWare Server error messages, see “Appendix E. Novell NetWare Server messages” on page 69.

Novell NetWare 4.11 Server

Before you start this installation, get the latest level of patches from Novell’s support Web site at `http://support.novell.com` and install them.

If Novell NetWare is not installed on your machine, use the following instructions. If it is installed, follow the instructions in “Server driver installation in existing NetWare 4.11 Server” on page 14.

Server driver installation in new NetWare 4.11 Server

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. It is for information only, and can be ignored.

1. Create a diskette containing the extracted files from the NETWAREP.EXE package file on the adapter CD-ROM.
2. When you see `INSTALL Found the following : PCI LAN Controller xxxx.xxxx.xxxx` press **Enter**. Then press the **Insert** key to install the unlisted driver.
3. Press **Alt+Esc** to toggle to the server console, and enter the following LOAD statements (make sure that the diskette that you created in step 1 is inserted in drive A):

   ```
   LOAD A:\NOVELL\NETWARE\MSM.NLM
   LOAD A:\NOVELL\NETWARE\TOKENTSM.NLM
   ```

4. Press **Alt+Esc** to toggle back to the INSTALL panel.
5. Press **F3** on the next panel to specify a:\novell\netware as the directory path.
6. Press **Enter** and then follow the instructions on the panel to complete the installation of the driver. If you need to make any custom configuration changes to the driver, do so at this time.
7. Follow the instructions in the Novell manual *Create an AUTOEXEC.NCF file*. In addition to the instructions in the manual, add the following lines to the AUTOEXEC.NCF file immediately after the IPX INTERNAL NET statement (if necessary, replace c:\nwserver with the location of the SERVER.EXE executable):

   ```
   LOAD C:\NWSERVER\NBI.NLM
   LOAD C:\NWSERVER\MSM.NLM
   LOAD C:\NWSERVER\TOKENTSM.NLM
   LOAD C:\NWSERVER\IBMTRPO.LAN NAME=IBMLS1 DATARATE=M16
   ```

   Note: There will be existing LOAD and BIND IPX statements in the AUTOEXEC.NCF. Delete the LOAD statement (we have replaced it with stated LOAD C:\NWSERVER\IBMTRPO.LAN statement). Also, make any needed modifications to the existing BIND IPX statement Refer to the ″Bind the Protocol to the LAN Driver″ section of the Novell manual for additional information.

   See “Appendix D. Novell NetWare Server driver parameters” on page 63 for a complete list of parameters that can be specified on the **LOAD IBMTRPO** command in the AUTOEXEC.NCF file.
8. Press **Esc** and answer **YES** to save the new file to disk. Press **Esc** again to return to the server console.
9. Type the following commands from the server prompt to shut down the server and exit to DOS: **down**, then **exit**.

10. Perform the following **COPY** commands, making sure that the diskette that you created in step 1 is inserted in drive A. Note that it will prompt you at each of the following files to ask if you want to perform a file overwrite; it is OK to overwrite these files.

```
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
```

11. Go to the Novell server directory and enter **server** at the DOS prompt to restart the server.
12. Install the latest available Novell patches for NetWare 4.11 now. Make sure to select the Version 3.31 ODI LAN Updates for Hardware if given the opportunity.
13. Issue the **down** command to bring the server down.
14. Reboot the server by entering **restart server**.
15. 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. See "Understanding the adapter LEDs and labels" on page 41.

If you experience problems, see "Chapter 4. Problem solving" on page 35.

For information concerning NetWare Server error messages, see "Appendix E. Novell NetWare Server messages" on page 69.

Server driver installation in existing NetWare 4.11 Server

If Novell NetWare is already installed in your computer, perform the following steps to install the adapter server device driver.

Note: If you are altering the configuration of a previously loaded adapter, unload that adapter before proceeding with these instructions.

1. Create a diskette containing the extracted files from the NETWAREP.EXE file on the adapter CD-ROM.
2. Be sure that your adapter has already been installed in your computer. If it has not, follow the instructions in "Chapter 2. Installing the adapter hardware" on page 5.
3. Install the latest available Novell patches for NetWare 4.11. Make sure to select the Version 3.31 ODI LAN Updates for Hardware if given the opportunity. Return to the server console when the installation is complete.
4. Issue the **down** command from the server prompt to bring the server down.
5. Reboot the server by entering **restart server**.
6. Check to see if the device driver is loaded. If it is, unload it using the following command: **unload ibmtrpo**
7. Type **load install** on the server.
8. Select **Driver Options**.
9. Select **Configure Network Drivers**.
10. Select **Select Drivers**.
11. Press the **Insert** key to install the unlisted driver.

12. Insert the diskette that you created in step 1.
13. Press **F3** and specify the path a:\novell\netware.
14. Follow the instructions on the panels to complete the installation of the driver. If you need to make any custom configuration changes to the driver, do so at this time.
15. Follow the instructions in the Novell manual *Create an AUTOEXEC.NCF file*. In addition to the instructions in the manual, add the following lines to the AUTOEXEC.NCF file, immediately after the IPX INTERNAL NET statement (if necessary, replace c:\nwserver with the actual location of the SERVER.EXE executable):

    ```
    LOAD C:\NWSERVER\NBI.NLM
    LOAD C:\NWSERVER\MSM.NLM
    LOAD C:\NWSERVER\TOKENTSM.NLM
    LOAD C:\NWSERVER\IBMTRPO.LAN NAME=IBMLS1 DATARATE=M16
    ```

    Note: There will be existing LOAD and BIND IPX statements in the AUTOEXEC.NCF. Delete the LOAD statement (we have replaced it with the stated LOAD C:\NWSERVER\IBMTRPO.LAN statement).

    Also, make any needed modifications to the existing BIND IPX statement. Refer to the ″Bind the Protocol to the LAN Driver″ section of the Novell manual for additional information.

    See “Appendix D. Novell NetWare Server driver parameters” on page 63 for a complete list of parameters that can be specified on the **LOAD IBMTRPO** command in the AUTOEXEC.NCF file.
16. Press **Esc** and answer **YES** to save the new file to disk. Press **Esc** again to return to the server console.
17. Type the following commands from the server prompt to shut down the server and exit to DOS: **down**, and then **exit**.
18. Type the following commands, making sure that the diskette that you created in step 1 is inserted in drive A. Note that it will prompt you at each of the following files to ask if you want to perform a file overwrite; it is OK to overwrite these files.

    ```
    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
    ```
19. Go to the Novell server directory and enter **server** at the DOS prompt to restart the server.
20. 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. See “Understanding the adapter LEDs and labels” on page 41.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

For information concerning NetWare Server error messages, see “Appendix E. Novell NetWare Server messages” on page 69.

Novell NetWare 5.0 Server

If Novell NetWare is not installed on your machine, use the following instructions. If it is installed, follow the instructions in “Server driver installation in existing NetWare 5.0 Server” on page 17.

Server driver installation during NetWare 5.0 Server installation

Installation of the network board and its device driver occurs during the combined storage device and network board installation step. Use the following instructions to install the network board and its driver during a new NetWare 5.0 Server installation.

1. Create a device driver installation diskette containing the extracted files from the NETWAREP.EXE package file on the adapter CD-ROM.
2. Select a storage device and a network board:
   - Select and configure the storage device.

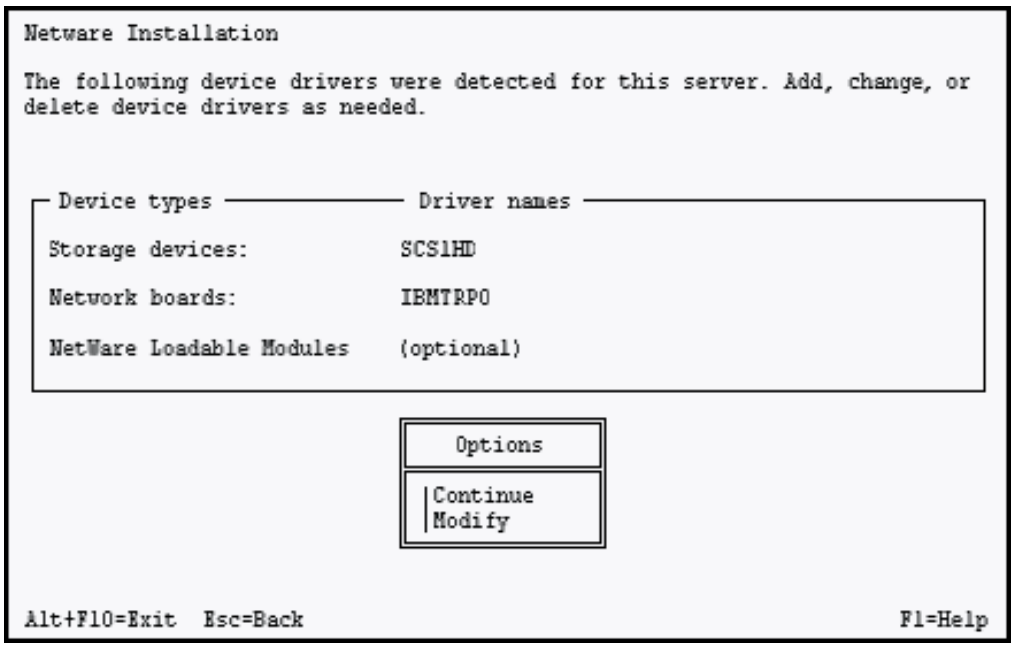
     Storage devices such as hard disks, CD-ROMs, and tape devices require a software driver to communicate with the storage adapter. The software driver for the storage device is called a custom device module (CDM). Each type of storage device requires a CDM.

     The installation program auto-detects many types of storage devices such as IDE drives, SCSI drives, CD-ROM drives, and tape drives. If your storage device is not detected, choose the appropriate driver from the list of available drivers provided with NetWare 5 or add a new driver from a diskette. CDMs can be obtained from the storage device manufacturer.
   - Select and configure the network board.

     The software driver for a network board is called a LAN driver. The installation program auto-detects many types of network boards. If your network board is not detected, choose the driver for the network board from the list provided with NetWare 5 or use a new or updated driver from the diskette that you created in step 1.

     The network board must be installed and configured correctly. For servers, it is recommended that DATARATE be set to M16 or M4, and clients be set to Auto. You might be able to influence certain network board properties by configuring the system and the network board or both.
   - Load a NetWare Loadable Module TM program, if required.

     Certain server and network configurations might require you to load a NetWare Loadable Module (NLM) before you can complete the server installation. An example is loading ROUTE.NLM for a token-ring environment that requires it.



3. Add, delete, or modify drivers as needed.
   - To add a driver:
     a. In the Options box, select **Modify**.
     b. Select the driver and press **Enter**.
     c. Press **Insert** to select from a list of drivers provided with NetWare.
     d. Press **Insert** again to install a driver from diskette.
   - To delete a driver:
     a. In the Options box, select **Modify**.
     b. Select the driver and press **Enter**.
     c. Select the driver to delete and press **Delete**.
   - To modify a driver:
     a. In the Options box, select **Modify**.
     b. Select the driver and press **Enter**.
     c. Select the driver to modify and press **Enter**.
     d. Select the property to modify.

Server driver installation in existing NetWare 5.0 Server

The following procedure explains how to use NWCONFIG to load a LAN driver and bind a protocol.

1. Create a diskette containing the extracted files from the NETWAREP.EXE package file on the adapter CD-ROM.
2. At the server console prompt, enter NWCONFIG.
3. Select **Driver Options → Configure network drivers**.
4. To select the driver from all of the available drivers, select **Select a driver**. The screen will display a list of all available drivers.
5. Press **Insert**. Follow the instructions on the panels. Use the diskette that you created in step 1 when you are prompted to supply an unlisted driver. The directory is a:\novell\netware.

Note: For some drivers, a message might appear indicating that the driver must be loaded manually (at the console prompt). To load a driver manually, follow the screen prompts or press **F1** for more information.

6. Set protocols. When the window containing protocol choices is displayed, select the protocol that you want to use and press the space bar. If you select TCP/IP, enter the IP address and the IP mask.
7. Set parameters. Use the down arrow key to move the cursor to the parameter window. Enter parameter values as needed. Press **F1** for help.

   It is recommended for servers that the Data Rate be set to 4 Mbps or 16 Mbps, and clients be set to Automatic.

   In some cases, the system displays a pop-up list of values for the field from which you select the desired value. In other cases, you must type in a value and press **Enter** to move to the next field.
8. To specify a particular frame type for a token-ring driver, press **F3** to display a list of frame types. Use the arrow keys to move up and down the list.
9. Press **Enter** to select a frame type.
10. When finished, press **F10**.

    If you do not specify a particular frame type, all frame types are loaded automatically, but only those found on the network are actually bound to the driver.
11. Select **Save parameters and load driver**.
12. Confirm bindings of the protocol with the driver and the network number.
13. To add another adapter, shut down the server, power off the server, and insert the additional driver. NetWare will load the appropriate driver automatically. Then repeat step 12.

Novell Client DOS/Windows 3.1x

1. Download Novell Client DOS/Windows 3.1x Version 2.5 or later from Novell's Web site at `http://support.novell.com`.
2. Unzip the downloaded file to a directory on your computer.
3. Exit Windows.
4. From a DOS prompt, go to the directory where you put the file. Run INSTALL.EXE.
5. Select **Yes** or **No** to respond to the Novell License Agreement.
6. Select **Novell Client Windows Support** and **Work Station Manager 3.X**. Press **F10** to save and continue.
7. Select **32-bit LAN Drivers** and press **F10** to save and continue.
8. Select **USER SPECIFIED 32-Bit Driver** and press **Enter**.
9. Insert the CD-ROM or the diskette containing the device drivers into the appropriate drive. Enter the path to the 32-bit ODI driver: ***x*:\novell\netware** where *x* is your CD-ROM drive letter. The panel should say

   ```
   IBM Token-Ring PCI Family Adapter
   ```

   Press **Enter**, configure the parameters, and press **F10** to save and continue.
10. At the panel entitled Installation Configuration Summary, confirm that the values are what you selected, and press **F10** to save and continue.

    The files will be copied at this point.
11. Reboot the computer and start Windows to connect to and log in to your server.

12. 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. See "Understanding the adapter LEDs and labels" on page 41.

If you experience problems, see "Chapter 4. Problem solving" on page 35.

OS/2 NDIS 2 device driver using MPTS

Use the following procedure to install the OS/2 NDIS 2 device driver using the Multiple Protocol Transport Services (MPTS).

1. When updating an existing device driver, error message `X100035`, which indicates that the driver could not be installed and the previous version could not be restored, can be prevented by performing the following steps before beginning the update. This is particularly useful when the existing driver was installed from the adapter CD-ROM.
    - From an OS/2 window, go to the drive where OS/2 is installed. Change to the ibmcom subdirectory (where *x* is your drive letter):

      ```
      x:
      cd \ibmcom
      ```

    - Enter the following two commands:

      ```
      attrib -r ibmtrp.* /s
      attrib -r la1*.msg
      ```

2. 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.
3. Select **OK** on the MPTS logo panel.
4. Select **Install**. You will be prompted for the source of the .NIF file. Enter the path to the driver directory. Select **OK** once the Installation Complete message appears. You will return to the main menu.
5. Select **Configure** in the MPTS dialog box.
6. On the Configure panel, make sure that LAN adapters and protocols is preselected and then select **Configure** at the bottom of the panel.
7. In the Configuration panel, in the Network Adapters group box, select **IBM Token-Ring PCI Family Adapter (IBMTRP.OS2)** and select **ADD**.

   Note: You can edit parameter settings for this adapter. Highlight your adapter in the Current Configuration list box and select **Edit**.
8. In the Protocols list box, select the protocols used by your network application. Highlight each protocol and select **ADD**.

   Note: 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**.

9. Select **OK** when you have finished selecting and editing protocols in the MPTS Configuration panel.
10. Select **Close** on the Configure panel.
11. Select **Exit** in the MPTS dialog box.
12. Select **Exit** on the Update CONFIG.SYS panel to update the CONFIG.SYS file.
13. Select **OK** when you get the message that the CONFIG.SYS has been successfully updated.
14. Select **Exit** on the Exiting MPTS panel.
15. Shut down and restart the computer to apply the changes.
16. 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.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

For information concerning NDIS driver error messages, see “Appendix C. NDIS 2 device driver messages” on page 57.

OS/2 NDIS 2 device driver using other installation programs

Use the following procedure to install the OS/2 NDIS 2 device driver using installation programs other than MPTS.

1. Insert the CD-ROM or the NDIS Drivers diskette into the appropriate drive.
2. Use your product documentation to install the driver (IBMTRP.OS2) that is located in the root directory on both the CD-ROM and diskette.
3. Modify the parameters if needed. See “Appendix B. NDIS 2 device driver parameters” on page 51 for a list and explanation of parameters.

   IBM TCP/IP for OS/2 and Warp Connect are examples of products that provide driver installation programs.
4. Shut down and restart the computer to apply the changes.
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, see “Chapter 4. Problem solving” on page 35.

For information concerning NDIS driver error messages, see “Appendix C. NDIS 2 device driver messages” on page 57.

OS/2 Novell NetWare Requester

Before installation, copy IBMTRPO.SYS from the CD-ROM to the root directory containing your Novell NetWare Requester source files.

Refer to the workstation basics and installation manuals from Novell. When a dialog box titled Requester Installation appears during the installation process, perform the following procedure:

1. If you are installing the NetWare Requester on a workstation, select **Edit CONFIG.SYS and Copy All Files...**. If the NetWare Requester is already installed on the workstation and only a driver update is needed, then select **Only Edit CONFIG.SYS...**.
2. On the next panel, specify the name of the adapter driver: IBMTRPO.SYS.
3. When you get to the panel labeled Copy ODI LAN Driver files, select **Copy only the default driver**.
4. Follow the instructions on the panels to continue installation.
5. When Installation Complete appears in the Requester window, go to the Configuration menu and select **This workstation...**.
6. Select **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. See "Appendix F. Novell NetWare DOS ODI driver parameters" on page 75 for a complete list of parameters that you can specify in the NET.CFG file.

   b. 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.

   c. 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. Select **Save** to complete the NetWare Requester installation.
9. Reboot the computer to apply the changes.

   Note: To make changes in the NetWare 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 select **Edit**. Edit the NET.CFG file in the edit box titled Current NET.CFG File Contents. When the changes are complete, select **Save** and reboot the computer to apply the changes.

10. 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, see "Chapter 4. Problem solving" on page 35.

DOS NDIS 2

Use the following procedure to install the DOS NDIS 2 device driver:

1. Insert the CD-ROM or the NDIS Drivers diskette into the appropriate drive.
2. Use your operating system documentation to install the driver (IBMTRP.DOS). This driver is located in the \dos subdirectory on both diskette and the CD-ROM.
3. Modify the parameters, if needed. See "Appendix B. NDIS 2 device driver parameters" on page 51.

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.

4. Shut down and restart the computer to apply the changes.
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. If error messages are displayed or if you do not see messages that indicate that the drivers have been installed, see “Starting the troubleshooting process” on page 35.
   - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

For information concerning NDIS driver error messages, see “Appendix C. NDIS 2 device driver messages” on page 57.

DOS Novell NetWare Requester (16-bit)

The 16-bit DOS Novell NetWare Requester environment supports access to servers running Novell NetWare 3.11 or later.

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

Note: Consult your Novell NetWare documentation for instructions regarding how to create the NetWare Client for DOS and MS Windows diskettes.

1. Create a diskette containing the extracted files from the DOSODIP.EXE file on the adapter CD-ROM.
2. Insert the NetWare Client for DOS and MS Windows Disk 1 into the appropriate drive.
3. At the command prompt, type **x:**, where *x* is your drive letter, and then press **Enter**.
4. Type **install** and then press **Enter**.
5. Follow the instructions as they appear. In step 5 of those instructions, select the driver for your network board by scrolling down through Network Boards, highlighting **Other Drivers**, and pressing **Enter**.
6. Insert the CD-ROM or the diskette that you created in step 1 of this procedure into the appropriate drive. When prompted, specify the location to the chosen media and press **Enter**. Specify the path as A:\NOVELL\DOS (or at X:NOVELL\DOS for the CD-ROM version).
7. Highlight your adapter and press **Enter**.
8. At this time you can change the default parameters. When you complete the changes, press **F10**. “Appendix F. Novell NetWare DOS ODI driver parameters” on page 75 contains the parameters that can be configured in the NET.CFG file.
9. Follow the instructions presented to complete 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
```

10. Shut down and restart the computer to apply the changes.
11. 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 with no error messages. If error messages are displayed or if you do not see messages that indicate that the drivers were installed, see “Starting the troubleshooting process” on page 35.
    - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

Windows NT Version 3.51

The following procedure assumes that Windows NT 3.51 has already been installed with networking support. It is highly recommended that you install Service Pack 5 from Microsoft before installing the driver.

1. Log on to Windows NT as an administrator.
2. From the Main program group within the Program Manager, double-click the **Control Panel** icon.
3. In the Control Panel window, double-click the **Network** icon.
4. In the Network Setting, select **Add Adapter**.
5. 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**.
6. Insert the CD-ROM or the diskette containing the device drivers into the appropriate drive. When prompted, enter the path to the driver directory and select **OK**.
7. Select **OK** to accept the drive and path information.
8. In the Select OEM Option dialog box, select **IBM Token-Ring PCI Family Adapter**.

   Several work-in-progress panels are displayed, indicating that the driver and its supporting files are being copied to your computer’s hard disk.
9. The Network Control panel is displayed again. There should be an entry in the Installed Adapter Cards list for each token-ring adapter found in the computer.

   To change default values for an adapter, select that adapter in the Installed Adapters list box, and then select **Configure**. Make the necessary changes and select **OK**.

   Note: Make sure that all of the appropriate protocols are installed to connect to the network. Consult your network administrator if you are unsure of what protocols need to be installed.
10. Select **OK** at the top right to complete the installation.

    Note: If TCP/IP is installed as a protocol on the computer, you will now see the TCP/IP configuration panel. Enter all necessary information and select **OK**.
11. The following message will be displayed:

```
Your network settings have changed.
You will need to exit and restart Windows NT so that the new
settings can take effect.
```

Select **Restart now** in order to have Windows NT automatically restart your computer.

Note: You might need to reinstall Service Pack 5 due to changes to your services or protocols during installation.

12. 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 logged for the IBMTRP service in the Event Viewer.
    - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

Windows NT Version 4.0

The following procedure assumes that Windows NT 4.0 has already been installed with networking support. It is highly recommended that you install Service Pack 3 or later from Microsoft before installing the driver.

1. Log on to Windows NT as an administrator.
2. Select **Start → Settings → Control Panel**.
3. From the Control Panel window, double-click the **Network** icon.
4. Select the **Adapters** tab.
5. Select **Add**.
6. You will see a dialog box that includes a list of adapters. Select **Have Disk...**.
7. Insert the CD-ROM or the diskette containing the device drivers into the appropriate drive. When prompted, enter the path to the root directory of the CD-ROM or diskette and select **OK**.
8. In the Select OEM Option dialog box, select **IBM Token-Ring PCI Family Adapter** and then select **OK**.

   Several work-in-progress panels are displayed, indicating that the driver and its supporting files are being copied to your computer’s hard disk.
9. The Network Control panel is displayed again. There should be an entry in the Installed Adapters list for each token-ring adapter found in the computer.

   To change default values for an adapter, select that adapter on the Network Adapters list, and then select **Properties**. Make the necessary changes and select **OK**.

   Note: Make sure that all of the appropriate protocols are installed to connect to the network. Consult your network administrator if you are unsure of what protocols need to be installed.
10. Select **Close** to complete the installation.

    Note: If TCP/IP is installed as a protocol on the computer, you will now see the TCP/IP configuration panel. Enter all necessary information and select **OK**.
11. The following message will be displayed:

    ```
    Your network settings have changed.
    You will need to exit and restart Windows NT so that the new
    settings can take effect.
    ```

    Select **Yes** in order to have Windows NT automatically restart your computer.

Note: You might need to reinstall the Service Pack due to changes to your services or protocols during installation.

12. 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 logged for the IBMTRP service in the Event Viewer.
    - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

Windows 95

There are two different versions of Windows 95 in distribution: the retail release that individuals can purchase, and the OEM Service Release 2 (OSR2) that is found on most computer system preloads. To find out which release you are running, select **Start → Settings → Control Panel**, and then double-click the **System** icon. Look at the version number under the text Microsoft Windows 95.

- If the number is 4.00.950a or 4.00.950, you are using the retail release of Windows 95.
- If the number is 4.00.950 B, you are using the OSR2 release of Windows 95.

Make sure that you refer to the appropriate installation section for the version of Windows 95 that you are using.

Before beginning installation, shut down the computer. Make sure that the operating system is correctly shut down and then switch off the power and disconnect the power cable from the power source.

Installing the driver when Windows 95 Retail is already installed

1. When you boot Windows 95, it will detect the new hardware and bring up a dialog box to allow a choice of drivers. Select **Driver from disk provided by hardware manufacturer** and then select **OK**.
2. Insert the CD-ROM or the NDIS Drivers diskette into the appropriate drive.
3. When prompted, enter the path to the driver directory and select **OK**.

   Note: Some of the files on the diskette are located in the DOS subdirectory. If necessary, you will have to supply this subdirectory to get additional files copied onto your computer.
4. At this point, Windows 95 might prompt you for network names. Type your computer’s name and workgroup. Consult your system administrator if you do not know this information. Select **OK** to continue.
5. The driver files will be copied. Windows might prompt you for the Windows 95 CD-ROM in order to install its default network protocols and services. Make sure that the location of your Windows 95 installation files (for example, d:\ or d:\win95 or c:\windows\catroot) appears in the entry and select **OK**.

   After the files have been copied, a dialog box displays the following message:

   ```
   To finish setting up your new hardware, you must
   restart your computer. Do you want to restart your computer now?
   ```
6. Remove the diskette or CD-ROM from the computer and select **Yes**.
7. 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.
- The device manager (System control panel applet) reports that the device is working correctly.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

Installing the driver when Windows 95 OSR2 is already installed

1. When you boot Windows 95, it will detect the new hardware and display the Update Device Driver Wizard dialog which displays the following message:

   ```
   This wizard will complete the
   installation of: PCI Token Ring Controller.
   ```

   Insert the adapter CD-ROM or the NDIS Drivers diskette containing the device drivers into the appropriate drive.
2. When prompted, enter the path to the driver directory and select **OK**.

   Note: Some of the files on the diskette are located in the DOS subdirectory. If necessary, you will have to supply this subdirectory to get additional files copied onto your computer.
3. At this point, Windows 95 might prompt you for network names. Type your computer’s name and workgroup. Consult your system administrator if you do not know this information. Select **OK** to continue.
4. The driver files will be copied at this point. Windows might prompt you for the Windows 95 CD-ROM in order to install its default network protocols and services. Make sure that the location of your Windows 95 installation files (for example, d:\ or d:\win95 or c:\windows\catroot) appears in the entry and select **OK**. You might also be prompted again for the location of the driver files. Enter the appropriate location again as described previously.

   After the files have been copied, a dialog box displays the following message:

   ```
   To finish setting up your new hardware, you must
   restart the computer. Do you want to restart your computer now?
   ```
5. Remove the driver diskette or CD-ROM from the computer and select **Yes**.
6. 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.
   - The Device Manager (System control panel applet) reports that the device is working correctly.
   - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

Installing the driver for a first-time Windows 95 installation

If Windows 95 is being installed on a computer with the adapter already installed, Windows 95 will detect the adapter, but will not install any drivers. Use the following procedure to correct the problem.

1. Insert the NDIS Drivers diskette or the CD-ROM into the appropriate drive.
2. Select **Start** → **Settings** → **Control Panel**. This will display the Control Panel.
3. In the Control Panel window, double-click the **System** icon.
4. Select the **Device Manager** tab.

5. Within the Device Manager, expand the Other Devices section by selecting the **+** icon that appears to the left of the words **Other Devices**. Select the entry for **PCI Token Ring Controller** and then select **Properties**.
6. Select the **Driver** tab. Depending on which version of Windows 95 you have (retail or OSR2), this dialog will look different.
   - If the Driver properties sheet has a Change Driver button, see "Continuing installation of the driver without the Device Wizard".
   - If the properties sheet has an Update Driver button instead, see "Continuing installation of the driver using the Update Device Driver Wizard".

Continuing installation of the driver without the Device Wizard

1. Select the **Change Driver** button to display the Select Hardware Type dialog. Select **Network adapters** and select **OK**.
2. Select **Have Disk** from the Select Device dialog. Type the letter of your CD-ROM drive and select **OK**.

   Note: Some of the files on the diskette are located in the DOS subdirectory. If necessary, you will have to supply this subdirectory to get additional files copied onto your computer.
3. Windows will display a list of compatible devices. Make sure that your adapter is selected and then select **OK**.
4. Windows will return to the PCI Token Ring Controllers Properties dialog box. Select **OK** to continue.
5. At this point, Windows might prompt you for network names. Type your computer's name and workgroup. Consult your system administrator if you do not know this information. Select **OK** to continue.

   The driver files will be copied at this point. Windows might prompt you for the Windows 95 CD-ROM in order to install default network protocols and services. Make sure that the location of your Windows 95 installation files (for example, d:\ or d:\win95 or c:\windows\catroot) appears in the entry and select **OK**.
6. If Windows 95 displays a dialog that warns you that the PCI Token-Ring Controller has a ROM, ignore the message and select **Test** to continue.
7. Select **OK** in the Device Manager.
8. Remove the driver diskette or CD-ROM.
9. Select **Start → Shut Down** and select **Restart the computer** to reboot the computer.

Continuing installation of the driver using the Update Device Driver Wizard

1. Select the **Update Driver** button on the properties sheet. Windows will display the Update Device Driver Wizard dialog. The dialog box should read:

   ```
   This wizard will complete the installation of: PCI Token Ring Controller.
   ```

   Insert the product CD-ROM or the the NDIS Drivers diskette into the appropriate drive.
2. Select **Next** to search for the drivers. Windows 95 will search the diskette or CD-ROM drives for an appropriate driver. At this point, the wizard should state:

   ```
   Windows has found the following updated driver
   for this device.
   ```
3. Select **Finish** to continue the installation.

Note: If the search fails, select **Other Locations** and type the letter of your drive.

4. Select **OK** and then select **Finish**.
5. Although Windows has already found the driver diskette in a previous step, you might be prompted for its location. Enter **a:** if installing from a diskette or the letter of the CD-ROM drive.

   Note: Some of the files on the diskette are located in the DOS subdirectory. If necessary, you will have to supply this subdirectory to get additional files copied onto your computer.
6. Windows 95 might prompt you for network names. If so, type your computer's name and workgroup. Consult your system administrator if you do not know this information. Select **OK** to continue.
7. The driver files will be copied at this point. Windows might prompt you for the Windows 95 CD-ROM in order to install its default network protocols and services. Make sure that the location of your Windows 95 installation files (for example, d:\ or d:\win95 or c:\windows\catroot) appears in the entry and select **OK**. You might also be prompted again for the location of the driver files. Enter the appropriate location again as described previously.

   After the files have been copied, a dialog box displays the following message:

   ```
   To finish setting up your new hardware, you must
   restart the computer. Do you want to restart your computer now?
   ```
8. Remove the driver diskette or CD-ROM from the computer and select **Yes**.
9. 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.
   - The Device Manager (System control panel applet) reports that the device is working correctly.
   - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

   If you experience problems, see "Chapter 4. Problem solving" on page 35.

Windows 98

Windows 98 ships with a device driver for your adapter. Although the driver will function with the adapter, it is strongly recommended that you use the driver included with your adapter. Use the following procedures to install the latest driver.

Installing the driver for a first-time Windows 98 installation

If you install Windows 98 on a computer that already has the adapter installed, Windows 98 may install a default driver for the adapter. If so, use the following procedure to install the driver that came with your adapter.

1. Select **Start → Settings → Control Panel**. This will display the Control Panel.
2. Double-click **System**. This loads the System Properties dialog.
3. Select **Device Manager**.
4. In the Device Manager, expand the Network adapters section by selecting the **+** that appears to the left of the words Network adapters. Select the entry labeled **IBM PCI Token-Ring Adapter,NDIS4**, and then select **Properties**.
5. Select **Driver** to display the driver information. On this page, select **Update Driver**.
6. At this point, the Update Device Driver Wizard dialog box opens. The dialog box contains the following text:

```
This wizard searches for updated drivers for:
IBM PCI Token-Ring Adapter,NDIS4.
```

Select **Next** to continue.

7. On the next page, select **Search for the best driver for your device** and then select **Next**.
8. The next page of the wizard will ask where you would like to look for the device driver.
   - If you are installing the device driver from the product CD-ROM, insert the CD-ROM into the CD-ROM drive and make sure that the **CD-ROM drive** checkbox is checked.
   - If you are installing from a diskette that you built from the CD-ROM or from the Web, insert the diskette and make sure that the **Floppy disk drives** checkbox is checked.
9. Select **Next** to continue. Windows should find an updated device driver on the diskette or the CD-ROM. Make sure that The updated driver is selected and select **Next**.
10. The next page of the wizard should confirm that the hardware and device driver are found. Select **Next** again to begin copying files.

    Windows might prompt you for the driver diskette. Type the letter of your drive.

    Windows might also prompt you for the Windows 98 CD-ROM in order to install its default network protocols. Make sure that the location of your Windows 98 installation files (for example, d:\ or d:\win98 or c:\windows\catroot) appears in the entry and select **OK**.
11. The wizard reports after the files have finished copying that:

    ```
    Windows has finished installing an updated driver for your hardware
    device.
    ```

    Select **Finish** to continue.
12. Windows returns you to the adapter properties page. Select **Close** to continue.
13. Next, you are returned to the Device Manager page. Select **Close** again to complete the process.
14. Reboot the computer to ensure that all components of the driver loaded correctly.
15. 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.
    - The Device Manager (System control panel applet) reports that the device is working correctly.
    - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

Installing the driver when Windows 98 is already installed

Use this procedure to install the driver that came with your adapter in a computer that already has Windows 98 running. This procedure assumes you have already installed the adapter.

1. When Windows 98 boots, it will detect the new hardware and display the Add New Hardware Wizard dialog. This dialog should contain the following text:

   ```
   This wizard searches for new drivers for:
   IBM PCI Token-Ring Adapter,NDIS4.
   ```

Select **Next** to continue.

2. On the next page, select **Search for the best driver for your device** and then select **Next**.
3. The next page of the wizard will ask where you would like to look for the device driver.
   - If you are installing the device driver from the product CD-ROM, insert the CD-ROM into the CD-ROM drive and make sure that the CD-ROM drive checkbox is checked.
   - If you are installing from a diskette that you built from the CD-ROM or from the Web, insert the diskette and make sure that the Floppy disk drives checkbox is checked.
4. Select **Next** to continue. Windows should find an updated device driver on the diskette or the CD-ROM. Make sure that The updated driver is selected and select **Next**.
5. The next page of the wizard should confirm that the hardware and device driver are found. Select **Next** again to begin copying files.

   Windows might prompt you for the driver diskette. Type the letter of your drive.

   Windows might also prompt you for the Windows 98 CD-ROM in order to install its default network protocols. Make sure that the location of your Windows 98 installation files (for example, d:\ or d:\win98 or c:\windows\catroot) appears in the entry and select **OK**.
6. The wizard reports after the files have finished copying that:

   ```
   Windows has finished installing the software that your new hardware
   device requires.
   ```

   Select **Finish** to continue.
7. A dialog box displays the following message:

   ```
   To finish setting up your new hardware, you must restart your
   computer. Do you want to restart your computer now?
   ```

   Remove the diskette or CD-ROM from your computer and select **Yes**.
8. 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.
   - The Device Manager (System control panel applet) reports that the device is working correctly.
   - The adapter LEDs indicate normal operation: Green ON, Amber OFF.

If you experience problems, see “Chapter 4. Problem solving” on page 35.

Windows 2000

Before installing the device driver, make sure that the adapter is installed in your computer.

Windows 2000 may automatically install a default device driver for your adapter. However, we recommend that you upgrade to the driver that we provide for the adapter. Use the following procedure to install the upgraded driver for Windows 2000.

1. Select **My Network Places** on the Windows desktop.
2. Select **Network and Dial-up Connections** to display the Network and Dial-up Connections window.

3. Scroll the left side of the window to locate and select **Network Identification**.
4. In the System Properties window, select the **Hardware** tab.
5. Select the **Device Manager** button.
6. In the Device Manager window, click the **+** next to Network adapters to expand the list of adapters.
7. Select your adapter and select the **Properties** button.
8. In the Properties window for your adapter, select the **Configure** button.
9. Select the **Driver** tab.
10. Select the **Update driver...** button to open the Update Device Driver Wizard.
11. Select **Next** to continue.
12. On the next page, select **Search for the best driver for your device** and then select **Next**.
13. The next page of the wizard will ask where you would like to look for the device driver.
    - If you are installing from a diskette, insert the diskette and make sure that the **Floppy disk drives** checkbox is checked.
    - If you are installing from a location on your hard drive, make sure that the **Specify a location** checkbox is checked.
14. Select **Next** to continue. Make sure that driver you want updated is displayed on on the screen and select **Next**.

    Note: If the wizard does not specify the correct driver location, for example the CD-ROM or diskette drive, perform the following steps:
    a. Click the **Back** button twice.
    b. Select **Display a list of known drivers . . .** and then select **Next**.
    c. Select **Have Disk. . .** and then specify the location of the driver (the CD-ROM or diskette drive letter).
    d. After you select the correct driver, an Update Driver Warning window might appear. If so, click **Yes** to continue.
15. The next page of the wizard should confirm that the hardware and device driver are found. Select **Next** again to begin copying files.

    Notes:
    a. Windows might prompt you for the driver diskette. If so, type the letter of your drive.
    b. Windows might also prompt you for the Windows 2000 CD-ROM in order to install its default network protocols. Make sure that the location of your Windows 2000 installation files (for example, d:\ or d:\win2000 or c:\windows\catroot) appears in the entry and select **OK**.
    c. A Digital Signature Not Found window might appear saying that the driver is not digitally signed. If so, select **Yes** to continue.

    After the files are copied, the wizard displays a message to inform you that the driver was installed.
16. Select **Finish** to continue.
17. Select **Yes** when asked to reboot the system.
18. 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.

- The Local Area Connection icon on the Network and Dial-up Connections window shows that the device is working correctly.
- The adapter LEDs indicate normal operation: Green ON, Amber OFF.

Remote unattended installation of Windows 95, Windows 98, Windows 2000, and Windows NT

Instructions for this environment are on the adapter CD-ROM. You can read the instructions with a Web browser. To access the instructions, perform the following steps:

1. Go to *x*:\startcd.htm (where *x* is your CD-ROM drive).
2. Select the proper adapter and then select **Downloads**.
3. Select the proper operating system to expand the list of packages.
4. Select **Remote Unattended Install (RUI).**

Novell Client for Windows NT

1. If the NDIS driver is not already installed, follow the instructions in “Windows NT Version 4.0” on page 24 or “Windows NT Version 3.51” on page 23. At step 11 of those instructions, make sure that you select the appropriate protocols and services to connect to the network.

   Note: If you are connecting to a Novell server through IPX, you need to install the NWLink IPX/SPX Compatible Transport protocol and also the Client Service for NetWare service under the Services → Workstation tab.
2. Download Novell Client for Windows NT from `http://www.novell.com/download/`
3. Unzip the downloaded file to a local directory.
4. Run I386\SETUPNW.EXE from the directory where you placed the files.
5. Select **YES** or **NO** to respond to the Novell License Agreement.
6. You might get a message indicating that the Microsoft Client Service for NetWare is installed and will be removed. If so, respond **Continue**.
7. Installation is complete when you see the Installation Complete panel.
8. Reboot and start Windows NT to connect and log in to your server.

Novell Client for Windows 95/98

Note: You can download Novell Client for Windows 95/98 from `http://www.novell.com/download/`

If you are upgrading from the NetWare DOS Requester (VLM) client or if you do not have any network client installed, you need to have the Windows 95 or Windows 98 CD-ROM or diskettes or the Windows 95 or Windows 98 .CAB files.

1. If the NDIS driver is not already installed, follow the instructions in “Windows 95” on page 25.
2. After downloading the code, run SETUP.EXE.
3. Select **Yes** or **No** to respond to the Novell License Agreement.
4. Select **Start** to begin the installation.

   If you are prompted to select a adapter, select one that matches your hardware (this step might not be necessary, as you should have already selected the adapter in the first step).

5. If you do not need to customize your installation, select **Reboot**.
6. If you want optional features or need to configure your workstation, select **Customize**. Then select **Reboot**.

Windows for Workgroups with NDIS 3

Note: Refer to Microsoft documentation for the general procedure regarding installation of network drivers for Windows for Workgroups.

1. Insert the CD-ROM or the NDIS Drivers diskette into the appropriate drive.
2. Double-click the Network group icon from the Program Manager window.
3. Double-click the Network Setup icon.
4. Select **Drivers** and then **Add Adapter....**
5. Select **Unlisted or updated network adapter** and then **OK**
6. Enter ***x:\wfw***, where *x* is your drive letter. Select **OK**.
7. Select **CLOSE**.
8. Select **OK**.
9. You will be prompted to reinstall specific network-related files. Reinstall them as needed.
10. You will also be prompted to insert the Windows for Workgroups program application diskettes or CD-ROM. Follow the instructions.
11. Select **OK** for any messages regarding updates to the SYSTEM.INI and PROTOCOL.INI files.
12. When prompted to restart your computer, select **RESTART COMPUTER**.

    Windows for Workgroups will automatically restart your computer and the driver will be loaded.
13. 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 41.
    - You are able to log on and communicate with the network.

      If you experience problems, see “Chapter 4. Problem solving” on page 35.

Managed Driver Upgrade for Windows 95, Windows 98, Windows NT, and Windows 2000

Managed Driver Upgrade is a package you can download from the IBM Token-Ring PCI Family Adapter Web site that assists local users and system administrators in upgrading their systems to the latest level of the driver. The package consists of the new driver, all necessary support files, and an executable program that can upgrade the driver without any user intervention.

Managed Driver Upgrade can be run locally by the user, or remotely by a system administrator using management software such as Tivoli TME® 10 Software Distribution.

Running Managed Driver Upgrade locally

To run the Managed Driver Upgrade locally, perform the following procedure.

1. Download the correct package. There are packages for Windows 95, Windows 98, Windows NT 4.0, and Windows 2000.
2. Run the package and extract all the files to a single directory such as c:\temp.
3. If you are using Windows NT 4.0, log in using a user ID with administrator privileges.
4. Open a DOS or command window.
5. Run the Managed Driver Upgrade executable. The name of the executable is TRMDU95.EXE for Windows 95, TRMDU98.EXE for Windows 98, TRMDU00.EXE for Windows 2000, and TRMDUNT.EXE for Windows NT 4.0.
6. Enter the following command line options as needed. Refer to the following table.

Table 4. Managed Driver Upgrade command line options

Option	Explanation
/boot=[y,n]	The adapter needs to be rebooted before the upgrade takes effect. The Managed Driver Upgrade executable can force the system to reboot after it completes. Set /boot=y if you want the system to reboot. Set /boot=n if you do not want the system to reboot. The default is /boot=y.
/down=[y,n]	There are times when you might want to revert to a previous version of a driver. Set /down=y in these cases. Set /down=n to prevent an older driver from being accidentally installed over a newer driver. The default is /down=n. ***Windows NT 4.0 does not support this option.***
/file=[y,n]	Controls the logging ability of the Managed Driver Upgrade executable. /file=y will generate a log file in the same directory where the executable resides. /file=n suppresses logging. The default is /file=y
/name=[*XXXXXXXX.XXX*]	Customizes the name of the log file. The name can be any valid Windows filename. The default name is MYOUT.DAT.

For example, to execute on Windows 98, log to a file called TRMDU.LOG, and reboot after completion, enter the following on the command line:

```
TRMDU98 /boot=y /file=y /name=TRMDU.LOG
```

Running Managed Driver Upgrade remotely

To run the Managed Driver Upgrade from a remote location using management software, perform the following procedure.

1. Download the correct package to the management server. There are packages for Windows 95, Windows 98, Windows NT 4.0, and Windows 2000.
2. Run the package and extract all the files to a single directory.
3. Repackage the files according to the specifics of the management software.
4. Follow the directions included with the management software to schedule an update. During the update, all the files in the package are typically pushed to the client, and the executable is started. The command line options for the executable described in Table 4 can typically be passed to the executable by the management software.

The Managed Driver Upgrade should be completely transparent to the user. The log file generated by Managed Driver Update will be stored in a directory designated by the management software. Refer to the management software for details on how to locate this directory.

Chapter 4. Problem solving

This chapter contains procedures that help you troubleshoot problems and optimize the performance of your adapter.

Starting the troubleshooting process

If you cannot successfully install the adapter or the adapter does not operate properly, perform the following steps:

- If yours is the first station on the ring, make sure that AutoSense is disabled.
- Refer to the following table. Locate the symptom that best describes the problem.

Symptom	Solution
Problem with adapter operation	See “Using Troubleshooting Utility” and “Running adapter diagnostics” on page 40.
Problem indicated by the adapter LEDs	See “Understanding the adapter LEDs and labels” on page 41.
Problem with loading the drivers	See “Solving problems with driver installation” on page 43.
Unable to communicate with the network	See “Solving an adapter communication problem” on page 44.

This chapter includes the following topics:

Section	Page
Using Troubleshooting Utility	35
Running adapter diagnostics	40
Understanding the adapter LEDs and labels	41
Solving problems with driver installation	43
Solving an adapter communication problem	44
Using PCISETUP	44
Contacting IBM product support	45
Downloading code from the Web	45
Tech tips and frequently asked questions	45
Other performance enhancements	45

Using Troubleshooting Utility

Troubleshooting Utility is an application that you can use to collect information about your system to help diagnose problems with your token-ring PCI adapter. It is available for Windows 95 OSR2, Windows 98, Windows NT 4.0, and Windows 2000.

Troubleshooting Utility helps you identify and solve network problems that involve the adapter. It analyzes your system and all token-ring PCI adapters in your system. Using the available information, it offers suggestions for solving your networking problems. Troubleshooting Utility also generates an adapter information report that

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provides detailed information about your system to enable your network administrator or other support personnel to efficiently assist you. You can also use it to create a diagnostic diskette.

If Troubleshooting Utility verifies that your adapter is working correctly, yet you are still having networking problems, you should use Windows Help to verify that the correct services and protocols are installed for your network.

Installing Troubleshooting Utility

You need the self-extracting installation package TRSHOOT.EXE in order to install Troubleshooting Utility. You can obtain this package from the adapter CD-ROM or the Web. For Windows 9x systems, the package automatically installs an IBM LAN Adapter Management IOCTL driver as a Windows protocol.

To install Troubleshooting Utility, run the software package executable and follow the instructions on the installation wizard windows.

A folder containing Troubleshooting Utility, Troubleshooting Utility Help, and a deinstall icon are copied to your computer.

Starting Troubleshooting Utility

You can use Troubleshooting Utility in the wizard mode or expert mode. The wizard mode provides a series of windows that guide you through the troubleshooting process. The expert mode is for more advanced users.

To start Troubleshooting Utility, perform the following steps.

1. Select **Start → Programs → Troubleshooting Utility → Troubleshooting Utility**.
2. Select ***one*** of the following options:
   - Select the **Wizard** button to run the Wizard. The Wizard provides a series of windows that guide you through the troubleshooting process.
   - Select the **Expert** button to display a dialog box with tabs for each troubleshooting process task.

Using Troubleshooting Utility

In the wizard mode, Troubleshooting Utility displays windows for performing troubleshooting tasks.

In the expert mode, Troubleshooting Utility displays a dialog box with tabs for performing troubleshooting tasks.

Window / Tab	Task
Adapter Analysis	Summarizes the adapter's operational status. See"Viewing adapter analysis information" on page 37.
NIC Status	Displays status information about the instances of the drivers installed in your system. See "Viewing NIC status" on page 37.
Event Log	Displays any logged messages about your adapter. See "Viewing the event log" on page 39.
Build Diagnostic Diskette	Gives you access to functions for building a diagnostic diskette. See "Building a diagnostic diskette" on page 39.

Window / Tab	Task
Contact Information	Provides a place to enter your name, address, telephone number, and customer report ID (if one has previously been assigned by support personnel). This information is printed on the adapter information report. See “Entering contact information” on page 39.
Adapter Information Report	Gives you access to the functions for generating a report containing information collected about your system. The information in this report is may be useful to support personnel in diagnosing problems with your adapter. See “Generating an adapter information report” on page 40.

Viewing adapter analysis information

Adapter analysis information displays on the first window that appears when you run Troubleshooting Utility Wizard. This information is also displayed on the NIC Status tab when you run Troubleshooting Utility in the expert mode.

Troubleshooting Utility analyzes your system and all token-ring PCI adapters in your system. For each adapter found, the adapter's burned-in address (mac address) and current operating status is displayed. A summary of the operational status and suggestions for correcting problems are displayed.

Viewing NIC status

The information displayed on the NIC Status tab might help you to quickly identify a problem. The NIC Instance list box contains a list of the adapters that are found in your system. This list is obtained from the registry.

On Windows NT 4.0 systems, the token-ring PCI adapters are listed in: HKEY_LOCAL_MACHINE\Software\Microsoft\Windows_NT\CurrentVersion\ NetworkCards. The token-ring PCI instances are listed in: HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\IBMTRP.

On Windows 9x systems, the token-ring PCI instances are listed in: HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Class\Net\.

On Windows 2000 systems, the token-ring PCI instances are listed in: HKEY_LOCAL_MACHINE\Software\Microsoft\Windows NT\Current Version\Network Cards\# in the registry variable 'ServiceName'.

To view NIC status, complete the following steps:

1. Click the arrow beside Select NIC Instance to display a list of all NIC instances.
2. Click the instance you want to troubleshoot.

   The information for the instance you selected displays in the fields. This information includes:

   - MAC address. This is the address of the NIC encoded in the adapter memory at the factory. This address can also be found on the adapter card label. This is a unique address that the network software uses to distinguish the adapter from others in the network
   - Transmit/Receive Test. The transmit/receive test indicates the number of packets being transmitted and received without errors by the adapter. These counters are updated approximately every 2 seconds. If the transmit and receive fields are being incremented, traffic is being processed by the adapter. If no other stations are on the ring, these counters will increment very slowly.

- Hardware status. This is the current status of the NIC. The status is represented by the following values that correspond to the NDIS_HARDWARE_STATUS-type values:

Status	NDIS_HARDWARE_STATUS-type value	Explanation
Ready	NdisHardwareStatusReady	The NIC is available and capable of sending and receiving data over the wire.
Initializing	NdisHardwareStatusInitializing	The NIC is initializing.
Resetting	NdisHardwareStatusReset	The NIC is resetting.
Closing	NdisHardwareStatusClosing	The NIC is closing.
Not Ready	NdisHardwareStatusNotReady	The NIC is closed, shut down, or broken.

- Ring state. This is the state of the NIC with respect to entering the ring. The ring state is represented by the following values that correspond to the NDIS_802_5_RING_STATE values:

Status	NDIS_802_5_RING_STATE value	Explanation
Open	NdisRingStateOpened	This specifies an open ring.
Closed	NdisRingStateClosed	This specifies a closed ring.
Opening	NdisRingStateOpening	This specifies a ring that is opening.
Closing	NdisRingStateClosing	This specifies a failure of a ring open operation.
Open Failure	NdisRingStateOpenFailure	The NIC is closed, shut down, or broken
Ring Failure	NdisRingStateRingFailure	This specifies a failure of a ring.

- Ring status. This indicates the last ring status, which corresponds to the NDIS token-ring ring status codes (OID_802_5_CURRENT_RING_STATUS) as listed in the following table:

Status	OID_802_5_CURRENT_RING_STATUS
Signal Loss	NDIS_RING_SIGNAL_LOSS
Hard Error	NDIS_RING_HARD_ERROR
Soft Error	NDIS_RING_SOFT_ERROR
Transmit Beacon	NDIS_RING_TRANSMIT_BEACON
Wire Fault	NDIS_RING_LOBE_WIRE_FAULT
Auto Removal Error	NDIS_RING_AUTO_REMOVAL_ERROR
Remove Received	NDIS_RING_REMOVE_RECEIVED
Counter Overflow	NDIS_RING_COUNTER_OVERFLOW
Single Station	NDIS_RING_SINGLE_STATION
Ring Recovery	NDIS_RING_RING_RECOVERY

- Analysis. A summary of the operational status and suggestions for correcting problems are displayed in this section of the NIC Status tab.

Viewing the event log

The event log displays all messages relating to the token-ring PCI adapters that have been generated since the last reboot of the machine. On NT systems, these messages are parsed from the Event Viewer, which is an NT Common Administrative Tool. On Windows 9x systems, these messages are parsed from the NDISLOG.txt file. This screen or tab is displayed only when there are messages to present. If no token-ring PCI events have been generated since the system was last rebooted, the screen or tab is not displayed.

Building a diagnostic diskette

Notes:

1. If your adapter came with the CD-ROM titled *IBM 16/4 Token-Ring CardBus and PCI Management Adapters Installation and CD-ROM Guide*, you can either build a diagnostic diskette to use for running diagnostics or use the CD-ROM to run diagnostics. To use the CD-ROM, your computer must have a bootable CD-ROM drive. The CD-ROM option allows you to perform diagnostics on a computer that does not have a diskette drive.
2. If your adapter came with the CD-ROM titled *IBM 16/4 Token-Ring PCI Management Adapter Installation and CD-ROM Guide*, you cannot use the CD-ROM to perform diagnostics.

To build a diagnostic diskette, perform the following procedure:

1. Insert a blank, high-density diskette into your diskette drive (usually drive A).
2. Click the **Build** button to build the diagnostic diskette.

   When the build is finished, you can run the diagnostics immediately if you want.
3. To run the diagnostics, leave the diskette in the diskette drive and click the **Reboot** button.

   When you click the Reboot button, your computer automatically reboots before running the diagnostics. For detailed information about running the diagnostics, see “Running adapter diagnostics” on page 40.

   When you finish running diagnostics, the system prompts you to remove the diskette and reboot the system. After the system reboots, Troubleshooting Utility resumes execution.

Entering contact information

The information you enter on this tab is printed on the adapter information report. For information on creating this report, see “Generating an adapter information report” on page 40.

To enter support information, complete the following steps:

1. Type your name, e-mail address, and telephone number in the fields provided.
2. If you have already reported your problem and received a customer report ID, type the customer report ID. If you do not have a customer report ID, leave this field blank.
3. Type a brief description of the problem.
4. Click **Yes** or **No** to indicate whether or not this is a new install.
5. Click **Yes** or **No** to indicate whether or not you have run the diagnostic diskette.

   For information on building a diagnostic diskette, see “Building a diagnostic diskette”.

Generating an adapter information report

The adapter information report contains information about the devices installed in your computer, including the adapters. The information collected in this report might be useful in determining the cause of a networking problem. Included is the following information:

- Operating system information
- Information about your computer such as model and BIOS level
- List of PCI device drivers installed in your system
- Detailed information about each PCI device such as PCI bus configuration

The information is copied to a file called ADPTINFO.PCI. This file is saved on the root directory of drive C. However, on Windows NT systems that have NTFS on drive C, the ADPTINFO.PCI file is saved to a FAT formatted diskette in drive A.

To generate the report, perform the procedure that is applicable to your operating system.

Windows 9x: To generate an adapter information report on Windows 9x, perform the following steps.

1. Click the **Generate** button to create the report file (ADPTINFO.PCI).
2. Click the **Print** button to print the report on your default printer.

Windows NT: To generate an adapter information report on Windows NT, perform the following steps.

1. Insert a blank, high-density diskette into your diskette drive (usually drive A).
2. Select the BUILD button to build the pci_info diskette.
3. Select the REBOOT button to generate the adapter information report.
4. When prompted, remove the diskette from drive A and reboot your computer.

   When NT starts, Troubleshooting Utility resumes.
5. Click the PRINT button to print the report on your default printer. If the file system on drive C is NTFS, you must reinsert the pci_info diskette into your diskette drive.

Running adapter diagnostics

Notes:

1. If your adapter came with the CD-ROM titled *IBM 16/4 Token-Ring CardBus and PCI Management Adapters Installation and CD-ROM Guide*, you can either build a diagnostic diskette to use for running diagnostics or use the CD-ROM to run diagnostics. To use the CD-ROM, your computer must have a bootable CD-ROM drive. The CD-ROM option allows you to perform diagnostics on a computer that does not have a diskette drive.
2. If your adapter came with the CD-ROM titled *IBM 16/4 Token-Ring PCI Management Adapter Installation and CD-ROM Guide*, you cannot use the CD-ROM to perform diagnostics.

Attention: To avoid potentially erroneous results, you should always perform a power-on reboot of your computer before running the diagnostics.

Creating a diagnostic diskette

You can create a diagnostic diskette in either of two ways:

- Download and run the DIAGDISK.EXE located on the adapter CD-ROM.
  1. Insert a blank, high-density diskette into your diskette drive (usually drive A).

2. Point your Web browser to *x*:\startcd.htm on the CD-ROM (where *x* is your CD-ROM drive).
3. Select your adapter and click **Downloads**.
4. Select **Diagnostics** to download the executable.
5. Run the executable to create the diagnostic diskette.

- Use Troubleshooting Utility to create the diskette. See “Building a diagnostic diskette” on page 39.

Running 4/16 Mbps diagnostics

Use the following procedure to run 4/16 Mbps diagnostics:

1. Insert the diagnostic diskette in drive A and reboot your computer.
2. At the DOS Boot Menu, select **IBM PCI adapter family extended diagnostics for 16 Mb/s and 4 Mb/s**.

   If the system will not boot with the adapter installed, but will boot without the adapter, skip to step 6.
3. If there is more than one adapter installed in your computer, a selection menu displays each adapter by its universally administered address. Use the cursor keys or the mouse to select the adapter to test.
4. Connect the adapter to the network and press the **Enter** key to select **Test**.

   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.
   - For the on-ring test, the adapter must be 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.
5. Select the option for the test to perform.
6. If the test indicates that 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 amber and green after you power up your computer.
   - See Table 5 on page 42 for LED states.
   - Run the adapter diagnostics again. If the tests are completed successfully, and your computer still is not communicating, contact your network administrator.
7. 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 device driver setting matches the data rate of the LAN segment.

Understanding the adapter LEDs and labels

Figure 2 on page 42 and Table 5 on page 42 describe the LEDs and labels located on the bracket of the adapter.

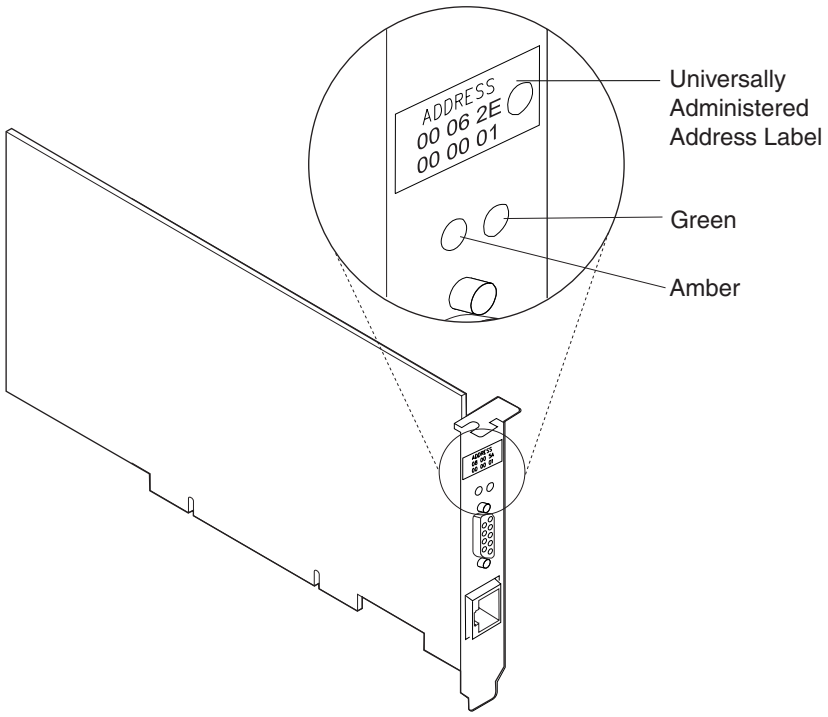


Figure 2. The adapter LEDs and labels

Understanding the adapter LEDs

The LEDs provide information useful for monitoring the status of the adapter and for solving problems. 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 indicates the sequence that displays when the you start the computer and the adapter reaches the open state successfully. Some of the states might be too brief to observe.

Table 5. Startup sequence of LED states

Amber	Green	Explanation
Blinking	Blinking	• Slow blink. The adapter is waiting for initialization. • Fast blink. The adapter has detected a wake-up frame and is attempting to wake up the system. If this state persists, it indicates that the attached PC does not have Wake on LAN enabled. To correct this problem, power on the PC and enable the Wake on LAN feature from the power management system configuration menu.
Off	Off	The adapter initialization is in progress, or the computer is powered off.
Off	Blinking	The adapter did not detect any problems during its self-diagnostic tests and is waiting to open. If this LED state occurs after the adapter has been opened, this state indicates that the adapter has been closed under software control.
Off	On	The adapter is open and operating correctly.

Table 6 lists LED states that indicate problems.

Table 6. Problems shown by adapter LED states

Amber	Green	Explanation	Action
On	Off	The adapter self-diagnostic tests failed or there is a problem with the adapter.	Go to “Running adapter diagnostics” on page 40 to test the adapter.
Blinking	Off	The adapter is closed due to one of the following conditions: • The adapter open failed. • The adapter detected a wire fault. • The adapter failed the auto-removal test.	Perform the following procedures, as appropriate: 1. Go to “Solving an adapter communication problem” on page 44. 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	The adapter has detected beaconing or a hard error.	Go to “Solving an adapter communication problem” on page 44
On	On	The adapter has failed before running the self-diagnostic tests.	Go to “Running adapter diagnostics” on page 40 to test the adapter.

See “Glossary” on page 95 for definitions of the terms used in Table 6.

Understanding the adapter labels

The *green dot label* indicates the speeds that this adapter supports over a token ring.

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 groups of two digits from left to right, starting on the first row. In Figure 2 on page 42, the universally administered address is X'00 06 2E 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 in the network. If you 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 problems with driver installation

If you have a problem with installing a driver, perform the following procedure.

1. Make sure that you correctly followed the instructions for installing the adapter.
2. In the following table, locate the row that describes the network operating system or network application on the computer and perform the recommended actions.

Environment	Message Type and Action
Novell NetWare Server	• Message prefix IBMTRPO: See Appendix E. Novell NetWare Server 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

Environment	Message Type and Action
OS/2 with MPTS	Check LANTRAN.LOG, usually found in the subdirectory \IBMCOM, for messages. LAN Server users can use the NET ERROR function to view the error log. • Message prefix LA1 or reference to IBMTRP: See Appendix C. NDIS 2 device driver messages.
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.
DOS NDIS 2	See Appendix C. NDIS 2 device driver messages.
Windows NT	Check for messages from the IBMTRP service using the Windows NT Event Viewer tool.

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.

1. Verify that the appropriate cable is connected to the adapter and to the network. See “Selecting adapter cables” on page 5 for a description of the compatible cables.
2. Verify that the adapter is firmly seated in the expansion slot.
3. 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.
4. Replace the adapter cable with one that is known to be good.

Using PCISETUP

The PCISETUP program is provided as an executable program on the CD-ROM in the *x*:\pcisetup directory.

The program looks for specific system chips based on their PCI Vendor ID and Device ID. Based on which chips are found, modifications are made to specific bits within that chip’s PCI configuration registers.

If there is already a version of PCISETUP installed on your computer, and you are adding a new token-ring adapter, you might need to replace the PCISETUP file in your computer with the PCISETUP file on the CD-ROM to ensure you are using the latest version number.

PCISETUP modifies the BIOS setup for the adapter in specific systems.

If you need to install a PCISETUP file, use the instructions that are applicable to your operating system.

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

1. Insert the CD-ROM in the drive.
2. Copy *x*:\pcisetup\pcisetup.exe (where *x* is your CD-ROM drive) to the root directory of the diskette from which the system boots.

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

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

1. Insert the CD-ROM in the drive.
2. Copy *x*:\pcisetup\pcisetup.dos (where *x* is your CD-ROM drive) to the root directory of the diskette from which the system boots.
3. Make the following line the first executable line in the CONFIG.SYS file:
   ```
   DEVICE=PCISETUP.DOS
   ```

OS/2

1. Insert the CD-ROM in the drive.
2. Copy *x*:\pcisetup\pcisetup.os2 (where *x* is your CD-ROM drive) to the root directory of the disk from which the system boots.
3. Make the following line the first executable line in the CONFIG.SYS file:
   ```
   DEVICE=PCISETUP.OS2
   ```

Windows NT

1. Insert the CD-ROM in the drive.
2. From the File pull-down menu, select **Run**.
3. Type *x*:\pcisetup\pcisetnt (where *x* is your CD-ROM drive) in the path entry field.
4. Select **OK**.

   PCISETNT.BAT will install PCISETUP.SYS as a device driver that will be loaded each time the system is started.

Contacting IBM product support

You can call the following telephone numbers for product support:

1-800-237-5511	IBM Support Services (U.S. only)
1-800-772-2227	IBM HelpCenter® (U.S. only)
1-800-565-3344	HelpPC (Canada)

Customers outside the U.S. and Canada should contact their place of purchase.

Downloading code from the Web

You can download the latest code from the following location on the Web:

```
http://www.ibm.com/networking/support
```

Tech tips and frequently asked questions

To find tips about specific hardware and software situations, go to *x*:\startcd.htm on the CD-ROM (where *x* is your CD-ROM drive.)

Other performance enhancements

There is a white paper on this subject at the following location on the Web:

```
http://www.ibm.com/networking/per/per10.html
```

Appendix A. CD-ROM content and software packages

The CD-ROM contains adapter drivers, supporting applications, publications, technical tips, and frequently asked questions related to the IBM 16/4 Token-Ring PCI Management Adapter.

A navigational tool is provided to assist you in accessing the contents of the CD-ROM. You can launch this tool by opening the file *x*:\startcd.htm (where *x* is your CD-ROM drive) in a Web browser. You can obtain release date information from the CD-ROM by selecting your adapter from the section CD-ROM - release date information.

However, the IBM Networking Web site might offer more current information. If you have Internet access, you can obtain the most current drivers and information by selecting your adapter from the section Networking Web site - current information.

The Web download packages and CD-ROM contain the following items:

- A user's guide and a features guide in HTML and PDF format. See "Product documentation" on page 49.
- Self-expanding PACKAGE and IMAGE files.
- Device drivers that can be installed directly from the CD-ROM during the device driver install process. They are located in the following directories:

Operating System	Directory
Windows NT 4.0	\(root)
Windows NT 3.51	\win32
Windows 95 Retail	\win32
Windows 95 OSR2	\(root)
Windows 98	\(root)
Windows 2000	\(root)
Windows for Workgroups	\WFW
Novell NetWare Server and 32-bit Client	\NOVELL\NETWARE
Novell NetWare DOS Requester (16-bit)	\NOVELL\DOS
Novell NetWare OS/2 Requester (16-bit)	\NOVELL\OS2
OS/2	\OS2
DOS	\DOS

Table 7 on page 48 lists packages that are available on the Web and on the CD-ROM. Table 8 on page 48 lists diskette images that are available on the Web and on the CD-ROM. You can obtain them by using the navigational tool already mentioned. Select the Web link for the latest version of the file, or select the CD-ROM link to copy the file directly from the CD-ROM. The files are located on the CD-ROM at *x*:\download (where *x* is your CD-ROM drive).

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Software packages

The package files can be executed to expand the files to a hard disk, or to a diskette where noted with an asterisk (*). The directory structure is maintained as it exists on the CD-ROM.

Table 7. Software packages

Package	Description	Executable
CD-ROM	Complete CD-ROM content	CDIMAGE.EXE
Device Drivers (*)	DOS and Windows 3.1x (NDIS 2) Novell NetWare DOS Requester (16-bit) Novell NetWare Server and Client OS/2 (NDIS 2) Windows 95 Retail/NT 3.51 Windows 95 OSR2/98/NT 4.0/2000 Windows for Workgroups	DOSNDISP.EXE DOSODIP.EXE NETWAREP.EXE OS2NDISP.EXE WIN32PKG.EXE PC99LOGO.EXE WFWPKG.EXE
Managed Driver Upgrade	Windows 95 OSR2 Windows 98 Windows NT 4.0 Windows 2000	WINMDU95.EXE WINMDU98.EXE WINMDUNT.EXE WINMDU2K.EXE
Documentation - HTML and PDF	User's Guide Features Guide	USERMGMT.EXE FEATURES.EXE
Troubleshooting Utility	Windows 95 OSR2/98/NT 4.0/2000	TRSHOOT.EXE
LAN Adapter Management Agents	OS/2 Windows 95/98/NT/2000	DMIOS2.EXE DMIWIN.EXE
PCI Setup (*)	PCI Setup Utility	PCIPKG.EXE
RPL (*)	Remote Program Load (RPL/DHCP/PXE)	RPLPKG.EXE
Tivoli Management Agents (*)	Windows 3.x Windows 9x Windows NT OS/2 NetWare 3.x NetWare 4.x and 5.x	TMAW3X.EXE TMAW9X.EXE TMAWNT.EXE TMAOS2.EXE TMANW3X.EXE TMANW4_5.EXE

Diskette images

Run these diskette image files to create diskettes. Each image file will create a single diskette.

Table 8. Diskette images

Image	Description	Executable
CID for OS/2	Configuration, Installation, and Distribution diskette	CID.EXE
Diagnostics	Diagnostics diskette	DIAGDISK.EXE
LAN Adapter Management Agents	OS/2 - Diskette 1 OS/2 - Diskette 2 Windows 95/98/NT/2000 - Diskette 1 Windows 95/98/NT/2000 - Diskette 2 Windows 95/98/NT/2000 - Diskette 3	DMIOS2A.EXE DMIOS2B.EXE DMIWINA.EXE DMIWINB.EXE DMIWINC.EXE
PCI Flash	PCI Flash Update diskette	PCIFLASH.EXE

Table 8. Diskette images (continued)

Image	Description	Executable
RUI	Remote Unattended Install diskette for Windows 95/98/NT/2000	RUI.EXE

Product documentation

Complete product documentation is available for downloading from the CD-ROM and the Web in both PDF and HTML formats. The HTML version can also be viewed directly from your Web browser. Five documents are provided on the CD-ROM — a user's guide for each of the three IBM Token-Ring PCI Management Adapters, a user's guide for the IBM 16/4 Token-Ring CardBus Adapter, and a features guide. Each user's guide includes hardware and software installation instructions, troubleshooting tips, device driver parameters, and error messages. The *IBM Token-Ring Features Guide* provides detailed information about Remote Program Load, LAN Adapter Management Agent, Route Switching, Class of Service, and Redundant NIC.

To access the download versions, perform the following procedure:

1. Insert the CD-ROM into the CD-ROM drive of your computer and point your Web browser to *x*:\startcd.htm (where *x* is your CD-ROM drive).
2. Select your adapter type and then **Downloads**.
3. Select **Target Operating System** and then select **User's Guide** or **Features Guide**.
4. Select the package name that appears.
5. Select **Save as...** and choose the path to the directory where you want to copy the package file.
6. Select **OK** to download the package file.
7. Go to the directory where the package was stored and run the package file to expand the files.

The user's guide in PDF format is stored in the file USERGUID.PDF. The features guide in PDF format is stored in the file FEATURE.PDF. The corresponding HTML versions are in USERGUID.HTM and FEATURE.HTM.

To view the documentation directly from the CD-ROM, insert the CD-ROM into the CD-ROM drive of your computer and point your Web browser to *x*:\startcd.htm (where *x* is your CD-ROM drive). Under CD-ROM - release date information, select your adapter type and then the documentation that you want to view.

Appendix B. NDIS 2 device driver parameters

The following table describes the NDIS 2 device driver parameters. For sample PROTOCOL.INI files, see Figure 3 on page 56 and Figure 4 on page 56.

Table 9. DOS and OS/2 NDIS device driver parameters in PROTOCOL.INI

Parameter	Explanation
NetAddress	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. 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). The universally administered address is the default value. That address appears on the adapter bracket. See Figure 2 on page 42 for an illustration. **Valid values:** ″400000000000″ to ″7FFFFFFFFFFF″ in hex
DataRate	Used for configuring the ring speed of the adapter. It is recommended for servers that the DataRate be set to M16 or M4, and clients be set to Auto. This parameter is ignored for 100 Mbps network operation. **Valid values:** **AUTO** AutoSense – automatic ring-speed detection. **Note:** The adapter will not function with AutoSense if it is the first one on the ring. AutoSense is not designed for changing ring speed while the adapter is operational. It is usually necessary to reload the driver. **M16** 16-Mbps ring-speed operation. **M4** 4-Mbps ring-speed operation. The default is AUTO.
EnableTxEofInt	This parameter specifies whether the Transmit End of Frame Interrupt is enabled. **Valid values:** **Yes** Indicates that the interrupt will be recognized by the interrupt handler. **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. The default is Yes.
MaxTransmits (OS/2 only)	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 adapter concurrently. **Valid values:** 1 to 128 The default is 31.

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Table 9. DOS and OS/2 NDIS device driver parameters in PROTOCOL.INI (continued)

Parameter	Explanation
MaxTxFrameSize (OS/2 only)	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: • The value of this MaxTxFrameSize parameter • Total Receive Buffer Area (see the MinRcvBuffs parameter) • The physical frame size capacity of the network (4500 bytes for 4-Mbps token rings and 18,200 bytes for 16-Mbps and 100-Mbps token rings) Do not count the 4 bytes of FCS defined for a frame when setting this parameter value. 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. **Note:** Some token-ring switches support a maximum frame size of 4500 bytes. **Valid values:** 14 to 18,000 The default is 4500.
MinRcvBuffs (OS/2 only)	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: Total Receive Buffer Area = MinRcvBuffs × RcvBuffSize **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 and 100-Mbps Token Rings). 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. **Valid values:** 1 to 512 The default is 20.
RcvBuffSize (OS/2 only)	This parameter specifies the size of each receive buffer. **Valid values:** 256 to 18 000 The default is 2252.
FullDuplex	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. **Valid values:** **Yes** Permits full-duplex operation. **No** Prohibits full-duplex operation. The default is Yes.

Table 9. DOS and OS/2 NDIS device driver parameters in PROTOCOL.INI (continued)

Parameter	Explanation
LoopBack	Determines whether or not the adapter will copy a frame that it is transmitting if the destination address is recognized by the adapter. **Valid values:** **Yes** Indicates that transmit frames whose destination is this adapter will be transmitted and then received by the adapter. **No** Indicates that transmit frames whose destination is this adapter must be looped back by the protocol stack. The default is No.
TxPriMax	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. **Valid values:** 0 to 6 The default is 6.
TxPriThresh	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. **Valid values:** 1 to 6 The default is 1.
LLCOnly	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, no MAC frames will be copied while in promiscuous copy mode. **Valid values:** **Yes** Copy only LLC frames. **No** Copy all frames on the ring. The default is No.
EOIDelay (OS/2 only)	This parameter should always be set to zero. It is intended for debug use. **Valid values**: 0 to 10 The default is 0.

Table 9. DOS and OS/2 NDIS device driver parameters in PROTOCOL.INI (continued)

Parameter	Explanation
RTSWMode (OS/2 only)	This parameter indicates whether the driver should enable code that attempts to send routable traffic directly to a destination rather than through the router. This can improve the performance of these connections and reduce the workload at the router. If the value is Disable, all routable frames will be sent through the router. **Valid values**: **Auto** Automatically determines whether to use Peer or Client mode. **Peer** Communicates with a peer destination station to establish a direct path. **Client** Uses an MSS server to determine the direct path. **Disable** Deactivates the route switching function for this adapter. The default is Disable.
RTSWTableSize (OS/2 only)	This parameter specifies the number of entries allowed in the route table for route switching support. This should be set equal to or greater than the number of remote stations that this station will send data to using routable frames (for example, TCP/IP). If it is set too low, some of the traffic that could be sent directly will instead be sent through the router. **Valid values**: 16, 32, 64, 128, 256, 512, 1024 The default is 16.
RTSWSubnetMask (OS/2 only)	This parameter contains a character string specifying the IP Subnet Mask for the IP subnet to which this adapter will attach. This value is entered as an IP dotted decimal value, for example, 255.255.255.0. This is a mandatory parameter when the RTSWMode parameter is set to Auto or Peer. **Valid values**: **xxx.xxx.xxx.xxx** A dotted-decimal IP network number (15 characters maximum). **Disable** When not in use. The default is Disable.
RTSWHoldingTime (OS/2 only)	This parameter specifies the Route Switching information holding time value. This determines how often a remote station must refresh its Route Switching information which pertains to this station. **Valid values**: 2 to 20 The default is 20.

Table 9. DOS and OS/2 NDIS device driver parameters in PROTOCOL.INI (continued)

Parameter	Explanation
TCPPortRangeN (OS/2 only)	This represents a set of parameters which designates the transmit frame priority value for a specified TCP port range. *N* is 1, 2, 3, 4, or 5. The format of this 9-digit hexadecimal string is: *PortNumber PortNumber PriorityValue* where each *PortNumber* is a four-character hex value and *PriorityValue* is a one-character hex value. The two *PortNumber* fields define a starting and ending value that make up a range, with the starting value less than or equal to the ending value. **Valid values**: **PortNumber** 0x0000 to 0xFFFF **PriorityValue** 1 to 6 There is no default for this parameter.
UDPPortRangeN (OS/2 only)	This represents a set of parameters which designates the transmit frame priority value for a specified UDP port range. N is 1, 2, 3, 4, or 5. The format of this 9-digit hexadecimal string is: *PortNumber PortNumber PriorityValue* where each *PortNumber* is a four-character hex value and *PriorityValue* is a one-character hex value. The two *PortNumber* fields define a starting and ending value that make up a range, with the starting value less than or equal to the ending value. **Valid values**: **PortNumber** 0x0000 to 0xFFFF **PriorityValue** 1 to 6 There is no default value for this parameter.

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

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

;Section B: NDIS Device Driver
[IBMTRP_NIF]
   Drivername = IBMTRP$
   NetAddress = "400000000000"
   DataRate = "M16"
   EnableTxEofInt = "Yes"
   FullDuplex = "Yes"
   TxPriMax = 6
   TxPriThresh = 1
   LLCOnly = "No"
```

Figure 3. Sample PROTOCOL.INI file for a DOS station configured for TCP/IP

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

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

;Section B: NDIS Device Driver
[IBMTRP_NIF]
   Drivername = IBMTRP$
   NetAddress = "400000000000"
   DataRate = "M16"
   EnableTxEofInt = "Yes"
   MaxTransmits = 31
   MaxTxFrameSize = 4500
   MinRcvBuffs = 20
   RcvBuffSize = 2252
   FullDuplex = "Yes"
   TxPriMax = 6
   TxPriThresh = 1
   LLCOnly = "No"
   EOIDelay = 0
   RTSWMode = "Disable"
   RTSWTableSize = 16
   RTSWSubnetMask = "Disable"
   RTSWHoldingTime = 20
```

Figure 4. Sample PROTOCOL.INI file for an OS/2 station configured for TCP/IP

Appendix C. NDIS 2 device driver messages

This appendix contains messages that can be received from the NDIS device driver. These messages can come from DOS and OS/2 message files. 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 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 adapter is incompatible with this driver version.

Explanation: The Revision ID of the 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 hardware and the device driver software.

User Action: Contact your support personnel for assistance. You might need to upgrade your 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 the correct value 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 MinRcvBuffs 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.

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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 restarting the computer to see if the problem is resolved. If so, 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: A hardware error was detected when opening the adapter for network operation.

User Action: Run the 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 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.

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.

This message is relevant for 4-Mbps or 16-Mbps operation only.

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 with having 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: A hardware error was detected when opening the adapter for network operation.

User Action: Run the 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: A hardware error was detected when opening the adapter for network operation.

User Action: Run the 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 connect 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.

This message is relevant for 4-Mbps or 16-Mbps operation only.

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.

LA10026 Unable to automatically change to *xx* Mbps operation. Please reboot the computer.

Explanation: The adapter attempted to open at one speed, but found the Token Ring operating at another speed. The configuration parameters used during initialization processing, notably the maximum frame size, preclude reliable operation at the new speed, so all additional attempts to open the adapter will be rejected. Rebooting the computer allows the new speed to be factored into the initialization processing without requiring a configuration change in most cases.

User Action: Shut down and restart the computer. Normally, no explicit configuration changes are required to begin operating at the current operational speed of the Token Ring. Optionally, you might be able to change the value of the configuration parameter that specifies the maximum frame size to a value of 4500 or less to eliminate the need to reboot the computer for a similar situation in the future.

LA10027 The adapter opened for token ring, *xx* Mbps., half duplex.

Explanation: Information only.

User Action: None.

LA10028 The 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 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 a 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 a 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 MinRcvBuffs 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.

LA10053E (DOS Only)
Device Driver could not initialize. Failure code: *xx*

Explanation: The device driver was not able to initialize itself. This is most often caused by conflicts between the device driver and other resources in the system.

User Action: Record this message number and the failure code and contact your support personnel for assistance.

LA10054E (DOS Only)
No adapters supported by %1 were found or adapters were not correctly configured by the machine and its BIOS.

Explanation: The device driver was not able to find any adapters that it knows about. Either the adapter is not installed in the computer, the adapter is malfunctioning, or the system BIOS has not correctly configured the adapter.

User Action: Record this message number and contact your support personnel for assistance.

LA10055E (DOS Only)
No adapters initialized correctly. *xx* adapters were found in the machine.

Explanation: The device driver was able to find the stated number of adapters. However, none of the adapters were successfully initialized. This message is often displayed along with one or more other messages from the device driver.

User Action: Record this message number as well as any other messages from the device drivers along with any specific failure codes in the messages and contact your support personnel for assistance.

Appendix D. Novell NetWare Server driver parameters

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

Table 10. Novell NetWare Server driver parameters

Parameter	Explanation
DATARATE=	Configures the token-ring data rate for the adapter. It is recommended for servers that the DATARATE be set to M16 or M4, and clients be set to AUTO. This parameter is ignored for 100-Mbps network operation. **Valid values:** **AUTO** AutoSense – automatic ring-speed detection. **Note:** The adapter will not function with AutoSense if it is the first one on the ring. AutoSense is not designed for changing ring speed while the adapter is operational. It is usually necessary to reload the driver. **M16** 16-Mbps ring speed operation. **M4** 4-Mbps ring speed operation. The default is AUTO. **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.
FRAME=	This string defines the frame type to be used with the adapter when loading the IBMTRPO LAN driver. Token-ring drivers can add most-significant bit (MSB) or least-significant bit (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). **Valid values:** TOKEN-RING or TOKEN-RING_SNAP The default is TOKEN-RING.
FULLDUPLEX=	This keyword permits the IBMTRPO LAN driver to activate token-ring full-duplex operation supported by the adapter and the NetWare server environment. **Valid values:** YES, NO The default is YES.

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Table 10. Novell NetWare Server driver parameters (continued)

Parameter	Explanation
NODE=	This keyword is used to set a locally administered address for the 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. 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. 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. **Notes:** 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 its memory.
RNICOPEN=	This is a Server environment only keyword parameter. The RNICOPEN keyword permits the adapter being controlled by the driver to function as a quick failover redundant adapter in conjunction with IBMRNIC.NLM. The required keyword value is used to specify the locally administered address to be used for this adapter in the redundant NIC pair. When the RNICOPEN keyword is specified, the adapter will not function until IBMRNIC.NLM is properly configured. Using this keyword causes the adapter to be controlled by IBMRNIC.NLM; it will NOT function as one would normally expect. Do NOT enable this keyword parameter without consulting the "Redundant NIC" chapter of the *Token-Ring Adapter Features* document. **Valid values:** A locally administered address containing 12 hexadecimal characters specified in most-significant bit (MSB) format. The value must be within the range X'400000000000' to X'7FFFFFFFFFFF' (for example, X'400000000002'). Use a configuration NLM (NWCONFIG or INSTALL) to assist with the correct usage of this parameter. The same Failover address must be specified for both adapters in a redundant NIC pair. This parameter is disabled by default.
RXBUFFERS=	This keyword defines the number of receive buffers used by the IBMTRPO LAN driver. **Valid values:** 4 to 64 The default is 32. For IBM LAN Client, the default is 4. **Note:** Receive buffer size is defined by the server SET command. Refer to your Novell NetWare system administration documentation for more information.
SLOT=	This keyword defines the slot number of the corresponding 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 NIC if you are using more than one.

Table 10. Novell NetWare Server driver parameters (continued)

Parameter	Explanation
STANDBY	This is a Server environment only keyword parameter. The STANDBY keyword prohibits the adapter from opening on the ring and should only be used in conjunction with IBMRNIC.NLM. When the STANDBY keyword is specified, the adapter will not function until an IBMRNIC failover event occurs to this adapter. Enable Standby for the secondary adapter of a Redundant NIC adapter pair where both adapters are using Standard Failover mode. Do NOT enable this keyword parameter without consulting the "Redundant NIC" chapter of the *Token-Ring Adapter Features* document. **Valid values:** There are no values associated with this keyword. Use a configuration NLM (NWCONFIG or INSTALL) to assist with the correct usage of this parameter. This parameter is disabled by default.
TXBUFFERS=	This keyword defines the number of transmit buffers used by the IBMTRPO LAN driver. **Valid values:** 1 to 16 The default is 16. **Note:** Maximum transmit frame size is defined by the server SET command. Refer to your Novell NetWare system administration documentation for more information.
TXPRIMAX=	Priority Transmit Maximum Level. This parameter permits the driver to set the maximum priority level that the adapter will accept. If any frame is queued for transmission at a priority level higher than this, it will be transmitted at this level. **Valid values**: 0-6 The default is 6.
TXPRITHRESH=	Priority Transmit Threshold. This parameter permits the driver to set the threshold for priority transmits. An IBM Token-Ring PCI Family Adapter has two transmit channels. All frames with priority level 0 through this threshold will be transmitted over the low priority channel. All frames with a priority level greater than this threshold up to the maximum will be transmitted over the high priority channel. **Valid values**: 1-6 The default is 1.
RT=	Route Switching Mode. This parameter indicates whether the driver should enable code that attempts to send routable traffic directly to a destination rather than through the router. This can improve the performance of these connections and reduce the workload at the router. If the value if Disable, all routable frames will be sent through the router. **Valid values**: **A** Automatically determines whether to use Peer or Client mode. **P** Communicates with a peer destination station to establish a direct path. **C** Uses an MSS server to determine the direct path. **D** Deactivates the route switching function for this adapter. The default is Disable.

Table 10. Novell NetWare Server driver parameters (continued)

Parameter	Explanation
RTTS=	Route Switching Table Size. This parameter specifies the number of entries allowed in the route table kept for Route Switching support. This should be set equal to or greater than the number of remote stations this station will send data to using routable IP frames. If it is set too low, some of the traffic that could be sent directly will instead be sent through the router. **Valid values**: 16-1024 The default is 1024.
RTSM=	Route Switching IP Subnet Mask. This parameter contains a character string specifying the IP subnet mask for the IP subnet to which this adapter will attach. This value is entered as an IP dotted-decimal value (for example, 255.255.255.0). This is a mandatory parameter when the RTSWMode parameter is set to Auto or Peer. **Valid values**: *xxx.xxx.xxx.xxx* A dotted-decimal IP network number (15 characters maximum). **Disable** When not in use. The default is Disable.
RTHT=	Route Switching Holding Time. This parameter specifies the Route Switching information holding time value. This determines how often a remote station must refresh its Route Switching information which pertains to this station. **Valid values**: 2 to 20 The default is 20.
TPRn=	TCP Port Range. This represents a set of parameters which designate the transmit frame priority value for a specified TCP port range. n is 1, 2, 3, 4, or 5. The format of this 9-digit hexadecimal string is: PortNumber PortNumber PriorityValue where each PortNumber is a four-character hex value and PriorityValue is a one-character hex value. The two PortNumber fields define a starting and ending value that make up a range, with the starting value less than or equal to the ending value. **Valid values**: **PortNumber** 0x0000 to 0xFFFF **PriorityValue** 1 to 6 There is no default for this parameter.

Table 10. Novell NetWare Server driver parameters (continued)

Parameter	Explanation
UPRn=	UDP Port Range. This represents a set of parameters which designate the transmit frame priority value for a specified UDP port range. n is 1, 2, 3, 4, or 5. The format of this 9-digit hexadecimal string is: PortNumber PortNumber PriorityValue where each PortNumber is a four-character hex value and PriorityValue is a one-character hex value. The two PortNumber fields define a starting and ending value that make up a range, with the starting value less than or equal to the ending value. **Valid values**: **PortNumber** 0x0000 to 0xFFFF **PriorityValue** 1 to 6 There is no default for this parameter.

Appendix E. Novell NetWare Server messages

IBMTRPO-xx-202:
The adapter UAA (BIA) is *xxx*.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-203:
The adapter is using an LAA of *xxx*.

Explanation: Information only.

User Action: None.

IBMTRPO-xx-204:
Revision level *xxx* of the adapter is incompatible with this driver version.

Explanation: The Revision ID of the 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 hardware and the device driver software.

User Action: Contact your customer service center for assistance. You might need to upgrade your 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 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 reload 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 resting the computer to see if the problem is resolved. If so, 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

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

User Action: Run the diagnostics program. See “Running adapter diagnostics” on page 40.

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 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-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.

This message is relevant for 4-Mbps and 16-Mbps operation only.

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

User Action: Run the diagnostics program. See “Running adapter diagnostics” on page 40.

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

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

User Action: Run the diagnostics program. See “Running adapter diagnostics” on page 40.

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

Explanation: The 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 installation instructions for additional information on setting the DataRate parameter.

This message is relevant for 4-Mbps and 16-Mbps operation only.

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-226:
Unable to automatically change to *xx* Mbps operation. Please reboot the computer.

Explanation: The adapter attempted to open at one speed, but found the Token Ring operating at another speed. The configuration parameters used during initialization processing, notably the maximum frame size, preclude reliable operation at the new speed, so all additional attempts to open the adapter will be rejected. Rebooting the computer allows the new speed to be factored into the initialization processing without requiring a configuration change in most cases.

User Action: Shutdown and restart the computer. Normally, no explicit configuration changes are required to begin operating at the current operational speed of the Token Ring. Optionally, you might be able to change the value of the configuration parameter that specifies the maximum frame size to a value of 4500 or less to eliminate needing to reboot the computer for a similar situation in the future.

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

Explanation: Information only.

User Action: None.

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

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 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.

IBMTRPO-xx-315:
Rnicopen keyword was ignored. Update your microcode level with the flash utility tool.

Explanation: The microcode level present on the identified hardware does not support the Quick Failover function of IBMRNIC.NLM.

User Action: Using the flash update tool, update your NIC's microcode level to a more recent version.

IBMTRPO-xx-316:
The RNICOPEN locally administered address is invalid and was ignored.

Explanation: A valid locally administered address keyword value was not specified for the RNICOPEN keyword parameter.

User Action: Use NWCONFIG or INSTALL to consult the RNICOPEN keyword help to determine what are valid locally administered addresses.

Appendix F. Novell NetWare DOS ODI driver parameters

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

Table 11. DOS and OS/2 Configurable Driver Parameters in the NET.CFG file.

Parameter	Explanation
FRAME	This keyword defines the frame type used with the adapter. **Valid values:** • TOKEN-RING MSB • TOKEN-RING LSB • TOKEN-RING_SNAP MSB • TOKEN-RING_SNAP LSB The default value is TOKEN-RING MSB.
NODE ADDRESS	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 most-significant bit (MSB), which is the default, or least-significant bit (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. If a node address is specified in MSB format, the characters must be within the range X'400000000000'–X'7FFFFFFFFFFF'. To specify a node address in MSB format, append an “M” to the end of the address (for example, 400000000001M). This address specified in LSB format would be X'020000000080L'. **Attention** 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. **Note:** 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 adapter. See Figure 2 on page 42 for an illustration.
SLOT	This keyword defines the slot number of the corresponding adapter in the computer. Slots must be assigned sequentially. This assignment is used to avoid conflict with other adapters. **Valid values:** 10001 or 10002 The default value is 10001.

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Table 11. DOS and OS/2 Configurable Driver Parameters in the NET.CFG file. (continued)

Parameter	Explanation
DATARATE	This keyword defines the data-rate setting for the adapter. It is recommended that clients be set to AUTO. This keyword is ignored for 100-Mbps network operation. **Valid values:** **AUTO** AutoSense – automatic ring-speed detection. **Note:** The adapter will not function with AutoSense if the adapter is the first one on the ring. AutoSense is not designed for changing ring speed while the adapter is operational. It is usually necessary to reload the driver. **M16** 16-Mbps ring-speed operation. **M4** 4-Mbps ring-speed operation. The default value is AUTO.
RXBUFFERS	This keyword defines the number of receive buffers used by the driver. **Valid values:** 9 to 64 The default value is 16.
TXBUFFERS	This keyword defines the number of transmit buffers used by the driver. **Valid values:** 1 to 3 The default value is 1.
FULLDUPLEX	This keyword influences whether a full-duplex network connection will be requested by the adapter. **Valid values:** NO, YES The default value is YES.

Appendix G. Notices

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Safety Information

Danger: Before you begin to install this product, read the safety information in *Caution: Safety Information—Read This First*, SD21-0030. This booklet describes safe procedures for cabling and plugging in electrical equipment.

خطـــر: قبـــل عمـــلية بـــدء تركيـــب هذا المنتـــج، قم بقراءة معلومـــات الحمـــاية الموجودة في التحذيـــر: معلومـــات الحمـــاية – Read This First، SD21-0030 . يقـــوم هذا الكتيـــب بوصـــف اجـــراءات الآمـــان لتوصـــيل الأدوات الكـــهربائية بالكـــابلات والمقبـــس الكـــهربائـــي.

Gevaar: Voordat u begint met de installatie van dit produkt, moet u eerst de veiligheidsinstructies lezen in de brochure *PAS OP! Veiligheidsinstructies—Lees dit eerst,* SD21-0030. Hierin wordt beschreven hoe u electrische apparatuur op een veilige manier moet bekabelen en aansluiten.

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.

危險：安裝本產品之前， 請先閱讀 "Caution: Safety Information--Read This First" SD21-0030 手冊中所提供的安全注意事項。 這本手冊將會說明使用電器設備的纜線及電源的安全程序。

Opasnost: Prije nego sto počnete sa instalacijom produkta, pročitajte naputak o pravilima o sigurnom rukovanju u Upozorenje: Pravila o sigurnom rukovanju - Prvo pročitaj ovo, SD21-0030. Ovaj privitak opisuje sigurnosne postupke za priključrivanje kabela i priključivanje na električno napajanje.



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.



Fare! Før du installerer dette produkt, skal du læse sikkerhedsforskrifterne i *NB: Sikkerhedsforskrifter—Læs dette først* SD21-0030. Vejledningen beskriver den fremgangsmåde, du skal bruge ved tilslutning af kabler og udstyr.



Gevaar Voordat u begint met het installeren van dit produkt, dient u eerst de veiligheidsrichtlijnen te lezen die zijn vermeld in de publikatie *Caution: Safety Information - Read This First*, SD21-0030. In dit boekje vindt u veilige procedures voor het aansluiten van elektrische appratuur.



VAARA: Ennen kuin aloitat tämän tuotteen asennuksen, lue julkaisussa *Varoitus: Turvaohjeet—Lue tämä ensin*, SD21-0030, olevat turvaohjeet. Tässä kirjasessa on ohjeet siitä, miten sähkölaitteet kaapeloidaan ja kytketään turvallisesti.



Danger : Avant d’installer le présent produit, consultez le livret *Attention : Informations pour la sécurité — Lisez-moi d’abord*, SD21-0030, qui décrit les procédures à respecter pour effectuer les opérations de câblage et brancher les équipements électriques en toute sécurité.



Vorsicht: Bevor mit der Installation des Produktes begonnen wird, die Sicherheitshinweise in *Achtung: Sicherheitsinformationen—Bitte zuerst lesen,* IBM Form SD21-0030 lesen. Diese Veröffentlichung beschreibt die Sicherheitsvorkehrungen für das Verkabeln und Anschließen elektrischer Geräte.



Κίνδυνος: Πριν ξεκινήσετε την εγκατάσταση αυτού του προϊόντος, διαβάστε τις πληροφορίες ασφάλειας στο φυλλάδιο *Caution: Safety Information-Read this first,* SD21-0030. Στο φυλλάδιο αυτό περιγράφονται οι ασφαλείς διαδικασίες για την καλωδίωση των ηλεκτρικών συσκευών και τη σύνδεσή τους στην πρίζα.



סכנה: לפני שמתחילים בהתקנת מוצר זה, יש לקרוא את הוראות הבטיחות בחוברת
Caution: Safety Information - Read This First, SD21-0030
חוברת זו מתארת את הוראות הבטיחות לחיבור הכבלים ולחיבור לחשמל של ציוד חשמלי.



Vigyázat: Mielôtt megkezdi a berendezés üzembe helyezését, olvassa el a *Caution: Safety Information— Read This First,* SD21-0030 könyvecskében leírt biztonsági információkat. Ez a könyv leírja, milyen biztonsági intézkedéseket kell megtenni az elektromos berendezés huzalozásakor illetve csatlakoztatásakor.



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.



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。
この小冊子は、電気機器の安全な配線と接続の
手順について説明しています。



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



ОПАСНОСТ
Пред да почнете да го инсталирате овој продукт, прочитајте
ја информацијата за безбедност:
"Предупредување: Информација за безбедност: Прочитајте го
прво ова", SD21-0030.
Оваа брошура опишува безбедносни процедури за каблирање
и вклучување на електрична опрема.



Fare: Før du begynner å installere dette produktet, må du lese sikkerhetsinformasjonen i *Advarsel: Sikkerhetsinformasjon — Les dette først*, SD21-0030 som beskriver sikkerhetsrutinene for kabling og tilkobling av elektrisk utstyr.



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.



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.



ОСТОРОЖНО: Прежде чем инсталлировать этот продукт, прочтите Инструкцию по технике безопасности в документе "Внимание: Инструкция по технике безопасности -- Прочесть в первую очередь", SD21-0030. В этой брошюре описаны безопасные способы каблирования и подключения электрического оборудования.



Nebezpečenstvo: Pred inštaláciou výrobku si prečítajte bezpečnosté predpisy v
Výstraha: Bezpeč osté predpisy - Prečítaj ako prvé,
SD21 0030. V tejto brožúrke sú opísané bezpečnosté postupy pre pripojenie elektrických zariadení.



Pozor: Preden zaènete z instalacijo tega produkta preberite poglavje: 'Opozorilo: Informacije o varnem rokovanju-preberi pred uporabo," SD21-0030. To poglavje opisuje pravilne postopke za kabliranje,

 **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.

 **Varning — livsfara:** Innan du börjar installera den här produkten bör du läsa säkerhetsinformationen i dokumentet *Varning: Säkerhetsföreskrifter— Läs detta först,* SD21-0030. Där beskrivs hur du på ett säkert sätt ansluter elektrisk utrustning.



危險：

開始安裝此產品之前，請先閱讀安全資訊。

注意：

請先閱讀 - 安全資訊 SD21-0030

此冊子說明插接電器設備之電纜線的安全程序。

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 for STP Media

The following notices for STP media apply to the IBM 16/4 Token-Ring PCI Management Adapter (PN 34L5001) when using shielded twisted-pair cable media or when using unshielded twisted-pair cable and a shielded power cord.

Federal Communications Commission (FCC) Statement

IBM 16/4 Token-Ring PCI Management Adapter (PN 34L5001)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 or 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
New Orchard Road
Armonk, NY 10504
Telephone: 1-919-543-2193

Tested to Comply
With FCC Standards

FOR HOME OR OFFICE USE

Industry Canada Class B Emission Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Avis de conformité aux normes d'Industrie Canada

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du 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 Verträeglichkeit (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,
Scotland PA16 0AH.

Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse B.

Japanese Voluntary Control Council for Interference (VCCI) Statement

This product is a Class B Information Technology Equipment and conforms to the standards set by the Voluntary Control Council for Interference by Technology Equipment (VCCI). This product is aimed to be used in a domestic environment. When used near a radio or TV receiver, it may become the cause of radio interference. Read the instructions for correct handling.

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
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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。

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 83 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 87 to attach your PC to the AC outlet. Otherwise, the following statements apply for this adapter.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 or the FCC Rules. These limits are design 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. 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 Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité aux normes d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du 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.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (bzw. der EMC EG Richlinie 89/336).

Dieses Gerät ist berechtigt in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die IBM Deutschland Informationssysteme GmbH, 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 3 Abs. (2) 2:

Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse A.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: “Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.”

EN 50082-1 Hinweis: “Wird dieses Gerät in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrößern.”

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den IBM Handbüchern angegeben, zu installieren und zu betreiben.

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.

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Power Cord Notices for UTP Media

When using the 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 at your local electronic distributors. IBM makes the shielded power cord PN 6952304 available through your IBM Marketing Representative for use at 115 volts in the United States and Canada. If purchasing other than the IBM PN, 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 PN 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 12. 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
13F9988	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, Chech 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 usage) 1838579 (230v usage)	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican 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

Taiwanese Emission Notice for All Cable Types

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HOST PROGRAM means that portion of the NetWare network operating system that executes on the Network Host or Network Server

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

NLM PROGRAM OR VAP PROGRAM means an application program that executes under control of the NetWare network operating system on the Network Host or Network Server

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Glossary

The following symbols are used in this glossary:

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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.

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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. 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.

wire fault. An error condition caused by a break or a short circuit in the cable segment that connects the adapter port to its access unit.

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