Network Interface Board
Owner's Manual

This manual provides a description of the Network Interface Board for use in Novell NetWare®, AppleTalk™, and TCP/IP networks.

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Conventions used in this manual

Convention	Description
Italic type	Indicates placeholders where you specify a value, such as a file name, address, or other value. Italics are also used for book titles and cross-references to other chapters or sections of this manual.
Bold type	Indicates specific choices within instructions or procedures, such as keys, buttons, or other dialog box options. For example: Click on **Software Installation**.
Choose **File -> Open**	Indicates a menu selection (such as choosing the **Open** command from the **File** menu).
`monospace bold type`	Indicates file names, path names, and so on. Code examples are also shown in a monospace font.
Press **Enter**	On some keyboards, the **Enter** key is marked **Return**. (Similarly, some keyboards may use different key labels such as **Esc** or **Escape**.) Unless it is otherwise noted, you terminate all typed commands (such as in a DOS command box) by pressing **Enter** or **Return**.

Acronyms used in this manual

Acronym	Meaning
`arp`	Address Resolution Protocol
DIB	Directory Information Base
DHCP	Dynamic Host Configuration Protocol
ESD	Electrostatic Discharge
FTP	File Transfer Protocol
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
IP	Internet Protocol
IPP	Internet Printing Protocol

Acronym	Meaning
IPX	Internetwork Packet Exchange
MAP	Management Access Program
MIB	Management Information Base
NIC	Network Interface Card
NDS	NetWare Directory Services
NOS	Network Operating System
PCL	Printer Control Language
PDS	Print Device Subsystem
PPD	PostScript Printer Driver
`rarp`	Reverse Address Resolution Protocol
SAP	Service Advertising Protocol
SMIT	System Management Interface Tool
SNMP	Simple Network Management Protocol
SPX	Sequenced Packet Exchange
STP	Shielded Twisted Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UTP	Unshielded Twisted Pair

Structure of this manual

- Chapter 1, *Introduction*, contains information about the Network Interface Board, its features, and the hardware and NOS requirements.
- Chapter 2, *Installing the Network Interface Board*, explains how to install the card.
- Chapter 3, *Monitoring the Network Interface Board*, explains how to use the Management Access Program (MAP) or a Web browser to configure and monitor the Network Interface Board.
- Chapters 4 through 7 explain how to configure the Network Interface Board for specific environments.
- Chapter 8, *Operation and Troubleshooting*, contains information on the LED status indicators, printing status reports, and resetting the print server to factory defaults. It also contains troubleshooting checklists.
- Appendix A, *Jumper Settings*, describes the jumper settings and locations.
- Appendix B, *Network Interface Board Specifications*, lists the general specifications for the Network Interface Board, including the specifications for the 10/100BaseT cables.

Table of Contents

Chapter 5 Windows Peer-to-Peer Printing

Chapter 6 AppleTalk Configuration

Chapter 7 TCP/IP Configuration

Chapter 8 Operation and Troubleshooting

Chapter 1
Introduction

The Network Interface Board is a Network Interface Controller that you install into compatible printers to provide Ethernet® network connectivity.

This chapter describes:

- Network Interface Board features
- Contents of the Network Interface Board package
- Hardware and NOS requirements

1.1 Network Interface Board Features

The Network Interface Board has the following features:

- Automatic selection of 100BaseT Fast Ethernet connection or 10BaseT Ethernet connection
- Fully-transparent AppleTalk™ printing support for Macintosh™ systems
- IP Peer-to-Peer (serverless) discovery and printing from Microsoft® Windows™ 95/98/Me or Windows NT™ 4.0 workstations
- IPX Peer-to-Peer (serverless) discovery and printing from Windows 95/98/Me workstations, without a Novell® file server present and without using IP
- Novell NetWare® PSERVER on Bindery based configurations and Novell Directory Services (NDS)
- **lpr**/**lpd** over TCP/IP for UNIX™-based systems and Windows systems
- IP and IPX Simple Network Management Protocol (SNMP) support of Management Information Base-2 (MIBII) and proprietary NIC-MIB
- SNMP support of standard MIB, MIBII, proprietary NIC-MIB, and proprietary printer MIBs on compatible printers
- Integral HTTP server to allow monitoring and management of your Network Interface Board from a Web browser such as Internet Explorer or Netscape® Navigator, Communicator
- Management Access Program (MAP) to allow Windows-based HTML viewing for monitoring and managing your Network Interface Board

- FTP printing directly from a Web browser or other FTP client

1.2 Network Interface Board Package Contents

The Network Interface Board package contains the following:

- Network Interface Board
- CD-ROM containing:
  - This manual
  - MAP
  - IPX Peer-to-Peer Windows Redirector
  - IP Peer-to-Peer Windows Redirector
  - NWSetup Utility

Check each directory for a **README** file containing the latest information about the installation and operation. Read these files before installing.

Note: Each Network Interface Board has a unique six-digit serial number with a three-letter prefix — for example, "RDP". The serial number is listed on the bottom of the Network Interface Board and displayed on the box.

1.3 Hardware and NOS Requirements

The Network Interface Board hardware and software require the following:

Version of protocol or NOS

- Novell NetWare Version 3.*x* (or higher), 4.*x*, or 5.*x*
- Apple Macintosh System 8.*x* or 9.*x*.
- UNIX, Windows, or LAN Server systems supporting **`lpr`** over TCP/IP
- Sun™ Solaris™ 2.5.1 or 2.6, 7, 8
- Hewlett Packard HP-UX™ 8.x, 9.x, 10.x, 11.0
- RED HAT Linux 6.2

Software

- NetWare printing requires NetWare Capture, NPRINT, and either PCONSOLE (later than 1.0) or NWADMIN.
- NWSetup requires Windows 95/98/Me, Windows2000 or Windows NT 4.0 and the Novell 32-bit client.
- The IP Peer-to-Peer utility requires Windows 95/98/Me or Windows NT 4.0.
- The IPX Peer-to-Peer utility requires Windows 95/98/Me.
- The MAP utility requires Windows 95/98/Me, Windows 2000 or Windows NT 4.0. MAP also requires a Web browser such as Internet Explorer or Netscape Navigator, Communicator.
- AppleTalk printing requires the appropriate PostScript® Printer Description (PPD) for the printer.
- TCP/IP setup and maintenance can be done with Telnet. To monitor and maintain with HTTP requires a Web browser.

Hardware

- Support for 10 Mbps Ethernet networks: 10BaseT (twisted pair) cables and hardware

- Support for 100 Mbps Ethernet networks: 100BaseT (twisted pair) cables and hardware
- CD-ROM drive on the workstation to accept Windows, Macintosh, or UNIX-based utilities

Chapter 2
Installing the Network Interface Board

This chapter describes:

- Installing an Network Interface Board in your printer
- Connecting the Network Interface Board to an Ethernet network
- Powering up the printer

2.1 Installing an Network Interface Board in Your Printer

1. Before installing the board, generate a printer status or test page, if possible.

   This gives you detailed information on the identification and configuration of your printer, and ensures the printer is set up and operating properly.
2. Make sure the printer is operating properly, there is paper in the paper tray, and the toner bottle is setting correctly.
3. Turn off the printer and remove the power cord.
4. Install the Network Interface Board in the option port, according to the printer manufacturer's instructions.

Note: The Network Interface Board is designed to protect sensitive components from damage due to electrostatic discharge during normal operation. When installing the card, however, take proper static-control precautions to prevent damage to equipment.

2.2 Connecting the Network Interface Board to an Ethernet Network

Connect the Network Interface Board to your Ethernet network using the 10BaseT or 100BaseT Ethernet interface. This network connection uses a 4-wire RJ cable to plug into the RJ45 network connector on the Network Interface Board. For a description of the signals, see *Appendix B, Network Interface Board Specifications*.

2.3 Powering up the Printer

1. Plug in the power cord.
2. Turn on the power and wait for the printer to warm up.

   The printer may print a status or start-up page if this option is not disabled.

   The Network Interface Board then sends a print job to the printer that contains the Network Interface Board status information. For more information, see *Section 8.2 Status Report*.
3. Check the Network Interface Board status report. Record the serial number (six digits with a three-letter prefix) and the network address or save the status report.

   You need this information when you configure the printer for your network.

Refer to the chapters relevant to your particular network setup for instructions on configuring the network for the Network Interface Board.

Chapter 3
Monitoring the Network Interface Board

This chapter describes:

- Overview of the Management Access Program (MAP)
- MAP requirements
- Where to install MAP
- Installing MAP in Windows 95/98/Me, Windows 2000 or Windows NT
- Using MAP to monitor and maintain the Network Interface Board
- Using a Web browser to monitor and maintain the Network Interface Board

3.1 MAP Overview

The Management Access Program (MAP) provides a Windows-based HTML viewer linked to a proprietary bi-directional IPX/IP channel program to allow access to the Network Interface Board's HTML pages for monitoring and maintenance capabilities.

Using MAP lets you:

- Configure your network protocols for the Network Interface Board
- Reset the Network Interface Board remotely or return it to its factory default settings
- Troubleshoot problems in the Network Interface Board
- Enable or disable the status sheet printout
- Access a context-sensitive help menu that explains how to use each Network Interface Board HTML feature

You can also access the monitoring and maintenance capabilities by using a Web browser such as Internet Explorer or Netscape Navigator. The Network Interface Board must have an IP address for access with a Web browser.

Note: To change parameter values with MAP or with a Web browser, you must know the Network Interface Board management password. The factory default password is

`sysadm`.

3.2 MAP Requirements

To use MAP, your workstation must have the following installed:

- Microsoft TCP/IP protocol

  It is not necessary for the network to support TCP/IP. However, the TCP/IP protocol must be installed even if the network does not support it.
- A Web browser — such as Internet Explorer or Netscape Navigator
- IPX — if you want to use the IPX search functions

  Both the Microsoft standard stacks and Novell 32-bit stacks are supported.

3.3 Installing MAP

You can install MAP on any workstation hard drive or network drive.

To install MAP:

1. Put the supplied CD-ROM into the CD drive of your workstation.
2. Choose **Start> Run**.
3. Type the following command and click **OK**:

   ***drive*:\MAP\SETUP.EXE**

   where *drive* is your CD drive.
4. Read the information in the MAP installation notes.
5. At the prompt “Do you wish to install MAP?,” click **Yes**.
6. Select a destination directory for the program (default is **C:\Program Files\MAP**) and click **Next**.
7. Select a program folder (default is MAP) and click **Next**.

Note: You cannot use MAP with Windows 3.1.

3.4 Monitoring with MAP

1. To start MAP on your workstation, choose **Start -> Map -> Map**.

   MAP lists IP print servers by their IP address and lists IPX print servers by their SAP identification.

2. Select the print server you want to access.

   MAP sets up a link to the print server and obtains its HTML page.

3.5 Monitoring with a Web Browser

Once you have assigned an IP address to your Network Interface Board, you can use a Web browser, such as Netscape Navigator or Internet Explorer, to view the Network Interface Board HTML pages for monitoring and maintenance as follows:

1. In your Web browser, choose **File -> Open**.
2. Enter the IP address of the Network Interface Board and click **OK**.

   For example:

   `http://192.9.200.200`

   The HTTP Server screen opens.

If you have problems, make sure you are using the correct IP address.

Chapter 4
NetWare Configuration

This chapter describes configuring the Network Interface Board as follows:

- Using PCONSOLE with NetWare 3.*x*
- Using PCONSOLE with NetWare 4.*x* Bindery Services (there is no bindery function in Version 5.*x*)
- Using NWADMIN with NetWare 4.*x* and 5.*x* Directory Services
- Using MAP or a Web browser to access parameters for NetWare
- Using standard NW Setup utilities to change the configuration

Note: These instructions assume that your NetWare environment is set up correctly according to the Novell documentation.

4.1 Configuring NetWare 3.*x*

Before configuring NetWare, use MAP or a Web browser to determine if the Network Interface Board has the name you want — either the default name or a user-defined name. See Chapter 3, *Monitoring the Network Interface Board*.

Note: Novell recommends upgrading to 4.2 and no longer supports versions lower than 3.2.

The general procedure for configuring the Network Interface Board for NetWare is as follows. Refer to the relevant sections in this chapter for detailed information.

- Using PCONSOLE, select the file server you want to use
- Create the print queues
- Specify the Network Interface Board as a print server
- Configure the print server and printer
- Assign the print queues
- Set Notify options

Note: You must have supervisor privileges to configure the queue. When you are finished, turn the printer off and on again. The printer prints a status page that lists the file servers attached to the unit and the queues it services.

Before you begin:

- Verify that you have supervisor privileges on the file servers on which you are entering the Network Interface Board print server and queue.
- Verify that your version of PCONSOLE is later than 1.0.

4.1.1 Using PCONSOLE to Select a File Server

1. Log in as a supervisor or `ADMIN`.
2. At the command prompt, enter the **PCONSOLE** command.
3. Choose **Change Current File Server** from the Available Options menu.

   A list of file servers is displayed.
4. Select the file server on which you want to install the print server.

   If the name of the file server you want is not displayed, type **h** to display a list of file servers.
5. Log in to the file server.
6. Press the **Esc** key to return to the Available Options menu.

4.1.2 Creating Print Queues

A print server takes the print jobs from queues and sends them to the printer. The print server must be assigned to at least one print queue on the file server.

If the print queue that you want the Network Interface Board to service already exists, and you know the name of this queue, refer to *Section 4.1.3 Entering the Print Server Name.*

If you do not know the name of the queue or it does not exist, create a queue.

To create a queue:

1. In PCONSOLE, choose **Print Queue Information** from the Available Options menu.

   A list of existing queues is displayed.
2. Press the **Insert** key.
3. Enter the name of the queue.

4. Press the **Esc** key to return to the Available Options menu.

4.1.3 Entering the Print Server Name

1. In PCONSOLE, choose **Print Server Information** from the Available Options menu.

   A list of existing print servers is displayed.

2. Press the **Insert** key.

   The New Print Server Name box is displayed.

3. Enter the name of the print server.

   On the printer status sheet, the print server name will appear under NetWare information. The default name is the Network Interface Board serial number (six digits with a three-letter prefix).

Note: You can change the print server name using the MAP utility or a Web browser. See Chapter 3, *Monitoring the Network Interface Board*.

4.1.4 Configuring the Print Server

1. In PCONSOLE, choose the print server name from the Print Servers list.

   The Print Server Information menu is displayed.

2. Choose **Print Server Configuration** from the menu.

3. Choose **Printer Configuration**.

   The Configured Printers menu appears. Since this is a new Print Server entry, all printers are labeled “Not Installed.”

4. Choose **Printer 0**.

   The Printer 0 Configuration screen appears with a title of "Printer 0."

5. To change the name that the print server uses in its messages in the Notify list to users, select **Name** and enter a name.

   This name helps you identify the printer — for example, `LASER_PRINTER`.

6. Choose **Type**.

   A list of printer types is displayed.

   In the list of printer types, choose **Remote Other/Unknown**.

   This creates default entries in the other fields. These defaults are usually optimal, so do not change them without specific knowledge of the effects.

7. Press the **Esc** key and save your changes. Then continue to press **Esc** to return to the Print Server Configuration menu. If you have finished the configuration, save your changes and exit from PCONSOLE.

4.1.5 Assigning Print Queues to the Printer

When you assign queues to the defined printer, you authorize the print server to service these queues.

Note: Do not assign the same queue to two different print servers. If a queue is assigned to multiple print servers, print jobs might not go to the intended printer.

To assign print queues to the printer:

1. In PCONSOLE, choose **Queues Serviced By Printer** from the Print Server Configuration menu.

2. Choose the printer name from the list of defined printers.

   The Available Queues list for the printer is displayed.

3. Choose the queue you want and then assign a priority level from 1 to 10 (where 1 is the highest priority. It is also the default).

   The queue is displayed on the list for the printer.

   You can press **Enter** again to assign additional queues.

4. When you finish assigning queues, press the **Esc** key and save your changes. Then continue to press **Esc** to return to the Print Server Configuration menu. If you have finished the configuration, save your changes and exit from PCONSOLE.

4.1.6 Setting Up Notify Options for the Printer

You can specify users or groups of users that are notified if a problem occurs when a print job is sent to the printer. The print server supports the enhanced Notify options for printers, including informing users when the printer —

- Is off-line, jammed, opened, or out of paper
- Requires a manual paper feed or a form change
- Has had an engine failure

If the print server services queues on multiple file servers, you must set up a Notify list for each file server.

To configure the Notify options:

1. In PCONSOLE, choose **Notify List for Printer** on the Print Server Configuration menu.
2. Choose the printer from the Defined Printers list.
3. Press **Enter** to view a list of Notify Candidates.
4. Select the user or group from the list.
5. Set the First and Next intervals in the Notify Intervals screen by entering a number for each interval.

   The First interval is the number of seconds the network waits before it notifies candidates about a print job problem. The Next interval specifies how often, in seconds, candidates are notified.
6. After entering the intervals, press the **Esc** key and save your changes. Then continue to press **Esc** to return to the Print Server Configuration menu. If you have finished the configuration, save your changes and exit from PCONSOLE.

4.1.7 Installing the Print Server on Multiple File Servers

To install the print server on more than one file server, perform the procedures described in sections 4.1.1 through 4.1.6 for each file server. You must use the same name and password (or no password) on all file servers. You can set the password for the Network Interface Board using MAP (see *Section 4.3 Configuring the Network Interface Board*). If you use a password, specify it on each file server using the Change Password option on the Print Server Information menu of the PCONSOLE utility.

A ***hop*** is an intermediate connection in a string of connections linking two network devices. For example, on a network, some data packets must go through several routers before reaching their final destination. Each time a packet is forwarded to the next router,

a hop occurs. The more hops, the longer it takes the data to go from the source to the destination.

A ***tick*** is 1/100 of a second for the Network Interface Board (Novell has a different value). ***Propagation delay*** is the time it takes for the data to travel through the network, from the source to the destination.

At startup, the Network Interface Board automatically searches for and attaches to the file servers that are no more than four hops away and that have no more than eight ticks propagation delay. For extremely large or complex networks, this allows a bounded search time on startup.

If the print server must attach to file servers beyond this range, or if you want to accelerate start up by eliminating the need to search all file servers within the four hops/eight ticks radius, enter the name of the file server operating with the print server in the Print Server Configuration of a ***primary file server***. The primary file server is a server close to the printer and contains a list of file servers that it services. The primary file server can be any file server within the four hops/eight ticks propagation time limits but ideally is as close as possible to the print server. Once the print server locates the primary file server and the list of file servers to be serviced, the automatic search stops and the print server goes directly to those file servers listed (and to no others).

4.1.8 Setting Up a Primary File Server

1. Log in to the server you want to designate as the primary server and run PCONSOLE on that server.
2. Choose **File Server To Be Serviced** from the Print Server Configuration menu.
3. Press the **Insert** key to display the Available File Servers list.
4. Select the name of each file server to be serviced and press **Enter** to add it to the list.
5. When the list is complete, press **Esc** to return to the menu.
6. Install the Network Interface Board on each primary file server.

4.1.9 Setting Up Preferred File Servers

You can specify a preferred file server on the Network Interface Board (see Chapter 3, *Monitoring the Network Interface Board*). If a preferred file server is listed, the Network Interface Board attaches to this identified file server instead of initiating the automatic search. If the preferred file server is also a primary file server (for example, has file servers listed under File Servers to Be Serviced), the Network Interface Board connects directly to these file servers.

Note: The Preferred File Server applies only to bindery-based queues. There is no effect on NDS queues.

4.2 Configuring NetWare Bindery Emulation

NetWare 4.*x* can operate in two modes:

- NetWare Directory Services (NDS)
- Bindery Services Emulation

For NDS, refer to *Section 4.3 Configuring the Network Interface Board*.

These services run simultaneously and transparently to each other. You can configure the Network Interface Board to operate with Bindery Services Mode only or to operate under NDS. When configured under NDS, the Network Interface Board also services older file servers operating in Bindery Mode.

Note: If the Network Interface Board is not properly set up for NDS and the Bindery Services Mode is not running, the Network Interface Board cannot find its file servers. The status page then indicates the NetWare protocol is not active.

4.2.1 Confirming Bindery Context

Before installing the Network Interface Board on a Novell NetWare 4.*x* server in Bindery Emulation Mode, check that the server has a Bindery Context (name for the server under Bindery Services Mode). If the server does not have a Bindery Context, you can install the Network Interface Board in NDS mode. If the Network Interface Board must be installed in Bindery Emulation Mode, the server must have a Bindery Context.

1. At the system console on the 4.*x* server, enter the **load install** command.
2. Choose **Maintenance/Selective Install** from the menu.
3. Choose **NCF Files Options** from the menu.
4. Choose **Edit AUTOEXEC.NCF** from the menu.
5. Search the file to see if you have a statement similar to the following:

   `SET BINDERY CONTEXT=0U=`*context*

   where *context* is the name of your file server context. If this string is not present, you can enter it in the **`autoexec.ncf`** file.

6. If you entered a new string in **autoexec.ncf**, then at the console prompt, enter the **SET BINDERY CONTEXT** statement that you entered in the file.

Note: The command at the console prompt takes effect immediately. The definition in **autoexec.ncf** takes effect when the server is restarted.

4.2.2 Configuring in Bindery Mode with PCONSOLE

Once you confirm the server has Bindery Context, use the following procedures to configure the Network Interface Board.

To configure the Network Interface Board with PCONSOLE:

1. Log in as a supervisor or ADMIN.
2. At the command prompt, enter the **PCONSOLE** command.
3. Press the **F4** key to switch to Bindery mode.

Note: If you receive a message asking you to log in to a server with Bindery connections, the server you are attached to does not have Bindery Mode enabled. Follow the steps in *Section 4.2.1 Confirming Bindery Context* or log in to a server with Bindery Services activated.

4. Choose **Quick Setup** from the Available Options list.
5. Use Quick Setup to connect your print server, print queue, and printer correctly. You can modify these later if necessary.
6. Select Print Server and press **F3** or **Insert** to modify the entry.
7. Enter the name of the print server in the **Print Server** field.

   The print server name appears under Novell Network Information on the Status and Configuration report. The default name is the Network Interface Board serial number (six digits with a three-letter prefix).
8. Enter a name in the **New Printe**r field.
9. Enter a name in the **New Print Queue** field.
10. In the Printer Type field, choose **Other/Unknown** from the list of printer types.
11. When you are finished, press **Esc** to save the configuration.

Repeat steps 5 through 11 for each file server that the print server services.

To view, add, delete, or modify print servers or queues after the initial setup, select either **Print Queues** or **Print Servers** on the Available Options menu.

4.3 Configuring the Network Interface Board

NDS offers a more advanced approach to network management than previous NetWare versions. It stores and tracks all network objects. As a rule, all 4.*x* and 5.*x* servers must have NDS loaded in order to function. In this way, every NetWare 4.*x* or 5.*x* server is a directory server, because it services named directory objects such as printers, print servers, and print queues. With the appropriate privileges, you can create a print server object which, once configured in its context (or location) on the network, eliminates the cumbersome setup of print servers on *every* network server. NDS provides true enterprise networking based on a shared network database rather than an individually defined physical site. The result is greatly improved print server setup and management.

The Directory Information Base (DIB) stores information about servers and services, users, printers, gateways, and so on. It is a distributed database, allowing access to data anywhere on the network wherever it is stored. NetWare versions earlier than 4.*x* provide the same data found in the DIB, but the NetWare Bindery stores the data. The DIB was designed with more flexible access and more specific security; moreover, since it is distributed, it was designed to be partitioned. The DIB uses an object-oriented structure rather than the flat-file structure of the Bindery, and offers network-oriented access rather than the server-oriented access found in the Bindery.

The DIB is backward-compatible with the NetWare Bindery through Bindery Emulation Mode. *Section 4.2 Configuring NetWare Bindery Emulation* describes Print Server Operation with a NetWare 4.*x* system in Bindery Emulation Mode. When Bindery Emulation is enabled, Directory Services accept Bindery requests and respond as if a Bindery exists on the NetWare server being accessed. Information obtained from the Bindery query may not be stored in the server because the DIB is a partitioned and distributed database. Even though the NetWare 4.*x* server is not operating from a Bindery, the applications making Bindery requests do not know the difference.

You can use NWADMIN to configure the printer in NDS. Before you can print, NDS must be set up as described in the following sections and the Network Interface Board must be set up with NDS Context and Tree. See *Section 4.4 Configuring the Network Interface Board*.

The following sections describe using NWADMIN to create printer, print server, and print queue objects. You can assign or associate these objects with each other. You can keep

Bindery resources on any server under NetWare 4.*x* if you include a SET statement in your **`autoexec.ncf`** file.

Alternatively, you can use PCONSOLE to set up static information about print servers, such as the queues to service and whom to notify in the event of a problem. Refer to the NetWare documentation for more information about the use of PCONSOLE for NDS.

4.3.1 Creating the Printer Object

1. Start NWADMIN. (For example, double-click the NWADMIN icon in the NetWare Tools group.)

   The NetWare Administrator window opens.

2. Choose **Object -> Browse**.

   Your directory tree is displayed.

3. Select the Organizational Unit or Organization where you want to create the printer in the Directory Tree, and choose **Object -> Create**.

   The New Object windows appears.

4. In the Class of New Object list, choose **Printer** and click **OK**.

5. When the Create Printer window appears, enter a value in the **Printer Name** field and click **Create**.

4.3.2 Creating the Print Server Object

To create a print server object:

1. In NWADMIN, choose **Object -> Browse**.

2. Select the Organizational Unit where you want to create the print server in the directory tree and choose **Object -> Create**.

3. In the New Object window, scroll down the Class of New Object list, choose **Print Server** and click **OK**.

4. When the Create Printer window appears, enter a value in the **Print Server Name** field and click **Create**.

4.3.3 Creating the Print Queue Object

1. Start NWADMIN.

2. Choose **Object -> Browse**.

3. Select the Organizational Unit where you want to create the print queue in the directory tree and choose **Object -> Create**.

4. In the New Object window, scroll down the Class of New Object list, choose **Print Queue** and click **OK**.
5. In the Create Print Queue window, click **Directory Service Queue**, enter values for **Print Queue Name** and **Print Queue Volume** and click **Create**.

   If you do not know the Print Queue Volume name (the hard drive you are accessing), click the icon to the right of the volume field. The Select Object window opens with the volume listed in Objects. If the volume is *not* listed, scroll through the Directory Context items to find the volume where you want the queue to reside.
6. Click the object (hard drive) of your choice.

   The object appears in the **Selected Object** field.
7. Click **OK** and then click **Create**.

4.3.4 Assigning the Printer Object

1. In NWADMIN, choose **Object -> Browse**.
2. In the NWADMIN directory tree, double-click the printer object created in *Section 4.3.3 Creating the Print Queue Object.*

   The Printer window opens.
3. Click **Assignments** and then click **Add**.
4. When the Select Object window opens, find the print queue object just created and select it.
5. Click **OK**.

   The print queue just created appears in the Print Queues list in the Printer window.
6. Click **OK**.

4.3.5 Assigning Print Server Object

1. In NWADMIN, choose **Object -> Browse**.
2. In the NWADMIN directory tree, double-click the print server object you just created.

   The Print Server window opens.
3. Click **Assignments** and then **Add**.
4. When the Select Object window opens, select the printer object just created in the Objects list and click **OK**.

   The printer (with its context) appears in the Printers list.

5. Click **OK**.

4.3.6 Checking Assignments

1. In NWADMIN, choose **Object -> Browse**.
2. In the NWADMIN directory tree, double-click the print queue object.

   The Print Queue window opens.
3. Click **Assignments**.

   If you configured the print queue and printer correctly, they will appear in the proper boxes in the Print Queue window.
4. Click **Cancel**.

4.3.7 Setting Up and Resetting the Printer

After completing the NWADMIN configuration, you must set up and reset (power cycle) the printer before you can begin printing.

4.4 Configuring the Network Interface Board

Use the MAP utility or a Web browser to:

- Define the context and tree of the Print Server
- Change the Print Server name
- Set a password
- Set values for Bindery Mode

For more information, see Chapter 3, *Monitoring the Network Interface Board*.

To configure the Network Interface Board:

1. Access the setup pages for the Network Interface Board using MAP or a Web browser.
2. Once you have accessed the Network Administration pages or the Main Menu, choose **Setup NetWare** under *Protocols*.
3. Confirm that there is a check mark in the **Enable NetWare** option. If necessary, put a checkmark in that option.
4. Optionally, enter a name in the **Print Server Name** field.

   To use the default name, leave the field blank.

The default name is the Network Interface Board serial number (six digits with a three-letter prefix). This is also the default name of the printer in peer-to-peer mode.

Note: If you make any changes, you will be prompted for a password. The default password is sysadm.

5. Optionally, to secure the Network Interface Board with a password, enter a password in the **Print Server Password** field and again in the **Password Retype** field.

   If you are using a password, use the same password for all bindery-based and NDS-based Print Server entries.

   If you enter a password, you must also enter the same password in the password field on your file server setup using PCCONSOLE or NWADMIN.

6. For Bindery emulation, enter the name of a preferred bindery-based file server in the **Preferred File Server** field.

   The Preferred File Server entry applies only for Bindery- or Bindery Emulation-based operations. See *Section 4.1.9 Setting Up Preferred File Servers* for the significance of a Preferred File Server. The Print Server must be configured on the preferred file server. Incorrect setup of a Preferred File Server can interfere with NetWare printing.

7. If the Print Server operates under Novell Directory Services, enter a Context and Preferred NDS Tree in the appropriate fields.

   Be sure to give the *whole* context, whether *typed* or *typeless*, and do not begin your context path with a leading period.

   An example of a ***typed context name*** is **`ou=standard.ou=organization_1`**.

   (If you do not know your tree, open a DOS command box and enter the **`whoami`** command.)

   An example of a ***typeless context name*** is **`organization_1`**.

   You must use a typeless context if the Network Interface Board is on the same network segment as the file server.

8. Enter the time intervals, in seconds, in which the Print Server will scan the queues that it services in the **Print Queue Scan Rate** field.

   The default scan rate is once per second.

9. If your network uses multiple frame types for Novell, you can bias the frame search to the desired type by setting the radio button next to the designation under Ethernet Frame Type.

The Network Interface Board normally monitors the network to determine which frame type is used for Novell. When it recognizes a type, it assumes the same frame type. Once it selects a frame type, the Network Interface Board only operates over that Novell frame type. Monitoring normally starts looking for IEEE 802.3, then Ethernet II, then 802.3 SNAP, and so on.

10. If you are operating in NDS mode only, you can disable Bindery Mode on the Print Server by putting a checkmark in the Disable Bindery checkbox.

    If you disable Bindery Mode, the Network Interface Board does not support Print Servers on a Bindery file server.

11. Once you have selected all desired settings and entered the desired NetWare information, click **Accept Settings** to save this information in the Network Interface Board NVRAM.

    If you have not entered the Network Interface Board Management password previously during this session, you must enter it in the appropriate space before clicking **Accept Settings**.

The values you entered do not take effect until the Network Interface Board is reset or power cycled. You can reset from MAP or the Web browser by returning to the home page or Network Administration page, and clicking **Reset** under **System**, and then clicking **Reset Unit**. Alternatively, you can power cycle the printer. The new NetWare values are now in effect.

4.5 Using the Novell PCONSOLE Utility

You can use the PCONSOLE utility to:

- Attach and select a file server
- Select or delete queues for the print server
- Set up the Notify function

See the *NetWare Print Server Manual* for detailed information on this utility.

Note: You must have Supervisor privileges to perform many PCONSOLE operations.

4.5.1 Changing the File Server

1. Log in to the file server and run PCONSOLE on that server.
2. Choose **Change Current File Server** from the Available Options menu.
3. Press the **Insert** key to display the available file servers.

4. Select the file server you want.
5. Enter your username.

   If the username requires a password, the Password screen appears. Enter the password.

   The name of the file server appears in the status header at the top of the PCONSOLE window.

4.5.2 Changing Print Queues

When you print a file, your system sends the file to a print queue. The print server assigned to that queue extracts the print job and sends it to the assigned printer. If a print server services queues on multiple file servers, you must assign queues to the printer on each file server.

To change the print queues:

1. Log in to the file server and run PCONSOLE on that server.
2. Choose **Print Server**s from the Available Options menu.
3. Select the print server you want.
4. Choose **Printers** from the Print Server Information window.
5. Select the printer you want.
6. In that printer's Configuration Menu, choose **Print Queues Assigned**.
7. Select a queue from the list.
8. Select the priority for the print queue.

   The highest priority queue is 1 (which is the default); the lowest is 10.
9. Press **Esc** and save all changes.

4.5.3 Setting Up a Notify List

You can specify users or groups of users that are notified if a problem occurs when a print job is sent to the printer. The print server supports the enhanced Notify options for printers, including informing users when the printer —

- Is off-line, jammed, opened, or out of paper
- Requires a manual paper feed or a form change
- Has had an engine failure

If the print server services queues on multiple file servers, you must set up a Notify list for each file server.

To set up a Notify list:

1. Log in to the file server and run PCONSOLE on that server.
2. Choose **Print Servers** from the Available Options menu.
3. Select the print server you want.
4. Choose **Printers** from the Print Server Information window.
5. Select the printer you want.
6. In that printer's Configuration Menu, choose **Notification** and press **Enter**.
7. Press the **Insert** key to get a list of available options.

   The Notify Candidates screen appears.
8. Select the notification candidate you want.

   The Notify Interval screen appears.
9. Specify the notify intervals you want.

   The **First** interval is the time the network waits before it notifies users about a print job problem. The **Next** interval specifies how often users are notified.
10. Press **Esc** and save all changes.

4.6 Configuring NetWare and Print Servers Using NWSetup

The NWSetup program lets you set up NetWare and your network interface card (NIC) using one program. NWSetup combines the following configuration steps:

- Setting up the Novell file servers and print servers for NetWare printing (without using NWSetup utilities)
- Setting up your print server printers for network printing

4.6.1 Installing and Running NWSetup

1. Put the CD-ROM into your CD drive on your workstation.
2. Choose **Start -> Run**.
3. Type the following command and click **OK**:

   ***drive*:\NWSETUP\SETUP.EXE**

   where *drive* specifies your CD drive.
4. Follow the instructions in the Setup program.

After you install NWSetup, a program icon appears in your **Start** menu. To start the program, choose **Start -> NWSetup -> NWSetup**.

Note: If you are configuring for NDS, make sure you are logged in to the correct tree and context before running NWSetup.

4.6.2 Selecting a Print Server

NWSetup displays a list of all NICs available on your network. Each NIC is listed with its serial number.

Note: NWSetup allows configuration of NICs that are connected to the same context of your NetWare server as the workstation running NWSetup.

To choose the NIC you want to configure, do either of the following:

- Highlight the NIC you want and click **Select**.
- Double-click the NIC you want.

The Print Server Settings screen appears. This screen lets you set up your version of NetWare for the NIC.

4.6.3 Configuring the Network Interface Board for NetWare

There are two Settings screens that you need to complete to configure the Network Interface Board for NetWare, including Directory and Bindery Services.

The following table describes the fields on the Settings screens.

Field	Description
Print Server Name	Indicates the NetWare print server name that the Network Interface Board uses to log in to NetWare. You can enter any name that does not already exist in the network directory or server bindery. The maximum length is 48 characters.

Print Queue Scan Rate	Specifies the rate at which a Network Interface Board polls print queues for a new print job. For example, if you put 1 in the field, the Network Interface Board polls for new print jobs each second. The minimum value is 1 and the maximum is 250.
Print Server Password and Print Server Password Retype	Indicates the password for a Network Interface Board used to log in to NetWare. When you change this field, NWSetup sets the password in both NetWare and the Network Interface Board. The maximum length is 32 characters. **Note:** The values in the **Password** and **Password Retype** fields must be identical before you can choose **Finish** on this screen.
Ethernet Frame Type	Indicates the Ethernet frame type that should be used by the NetWare protocol stack by default. Only one frame type can be selected.
Enable NDS Mode	Indicates whether the Network Interface Board supports Directory Services. When the box is checked, the Network Interface Board supports Directory Services. If this box is not checked, all other fields on this screen are not enabled.
Preferred NDS Context	Enter a text string to set the NDS directory context that the Network Interface Board uses to log in to the network. The maximum length is 128 characters.
Preferred NDS Tree	Enter a text string to set the NDS tree that the Network Interface Board uses to log n. The maximum length is 48 characters.
Enable Bindery Mode	Determines whether the Network Interface Board should attempt to service the NetWare network in Bindery Mode. If this option is not enabled, the Primary File Server option is not enabled.

Primary File Server	Specifies the NetWare file server that the Network Interface Board uses as the primary file server. If no primary file server has been selected yet, or if an unavailable server is selected, the first file server in the list is selected.

4.6.4 Entering Print Server Settings

NWSetup also lets you set up each print server and queue. This information is usually entered using NWADMIN or PCONSOLE. NWSetup eliminates the need for configuring the file server with any NetWare utility.

The following table contains a description of the NWSetup dialog box options.

Dialog Box Option	Description
Enable Printer	Indicates whether support for the Network Interface Board and printer is enabled. • If this box is checked, then the printer is enabled. • If the box is not checked, then the printer is not enabled. and the remaining fields on the screen are disabled.
Printer	Displays the name of the printer. This is a read-only field.
Queues Serviced by *printer-name*	Lists all the queues that are to be serviced by the printer. • Queues associated with bindery connections are listed in the format *bindery server name: queue name*. • Queues associated with NDS connections are listed by their distinguished names. For example: If a printer services a queue named **`YOURPTR_Q`** on a bindery server named **`OLD_SERVER`**, the queue is named **`OLD_SERVER:YOURPTR_Q`**. If an NDS server has a distinguishing name such as **`ENGINEERING.CORP`** and a queue named **`ENGINGEERING_Q`** servicing the printer, the queue is listed as **`ENGINEERING_Q.ENGINEERING.CORP`**.

Dialog Box Option	Description
Users/Groups Notified by *printer-name*	Lists all users and user groups who are notified when a printer error is detected. • Users and groups associated with bindery connections are listed in the format *bindery server name: user name*. • Users and groups associated with NDS connections are listed by their distinguished names. For example: If a user named **`Susan`** on the bindery server **`OLD_SERVER`** is listed on the printer's notify list, the user is listed as **`OLD_SERVER:SUSAN`**. If a user named **`Albert`** with an NDS context of **`ENGINEERING.CORP`** is on the printer's notify list, that user is listed as **`ALBERT.ENGINEERING.CORP`**. When you double-click an entry in this field, the Notify Settings screen appears. See *Section 4.6.5 Configuring the Notify Settings*. **Note:** The Network Interface Board supports the Notify function only in Bindery Mode.
Add Queue/ Delete Queue	Select **Add Queue** and/or **Delete Queue** to make changes. See *Sections 4.6.4.1 Adding a Queue* and *4.6.4.2 Deleting a Queue* for detailed information.
Add User/ Delete User	Select **Add User** or **Delete User** to add or remove users or groups for notification. See *Section 4.6.4.3 Adding Users/ Groups for Notification*.

Dialog Box Option	Description
Create Queue	• **Queue Name** — Enter the name of the new queue. This field must be completed in order to create a new queue. The maximum length is 48 characters. • **File Server Volume** — Indicates the volume on which the queue should be created. This field is enabled only if the current connection is an NDS connection. When enabled, it contains a list of all available volumes. For Bindery Services, the default volume name is SYS. • **NDS Context** — Specifies the NDS context in which the queue is created. This field is enabled only when an NDS connection is being used. When this field first appears, it lists the NDS context specified in the Add Queue dialog box. If you change the context, NWSetup verifies that the new context exists on the directory tree. Click **OK** to start the verification process.

4.6.4.1 Adding a Queue

To add a queue to the printer, click **Add Queue**.

A dialog box opens containing the following buttons and fields:

Dialog Box Option	Description
Create Queue	• **Queue Name** — Enter the name of the new queue. This field must be completed to create a new queue. The maximum field length is 48 characters. • **File Server Volume** — Indicates the volume on which the queue should be created. This field is enabled only if the current connection is an NDS connection. When enabled, it contains a list of all available volumes. For Bindery Services, the default volume name is SYS. • **NDS Context** — Specifies the NDS context in which the queue is created. This field is enabled only when an NDS connection is being used. If you change the context, NWSetup verifies that the new context exists on the directory tree. Click **OK** to start the verification process.
Connection/Server	Selects a server connection. This list includes the NDS connection and all of the bindery file server connections that the user has. The NDS connection is always listed first, by default. When a new connection is selected, the **Queue** field is automatically updated.
NDS Context	Specifies an NDS context for the queue. NWSetup lists all the queues within this context or the subcontexts in the **Queue** field. This field is only enabled when NDS support is enabled. By default, the NDS Context should be set to the preferred NDS context specified in the Print Server Settings screen.

Dialog Box Option	Description
Queue	Lists all queues available on the currently selected connection. • If an NDS connection is specified, then a list of all queue names in the selected context and all subcontexts displays. • If you change the context in the **NDS Context** field or change the connection in the **Connection/Server** field, the queue list refreshes to reflect the new connection or context. • If you double-click a queue in the list, the queue is automatically added to the printer's service and you exit this screen.

4.6.4.2 Deleting a Queue

1. In NWSetup, highlight the queue you want to delete.
2. Click **Delete Queue**.

   A confirmation screen asks if you really want to delete the highlighted queue.
3. Select **Yes** to delete or **No** to cancel.

Note: Deleting a queue does not physically remove it from the file server. To remove the queue from a file server, you must use the NetWare utility to delete the queue from the file server queue list.

4.6.4.3 Adding Users/Groups for Notification

To add users and groups for notification, click **Add Users/Groups**. A dialog box opens, containing the following buttons and fields:

Dialog Box Option	Description
Connection	Selects a connection from this field. This list includes the NDS connection and all of the bindery file server connections that a user can access. The NDS connection is always listed first, by default.

NDS Context	Specifies the NDS context to use when generating a list of users and/or groups. This field is enabled only for NDS connections. When first displayed, this field lists the preferred NDS context specified in the Print Server Settings screen. If you change this value, NWSetup verifies that it is correct when you attempt to move to another field or when you click **OK**.
Users/Groups	Lists all the users and groups available on the selected connection. Any entry on this list can be added to a printer's service list. The list includes print job owner (the user whose job is currently being printed). • If an NDS connection is selected, NWSetup generates a list of all users and groups in the currently selected context and all subcontexts. • When you double-click an entry in the list, the entry is added to the printer's service list. • The user/group list is updated whenever the **Connection** or **NDS Contex**t field is changed.
Delay in seconds for first	Indicates how long the Network Interface Board should wait before sending a notification message that an error condition has been detected.
Delay in seconds for repeat	Indicates how long the Network Interface Board should wait before sending a repeat notification of an error condition. **Note:** The Network Interface Board supports Notify in Bindery Mode only.

4.6.5 Configuring the Notify Settings

To configure the Notify function for the users or group, double-click an entry in the **Users/ Groups Notified by Printer** field on the Print Server screen. The Notify Settings screen appears with the following options.

Field	Description

User/Group name	Indicates the name of the user or group that is being edited. This field cannot be changed.
Delay in seconds for first	Indicates how long the Network Interface Board should wait before sending a notification message to the user that an error condition has occurred.
Delay in seconds for repeat	Indicates how long the Network Interface Board should wait before sending a repeat notification message to a user or group when an error condition has occurred. **Note:** The Network Interface Board supports Notify in Bindery Mode only.

Chapter 5
Windows Peer-to-Peer Printing

This chapter describes:

- Windows IPX Peer-to-Peer Printing, including preparing for the installation, installing, operating, setting up printing, and adding printers.
- Windows IP Peer-to-Peer Printing, including preparing for the installation, installing, setting up printing, and adding printers.

5.1 Windows IPX Peer-to-Peer Printing

Windows IPX Peer-to-Peer printing allows workstations to print to Network Interface Board printers without an intervening server and without using IP. The main features of Windows IPX Peer-to-Peer printing are:

- Runs on Windows 95/98/Me workstations “out of the box”
- Runs on networks with or without a NetWare file server
- Implements IPX peer-to-peer bi-directional printing between Windows workstations and Network Interface Board printers

5.1.1 Introduction and Preparation

The Peer-to-Peer implementation uses the IPX/SPX stacks provided with Windows 95/98/Me. The redirector software provided establishes a connection with the printers supporting IPX Peer-to-Peer, without using an intermediate file server, whether your network uses NetWare or not.

When configuring the network capabilities for Windows, you must include the IPX/SPX Compatible Protocol. If you are not using NetWare, you need not activate any NetWare Client application.

You can include IPX/SPX after the initial Windows installation by choosing **Start -> Settings -> Control Panel -> Network**. You will also need the Windows disks or CD-ROM.

Note: Peer-to-Peer printing uses the IPX/SPX protocol. Therefore, Novell operation must remain enabled on the Network Interface Board even if you are not using Novell printing facilities. The name of the Peer-to-Peer printer in the Windows Port List is the same as the Novell Print Server name. You can change the Novell Print Server name using MAP or a Web browser. See Chapter 3, *Monitoring the Network Interface Board*.

On power-up, the Network Interface Board checks the network for any Novell activity. If there is activity, the Network Interface Board uses the frame type and the local network number that it senses. In addition, if the Network Interface Board can log in to a file server, it assumes Novell is normally used and stores this frame type and new number in NVRAM. Thus, when the Network Interface Board comes up again, it does not have to spend time sensing (which can cause a delay).

However, if the Network Interface Board cannot attach to a file server, it will use the sensed values but will not store them.

If the Network Interface Board does not see any Novell activity, it uses 802.2 on 802.3 as a frame type and assigns itself a network number of 0 (zero). The status and configuration sheet contains information on the frame type and network number used.

If you move Network Interface Board from a site that has active NetWare to a site that does not, you should reset the Network Interface Board to factory default values to clear the frame type and network number information.

5.1.2 Installing the IPX Peer-to-Peer Redirector

1. Put the CD-ROM labeled “Print Server Software and Documentation” into your CD drive.
2. Choose **Start -> Run**.
3. Type the following command and click **OK**:

   ***drive*:\IPX-P2P\SETUP.EXE**

   where *drive* specifies the CD drive on your system.
4. Follow the instructions in the Setup program.

Note: If there is a previous installation of the IPX Peer-to-Peer Redirector, the Setup program prompts you to have Setup delete the old driver and continue the installation procedure. Click **Yes** or **No**.

Once the redirector is installed, each printer on the network that supports this peer-to-peer capability appears as a port under Printer Properties.

5.1.3 Setting Up IPX Peer-to-Peer Printing

IPX Peer-to-Peer printing allows you to print to a network printer for networks without a file server or for networks where you do not want to use the server for printing. Use peer-to-peer printing on Windows 95/98/Me systems.

To set up IPX Peer-to-Peer printing, choose **Start -> IPX-P2P -> IPX-P2P**. The IPX peer-to-peer printing setup screen appears. The following table describes the fields and buttons in the screen.

Field or Button	Description
Available Printers	The list of printers detected on the network. To clear this list, click **Clear**. To update the list, click **Find Printers**. • **Unit Name** — The Print Server Name defined in the printer. The default name is the Network Interface Board serial number (six digits with a three-letter prefix). • **Description** — Typically, the manufacturer's name and the printer's model number. • **Flags** — Selected (S) or Permanent (P) Any printers flagged with S appear in the Windows Port List. When you are adding or changing a printer, only selected printers are listed. Only 30 printers can be selected at one time. Any printer flagged with P remains in the Available Printers list even if the printer is physically removed from the network or if you click **Clear**.
OK	Accepts changes made to setup and exits the program.
Cancel	Discards any changes made to setup and exits the program.
Clear	Clears the Available Printers list. This does not clear any printer marked with the Permanent flag (P).

Field or Button	Description
Delete	Deletes the highlighted printers from the Available Printers list. Printers deleted this way no longer appear in the Windows Port List when you are adding a printer. However, the printer is not actually deleted from the network — it is only removed from the list. You can put the printer back on the list by clicking **Find Printers**, so long as the printer is still connected to the network.
Permanent	Flags the highlighted printers with a P. These printers remain in the Available Printers list even if the printers are physically removed from the network or you click **Clear**.
Find Printers	Searches the network for printers and lists them by their Print Server Name (defined in the printer). The default name is the Network Interface Board serial number (six digits with a three-letter prefix).
Select	Flags the highlighted printers with an S. Only 30 printers can be selected at one time. When the Windows Port List is displayed during the process of adding or changing a printer, only selected printers are listed.

5.1.4 Adding Printers for IPX Peer-To-Peer Printing

You can add printers manually if the program cannot find printers automatically because of router setup or hop count setting. In general, this should not be necessary.

Using IPX-P2P to Add Printers to the port list:

1. Choose **Start -> IPX-P2P -> IPX-P2P**.

   The IPX Peer-to-Peer Setup screen appears. A list of available IPX-enabled printers appears after a brief pause while the program searches the network.

2. Highlight one or more printers you want to display in the Windows Printer Port listing and click **Select**.

   This ensures that these printers are included in the Windows Printer Port listing. You can have a maximum of 30 printers selected at a time.

3. Click **OK** when you have finished selecting all the printers you want to display in the Windows Printer Port list.

Using the Add Printers Wizard:

1. Choose **Start -> Settings -> Printers**.

2. Double-click **Add Printer**.

   The Add Printer wizard appears. Click **Next** to proceed.

3. Choose the **Local Printer** option and click **Next**.

4. Select the make and model of the printer you want to use and click **Next**.

   A list of printer ports appears. Any IPX peer-to-peer printers that have been selected from IPX-P2P Setup appear in this list.

5. Select the IPX printer you want to use.

6. Complete the remainder of the printer setup procedure as you would normally.

To change the printer port:

1. Right-click the printer icon.

2. Choose **Properties** and then choose the **Details** tab (it can take up to 15 seconds to access).

3. Select the printer address you want to use from the **Print to the Following Port** list. (In Windows NT and Windows 2000, you must first deselect the previous printer port.)

4. Click **OK**.

5.2 Windows IP Peer-to-Peer Printing

Windows IP Peer-to-Peer printing allows Windows 95/98/Me workstations or Windows NT 4.0 workstations and servers to print to Network Interface Board printers without an intervening server and without using IPX. The main features of Windows IP Peer-to-Peer printing are:

- Runs on Windows 95/98/Me workstations and on Windows NT 4.0 workstations or servers “out of the box”
- Implements IP peer-to-peer bi-directional printing between Windows workstations and Network Interface Board printers

5.2.1 Introduction and Preparation

The Peer-to-Peer implementation uses the TCP/IP stacks provided with Windows 95/98/Me or Windows NT. The redirector software provided establishes a connection with the printers supporting Peer-to-Peer, using a direct IP connection over the network.

When configuring the network capabilities for the Windows computer, you must include the TCP/IP Protocol. You do not need to activate any TCP/IP Client application.

You can include TCP/IP after the initial Windows installation by choosing **Start -> Settings -> Control Panel -> Network**. You will also need the Windows CD-ROM.

For more detailed information on TCP/IP setup and printing, see Chapter 7, *TCP/IP Configuration*.

Note: Peer-to-Peer uses TCP/IP. Therefore, TCP/IP operation must remain enabled on the Network Interface Board, and the Network Interface Board must be assigned a valid IP address. By default, the name of the Peer-to-Peer printer as it appears in the Windows Port List is the same as the IP Address assigned to the Network Interface Board. You can change the IP address by using a Web browser or MAP. Refer to Chapter 3, *Monitoring the Network Interface Board*, for details.

If you are moving the Network Interface Board from a site that had active TCP/IP to a site that does not have it, you should restore the Network Interface Board to the factory default settings to clear the IP address and other network information.

5.2.2 Installation and Operation

T**o install the Windows IP Peer-to-Peer redirector:**

1. Put the Network Interface Board CD-ROM into the CD drive on your workstation.
2. Choose **Start -> Run**.

3. Type the following command and click **OK**:

   ***drive*:\IP-P2P\SETUP.EXE**

   where *drive* specifies your CD drive.
4. Follow the instructions in the Setup program.

Note: If the Setup program detected a previous installation of the IP Peer-to-Peer Redirector, the program asks whether to delete the old driver and continue the installation procedure. Click **Yes** or **No**.

Once the redirector is installed, each printer on the network that supports this peer-to-peer capability appears as a Port under Printer Properties.

5.2.3 Setting Up IP Peer-to-Peer

IP Peer-to-Peer printing allows you to print to a network printer on networks without a file server or on a network where you do not want to use the server for printing. You can use peer-to-peer printing on Windows 95/98/Me or Windows NT 4.0.

To set up IP Peer-to-Peer printing, choose **Start -> IP-P2P -> IP-P2P**. The Peer-to-Peer printing setup screen appears. The following table describes the fields in the setup screen.

Field or Button	Description
Max Hops for Search	The hop count determines how many networks the program searches to find units. The default count is 2. An entry of 0 (zero) means the program searches only the network wire directly connected to the workstation. An entry of 2 searches the wire directly connected to the workstation and also searches all networks accessible through two routers. Entries of 15 or higher cause an automatic search of every connected network. (This is not recommended due to the network traffic it could generate.)

Field or Button	Description
IP Port Base	The starting port number for the print server. Each print server is assigned an IP port number. By default, the Network Interface Board is assigned port number 10001. However, the network administrator can change this setting. If the print servers on your network have been configured to use a different set of port numbers, then you should configure the IP Peer-to-Peer software accordingly. Note that IP Peer-to-Peer uses the new port number to communicate with all print servers. **Note:** The IP Port selected here and in the print server should be one less than the actual port. For example, if port 10001 is desired, the IP Port on the this screen and on the Network Interface Board's HTML pages should be defined as 10000.
Printer Names	Lets you select how the printer names are displayed in the Windows Port List: • **Based on Serial Number** — Uses the print server serial number to identify the printer names. For example, if SN991354 is the serial number of the unit, SN991354 would be the printer port. • **Based on IP Address** — Uses the IP address to identify the printer port. For example, if the IP address for the unit is 199.99.92.99, the printer port is also 199.99.92.99. (This is the default.) • **Based on DNS** — Uses the Domain Name Server (DNS) name to identify the printer name. • **Based on Unit Name** — Uses the Network Interface Board Peer-to-Peer name set in the Novell section of the print server setup. This is the name used to identify the printer. The default name is the Network Interface Board serial number (six digits with a three-letter prefix). **Note:** If you have both the IP Peer-to-Peer and IPX Peer-to-Peer Redirector Programs installed, you should not select the option to display IP Peer-to-Peer units based on **Unit Name**. This conflicts with the IPX Peer-to-Peer redirector and may cause conflicts in the Windows Printer Port List.

Field or Button	Description
Printers	Displays the next program screen.
OK	Accepts changes made to setup and exits the program.
Cancel	Discards any changes made to setup and exits the program.
Help	Displays a description of the **Hop Count** and IP port number.

When you click **Printers**, the Windows Port List appears, allowing you to list, search, remove and manually add printers.

The following table contains an explanation of the fields and buttons in the Windows Port List:

Field or Button	Description
IP Address	Allows you to manually enter the IP address of a printer you want to add to the list.
Name	The name you want the printer to be listed by in the **Unit Name** field.
Port	The actual port for communicating with the printer. Default is 10001.
Description	The description you want listed in the **Description** field for the printer.

Field or Button	Description
Available Printers	The list of printers detected on the network. To clear this list, click **Clear**. To update the list, click **Find Printers**. • **Unit Name** — The Printer Name based on the method defined in the previous screen. The default Printer Name method is by IP address. Printers can also be displayed by the Network Interface Board serial number, by the DNS Name of the printer, or by the Unit Name. The Unit Name is the Print Server Name defined in the Network Interface Board. • **Unit IP —** The actual IP address of the unit. This appears regardless of the selected Unit Name method. • **Port Number —** The IP port number used to connect with the printer over the network. The default port number is 10001. **Note:** The IP Port selected on the previous screen and in the printer should be one less than the number displayed here (that is, if port 10001 displays here, the IP Port in the previous screen and in the printer should be defined as 10000). • **Description** — Typically, the manufacturer's name and the printer's model. • **Flags** — Selected (S) or Permanent (P) Any printers flagged with S appear in the Windows Port List. When you are adding a or changing a printer, only selected printers are listed. Only 30 printers can be selected at one time. Any printer flagged with P remains in the Available Printers list even if the printer is physically removed from the network or if you click Clear.
OK	Applies the changes you have made to setup and returns to the previous screen.
Cancel	Discards any changes you have made and returns to the previous screen.

Field or Button	Description
Add	Lets you manually add a printer to the Available Printers list by entering information in the fields to the left of the button. This bypasses the Find Printers function. The port is not checked to see if it is actually available on the network.
Delete	Deletes the highlighted printers from the Available Printers list. Printers deleted this way no longer appear in the Windows Port List. However, the printer is not actually deleted from the network — it is only removed from the list. You can put the printer back on the list by clicking **Find Printers** so long as the printer is still connected to the network.
Find Printers	Searches the network for printers. The default method for displaying the list of printers is by IP Address.
Clear	Clears the Available Printers list. This does not clear any printer marked with the Permanent flag (P).
Select	Flags the highlighted printers with an S. Only 30 printers can be selected at one time. When the Windows Port List is displayed during the process of adding or changing a printer, only selected printers are listed.
Permanent	Flags the highlighted printers with a P. These printers remain in the Available Printers list even if the printers are physically removed from the network or you click **Clear**.

5.2.4 Manually Adding Printers for IP Peer-to-Peer Printing

You can add printers manually whenever the program cannot find printers automatically because of the router setup or hop count setting. In general, this should not be necessary.

Using IP-P2P to Add Printers to the port list:

1. Choose **Start -> IP-P2P -> IP-P2P**.

   The IP Peer-to-Peer Setup screen appears.
2. Click **Printers**.
3. Enter information for the printer in all the following fields:
   - **IP Address**
     Enter the IP address of the printer you want to add.

— **Name**
Assign a name to identify the printer you want to add.

— **Port Number**
Enter the port number of the printer. Default is 10001.

— **Description**
Use this field to describe the printer's physical location, the users who can access the printer, or other convenient description information.

4. When you have entered all the information, click **Add**.

   The printer is listed in the **Available Printers** field at the bottom of the screen.

5. Highlight the printer you have just added and click the S flag for this printer.

Using the Add Printers Wizard:

1. Choose **Start -> Settings -> Printers**.
2. Click **Add Printer**.

   The Add Printer wizard appears. Click **Next** to proceed.

3. Choose the **Local Printer** option and click **Next**.
4. Select the make and model of the printer you want to use and click **Next**.

   A list of printer ports appears. Any IP peer-to-peer printers that have been selected from IP-P2P Setup appear in this list.

5. Select the IP printer you want to use.
6. Complete the remainder of the printer setup procedure normally.

To change the printer port:

1. Right-click the printer icon.
2. Choose **Properties** and then choose the **Details** tab (it can take up to 15 seconds to access).
3. Select the printer address you want to use from the **Print to the Following Port** list. (In Windows NT and Windows 2000, you must first deselect the previous printer port.)
4. Click **OK**.

Chapter 6
AppleTalk Configuration

This chapter describes:

- Creating the printer
- Configuring the Network Interface Board using AppleTalk
- Changing the device names and AppleTalk zones
- Displaying the error log
- Configuring network protocols other than AppleTalk
- Setting up status report printing

6.1 Choosing the Printer

To verify that AppleTalk is enabled:

1. Make sure you have loaded the print driver and file drivers appropriate to your printer.
2. Choose **Control Panel** from the Apple menu.
3. Choose **AppleTalk**.
4. Choose **Connect via Ethernet** and close the window.

To create a printer:

1. Choose **Chooser** from the Apple menu.

   A list of AppleTalk zones is displayed (unless your network has only one zone).
2. Select the zone containing the printer from the AppleTalk Zones list, and then select the device driver type corresponding to your printer from those in the list in the upper left of the screen.

   The choice of driver determines the name of the list — Select PostScript Printer, Select LaserWriter Printer, and so on.

3. Select the printer from the Select a Printer list.

   The AppleTalk printer name for your printer appears in the Status and Configuration report under AppleTalk Connection Information.

4. Click **Create**.

   A dialog box appears so you can choose the PostScript Printer Description (PPD) you want.

5. Choose the PPD you want and click **Select**.

   (An additional dialog box may appear depending on the options available for that printer.)

   The printer now appears both on your desktop and in the list in Chooser.

6. To view printer information, change PPDs, or change other configuration options, click **Setup**.

7. If you are finished, exit from Chooser.

Chapter 7
TCP/IP Configuration

7.1 Overview

This chapter describes configuring the Network Interface Board and your network for use with TCP/IP communication in various environments.This includes:

- Installing in a Windows environment
- Dynamic Host Configuration Protocol (DHCP)
- Windows Internet Name Service (WINS)
- FTP printing
- Printing on UNIX-based systems, including Linux
- Running Telnet
- Using the Internet Printing Protocol (IPP)

The Network Interface Board TCP/IP capability also operates with **`lpr`** spoolers on other systems, and with spooler/supervisor capabilities that communicate raw print jobs to the TCP/IP port.

The IP Peer-to-Peer redirector provided with the Network Interface Board for Windows 95/98/ME or Windows NT uses this TCP/IP port. The default port number is 10001 but can be changed by using Telnet or SNMP or by accessing the Network Interface Board HTML pages with MAP or a Web browser. For information on using Telnet, see *Section 7.7 Running Telnet*. For information on MAP and the HTML pages, see Chapter 3, *Monitoring the Network Interface Board.*

7.2 Installing in a Windows Environment

Several versions and variations of Windows can be used on NetWare and TCP/IP networks, as well as in a native Windows network. This flexibility provides you with various options for setting up the network printing system even though this Network Interface Board does not support NetBEUI.

If the Windows workstations are connected to a NetWare network, configure the printer interfaces for NetWare and use standard Windows and NetWare utilities to provide access to the printer. See Chapter 4, *NetWare Configuration*.

If you are not using NetWare, you can access the printer using TCP/IP.

If you are using Windows 95/98 or Windows NT 4.*x*, you can also use the Network Interface Board Peer-to-Peer capability described in Chapter 5, *Windows Peer-to-Peer Printing*.

7.2.1 Installing TCP/IP on Windows

Windows 95/98/ME and Windows NT come with TCP/IP and **`lpr`** capabilities, although these must be installed when the unit is configured. You must install the TCP/IP Protocol, Simple TCP/IP Services, and Microsoft TCP/IP Printing prior to entering the network printer on the workstation.

Once **`lpr`** is installed on a Windows system and you have allowed printer sharing, other workstations can use the printer through the Microsoft Windows Network without having to have separate **`lpr`** queues installed on each workstation.

7.2.2 Setting Up the Network Interface Board

1. Install the Network Interface Board in your printer.
2. Power up the printer.

Keep the status sheet handy for the Ethernet (MAC) address. It shows that TCP/IP is enabled but that the IP address is not configured.

If the unit already has an IP address, these procedures do not work. However, you can use Telnet to access the unit and change the IP parameters.

7.2.3 Assigning an IP Address

The Network Interface Board must be given an IP address and routing information to be used with TCP/IP. To do this:

- If you have a NetWare connection, use MAP (see Chapter 3, *Monitoring the Network Interface Board*).
- Otherwise, use **`arp`** (see *Section 7.2.3.1 Using arp*)

7.2.3.1 Using `arp`

The Network Interface Board must be on the same network segment as the workstation you are using to configure it. The TCP/IP stack must be installed and operating.

To assign an IP Address with `arp`:

1. Open a DOS command box and enter the following command:

   `ping` *`psc-ip-address`*

   where *psc-ip-address* is the IP address you want to use for the Network Interface Board. The request should time out with no response (which indicates that the address is unused).

2. Enter the following command:

   `ping` *`ip-address`*

   where *ip-address* is any valid IP address on your network. The identified unit should reply.

3. After the response, enter the following command:

   `arp -s` *`psc-ip-address mac-address`*

   where *psc-ip-address* is the IP address of the Network Interface Board and *mac-address* is its MAC address.

   The entry should be accepted.

4. Enter the **`ping`** command from Step 1 again. The request should time out.

5. Let the Network Interface Board reset itself.

   The Network Interface Board generates a status page that should include the entered IP address.

6. When the Network Interface Board is up again, re-issue the **`ping`** command from Step 1. Continue until you get a reply.

Note: This only enters the IP address. To enter other IP parameters, use Telnet (*Section 7.7 Running Telnet*) or use MAP or a Web browser (see Chapter 3, *Monitoring the Network Interface Board*).

7.2.4 Setting Other IP parameters

The Network Interface Board provides for a setup connection through the standard Telnet port. To make changes to a unit with factory default settings, you must log in as the system administrator. You can change this password using Telnet (see *Section 7.7 Running Telnet*).

To set up IP and `lpr` parameters:

1. Use Telnet to access the Network Interface Board.

   The default login and password are both `sysadm`.
2. Turn off the protocols you are not using (Option 3).
3. Set up the subnet mask and default gateway for the Network Interface Board, if applicable (Option 1).
4. Exit, save, and reset the Network Interface Board.

Alternatively, you can set up IP and **`lpr`** parameters by accessing the Network Interface Board HTML pages with MAP or a Web browser (see Chapter 3, *Monitoring the Network Interface Board*). The password to change parameters with the HTML pages is the same as the Telnet password.

7.2.5 Setting Up `lpr` on Windows NT or Windows 2000

1. Choose **Start -> Settings -> Printers**.
2. Click **Add Printer**.

   The Add Printer wizard appears. Click **Next** to proceed.
3. **On Windows NT:**

   — Choose the **My Computer** option and click **Next**.

   — Click **Add Port**. A list of printer ports is displayed.

   — Select **LPR Port** in the list of ports and click **New Port**. The Add LPR Compatible Printer window appears.

   On Windows 2000:

   — Choose the **Local Printer** option and click **Next**.

   — Choose **Create a New Port** and select **LPR Port** from the list.

   — Click **Next**.
4. Specify the IP address of the Network Interface Board. For the name of the printer or queue, specify **`PORT1`** (all uppercase, no space) and click **OK**.
5. **On Windows NT**: In the list of available ports, put a checkmark next to the LPR port you created and click **Next**.
6. Select the printer manufacturer and printer and click **Next**.
7. Optionally, specify the printer name and click **Next**.
8. You can choose the **Shared** option and select one or more operating systems that will print to this printer. Click **Next**.

9. Print a test page and click **Finish**.

7.3 Dynamic Host Configuration Protocol (DHCP)

DHCP is a service that provides a method for assigning and maintaining IP addresses. The Network Interface Board obtains IP information from this service.

There are two user-defined variables related to the DHCP function:

- DHCP enable
- Use IP info in NVRAM

These variables are accessible in the TCP section of Network Administration, in the HTML pages.

If DHCP is not enabled:

- The Network Interface Board makes no DHCP requests under any circumstances.

If DHCP is enabled:

- The Network Interface Board makes DHCP requests when the Network Interface Board is reset or on power up, provided that the Network Interface Board does not have an IP address stored or that "Use IP info in NVRAM" is OFF.
- If the Network Interface Board has an IP address in NVRAM and "`Use IP info in NVRAM`" is ON, the Network Interface Board uses the IP information from NVRAM and there is no DHCP activity on the part of the Network Interface Board.

The factory default is DHCP disabled and "`Use IP info in NVRAM`" is set ON. When DHCP is enabled and IP address in NVRAM is set OFF, the Network Interface Board issues DHCP requests if it does not already have IP identification information stored in NVRAM.

7.4 Windows Internet Name Service (WINS/DHCP)

Windows Internet Name Service (WINS) allows a device, such as your print server, to register a NetBIOS name such as the Network Interface Board serial number (six digits with a three-letter prefix) along with its current IP address (for example, 199.92.187.171). A client that wants to contact the printer uses the WINS server to match the NetBIOS name with an IP address. Most users find it easier to remember the NetBIOS name for the printer rather than its IP address.

7.4.1 Using WINS with Your Print Server

To use WINS with your Print Server, enter the IP address of the WINS Server on the TCP/IP configuration screen. You can access this screen with a Web browser or MAP utility (refer to Chapter 3, *Monitoring the Network Interface Board*).

7.4.2 Configuring the WINS Server

You can configure your DHCP Server to automatically provide WINS Server information to the print server, or you can use the print server's TCP/IP Configuration Menu to manually enter the necessary information. Refer to your DHCP Server's documentation for further information on automatic configuration through the DHCP Server.

To manually configure your print server to work with the WINS server:

1. Assign an IP address to the print server.

   To assign the address, you can use MAP, Address Resolution Protocol (**`arp`**), DHCP, Reverse Address Resolution Protocol (**`rarp`**).

2. Run your Web browser — Internet Explorer or Netscape Navigator.

3. Choose **File -> Open**.

   The Open dialog box opens.

4. Enter the print server's IP address to access the print server's TCP/IP Configuration Menu.

5. Choose **TCP/IP Configuration** from the main menu.

   The NetBIOS Name for the print server is shown on this screen. The default name is the Network Interface Board serial number (six digits with a three-letter prefix) unless you have previously configured a name for the print server with DHCP.

6. Optionally, specify a new NetBIOS name (15 characters or less).

7. If you have previously configured a DHCP Server to provide the print server with the IP address of the Primary WINS Server, the address is shown on the TCP/IP Configuration Menu. Otherwise, specify the IP address of the Primary NetBIOS Name Server here.

8. Optionally specify the IP address of a Secondary NetBIOS Name Server as well. If you have configured your DHCP Server to provide the address of a Secondary WINS Server to the print server, the address fields are automatically completed for you.

9. Reboot the printer/print server.

   The printer's status page now shows that the print server has successfully registered with the WINS server. The check boxes labeled "`Primary Server Logged in`" and "`Secondary Server Logged in`" on the TCP/IP Configuration Menu now indicate any WINS Servers with which the print server has registered.

   Normally, the print server automatically renews its registration with the WINS Server before its lease expires.

7.5 FTP Printing

7.5.1 FTP Printing Using Netscape

FTP printing with Netscape requires Navigator 2.0 or higher.

To print from Netscape:

1. Connect to the port you want to send the print job to on your print server.

2. Enter the command:

   `ftp://PORT1@`*`dest-srvr-addr`*

   where *dest-srvr-addr* is the IP address of the print server to which you want to send the print job.

3. Run Netscape.

4. Choose **File -> Upload File** and specify the file, or drag and drop the file to your browser window and click **OK**.

Note: FTP printing does *not* support selecting multiple file names. Only **one** user can be logged on to a port at any particular time.

7.5.2 Printing from an FTP Client

1. Open a DOS Command window and enter the following command:

   `ftp` ***`dest-srvr-addr`***

   where *dest-srvr-addr* is the IP address of the print server to which you want to send the print job.

2. Specify **`PORT1`** as the login.

3. Enter the following FTP command:

   `put` ***`filename`***

   where *filename* is the file you want to print.

7.6 UNIX Printing

The Network Interface Board can support UNIX TCP/IP printing in the following mode:

- Printer-based **`lpd`** where the printer appears as a host running a line printer daemon

In general, printer-based **`lpd`** is easiest to use on BSD UNIX systems, requiring an entry in the **`printcap`** file once the Network Interface Board has its IP information.

7.6.1 Configuring the IP Address on the Network Interface Board

The Network Interface Board must be given IP address and routing parameters. You can configure the IP address for the Network Interface Board in one of the following ways:

- Use MAP, as described in Chapter 3

- Use the reverse ARP (**`rarp, Ethernet II frame type only).`**
- Use **`arp`** and **`ping`**

For each method, you need to provide the Ethernet address of the Network Interface Board. The Ethernet address is the 12-character code that is printed under Network Address on the configuration status report each time the printer is turned on.

You can use the **`rarp`**, or **`ping`** procedures only when the Print Server is in its factory default state (no IP information entered.) After the Print Server has an IP address, you must use the Telnet utility or the Network Interface Board HTML management pages accessed through the MAP utility or a web Browser to change an IP address, Subnet Mask and Default Gateway.

7.6.1.1 Using `rarp`

The Reverse Address Resolution Protocol (**`rarp`**) allows network devices to query a server for their IP addresses on start up. For this procedure, there needs to be a workstation with a **`rarp`** server. To store the IP address, use the following procedure:

1. Turn off the printer.
2. Log in as **superuser** on a host on the same subnet as the print server.

   However, if the server resides on another subnet, complete this procedure to store the IP address in the print server. Reconnect the print server anywhere on the network, and then use the TelNet or the HTML pages accessed by MAP or a Web Browser to adjust the IP parameters for the subnet on which the Network Interface Board is operate.
3. Find the Ethernet address of the Network Interface Board. The address is printed on the configuration status report when you power on the printer.
4. Edit the hosts file (usually **`/etc/hosts`**) or use NIS or DNS to add the IP Address and Network Interface Board's node name. See the network administrator for the IP address.

   For example, a print server with the name of **`printfast`** has the following entry:

   ```
   192.9.200.200 printfast
   ```
5. Edit the **`/etc/ethers`** file or use NIS or DNS to add the Ethernet address.

   To continue the example, for the printfast card with an Ethernet address of 00:40:c8:00:00:ff, make the following entry:

   ```
   0:40:c8:0:0:ff printfast
   ```
6. If the **`rarp`** daemon is running, stop it and restart it. Verify that the daemon is running.
7. Check the printer to see that the print server is connected to the network. Turn on

the printer.

8. Wait until the printer powers up and finishes initializing to allow enough time for the IP address to become known and to be saved in non-volatile memory. The Network Interface Board should then reset itself.
9. After the Network Interface Board has reset, use the **`ping`** command to verify that the print server obtained its IP address. For example:

   ```
   ping 192.9.200.200
   ```

   If the server has the address, the result is a confirmation message:

   ```
   192.9.200.200 is alive
   ```
10. Remove, or comment out, your changes to the **`/etc/ethers`** file.
11. Stop the **`rarp`** daemon and, if you want it to run, restart it.

7.6.1.2 Using `ping`

Use the following procedure to enter the IP Address:

1. Turn off the printer.
2. Log in as **`superuser`** on a host on the same subnet as the print server.

   However, if the server resides on another subnet, complete this procedure to store the IP address in the print server. Reconnect the print server anywhere on the network, and then use Telnet or the HTML pages accessed by MAP or a Web Browser utility to change the IP Address.

   See 7.7 Running Telnet, for instructions on using Telnet.
3. Find the Ethernet address of the Network Interface Board. The address is printed on the configuration status report each time you turn the printer on.

   The address is printed on the configuration status report each time you turn the printer on.
4. Edit the hosts file (usually **`/etc/hosts`**) or use NIS or DNS to add the IP address and print server's node name. See the network administrator for the IP address.

   For example, a print server with the name of **`printfast`** has the following entry:

   ```
   192.9.200.200 printfast
   ```
5. Add an entry to the **`arp`** cache for the Print Server’s IP address and Ethernet address.

   For example:

   ```
   arp -s 192.9.200.200 0:40:c8:0:0:ff
   ```
6. Check the printer to see that the Print Server is connected to the network. Turn on the printer.

7. Send a **ping** command the Network Interface Board to verify it is running on the network.

   For example:

   ```
   ping 192.9.200.200 or
   ping printfast
   ```

   The Network Interface Board will not respond to this **ping** command but it will read its IP address from the packets.

8. Turn the printer off and back on again and then send the ping command again to verify that the print server obtained its IP address. If the Print Server has the address, the result is a confirmation message:

   ```
   192.9.200.200 is alive
   ```

9. Remove the entry from the **arp** cache using the following command. Specify the Print Server either by its IP address or by its name.

   For example:

   ```
   arp -d printfast
   ```

7.6.2 lpd/lpr Printing

The **lpd**/**lpr** is an implementation of the standard UNIX line printer daemon which lets you print across a TCP/IP network without installing software on your workstation with all filtering and banners done by the Network Interface Board. Remote printing uses the same commands (**lpr**, **lpq**, **lpc**) as local printing.

The process begins when the **lpr** call finds a printer on a remote system by looking at the remote (**rm**) entry in the **/etc/printcap** file for that printer. The **lpr** handles a print job for a remote printer by opening a connection with the **lpd**/**lpr** process on the remote system and sending the data file (followed by the control file containing control information for this job) to the remote system. The printer-based **lpd** then filters the data and prints the job according to information contained in the control file and its own **printcap** file.

The Network Interface Board **lpd** recognizes the format of certain printer emulations and filters the data, if possible, so the data can be printed on the printer type you specify.

You can indicate to the Network Interface Board **lpd** what type of printer is attached to by either:

- Accept the default port setting (PCL, PostScript, and other)
- Change the listed emulations via the Telnet or the HTML pages accessed by MAP or a Web Browser utility

The following sections give specific **lpd**/**lpr** setup instructions for various systems.

7.6.2.1 Setting Up a BSD Remote Printer to Use lpd

To set up a remote printer on the host that sends jobs to Network Interface Board using printer-resident **lpd**, add an entry to the **/etc/printcap** file on your host for each printer you use.

The steps are described below.

1. Open the **/etc/printcap** file. Make an entry naming the Network Interface Board as the remote host and PORT1 as the remote printer name. A typical printcap entry is shown below:

```
<printer_name>\
 (for example, lprprinter)
   :lp=:\
   :rm=<remote_host>:\
     (for example, name as entered in /etc/hosts)
   :rp=PORT1:\
   :sd=/usr/spool/lpd/<printer_name>:
     (for example, spool directory on system used to
spool data and control files)
```

   This entry will send jobs spooled at **/usr/spool/lpd/<*printer_name*>** to the printer designated <*printer_name*> to be printed at **lp**(the internal connection to the printer) of the Network Interface Board designated as <*remote_host*>.

2. Create the spooling directory. For example, type:

```
mkdir /usr/spool/lpd/<printer_name>
```

3. To print via the spooler, use the **lpr** command. Type:

```
lpr -P<printer_name> <file_name>
```

   Installation and testing is done. You are now ready to print.

7.7 Running Telnet

The Telnet utility uses the standard remote terminal protocol to configure the IP address, **lpd**/**lpr** printers, and other parameters on your system. You have the same functionality with Telnet as with accessing the Network Interface Board HTML pages with MAP or a Web browser (see Chapter 3, *Monitoring the Network Interface Board*).

Use the following guidelines to run Telnet:

- Typically you make selections from menus by toggling between one choice or another, by selecting/deselecting or enabling/disabling an item.
- Press **Enter** when not selecting an item. This returns you to a previous menu.

- If you do not make a menu selection for two minutes, you get a two-minute warning that within two more minutes your Telnet session ends. This ensures that no one user leaves a session idle for too long.

7.7.1 Making the Connection and Accessing the Main Menu

To make the connection and access the Main menu:

1. At the prompt, type the following command:

   `telnet` ***`ip-address`***

   where *ip-address i*s the IP address of the card.

2. When the login prompt appears, type **`guest`** if you are interested in only browsing the menus, or type **`sysadm`** if you want to change the configuration.

3. When the password prompt appears, again type **`guest`** or **`sysadm`**.

   The main menu is displayed. This utility lets you change the IP parameters, **`lpd`**/**`lpr`** printers, protocols, and password, and lets you restore to factory defaults.

4. Type the number for the parameter you want to check or change and press **Enter**.

   ```
   1. IP Parameters
   2. LPD Printers
   3. Protocols
   4. Restore Factory Defaults
   5. Change Password
   E. Exit
   ```

5. To end your Telnet session, type **E** at the Main Menu.

   If you have made any changes you are prompted to either Save Changes and Exit or Exit Without Saving Changes. Choose the appropriate option and press **Enter**.

Note: To get online help in Telnet, type **?** (question mark).

7.7.2 Configuring IP Parameters

Although the Network Interface Board must have an IP address before a Telnet connection can be made, you can use the Telnet utility to change the address or the other IP parameters. The Network Interface Board automatically initiates a soft reset when it senses the IP address change.

Note: This causes the Telnet connection to be broken. It is advisable to make all other desired changes before changing the IP address.

To configure IP parameters:

1. At the main menu, type **1** and press **Enter** to display the IP Parameters menu.
2. Type **1** again and press **Enter**.

   The IP Address submenu is displayed:

1. IP Address	199.92.187.37
2. Subnet Mask	255.255.255.0
3. Default Gateway	199.92.187.254
4. Base Port Number	10000

3. Type the number for the parameter you want to change and press **Enter**.

Note: The base port number is one less than the actual TCP/IP port number used by the printer. For example, to set the port number to 9100, enter 9099.

7.7.3 Selecting Printer Languages

Selection 2 in the main menu lets you designate the emulations (printer interpreter languages) that the printer supports. This lets the resident **`lpd`**/**`lpr`** modify files intended for other emulations so they can be printed. The menu also allows you to enable or disable banners attached to **`lpd`**/**`lpr`** handled jobs.

The emulation choices are:

- Printer Control Language (PCL)
- PostScript (PS)
- ASCII (simple text)
- Other (any print job not recognized as PCL, PS, or ASCII)

The file modifications and conditions are:

Print Server Setup	Job detected as	Action
PCL, (PostScript)	ASCII	<CR> changed to <CR><LF>
PostScript	PCL, Other	PostScript header added
not PostScript	PostScript	Job discarded
PostScript	ASCII	PostScript header added, <CR> changed to <CR><LF>
PCL, PS, ASCII	any	No action

To select the printer language:

1. To access the LPD Printers menu, type **2** and press **Enter**.

   For a unit at factory default, the following menu appears.

LPD Printers	
1. Printer 1	PCL PS OTHER
2. Banners	DISABLED

2. To change the set of emulations, type **1** and press **Enter**.

   The following options are displayed.

Printer 1	PCL PS OTHER
1. PCL	
2. PS	
3. ASCII	
4. OTHER	

3. To delete an emulation, select the number opposite the language listed and press **Enter**.
4. From the LPD Printers menu, type **2** to toggle Banners between Enabled/ Disabled.

7.7.4 Enabling/Disabling Network Protocols

To enable network protocols, type **3** at the main menu.

You are given the choice of disabling either NetWare or AppleTalk since both network OSs are enabled by default. For example, to disable Appletalk, type **2** and press **Enter**.

7.7.5 Restoring Factory Defaults

When you need to restore factory defaults on your print server, type **4** at the Main Menu and press **Enter**. All NVRAM stored parameters are returned to their factory default values. The factory default values do not take effect until you exit the Telnet program or the unit is powered off and on.

7.7.6 Changing a Password

1. Type **5** at the main menu.
2. Type up to eight characters at the New Password query and press **Enter**.
3. Retype the same characters at the Retype New Password query and press **Enter**.
4. Choose the **Save Changes and Exit** option.

   Once you have set your password, the `sysadm` password is no longer valid.

Note: There is a single maintenance access password to the Network Interface Board. You use this password with Telnet or when accessing the Network Interface Board HTML pages with MAP or a Web browser.

7.7.7 Exiting Telnet

1. Type **E** at the main menu.

   If you have made any changes, the exit menu is displayed:

```
Exit

1. Save Changes and Exit
2. Save Changes and Reset
3. Exit Without Saving Changes
```

2. Choose an exiting option and press **Enter**.

7.8 Internet Printing Protocol (IPP) Printing

7.8.1 Setting Up a Printer Using IPP

You can use the IPP with Windows 2000.

To set up a printer for IPP printing:

1. Assign an IP address to your print server.
2. Reset the print server.
3. Use the **`ping`** command to make sure the print server responds.

7.8.2 Setting Up the IPP Functions of the Printer

You can set up the IPP functions of the printer by using MAP or a Web browser. For IPP printing, your workstation must have an IPP client installed (either from Microsoft or a third-party).

To configure the printer for printing:

1. Choose **Start -> Settings -> Printers**.
2. Click **Add Printer**.

   The Add Printer wizard appears. Click **Next** to proceed.
3. Choose the **Network Printer** option and click **Next**.
4. On the Locate Your Printer screen, select **Connect to a printer on the Internet or on your intranet** and type the correct printer path. (case sensitive)

   The format is:

   `URL: http://`*`ip-addr`*`:631/Print`

   where *ip-addr* is the IP address of the printer. For example:

   `URL: http://199.92.186.97:631/Print`

Note: Your printer port number is listed on the NIB Status Page next to the Internet Printing Protocol.

---

5. Click **Next** and finish printer setup.

   For example, select the appropriate printer type.
6. Perform a Test Print from your printer and check the printer for the test page.

The printer configuration is complete.

Chapter 8
Operation and Troubleshooting

This chapter describes:

- Normal operation of the Network Interface Board in the printer
- LED status indicator
- Status reports
- Resetting the Print Server to factory defaults
- Troubleshooting any problems you might have with the Network Interface Board

8.1 LED Status Indicators

The Network Interface Board has two LED status indicators: orange and green. The orange LED generally indicates job activity. The green LED indicates the operating condition of the Network Interface Board.

8.1.1 Normal Operating Condition

Green LED

- When you first power on the printer, the green LED is on solid (that is, not blinking). This indicates that the Network Interface Board is performing self tests. The green LED may also be on solid when the printer is awaiting a print job and the Network Interface Board is functioning properly.
- When the printer finishes the self-tests, the green LED blinks, and may blink again after initialization with the printer is completed. If the Print Status Report on Power up feature is enabled, the Network Interface Board generates a status report.

Orange LED

- When the printer is receiving print jobs over the network, the orange LED blinks. It is off when there is no activity.
- The orange LED is on solid (not blinking) to indicate that the network connection has been lost — typically, because the server has been shut down.

8.1.2 Error Conditions

Combinations of blinking LEDs — 1 to 7 orange blinks followed by 1 to 12 green blinks — indicate various hardware failures. You should then notify the supplier of your printer according to whatever arrangements you have for technical support or replacement of defective equipment.

8.2 Status Report

The Status/Configuration report is generated when the print server is powered on (if the Print Status Report on Power up feature is enabled). The following sample report shows the configuration of the print server immediately before the report is printed. Some printers also allow you to use a command from the front panel that produces a status report.

You should generate and review a status report after installation and any time the setup changes. If your status report does not include a protocol that was configured, make sure the procedure was done properly.

Sample Status Report

```
------------------------------------------------------------------------
Unit Serial No: 123456               Version: 05.60
Network Address:  00:11:22:33:44:55
Network Topology: Ethernet           Connector: RJ45
Network Speed: 100 Megabits

Novell Network Information           enabled
    Novell Print Server Name: RDP_123456
    Password Defined: No
    Directory Services Context not defined
    Frame Type: 802.3
Peer-to-Peer Information             enabled
    Frame Type: 802.2 on 802.
    Network ID: 6
TCP/IP Network Information           enabled
    Frame Type: Ethernet II          Protocol Address: 123.123.123.123
    Subnet Mask: 123.123.123.123     Default Gateway:  123.123.123.123
    WINS Name:
IPP Network Information              enabled
    Internet Printing Protocol       http://123.123.123.123:631/Print
AppleTalk Network Information        enabled
```

```
    Frame Type: 802.2 SNAP on 802.3
    Protocol Address: Net Number 123 Node Number:45 Socket Number 678
    Preferred AppleTalk Zone:        Default Zone
Novell Connection Information
    Printer Name: Assigned Name
    File Server: NameOfFileServer
        Queue:  NameOfQueue  Priority: 1     Attached: yes
        Notify: Supervisor   First:    30    Repeat:   60
Peer-to-Peer Connection Information
    Port Name: RDP_123456
AppleTalk Connection Information
    AppleTalk Printer Name: RDP_123456
TCP/IP Connection Information
    Port Number: 10001
-----------------------------------------------------------------------
```

8.3 Returning the Network Interface Board to Factory Default Settings

You can restore parameters on the Network Interface Board to their factory default settings. You should do this before the Network Interface Board is moved to a new location where the environment (AppleTalk network zones, NetWare file servers, IP subnets, and so on) is different.

Note: Returning to factory default settings means that the print server loses all data such as names and IP addresses. It does not lose its serial number or MAC (Ethernet or Token Ring hardware) address.

To restore the factory default settings, you can use Telnet or the Network Interface Board's HMTL pages (via MAP or a Web browser). If the network is not available, you can use the following method.

To reset the Network Interface Board:

1. Power off the printer and remove the Network Interface Board from the printer.

   The removal process is the reverse of the installation process described in Chapter 2, *Installing the Network Interface Board*.

2. Locate the Reset Jumper (labeled OP2. Refer to the diagram in *Appendix A*). Move this jumper to the **ON** position.

3. Reinstall the Network Interface Board as described in Chapter 2 but do not connect the printer to the network.
4. Power on the printer.

   The Network Interface Board performs self-diagnostic tests. The green LED blinks 3 times and then goes into an alternating green/orange sequence. When you see this LED pattern, do the following steps.
5. Power off the printer.
6. Remove the Network Interface Board from the printer.
7. Move the OP2 jumper to its **OFF** position, so that the jumper covers the center pin and the pin nearest the OFF designation.
8. Reinstall the Network Interface Board according to Chapter 2, *Installing the Network Interface Board*.
9. Reconnect to the network and power on the printer.

8.4 Troubleshooting Checklists

8.4.1 General Troubleshooting

Use the following list to determine the cause of printing problems:

- Verify that the printer is functioning properly:
  - — Is the printer printing? To check whether the printer is operating properly, make it generate a test page. See your printer's owner's manual for instructions on generating a test page.
  - — Is the printer on-line?
  - — Does the control panel indicate an error? Refer to your printer documentation for an explanation of the error messages.
  - — Did you get a Network Interface Board status page (if the Print Status Report on Power up feature is enabled)? On preppy, the Network Interface Board sends a status page which contains information that is useful for troubleshooting. Keep the status page available until the problem is resolved.
  - — Check the Network Interface Board's LED status indicators to make sure there is no error condition. See *Section 8.1 LED Status Indicators* for more information.
  - — Check the status report to see what protocols are enabled and active.

- See the appropriate chapter of this manual to confirm that you have installed and configured your network protocol correctly for the Network Interface Board. See *Section 8.2 Status Report* for a sample status report.
- If you added, changed, or removed any hardware on the network, verify that it was installed or removed correctly.
- If you added any new software applications, make sure the program is compatible and installed correctly on the network. See your network protocol documentation for more information.
- Can other users print? If they cannot print and they are all using the same network protocol, go to the troubleshooting section for that protocol.

When you have determined the nature of the problem, use the checklists in the next section.

8.4.2 Troubleshooting Network Hardware Connections

- Make sure the Network Interface Board has properly selected the connector type that you are using. The connector type is on the status/configuration report — RJ45 or BNC.
- For Thinnet, check that the network connector is plugged into the BNC connector on the Network Interface Board. If the printer is at the end of a run, ensure that a 50-ohm terminator is installed.
- For 100BaseT or 10BaseT, check that the network connector is plugged into the RJ45 connector on the Network Interface Board.
- If the network connectors are properly plugged in and the problem persists, try another cable.
- If you are using a 10BaseT Network Interface Board connected to a concentrator hub that does not support the link signal, use Manual Ethernet Port selection instead of the factory default of Automatic Ethernet Port selection. See *Appendix A, Jumper Settings*.

8.4.3 NetWare Troubleshooting

Use MAP to get the NetWare setup and parameter values. If you cannot resolve the problem after running MAP, go through the checklists in this section.

8.4.3.1 NetWare Checklist

- Is the print server name entered correctly?
- The default name is the Network Interface Board serial number (six digits with a three-letter prefix). This number is located on the card.
- Did you assign print queues to the printer?
- It is recommended you assign each print queue to only one Network Interface Board-connected printer. If print queues are assigned to other network printers, the print jobs might be going to another network printer.
- Did you assign the printer to the type **Remote Other/Unknown**?
- If the server settings are correct, the connection between the printer and network might have been broken. In this case:
  - — Turn the printer off and, using NWADMIN or PCONSOLE, wait for the status message Not Connected.
  - — Turn the printer on and the status should change to **Waiting for Job**.

8.4.3.2 File Server Checklist

- Is there enough disk space on the file server and is it running?
- Is the correct file server associated with the printer? Use NWADMIN or PCONSOLE to check this.
- Did you have the proper rights to configure the printer?
- Are the File Server and the Print Server communicating? Run the NetWare COMCHECK utility from any network workstation to check this.
- Are there enough user positions on the File Server? The Print Server function logs on as a user.

8.4.3.3 Workstation Checklist

- Is the network loaded onto the workstation? See your Novell documentation.
- Is the application set up to print to the printer? For example, are you using the correct driver?
- Is the workstation connected to the correct print queue? Print a file and verify that the file goes to the queue.
- Are the print queues assigned to the Network Interface Board-connected printer also assigned to another network printer? If so, the print jobs may be going to that printer.

- From NWADMIN or PCONSOLE, enter a sample print job directly into an assigned queue. Does the job become Active? Is the job printed?
- Is **AUTO ENDCAP** enabled? This option lets you send data to a network printer. Use PRINTCON to check.

8.4.3.4 Network Interface Board Configuration Checklist

If all your hardware connections are correct, check the following:

- Use MAP to check the status of the print server.

  The Report Print Server Status screen shows the status for the selected Network Interface Board. This report includes a status of file servers and queues assigned to a printer along with a description of any problems.
- The printer might not be assigned to the correct print queues.

  Use NWADMIN or PCONSOLE to direct print jobs to the correct queues, then check to see if the print job is in the queue.
- If devices were added or changed, use NWADMIN or PCONSOLE to make sure you configured the new devices correctly.
- Make sure the Network Interface Board's name has been entered correctly. If you changed the name in MAP, you must also change the name in NWADMIN or PCONSOLE before you can print.
- Use NWADMIN or PCONSOLE to check the printer status. Make sure it is not stopped or paused.

8.4.3.5 Printer Server, File Server, and Printer Checklist

- Can the Network Interface Board log in to the file server, and can it service jobs from a file server?
- Is the print server name listed on that file server?
- Does the print server password assigned to the Network Interface Board through NWADMIN or PCONSOLE match the print server password assigned through MAP?

  (Use MAP to update the password stored in the network print server's memory.)
- Is the print job in the print queue and waiting to be printed? Use NWADMIN or PCONSOLE to check whether the print jobs are being sent to the printer.

8.4.3.6 Workstation to Network Interface Board Connection Checklist

To make sure the workstation is communicating with the Network Interface Board:

- Print a file from the workstation. Use NWADMIN or PCONSOLE to verify that the print job gets to the print queue. If the print job does get to the queue, the problem is not with the workstation/print server connection.
- Use CAPTURE to send data to the printer from a software application. See your Novell documentation for information.
- Make sure another printer is not taking the print jobs from the queues before the Network Interface Board can service the job. Disable the other printer until you can verify the Network Interface Board-connected printer setup.

8.4.3.7 If the Network Interface Board Loses Its File Server Connection

If the network interface board loses its connection to the file server, it can take approximately 5–10 minutes to reconnect. If the connection is not made after some reasonable time, check the error conditions to troubleshoot the problem.

8.4.3.8 Cannot Print from a Different Context

The Network Interface Board does not support printing from a context different from the context you are installed in. If you want to do this, you must create an alias queue. See your Novell documentation for more information.

8.4.4 AppleTalk Troubleshooting

- Is the Macintosh connected to the network through Ethernet and has the AppleTalk driver been selected? To check, choose **Control Panel** from the Apple menu and then choose **Networks**.
- Did you select the correct Network Interface Board and correct zone?
- Is AppleTalk enabled on the Macintosh? Use Chooser to check this.
- If you are on a network with multiple zones, is the zone correct?
- Did you select the correct printer driver in Chooser? You must first select the printer icon and then select the printer name. (Not all printers communicate with the default Macintosh driver.)
- If you renamed the printer in the AppleTalk program, did you re-select the printer under its new name?
- If you put the printer in a new zone, did you re-select the zone?
- Are there other printers with similar names in Chooser? Make sure you chose the Network Interface Board-connected printer.

8.4.5 TCP/IP Troubleshooting

Problem: Cannot access the Network Interface Board from the network

- Make sure the Network Interface Board has a valid IP address. Use **`ping`** to check the IP address assigned to the card.
- Check the TCP/IP parameters (subnet mask, gateway, and so on).
- If your network supports DHCP or WINS:
  - — Are the server names set correctly on the Network Interface Board Status Configuration page?
  - — Is the DHCP Server or WINS Server running?
  - — If the DHCP Server or WINS Server is running, is it configured properly? Refer to your network documentation for more information on configuring servers.

Problem: Cannot print from **`lpr`**

- Do you have the correct drivers?
- Is the print job directed to the correct IP address?
- Is the **`lpr`** channel full because of other jobs in the queue?

Problem: Cannot print from IP-P2P or Windows 2000 direct IP

- Do you have the correct drivers?
- Is the print job directed to the correct IP address?
- Is the correct port number being used for Raw Sockets printing? (The default for the Network Interface Board is 10001.)
- Is the printer reporting any errors?
- Was the print job removed from the spooler? (Check the Windows spooler for any details on the status of a failed job.)

Problem: Cannot print from IPP

- Do you have the correct drivers?
- Is the print job directed to the correct IP address in the IPP client (that is, **`http://`*`ip-address`*`:631/Print`**)?
- Was the print job removed from the spooler? (Check the Windows spooler for any details on the status of a failed job.)

Appendix A
Jumper Settings

This appendix describes:

- Changing jumper settings
- Network Interface Board and jumper locations
- Reset to factory defaults
- BUS handshake
- Ethernet-specific jumpers (10BaseT only)

A.1 Changing Jumper Settings

The Network Interface Board normally configures the network configuration automatically without the need to access internal jumpers. However, there are certain jumpers on the board that you might have to access under certain circumstances. If you need to change the jumpers, follow the steps in this section.

Note: **Handling Precautions for Static Sensitive Devices:** The Network Interface Board is designed to protect sensitive components from damage due to electrostatic discharge during normal operation. When installing the card, however, take proper static-control precautions to prevent damage to equipment.

Make sure you do not have the printer plugged into a wall outlet. If it is plugged in, unplug the power cord ***before*** you open the unit. Remove the Network Interface Board according to the printer instructions.

A.2 Reset to Factory Defaults

The Network Interface Board can be restored to factory default conditions by jumper OP2. The function of OP2 is to reconfigure NVRAM. Do this when a unit is moved from one site to another and should be restored to as-new condition.

If the unit is powered up with jumper OP2 in the FACT position (opposite of the CUST position), the board resets all parameters to their factory default values. This is indicated

by the three quick green flashes followed by the alternating amber and green indications (once per second rate). You should then turn off power and shift the OP2 jumper to the CUST or OFF position (opposite of the FACT or ON position). The unit operates normally when you turn the power on again.

Appendix B
Network Interface Board Specifications

This appendix describes:

- General specifications for the Network Interface Board
- 10/100BaseT cables

B.1 General Specifications for the Network Interface Board

Size:	Length: 123.7 mm Width: 95 mm
Weight:	8 ounces
Environment:	0–50° C 5%–80% humidity
Controls and Indicators:	One green LED and one amber LED
Configuration:	Stored in NVRAM
Connectors:	Any of the following: • Ethernet: 8-wire RJ45 10/100BaseT

B.2 10/100BaseT Cables

Use the following universal Ethernet standard when configuring your 10/100BaseT cables to connect to the RJ45 connector on the Network Interface Board. The cable should be Category/Type 5 or better (depending on length).

Pin	Color	Ethernet
8	Blue/white	
7	Blue	
6	Orange/white	Receive –
5	Green/white	
4	Green	
3	Orange	Receive +
2	Brown/white	Transmit –
1	Brown	Transmit +

Index

Numerics

A

B

C

L

M

N

P

Q

R

S

T

W