



***i*SPAN™ Serial WAN Adapter Users Guide**

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NOTE

See Appendix F for Regulatory Statements/Conditions that affect the operation of this product.

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Do Not Substitute Parts or Modify Equipment

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Ground the Instrument

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter, with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

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Keep away from Live Circuits

Do not install or replace the component with power cables connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Telephone Lines Unsafe Voltages

As unsafe voltages (Telecommunication Network Voltages) exist on ISDN lines, safety precautions must be taken to prevent contact with any dangerous area of the system.



WARNING

- The network cable(s) must remain disconnected from the telecommunications system until the card has been installed in the system.
 - The installation of the card in the host system must be done in a way that ensures at least 2mm of air gap between the Printed Circuit Board (PCB) card and any other components in the host system, so that the unsafe area remains located only on the card.
-

Telephone Wiring Warnings

Never install telephone wiring during a lightning storm. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations. Never touch non-isolated telephone wires or terminals unless the telephone line has been disconnected at the network interface. Any intervention on the card or in its proximity should be made with the telephone connector unplugged.

Observe Dangerous Procedure Warnings

Warnings precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.



WARNING

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Using This Guide

Purpose

This Users Guide provides information about the Interphase *iSPAN*[™] Serial WAN adapter. It describes general features, hardware and software installation procedures (with safety precautions), and the modules that comprise the product. It also provides detailed information about the external software interface and about how the software modules interact.

Audience

This manual assumes that its audience has a general understanding of computing and networking terminology. If you need more information about this terminology (in addition to what this manual provides), see the networking glossary at the following web site:

<http://www.ctcnet.com/html/telecom.htm>
(Select the **Telecom Library** tab.)

Icon Conventions

Icons draw your attention to especially important information, such as the following:



NOTE

The Note icon indicates important points of interest related to the current subject.



CAUTION

The Caution icon brings your attention to those items or steps that, if not properly followed, could cause problems in your machine's configuration or operating system.



WARNING

The Warning icon alerts you to steps or procedures that could be hazardous to your health, cause permanent damage to the equipment, or impose unpredictable results on the surrounding environment.

Text Conventions

The following conventions are used in this manual. Computer-generated text is shown in typewriter font. Examples of computer-generated text are: program output (such as the screen display during the software installation procedure), commands, directory names, file names, variables, prompts, and sections of program code.

Example of computer-generated text

Commands to be entered by the user are printed in **bold Courier** type. For example:

```
cd /usr/tmp
```

Pressing the return key (↵ **Return**) at the end of the command line entry is assumed, when not explicitly shown. For example:

```
/bin/su
```

is the same as:

```
/bin/su ↵ Return
```

Required user input, when mixed with program output, is printed in **bold Courier** type.

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The latest documentation (in Adobe[®] Acrobat[®] pdf) for our current products are available on our WWW site. Interphase recommends our customers visit the web site to verify that they have the latest version of the documentation.

1. Access the following web page:
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2. Move the mouse (or other pointer) and click on the `Products` option. A menu will appear on the left side with **Telecom Solutions**, **Enterprise Solutions**, and **Services** options. Choose the appropriate menu item (such as **PowerSAN Fibre Channel HBAs**).
3. A new web page with a list of the currently offered products will appear. Choose your product by clicking on the product number (i.e. 4532, 5540, 4575, etc.).
4. The Product Description page appears for the product selected. At the left side of the page is a list showing additional information web pages for that product. Choose the **User Guides** item.

5. A new web page appears with a list of the latest released user guides available for the product. Click on the document you require.

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Contact our Technical Support Department at swlib@iphase.com to determine if updated drivers are available for your product.

When contacting technical support, please be sure to provide your name, company name and address, phone number, product name, driver version (if applicable), OS and version (if applicable) and serial number. Providing this information will help speed up our response.

Adapter Overview

The Interphase *iSPAN*-Serial WAN adapter is a single-slot, Peripheral Component Interconnect (PCI) add-on board for PCI-based PCs, servers, and workstations. The adapter provides a fast pathway to enterprise communication server applications. It is a *smart* adapter that connects systems to a Serial Line interface through a single, high-speed synchronous communication port.

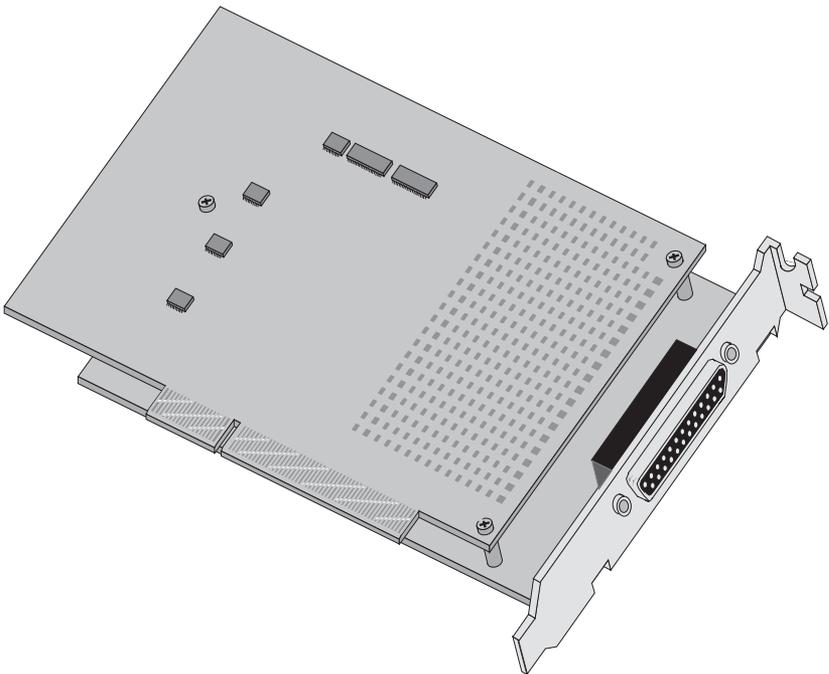


Figure 1-1. *iSPAN*-Serial WAN Adapter

The modular adapter architecture includes a CPU motherboard and a WAN daughtercard.

The CPU motherboard is powered by an IBM PowerPC™ 403GA 32-bit RISC processor, combined with a 32-bit/33-MHz PCI interface. The processor allows full support of communication protocols, reducing host CPU usage.

The WAN daughtercard handles various communication protocols at up to 2 megabits per second (Mbps). The daughtercard supports the following serial interface types with automatic recognition:

- V.24/V.28
- V.35
- X.21/V.11



NOTE

The *iSPAN-Serial WAN* adapter is referred to internally as the *5535-1P-SR* adapter. You might see both names used in the Users Guide and the software dialog boxes to refer to the adapter.

Hardware Overview

Following are the standard hardware features of the adapter:

- Short PCI form factor (174.63 x 106.68 mm)
- PCI 2.1-compliant master/target bus interface
- Compliance to industry standards and specifications (FCC part 15 Class A, IEC950)
- 32-bit RISC processor PowerPC™ 403 GA @ 33 MHz
- 32-bit local bus at 33-MHz

- 4 MB dual port DRAM memory and 128 KB Flash EEPROM
- Synchronous serial line with DB25 female connector (for serial WAN connection only)
- V24/V28, V35, or X21/V11 electrical interface
- Full plug-and-play installation

Software Overview

The software included with the adapter runs under Windows NT 4.0 operating systems. It supports up to four *iSPAN*-Serial WAN adapters installed in a system.

Two software packages are available: the NDIS package and SNA Server Link Services package. The software is available on two CD-ROMs, one for each package.

Software Packages

You can install the NDIS software package, the SNA Server Link Services software package, or both software packages, depending on your system needs. Both packages include the Base driver.

Base Driver

The Base driver is the basic driver required to support the adapter. It is delivered as a standard product with both the NDIS driver and SNA Server Link Services.

The Base driver software files include the following utilities:

- The WAN Adapters Setup utility enables you to manage adapter firmware and hardware.

- The Synwatch utility enables you to track connections and data traffic on the Serial port.

NDIS Driver

The NDIS driver emulates a LAN adapter. It enables transportation and routing of TCP/IP and IPX/SPX protocols over WAN serial lines, using X.25, PPP, or Frame Relay protocols.

Along with the Base driver and NDIS driver, the NDIS software package also includes the following utilities:

- The NDIS Driver Setup utility enables you to set up logical adapters for NDIS communications.
- The NDIS Driver Log records NDIS driver events. It enables you to view the events in the NDIS Driver Log dialog box or the Windows NT Event Viewer.

Using the NDIS Driver Setup utility, you can configure as many as four NDIS logical adapters in a Windows NT system. (A *logical adapter* represents a unique configuration of connections to be handled by the NDIS driver.) As a result, the NDIS driver can connect to four different IP and/or IPX networks seamlessly. However, the driver needs to be installed only once.

The following figure shows the capabilities of the NDIS driver.

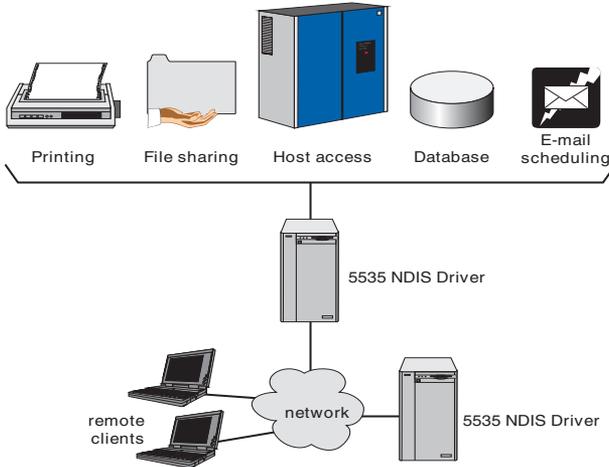


Figure 1-2. NDIS Driver Capabilities

The NDIS Driver provides the following types of connections:

- Connection of two or more LANs through WAN networks
- Connection of stand-alone workstations to remote LANs through WAN networks

For complete information about installing and setting up NDIS software, see [Installing the NDIS Software Package](#) on page 35, [Setting Up the NDIS Driver](#) on page 63, and [Logging NDIS Driver Events](#) on page 95.

SNA Server Link Services Software

The SNA Server Link Services software provides Microsoft SNA Server link support. This software creates QLLC/X.25, SDLC, or Frame Relay links with Microsoft SNA Server version 4.0 (with Microsoft SNA Server Service Pack 1). SNA Server links enable you to connect your Microsoft SNA Server to an SNA host or to another Microsoft SNA Server.

After installing SNA Server Link Services software, you can use the Microsoft SNA Server Manager to configure services. For detailed information about installing and setting up SNA Server Link Services software, see [Installing SNA Server Link Services Software on page 107](#) and [Setting up SNA Server Link Services on page 123](#).



NOTE

If you plan to use the SNA Server Link Services software with your *i*SPAN-Serial WAN adapter, see *Basic Methods for Evaluating Hardware Requirements* in the *Microsoft SNA Server Planning Guide*.

Software Features

The *i*SPAN-Serial WAN software includes the following onboard data protocols:

- HDLC
- PPP
 - Point-to-point protocol (RFC 1618, RFC 1661, RFC 1662, RFC 1663, RFC 1570, RFC 1333)
 - PAP, CHAP authentication (RFC 1334)
 - Multi-link protocol (RFC 1717)

- IP and IPX support (RFC 1332, RFC 1552)
- X.25
 - ISO 8208, ISO 7776, IUT-T X.25
 - Packet size up to 4096 bytes
 - Up to 256 VCs
 - IP and IPX over X.25 (RFC 1356)
- Frame Relay
 - Link Management Interface UNI: UI ANSI T1.617 Annex D, UI IUT-T Q.933 Annex A or I
 - Data Link Layer IUT-T Q.922 / ANSI T1 618
 - User side of the User-to-Network Interface
 - PVC only (up to 976 user DLCIs)
 - DLCI management (user-defined, automatic)
 - Unicast only
 - Frame size up to 4096 bytes
 - Quality of Service management (CIR, Bc, Be, T)
 - Congestion management (BECN, FECN, DE)
 - IP and IPX over Frame Relay (RFC 1490)

Features specific to the NDIS software include the following:

- NDIS 4 driver for NT 4.0
- Supports IP/IPX over PPP, X.25, or Frame Relay networks

Features specific to the SNA Server Link Services software include the following:

- SNADIS driver for Microsoft SNA Server support
- Supports SDLC, QLLC/X.25, and 802.2 LLC type 2 (LLC2) emulation over Frame Relay

Point-to-Point and Multipoint Connections

The iSPAN-Serial WAN adapter supports point-to-point and point-to-multipoint connections. The following figure shows a point-to-point connection over dedicated leased lines.

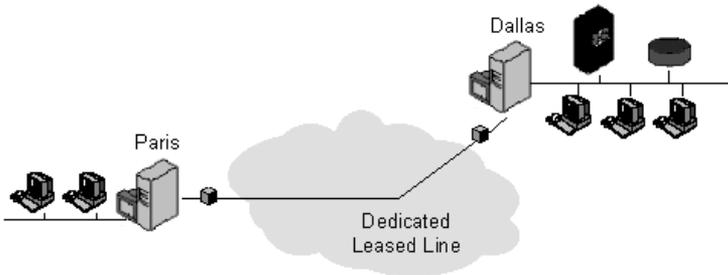


Figure 1-3. Point-to-Point Connection

The following figure illustrates a point-to-multipoint connection across a Frame Relay or X.25 network.

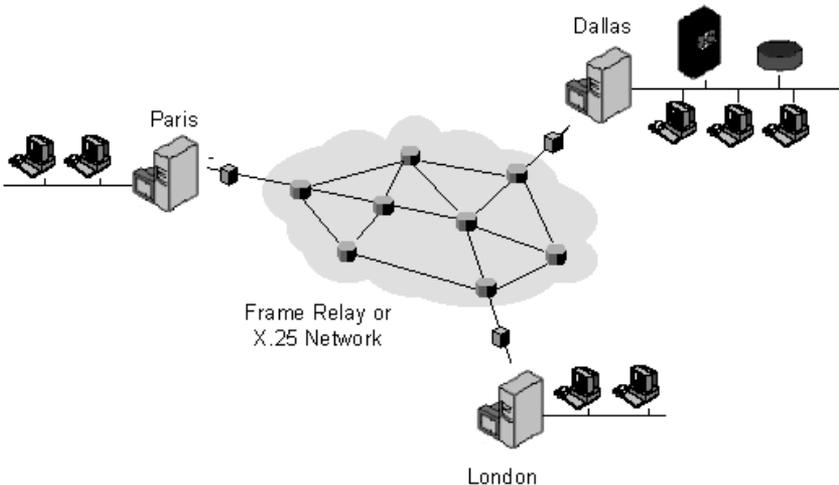


Figure 1-4. Point-to-Multipoint Connections

Minimum System Requirements

Following are the minimum system requirements for using the board with NDIS or SNA software:

- Intel® system running Windows NT Version 4.0 Server
- Windows NT Service Pack, Version 3 recommended
- For SNA link services, Microsoft SNA Server Version 4.0 and Microsoft SNA Server Service Pack 1
- Bus architecture: PCI Local Bus Specification Revision 2.1
- 32 MB RAM
- Hard disk with 3 MB free
- CD-ROM drive

Overview

You can install the adapter in any suitable PCI expansion slot. To install the adapter, follow these basic steps:

1. Verify that the system meets minimum requirements.
2. Inspect the adapter.
3. Install the adapter in a host expansion slot.

The tools required are a grounding strap and a #1 Phillips head screwdriver. Both are included in the product packaging.



NOTE

Refer to the users manual that came with your personal computer for additional detailed installing instructions.

Verifying Minimum Requirements

Before installing this adapter, verify that your system meets the minimum requirements described in [Minimum System Requirements](#) on page 9.

Inspecting the Adapter

Before installing the adapter in your computer, visually inspect it for any damage that might have occurred during shipment from the factory.



CAUTION

The adapter is packed in an antistatic bag to protect it during shipment. Keep the adapter in its protective antistatic bag until you are ready to install it in the host computer. To prevent damage to the adapter due to electrostatic discharge, wear a grounding strap on your wrist or ankle and handle the adapter only by its edges. Do not touch its components or any metal parts other than the faceplate.

1. Open the shipping container and carefully remove its contents from the antistatic bag.
2. Inspect each item for damage. If you find any omissions or damage, contact your network supplier and the carrier (for example, UPS or Federal Express) that delivered the package.

Installing the Adapter



WARNING

Your computer operates at voltages that can be lethal. Follow all cautions and warnings in this installation procedure, both to protect yourself and prevent damage to your computer. Use only tools with nonconductive handles, or tools coated with, covered with, or made with nonconductive materials. Nonconductive materials are materials that do not conduct electric current, such as plastic, rubber and fiberglass.

With a grounding strap connected to your wrist or ankle, do the following to install the adapter:

1. Turn off the computer's power switch, and unplug the unit from its power source.

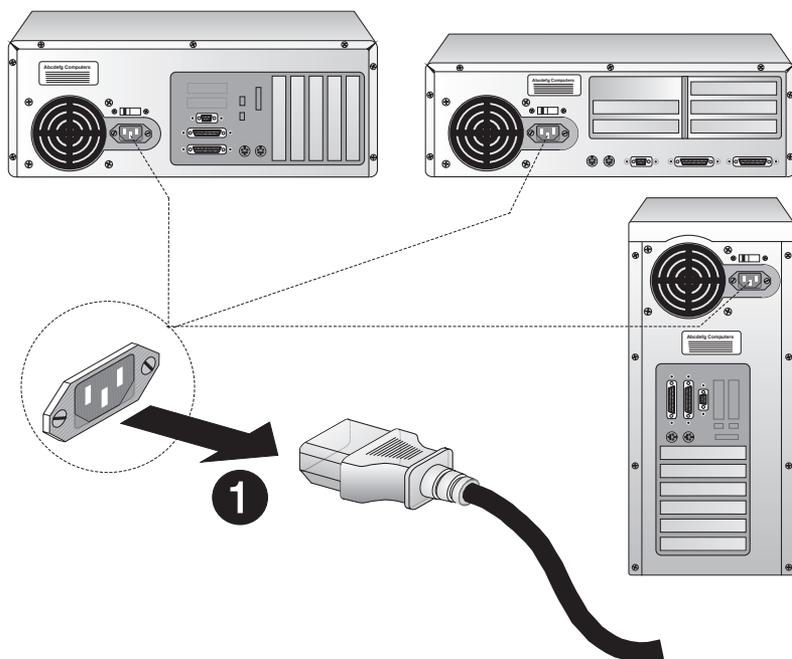


Figure 2-1. Unplugging the Computer

2. Disconnect all cables connected to the main system unit, and remove the computer cover according to the manufacturer's instructions.

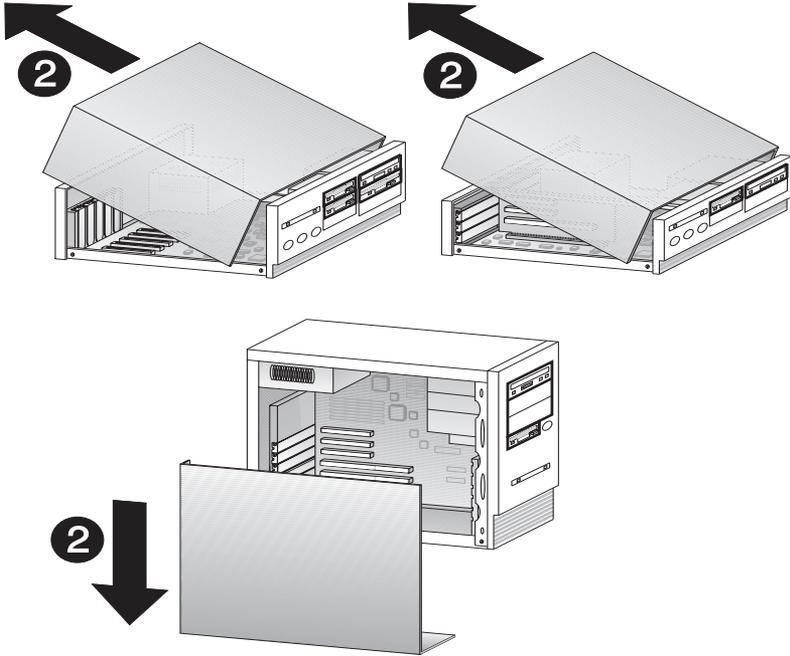


Figure 2-2. Removing the Computer Cover

3. Locate a suitable PCI expansion slot, and remove the screw that attaches the expansion plate to the computer. Save the screw for Step 6.
4. Remove the expansion plate.

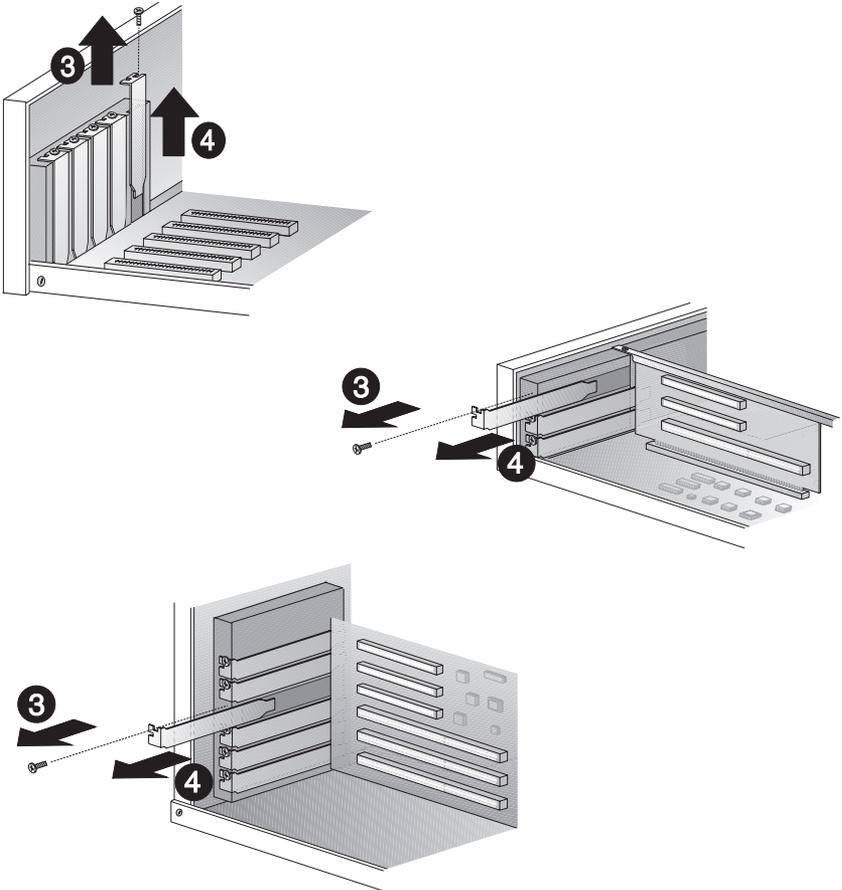


Figure 2-3. Removing the Expansion Plate

5. Carefully remove the adapter from its antistatic bag, and position the adapter in the PCI expansion slot. Align the adapter's connector pins with the slot's receptacle; then press gently but firmly on the board to seat it in the slot.
6. Attach the adapter with the screw removed in step 3.

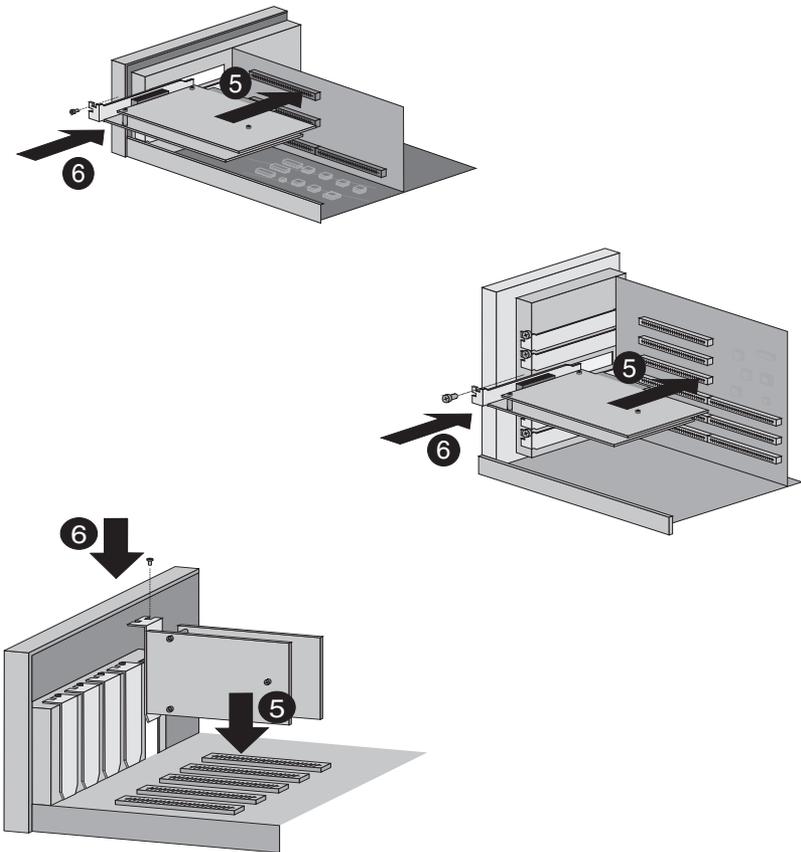


Figure 2-4. Inserting the Adapter

7. Replace the computer cover according to the manufacturer's instructions. Then connect the adapter to the line, as described in [Connecting to the Line on page 19](#).



CAUTION

Keep the computer *closed* while the adapter is running, so that the fan works properly and prevents overheating.

Overview

The *iSPAN*-Serial WAN adapter can be connected as data terminal equipment (DTE) to a communication device such as a modem, data service unit (DSU), host computer, or another serial adapter. The communication device enables connection to the Public Switched Telephone Network (PSTN), a leased line, an X.25 network, or a Frame Relay network. The *iSPAN*-Serial WAN adapter can also be connected as data communications equipment (DCE) to another serial adapter in a back-to-back configuration.

Through its DB25 connector, the *iSPAN*-Serial WAN adapter can be connected to any communication device that provides a V.24, V.35, or V.11 interface. Each interface type requires a specific cable. The adapter detects the cable connected to its DB25 connector and automatically configures itself to the appropriate interface.

This chapter provides the information about the following:

- *iSPAN*-Serial WAN adapter connector and DB25 pinout
- V.24 interface connection
- V.35 interface
- V.11 interface
- Back-to-back configuration
- Summary of steps to connect the adapter to the network



CAUTION

Incorrectly wired or installed cabling is the most common cause of communications problems for wide area networks. Interphase recommends that you work with a qualified cable installer for assistance with your cabling requirements.

DB25 Connector

The *i*SPAN-Serial WAN adapter connector uses a DB25 pinout. The DB25 pin signals vary according to the interface selected. This external link is a Low Voltage Directory (LVD) according to safety standard IEC950.



CAUTION

The adapter's DB25 female connector is for serial WAN connections only. Take care not to connect it to a parallel device. (Parallel ports also use DB25 connectors.) Connecting it to a parallel device may result in damage to both the adapter and the parallel device.

The following table lists pinout features for the various interfaces.

Pin	V.24	V.11	V.35	Direction
1	Shield	Shield	Shield	Common
2	TxD (Transmit Data)	T(A) (Transmit Data)	TXD(A) (Transmit Data)	Out

Pin	V.24	V.11	V.35	Direction
3	RxD (Receive Data)	R(A) (Receive Data)	RXD(A) (Receive Data)	In
4	RTS (Ready to Send)	C(A) (Command)	RTS (Ready to Send)	Out
5	CTS (Clear to Send)	I(A) (Indication)	CTS (Clear to Send)	In
6	DSR (Data Set Ready)		DSR (Data Set Ready)	In
7	GND (Ground)	GND (Ground)	GND (Ground)	Common
8	DCD (Data Carrier Detect)		DCD (Data Carrier Ready)	In
9		S(B) (Receive Clock)	RXC (B) (Receive Clock)	In
10				
11		X(B) (Transmit Clock)	TXCout(B) (Transmit Clock—DTE)	Out
12			TXCin(B) (Transmit Clock—DCE)	In
13		I(B) (Indication)		In
14		T(B) (Transmit Data)	TXD(B) (Transmit Data)	Out
15	TXCin (Transmit Clock—DCE)		TXCin(A) (Transmit Clock—DCE)	In
16		R(B) (Receive Data)	RXD(B) (Receive Data)	In
17	RxC (Receive Clock)	S(A) (Receive Clock)	RXC(A) (Receive Clock)	In

Pin	V.24	V.11	V.35	Direction
18		-ENV11 (V.11 Interface enable)		In
19		C(B) (Command)		Out
20	DTR (Data Terminal Ready)		DTR (Data Terminal Ready)	Out
21			-ENV35	In
22	RI (Ring Indication)		RI (Ring Indication)	In
23				
24	TXCout (Transmit Clock—DTE)	X(A) (Transmit Clock)	TXCout(A) (Transmit Clock—DTE)	Out
25	-TEST	-TEST	-TEST	In

V.24 Interface

The following specifications describe the V.24 interface:

- **Electrical specification:** CCITT V.28, TIA/EIA RS-232-C (+/-12V single-ended)
- **Signaling:** CCITT V.24
- **Maximum data rate:** 20 kilobits per second (Kbps)
- **Maximum cable length:** 50 feet
- **Standard DCE connector:** ISO2110 (DB25)

The following table and illustrations describe the V.24 signals on the connector.

Pin #	Name (CCITT #)	Signal	Direction
1	Shield(101)	Shield	Common
2	TxD(103)	Transmit Data	Out
3	RxD(104)	Receive Data	In
4	RTS(105)	Ready to Send	Out
5	CTS(106)	Clear to Send	In
6	DSR(107)	Data Set Ready	In
7	GND(102)	Ground	Common
8	DCD(109)	Data Carrier Detect	In
15	TXCin(114)	Transmit Clock (DCE)	In
17	RxC(115)	Receive Clock	In
20	DTR(108)	Data Terminal Ready	Out
22	RI(125)	Ring Indication	In
24	TxC(113)	Transmit Clock (DTE)	Out
25	-TEST	Test	In

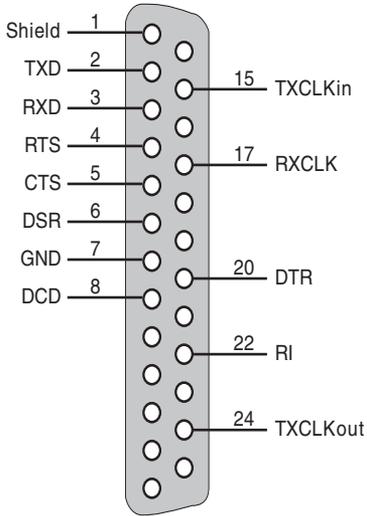


Figure 3-1. V.24 DCE Connector

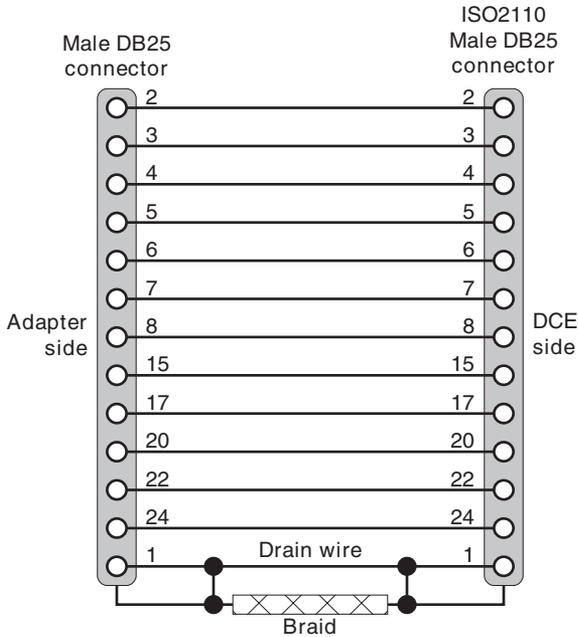


Figure 3-2. V.24 Cable Wiring

V.35 Interface

The following specifications describe the V.35 interface:

- **Electrical levels:** V.35 (+/0.3V differential) for data and clocks, V.28 (+/-12V single-ended) for other modem signals
- **Maximum data rate:** 2 Mbps (card limitation)
- **Maximum cable length:** 100 feet (at 2 Mbps)
- **DCE standard connector:** ISO2593

The following table and illustrations describe the V.35 signals on the connector.

Pin #	Tw. Pair	Name (CCITT #)	Signal	Direction
2	I	TXD A (103 A)	Transmit Data	Out
14	I	TXD B (103 B)	Transmit Data	Out
3	II	RXD A (104 A)	Receive Data	In
16	II	RXD B (104 B)	Receive Data	In
24	III	TXCout A (113 A)	Transmit Clock (DTE)	Out
11	III	TXCout B (113 B)	Transmit Clock (DTE)	Out
17	IV	RXC A (115 A)	Receive Clock	In
9	IV	RXC B (115 B)	Receive Clock	In
12	V	TXCin B (114 B)	Transmit Clock (DCE)	In
15	V	TXCin A (114 A)	Transmit Clock (DCE)	In
4		RTS(105)	Ready To Send	Out
5		CTS(106)	Clear To Send	In
6		DSR(107)	Data Set Ready	In
8		DCD(109)	Data Carrier Detect	In
20		DTR (108)	Data Terminal Ready	Out
22		RI(125)	Ring Indication	In
21		-ENV35	V.35 interface enable	In
25		-Test	Test	In
7		GND(102)	Ground	Common
1		Shield	Shield	Common

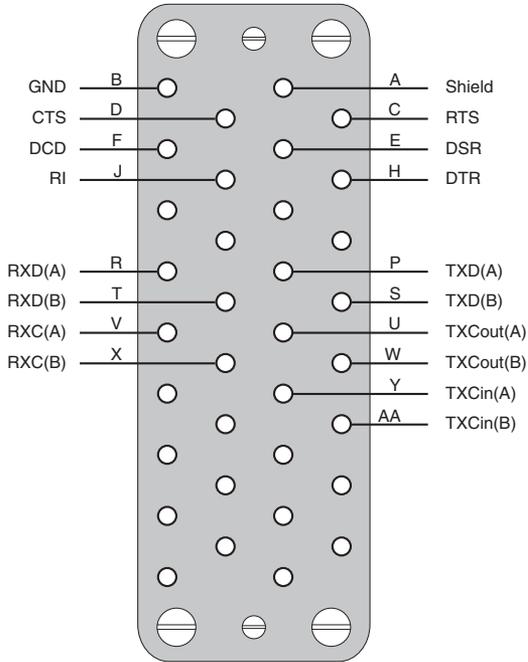


Figure 3-3. V.35 DCE Connector

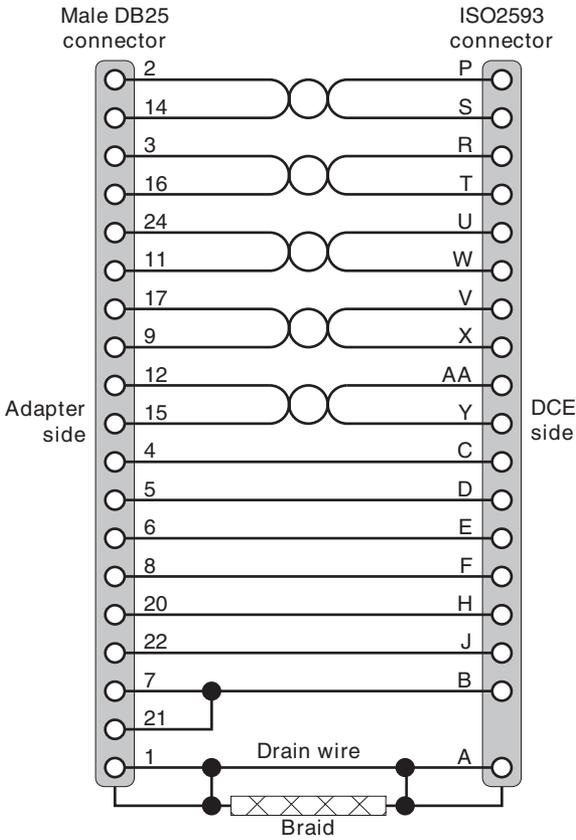


Figure 3-4. V.35 Cable Wiring

V.11 Interface

The following specifications describe the V.11 interface:

- **Electrical specification:** CCITT V.11, CCITT X.27, TIA/EIA RS-422 (0-5V differential)
- **Signaling specification:** CCITT X.21
- **Maximum data rate:** 2 Mbps (card limitation)
- **Maximum cable length:** 150 feet (at 2 Mbps)
- **Standard DCE connector:** ISO 4903 (DB15)

The following table and illustrations describe the V.11 signals on the connector..

Pin #	Tw. Pair	Name (CCITT #)	Signal	Direction
2	I	T(A) (103A)	Transmit Data	Out
14	I	T(B) (103B)	Transmit Data	Out
3	II	R(A) (104A)	Receive Data	In
16	II	R(B) (104B)	Receive Data	In
24	III	X(A) (113A)	Transmit Clock	Out
11	III	X(B) (113B)	Transmit Clock	Out
17	IV	S(A) (115A)	Receive Clock	In
9	IV	S(B) (115B)	Receive Clock	In
4	V	C(A) (105A)	Command	Out
19	V	C(B) (105B)	Command	Out
5	VI	I(A) (109A)	Indication	In
13	VI	I(B) (109B)	Indication	In
18	-	-ENV11	V.11 Interface enable	In

Pin #	Tw. Pair	Name (CCITT #)	Signal	Direction
25	-	-TEST	Test	In
7	-	GND	Ground	Common
1	-	Shield	Shield	Common

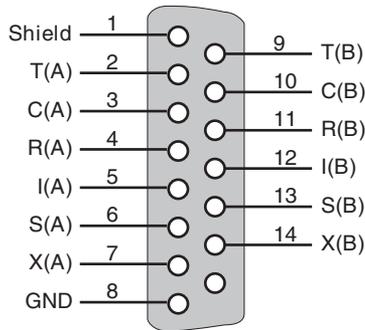


Figure 3-5. V.11 DCE Connector

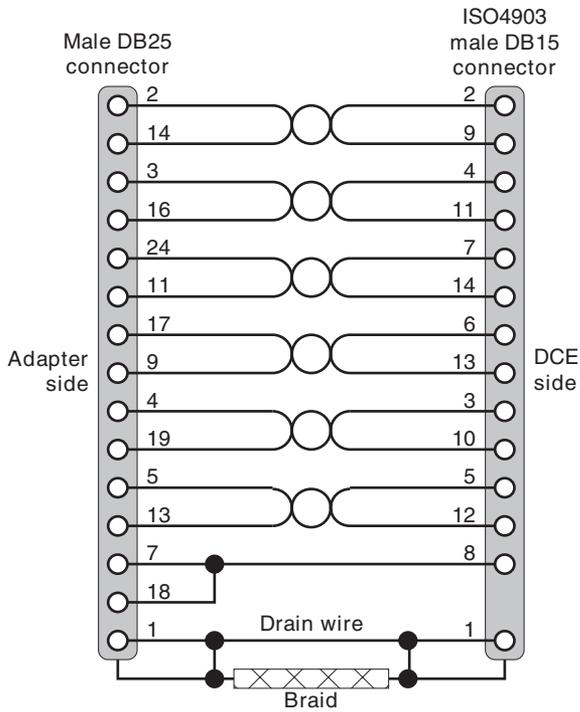


Figure 3-6. V.11 Cable Wiring

Back-to-Back Configuration

The *i*SPAN-Serial WAN adapter can be connected to another serial adapter in a back-to-back configuration.

If the other adapter is also an *i*SPAN-Serial, the preferred interface is V.11; the cable must have the wiring shown in the following illustration. Both adapters must provide clocks.

Following is an illustration of a back-to-back cable configuration.

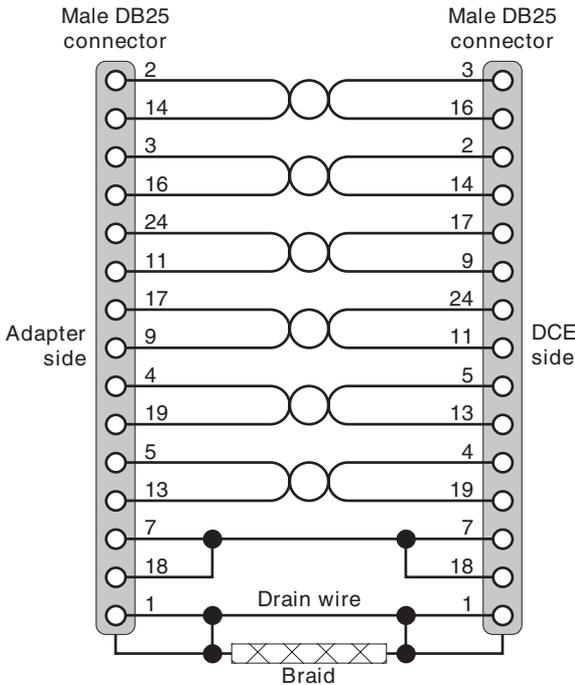


Figure 3-7. Back-to-Back Cable Wiring

Connecting to the Network



WARNING

Before connecting the cable, read the [Safety Precautions](#) section at the front of this manual.

With the adapter installed, you are ready to connect the adapter to the network, as follows:

1. Attach the appropriate connector to the adapter.
2. Reconnect the power cable and turn on the computer.

After connecting the adapter to the network, install the adapter software. To install NDIS software, see [Installing the NDIS Software Package on page 35](#). To install SNA Link Service software, see [Installing SNA Server Link Services Software on page 107](#).

Installing the NDIS Software Package

4

Overview

The NDIS driver enables the *iSPAN*-Serial WAN adapter to emulate a LAN adapter. It supports the transportation of TCP/IP and IPX/SPX protocols over WAN serial lines. The NDIS driver enables the adapter to connect simultaneously to TCP/IP and IPX/SPX LANs over dedicated leased lines or through Frame Relay or X.25 networks. It is available for PPP, X.25, and Frame Relay data protocols.

This chapter explains how to install the NDIS software on Microsoft Windows NT 4.0 systems. Use this process to install the Base driver, Base driver utilities, NDIS driver, and NDIS driver utilities. This chapter also explains how to remove NDIS and Base driver software, if required.

After installation, you can create up to four NDIS driver configurations (referred to as *logical adapters*) on the server for LAN connections. This multi-driver capability on the server side enables remote users to connect to the server through different networks simultaneously over serial lines. NDIS driver connections provide remote access to services typically available to LAN-connected users, such as file- and print-sharing, database access, and messaging.

To install the NDIS software, follow these basic steps:

1. Verify that your system meets minimum requirements.
2. Install the Base driver and NDIS driver, with accompanying software.
3. Set up WAN properties.

4. Add an NDIS logical adapter.
5. Set up network protocol properties.
6. Complete the installation to make settings take effect.

Review the *Read Me* text file on the *iSPAN-Serial WAN* CD-ROM before installing the software. It contains information about the files included on the CD. Also, if *Read Me First* documentation is included in your installation kit, review it for information about changes and updates made to this Users Guide after the print date.



NOTE

The *iSPAN-Serial WAN* is named **5535-1P-SR** in the software installation and configuration dialogs.

Verifying Minimum Requirements

If you have not already done so, verify that your system meets the minimum requirements described in [Minimum System Requirements on page 9](#).

Installing the Drivers

Before you begin, verify that the adapter is installed in your machine, and that you are logged on with administrator rights to the Windows NT 4.0 system.

To install the Base driver and NDIS driver, do the following:

1. From the Windows Start menu, select **Settings** and then **Control Panel**. Then double-click the **Network** icon,

and select the **Protocols** tab to display the Network Protocols dialog box.

2. Verify that a supported network protocol is installed. This protocol can be TCP/IP and/or IPX/SPX.

If you need to install the network protocol(s), click **Add**. Then select the appropriate protocol from the list and follow the onscreen instructions.

3. After you have verified or added the protocol(s) to be used, select the **Adapters** tab.

The Network Adapters dialog box appears.



Figure 4-1. Adding the Driver

4. Click **Add to begin loading the drivers.**

The system creates an adapter list in the Select Network Adapter dialog box, as shown in the following illustration.

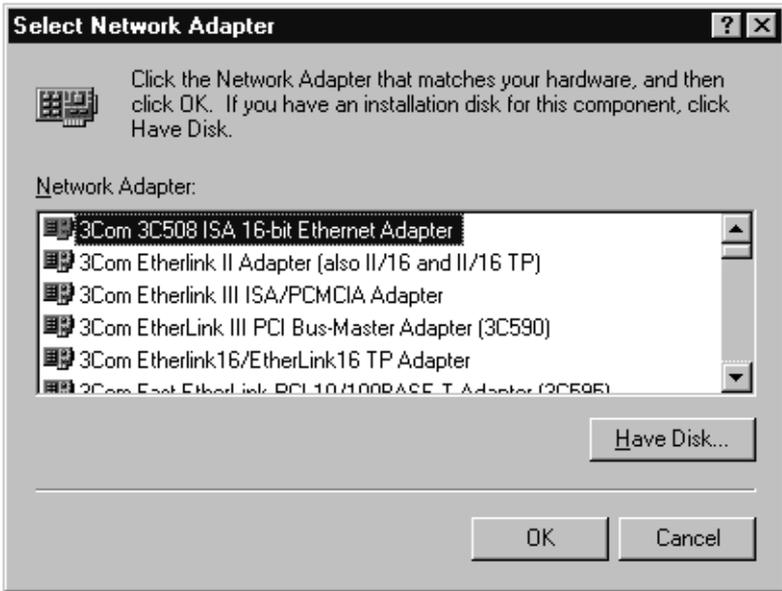


Figure 4-2. Select Network Adapter Dialog Box

5. Click **Have Disk.**

The Insert Disk dialog box appears, prompting you to insert the disk and identify the file location, as shown in the following illustration.

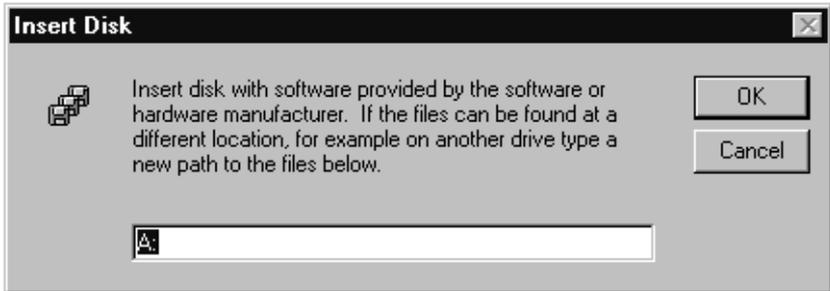


Figure 4-3. Insert Disk Dialog Box

6. Insert the CD-ROM containing the NDIS driver software.
7. Change the installation path to `[drive]:\5535SR` (where `[drive]` is the CD-ROM drive—for example `D:\5535SR`). Then click **OK**.

The Select OEM Option dialog box appears, with **Interphase 5535 NDIS Adapter** selected.

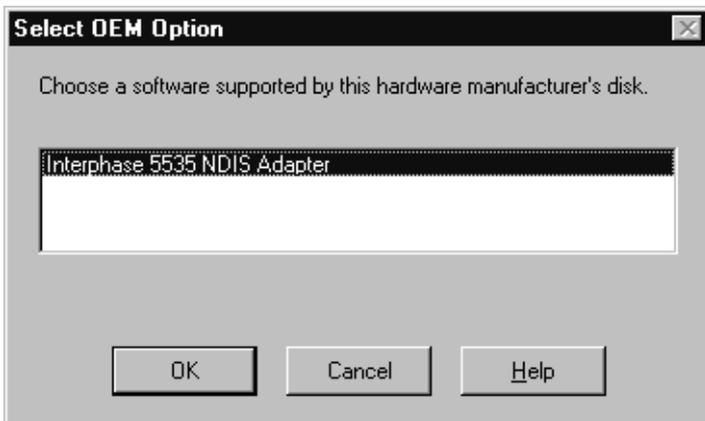


Figure 4-4. Select OEM Option Dialog Box

8. Click **OK** to confirm the selection.



NOTE

If the Base driver is already installed (for example, if it was installed with Interphase SNA Link Service software before the NDIS software installation), skip to [Adding the NDIS Logical Adapter on page 44](#).

The Interphase 553X Base Driver dialog box appears, prompting you to accept or change the installation directory and begin installation.



Figure 4-5. Base Driver Installation Dialog Box

9. If needed, change the default installation path in the **Copy To** field to the desired pathname. (The default path is *C:\WANSETUP*.)
10. Click **Continue** to install the driver.

The installation program copies product files to the directory specified in the **Copy To** field, and creates a program group in the Windows NT **Start** menu.

To continue the software installation, set up port properties as described in the next section, *Setting Up WAN Properties*.

Setting Up WAN Properties

After the driver software is installed as described in *Installing the Drivers on page 36*, the WAN Adapters Setup dialog box appears.



Figure 4-6. WAN Adapters Setup Dialog Box

The card name is displayed in the **Cards** section. Use the Cards section to set up the card's port properties.



NOTE

If the Cards list is empty, the board might not be properly installed. See [Problems and Solutions on page 166](#) for information to correct the problem.

When configuring WAN port properties, if you are not sure which options to select, use the default values. You can change the settings later. For detailed information about setting up WAN properties, press the **F1** key to view field-level help, or see [Setting up Firmware and Hardware on page 145](#).

To set up port properties, do the following:

1. In the Cards list of the WAN Adapters Setup dialog box, select the serial port and click **Properties**.

The SR Port Properties dialog box appears.

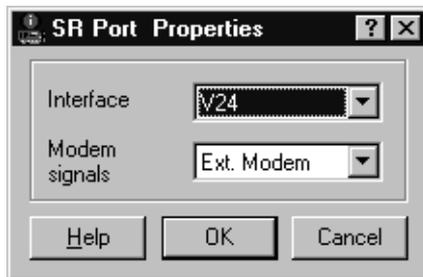


Figure 4-7. SR Port Properties Dialog Box

2. In the **Interface** field, select the serial line interface type to be used with the adapter.
3. In the **Modem signals** field, select the method for handling modem signals. (In most cases, the default option, *External modem*, is appropriate.)

4. Click **OK** to return to the WAN Adapters Setup dialog box.
5. When WAN properties are configured as needed, click **OK** in the WAN Adapters Setup dialog box.

The setup software automatically finds the firmware for the adapter. It updates the Windows NT registry and dynamically installs the drivers. When the software configuration is finished, the following message informs you that the driver is running.



Figure 4-8. Successful Configuration Message

6. Click **OK**.

To continue the software installation, add an NDIS logical adapter as described in the next section, [Adding the NDIS Logical Adapter](#).

Adding the NDIS Logical Adapter

After you respond **OK** to the message that the driver is running, the NDIS Driver Setup dialog box appears.

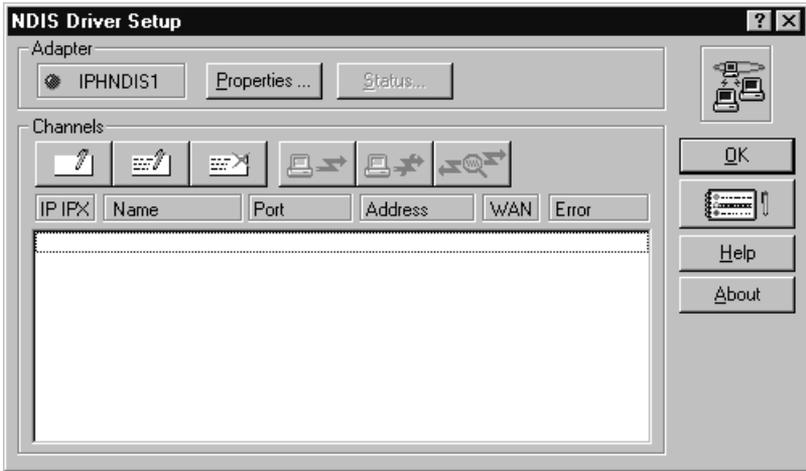


Figure 4-9. NDIS Driver Setup Dialog Box

The Adapter section of this dialog box displays the NDIS logical adapter that is created automatically with the driver installation. Use this dialog box after you finish the driver installation to set up WAN transport protocols and channels for logical adapters (as described in [Setting Up Channels for Logical Adapters](#) on page 75.)

To continue with the driver installation, do the following:

1. Click **OK** to add the new logical adapter to the operating system and close the NDIS Driver Setup dialog box.

The Network Adapters dialog box appears.

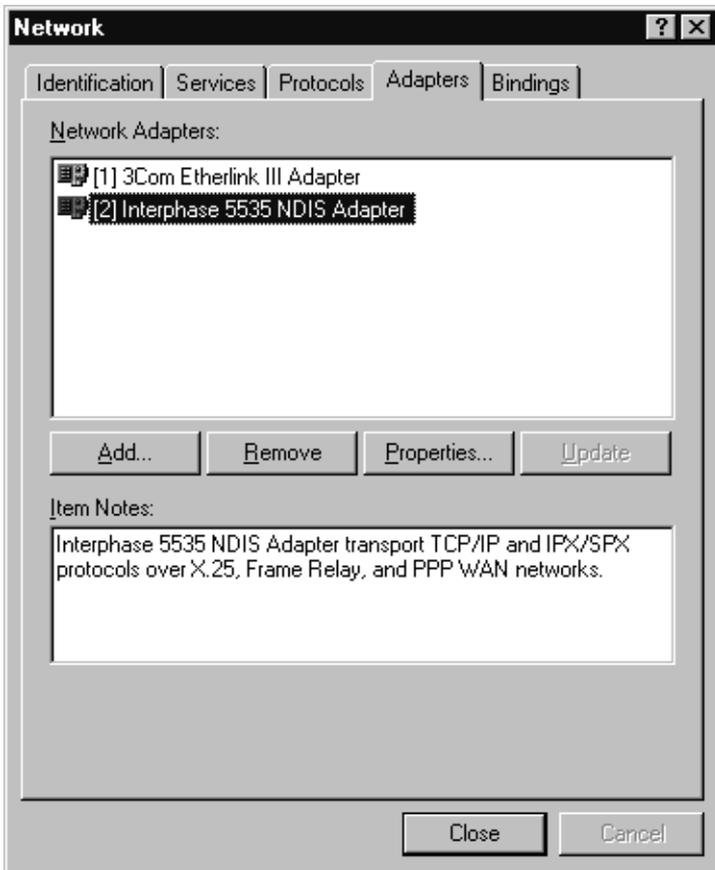


Figure 4-10. New Logical Adapter Added to Network

The Network Adapters list displays the *Interphase 5535 NDIS Adapter*. The NDIS logical adapter is now added to the network configuration.

2. Click **Close**.

Next, set up network protocols for the logical adapter. Continue to the next section, [Setting Up Network Protocol Properties](#).

Setting Up Network Protocol Properties

After you add the NDIS logical adapter, one or both of the following dialog boxes appear:

- Microsoft TCP/IP Properties dialog box
- NWLink IPX/SPX Properties dialog box

This sequence depends on the network protocol(s) installed on your system.

If your network configuration contains multiple WAN adapters, you are first prompted to change the default internal network number to a unique number.

- If the IPX/SPX protocol is installed, click **Yes** to display the IPX/SPX Properties dialog box.
- If the IPX/SPX protocol is not installed, click **No** to display the TCP/IP Properties dialog box.

Continue as follows:

- To configure IPX/SPX settings, continue to [Setting Up IPX/SPX Protocols on page 47](#).
- To configure TCP/IP settings, skip to [Setting Up TCP/IP Protocols on page 49](#).

Setting Up IPX/SPX Protocols

If the IPX/SPX protocol is installed, the NWLink IPX/SPX Properties dialog box appears after you add the NDIS driver.

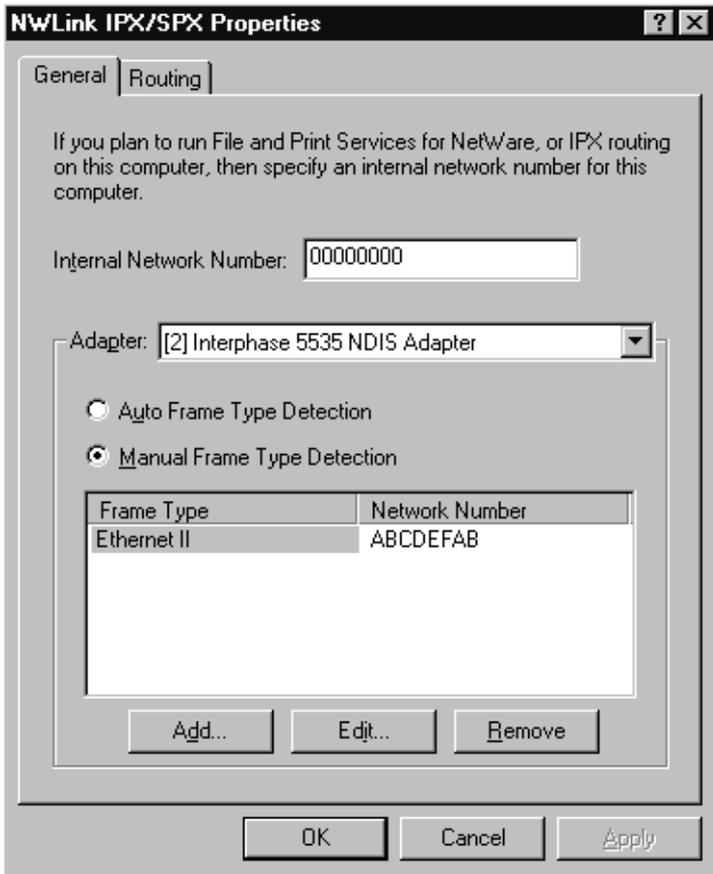


Figure 4-11. IPX/SPX Properties Dialog Box

To set up IPX/SPX properties for the NDIS logical adapter, do the following:

1. In the **Adapter** field, select **Interphase 5535 NDIS Adapter**.
2. Select the **Manual Frame Type Detection** option and click **Add**.
3. On the Manual Frame Detection dialog box, select the **Ethernet II** frame type (mandatory), and assign a network number to this adapter interface.
A message informs you that a different number must be assigned for each adapter installed. Assigning a unique number for each adapter enables you to access different networks.
4. Click **OK**.

After you complete the IPX/SPX configuration, continue as follows:

- If the TCP/IP protocol is installed, the TCP/IP Properties dialog box appears. Continue to the next section, *Setting Up TCP/IP Protocols*.
- If the TCP/IP protocol is not installed, skip to *Completing the Software Installation on page 51*.

Setting Up TCP/IP Protocols

If the TCP/IP protocol is installed, the Microsoft TCP/IP Properties dialog box appears after you add the NDIS driver or change the IPX/SPX properties.

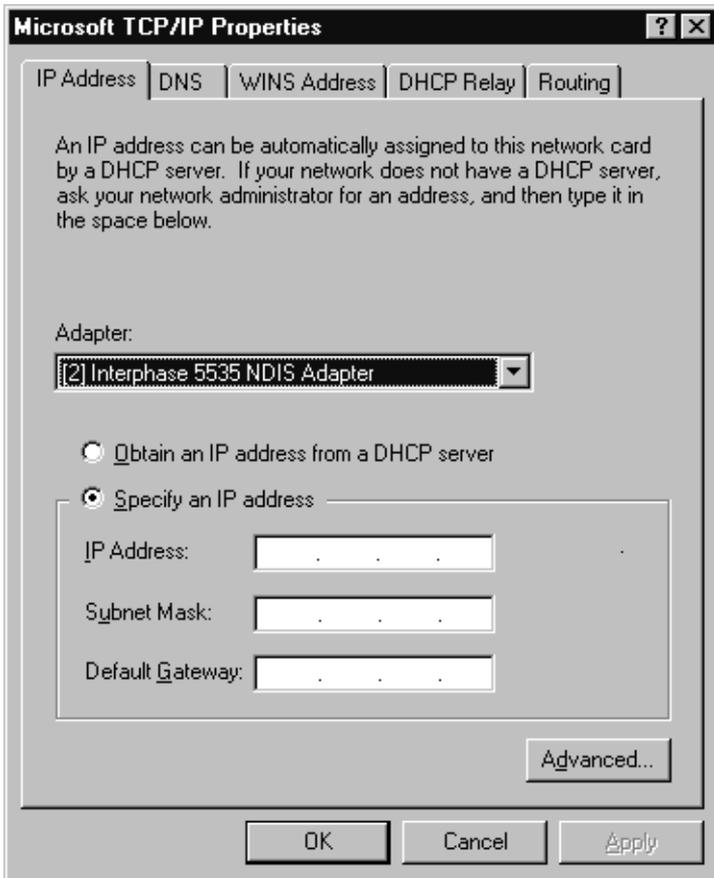


Figure 4-12. TCP/IP Properties Dialog Box

To set up TCP/IP properties for the NDIS logical adapter, do the following:

1. In the **Adapter** field, select **Interphase 5535 NDIS Adapter**.
2. Select the **Specify an IP address** option.



NOTE

You must specify an IP address. DHCP is not supported.

3. To assign an IP address and subnet mask to the new logical NDIS adapter, do the following:
 - a. In the **IP Address** field, type a valid IP address.
 - b. In the **Subnet Mask** field, type a valid subnet mask. These values depend on your network configuration. If you do not know the exact IP address or subnet mask for your configuration, ask your Network Administrator for assistance.
4. Type the default gateway address in the **Default Gateway** field.

This is an optional parameter that, if used, must correspond to an NDIS driver WAN channel. (For information about setting up NDIS driver WAN channels, see [Setting Up Channels for Logical Adapters on page 75](#)).
5. If you want the system to act as a TCP/IP router, select the **Routing** tab, and select the **Enable IP Forwarding** check box.

6. Click **OK**.

Completing the Software Installation

After you set up network protocols for the NDIS logical adapter, the following message informs you that you must shut down and restart your computer before the settings take effect.



Figure 4-13. Computer Restart Message

Continue as follows:

- If you did **not** change the network protocol setup, click **Yes** to restart the computer.
- If the Windows NT Service Pack is installed and you **did** change the network protocol setup, click **No**. Then reinstall the Service Pack. Restart the system when prompted after you complete the Service Pack installation.



CAUTION

If you do not reinstall the Service Pack, the network may fail to start or malfunction when connecting lines. Service Pack Version 3 or higher is recommended. For installation information, see the latest available version of your Service Pack help.

To determine whether a Service Pack is installed, see [Quick Reference of Common Tasks on page 181](#).

After the system restarts, the adapter properties must be set up to match those of the NDIS driver.

- To set up NDIS driver adapter and channel properties, see [Setting Up the NDIS Driver on page 63](#).
- To set up firmware, card, and port properties, see [Setting up Firmware and Hardware on page 145](#).
- For an overview of common tasks you might need to perform for the adapter, see [Quick Reference of Common Tasks on page 181](#).

Removing the Drivers

This section explains how to remove the NDIS driver along with the Base driver, and how to remove the Base driver if it is the only installed driver.

Removing the NDIS and Base Drivers

You can remove the NDIS and Base driver together, or you can remove the NDIS driver without also removing the Base driver.



CAUTION

If any other software requiring the Base driver (such as SNA Link Services) is installed in your system, do not remove the Base driver with the NDIS driver.

If you want to remove both drivers, remove the NDIS driver first.

If multiple NDIS logical adapters are configured, you must remove all of the logical adapters to remove the NDIS driver. Removing the final logical adapter removes the driver.

Removing the NDIS Driver

To remove the NDIS driver, do the following:

- 1. Be sure you are logged on with administrator rights to the Windows NT 4.0 system.**
- 2. From the Start menu, select Settings, and then Control Panel. Then double-click the Network icon, and select the Adapters tab to display the Adapters dialog box.**

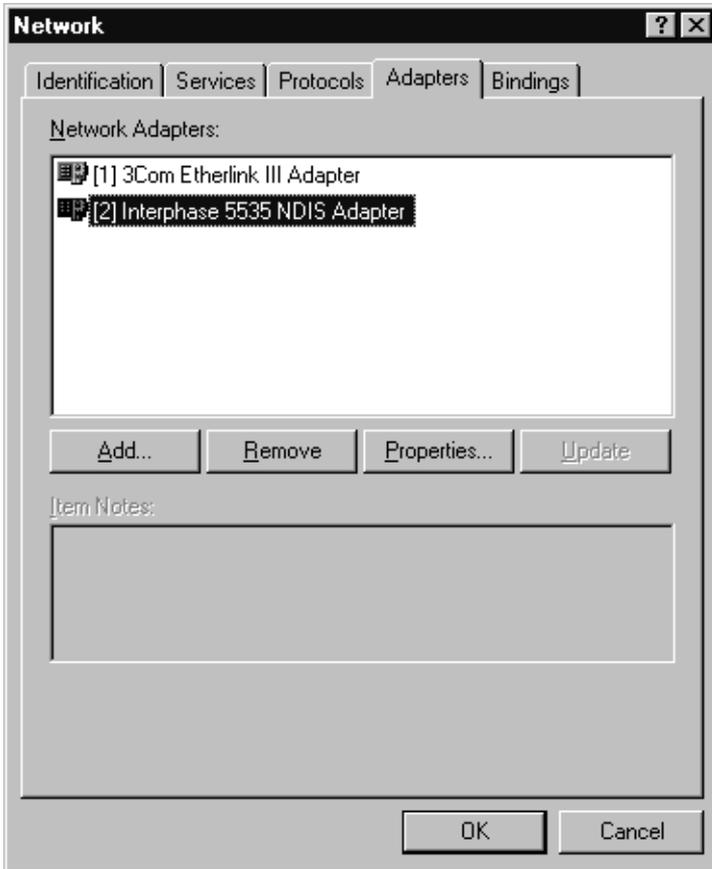


Figure 4-14. Removing the NDIS Adapter Driver

3. Select **Interphase 5535 NDIS Adapter**, and click **Remove**. (If multiple logical adapters are configured, the Network Adapters box will list each one as *Interphase 5535 NDIS Adapter*, preceded by an adapter number.)

A warning message informs you that this action will permanently remove the component, and asks if you want to continue.

4. Click **Yes** to continue the driver removal.

If any NDIS logical adapters are still installed, the Network Adapters dialog box reappears. Repeat steps **3** and **4** to remove the next NDIS logical adapter.

5. When you select to continue the removal of the final logical adapter, the Interphase 5535 NDIS Driver Tools dialog box appears. It identifies the NDIS driver install directory that will be deleted, and asks if you are sure you want to uninstall the software.

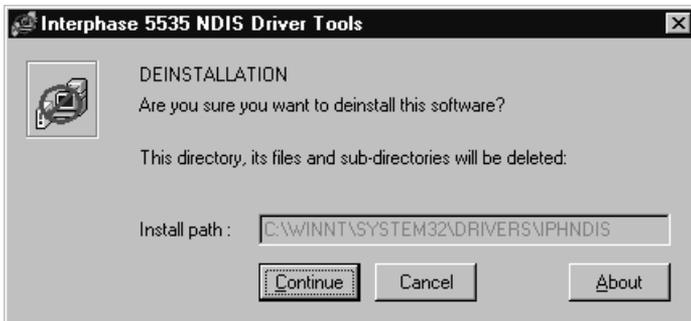


Figure 4-15. Remove NDIS Driver Tools

Click **Continue** to confirm removal of the NDIS driver.

6. After the NDIS driver is removed, the Interphase 553X Base Driver dialog box appears.

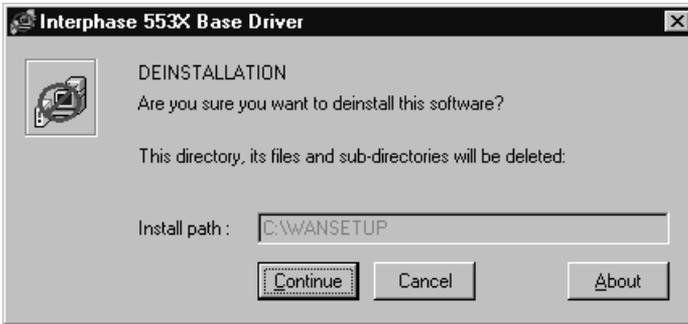


Figure 4-16. Remove Base Driver Dialog Box

The Interphase 553X Base driver dialog box identifies the Base driver install directory that will be deleted, and asks if you are sure you want to deinstall the software.

7. Continue as follows:
 - If you do **not** want to remove the Base driver at this time, click **Cancel** to remove the NDIS driver only. Then skip to [Completing the Driver Removal on page 58](#).
 - If you **do** want to remove the Base driver along with the NDIS driver, continue to the next topic, [Removing the Base Driver](#).

Removing the Base Driver



CAUTION

Before continuing, make sure no other drivers or SNA link services requiring the Base driver are still installed in your system.

To remove the Base driver along with the NDIS driver, do the following:

1. When the Interphase 553X Base driver dialog box asks if you are sure you want to deinstall the software, click **Continue** to remove the Base driver.

The following pop-up prompts you to confirm the card(s) removal and driver deletion.

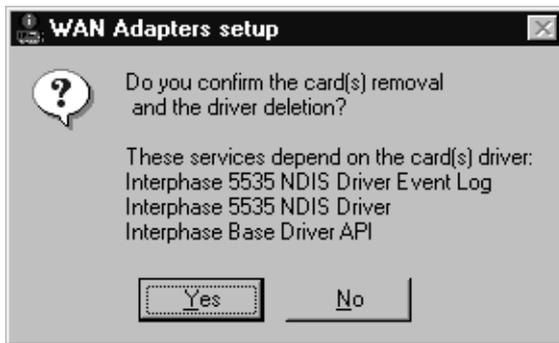


Figure 4-17. Removal Confirmation Request

2. To confirm the deletion, click **Yes**.

Upon confirmation, the system does the following:

- Deletes product files and the Base driver program group from the **Start** menu
- Dynamically unloads the drivers from memory
- Cleans up the registry

Continue to the next section, [Completing the Driver Removal](#), to make the driver removal take effect.

Completing the Driver Removal

When the Base driver removal process is finished, the Network Adapters dialog box reappears.

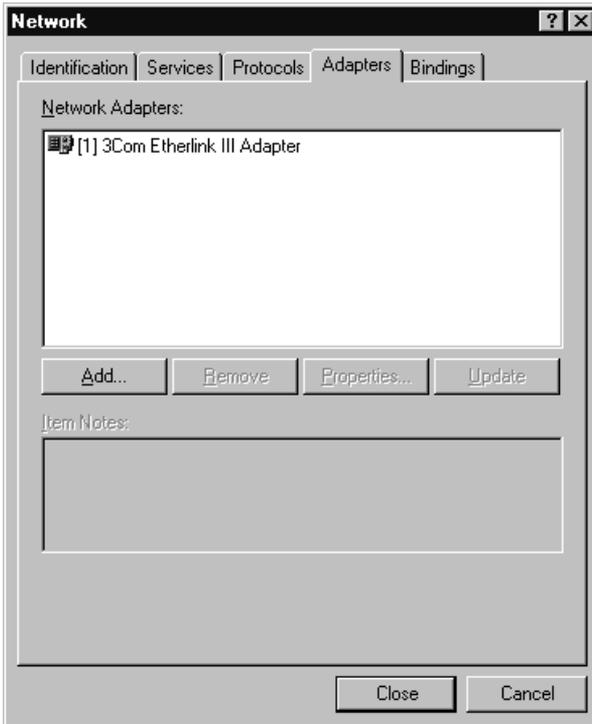


Figure 4-18. Adapter Removed from Network Settings

To complete the driver removal, do the following:

1. Click **Close** to validate the new network settings.
Windows NT updates network bindings.

Next, the following message prompts you to restart your computer to make changes take effect.

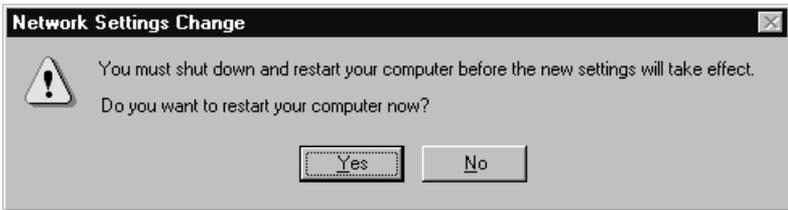


Figure 4-19. Network Settings Restart Message

2. To make the settings take effect, click **Yes**.

Removing the Base Driver Only



CAUTION

Use this procedure only if you have already removed the NDIS driver and all other drivers that require the Base driver.

To remove the Base driver, do the following:

1. **Be sure you are logged on with administrator rights to the Windows NT 4.0 system.**
2. From the **Start** menu, select **Settings**, and then **Control Panel**. Then double-click the **Add/Remove Programs** icon, and select the **Install/Uninstall** tab.

The Install/Uninstall dialog box appears.



Figure 4-20. Removing the Base Driver

3. Select **Interphase 553X Base driver**, and click **Add/Remove**.

The Interphase 553X Base Driver dialog box appears.

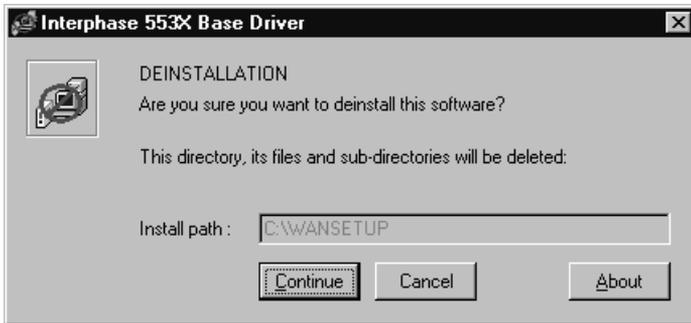


Figure 4-21. Remove Base Driver Dialog Box

The Interphase 553X Base driver dialog box identifies the Base driver install directory that will be deleted, and asks if you are sure you want to deinstall the software.

4. Click **Continue** to remove the Base driver.
5. If the following pop-up prompts you to confirm the card(s) removal and driver deletion, click **Yes** To confirm the deletion. (Or click **No** to cancel if the NDIS driver is still installed.)

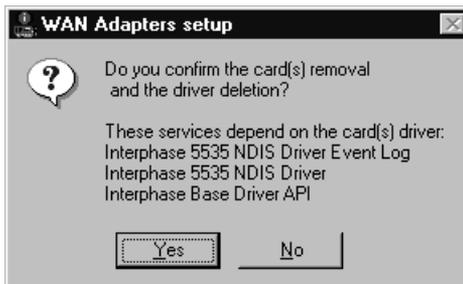


Figure 4-22. Removal Confirmation Request

Upon confirmation, the system does the following:

- Deletes product files and the Base driver program group from the **Start** menu

- Dynamically unloads the drivers from memory
- Cleans up the registry

When the Base driver removal process is finished, the Install/Uninstall dialog box reappears.

Setting Up the NDIS Driver

5

Overview

You can create up to four NDIS driver configurations for connecting the *iSPAN*-Serial WAN adapter to IP and/or IPX networks. This capability allows the adapter to emulate a LAN adapter and connect with up to four IP and IPX networks simultaneously. The driver transports TCP/IP and IPX/SPX protocols over the following types of connections:

- PPP, X.25, and Frame Relay point-to-point connections
- X.25 and Frame Relay point-to-multipoint connections

Each NDIS driver connection configuration is referred to as a *logical adapter*. Logical adapters specify adapter properties, network protocol properties, channels, and channel properties to use for WAN network connections.

During the NDIS driver installation, one logical adapter is automatically created and assigned a unique adapter identifier. You can use the NDIS Driver Setup utility to change the logical adapter's default network and channel properties. In addition, you can use the Windows NT Network Control Panel to create up to three additional logical adapters, and then use the NDIS Driver Setup utility to set up properties for the logical adapters.

The chapter explains how to do the following NDIS Driver Setup tasks:

- Access online help
- Start and use the NDIS Driver Setup utility
- Add a logical adapter
- Set up logical adapter network properties

- View the status of logical adapter connections
- Set up channels for logical adapter connections
- Delete channels from a logical adapter configuration
- Manually connect a channel
- Manually disconnect a channel
- View the status of channel connections

Accessing Online Help

For detailed information about the functions and dialog boxes described in this chapter, see the NDIS Driver Setup online help. You can access online help in the following ways:

- Press **F1** to display field-level contextual help in a pop-up window.
- Click **Help** to display the main online help window.
- Click the **Help** icon  , and then select the topic you want to read about.

Starting the NDIS Driver Setup Utility

Start the NDIS Driver Setup utility in either of the following ways:

- If you need to change network protocol properties for a logical adapter, you must start the utility adapter from the Control Panel, as follows:
 - a. From the **Start** menu, select **Settings**, and then **Control Panel**.
 - b. Double-click the **Network** icon, and select the Adapters tab.

- c. On the Network adapters dialog box, select the Interphase NDIS logical adapter you want to configure, and click **Properties**.
- For any other purposes, you can start the utility from the Interphase WAN Adapters menu.

From the **Start** menu, select **Programs**, then **Interphase WAN Adapters**, and then **NDIS Driver Setup**.

When you start the utility, the NDIS Driver Setup dialog box appears.

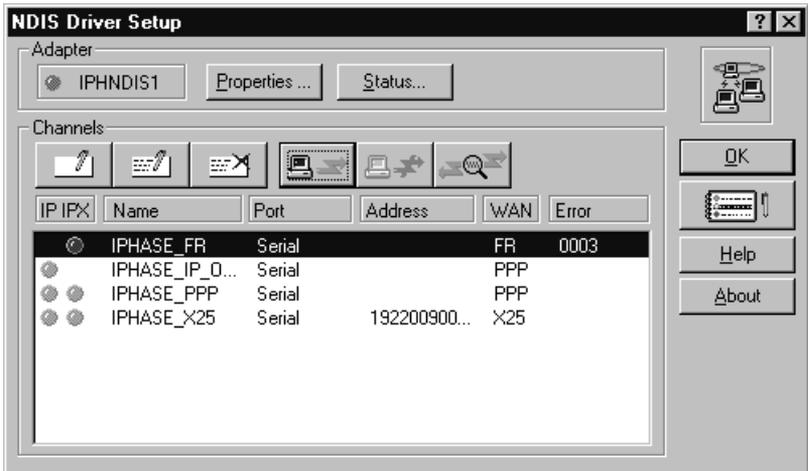


Figure 5-1. NDIS Driver Setup Dialog Box



NOTE

The *iSPAN*-Serial WAN adapter is listed as **5535-1P-SR** card in some of the NDIS Driver Setup dialog boxes.

The NDIS Driver Setup dialog box contains two sections: Adapter and Channels.

Adapter Functions

Use the Adapter section of the NDIS Driver Setup dialog box to set up or display NDIS logical adapter properties.



NOTE

If multiple logical adapters have been created, and you started the utility from the Interphase WAN Adapters menu, the Adapter section of the screen displays forward and back arrow buttons. These buttons enable you to move among the logical adapters.

An LED beside the logical adapter identifier displays the adapter status. The following table describes the adapter LED.

This LED color...	Means...
Black	The adapter is not working. If you are in the installation process, you might need to restart your system to use the adapter. Otherwise, a problem might have occurred affecting adapter startup. For more information, use the Windows NT Event Viewer to view error events.
Gray	The adapter is running, but without a PVC connection.
Green	The adapter is working properly. At least one PVC is connected.

Channels Functions

Use the Channels section of the NDIS Driver Setup dialog box to create and configure channels for each logical adapter's WAN and LAN network communications.

For each channel, the IP/IPX column displays LEDs associated with the LAN protocol(s) routed through the channel. The IP LED represents the TCP/IP protocol, and the IPX LED represents the IPX/SPX protocol. The LED color is dynamically updated when the channel status changes. The following table describes the channel LEDs.

This LED color...	Means...
Green	The channel is connected.
Black	An error occurred during the transfer of properties between the NDIS Driver Setup program and the NDIS driver. If the NDIS driver is not running, or if you have not restarted your system since the last installation, this state is normal.
Gray	The channel is not connected, and has not been connected since the last system startup.
Yellow	Channel connection is pending for an incoming or outgoing call. This is a transitional state; the channel should be in this state for only a few seconds.
Blue	The channel was connected but is now idle due to inactivity.
Red	An error occurred during the last connection. See the error code in the last column or click the Status button to view information in the Status dialog box.

Use the following icons in the Channels section of the NDIS Driver Setup dialog box to manage channel properties.

Click this icon...	To do the following...
	<p>Create. Create a new channel. For more information, see Setting Up Channels for Logical Adapters on page 75.</p>
	<p>Edit. Edit the selected channel. (You can also double-click a channel row to edit the channel.) For more information, see Setting Up Channels for Logical Adapters on page 75.</p>
	<p>Delete. Delete the selected channel. For more information, see Deleting Channels from Logical Adapters on page 92.</p>
	<p>Activate. Manually connect to an outgoing channel. Usually a channel is automatically connected when LAN frames are routed to the NDIS logical adapter. For more information, see Manually Connecting a Channel on page 93.</p>
	<p>Release. Manually disconnect an active channel. Usually a channel is automatically disconnected due to inactivity. Caution: Use this button carefully because a connected channel may contain data traffic; manual disconnection can cause data loss. For more information, see Manually Disconnecting a Channel on page 93.</p>
	<p>Status. Display the selected Channel status dialog box. You can display one Status dialog box simultaneously for each channel. (For more information, see Viewing Channel Status on page 91.)</p>

Adding a Logical Adapter

To add a new logical adapter to the NDIS driver configuration, do the following:

1. From the **Start** menu, select **Settings**, and then **Control Panel**. Then double-click the **Network** icon and select the **Adapters** tab to display the Network Adapters dialog box.
2. On the Network Adapters dialog box, click the **Add** button.

The Select Network Adapter dialog box appears, listing adapter drivers.

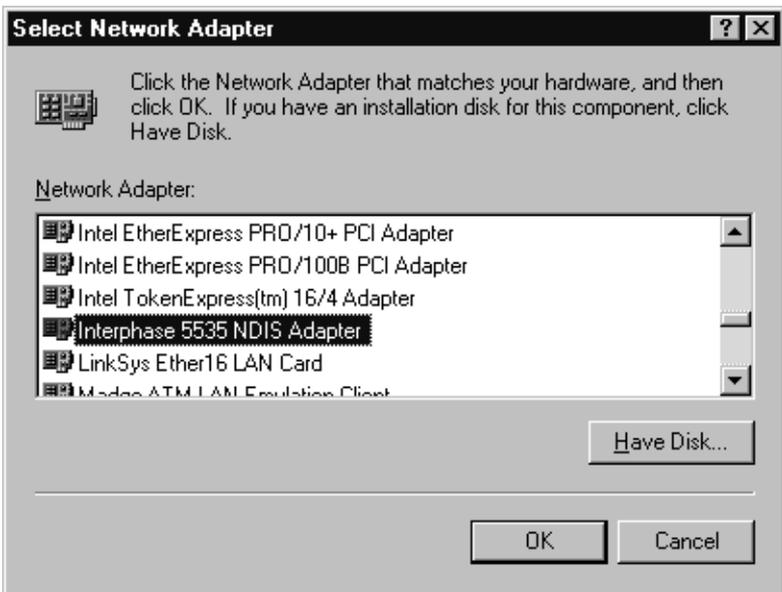


Figure 5-2. Adding a Logical Network Adapter

3. Select **Interphase 5535 NDIS Adapter**, and click **OK**.
The NDIS Driver Setup dialog box appears.

To continue, set up WAN Networking properties for the new logical adapter as described in the next section, [Setting Up Logical Adapter Network Properties](#).



NOTE

When you close the Network Adapters dialog box after adding a new logical adapter, you will be prompted to set up IPX/SPX and/or TCP/IP properties for the logical adapter, as described in [Setting Up Network Protocol Properties on page 46](#).

Setting Up Logical Adapter Network Properties

After you add a new logical adapter or start the NDIS Driver setup utility to configure an existing logical adapter, the NDIS Driver Setup dialog box appears.

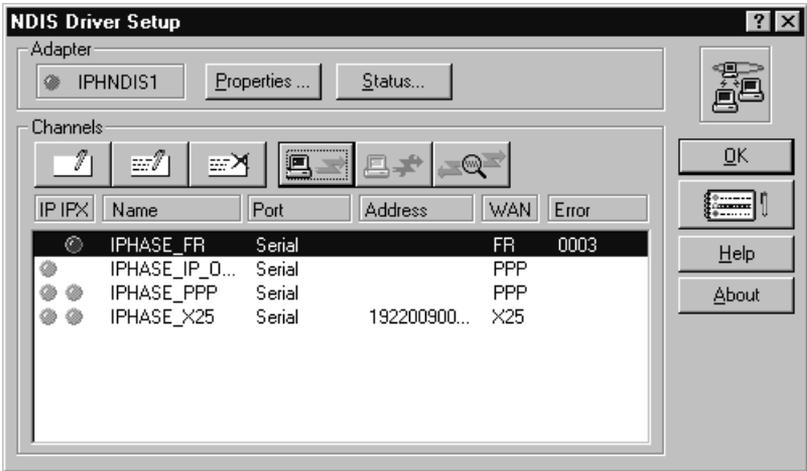


Figure 5-3. NDIS Adapter Properties Dialog Box

To set up the logical adapter network properties, do the following:

1. If needed, start the NDIS Driver Setup utility from the control panel, as described in *Starting the NDIS Driver Setup Utility* on page 64.
2. In the Adapter section of the NDIS Driver Setup dialog box, click the **Properties** button.

The Properties dialog box appears for the displayed logical adapter.

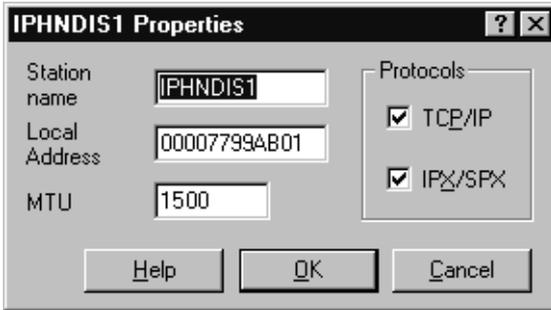


Figure 5-4. NDIS Logical Adapter Properties

3. In the **Station Name** field, enter the station name for the logical adapter. (This is an optional property.)



CAUTION

In the Local Address field, the default Ethernet address is correct and must not be modified.

4. In the **MTU** field, enter the MTU (Maximum Transmission Unit) to be used for communication. If you are not sure which value to use, leave the default value.
5. In the Protocols section, select the protocol(s) to be linked to the adapter. At least one of the protocols is required.

You can change the protocols only if you started the NDIS Driver Setup from the Control panel.

If one or both of the protocols are selected but unavailable, the protocol is already used by a defined channel.

If one or both protocols are neither selected nor available, the protocols might not be installed. To install the network protocols do the following:

- a. Close the NDIS Driver Properties dialog box, and then close the NDIS Driver Setup dialog box.
 - b. On the Network Adapters dialog box, select the **Protocols** tab.
 - c. If the desired protocols (IP or IPX/SPX) are not listed, click **Add** and follow the onscreen instructions. Then repeat steps **1** through **5**.
- 6.** When you finish setting up logical adapter network properties, click **OK** to save the properties and return to the NDIS Driver Setup dialog box.



NOTE

When you close the Network Adapters dialog box after adding a logical adapter or a logical adapter network protocol, you are prompted to set up IPX/SPX and/or TCP/IP properties for the logical adapter, as described in [Setting Up Network Protocol Properties on page 46](#).

Viewing Logical Adapter Connection Status

To view the logical adapter connection status:

1. If needed, start the NDIS driver Setup utility, as described in [Starting the NDIS Driver Setup Utility on page 64](#).
2. In the Adapter section of the NDIS Driver Setup dialog box, click the **Status** button.

The Status dialog box appears for the displayed logical adapter.

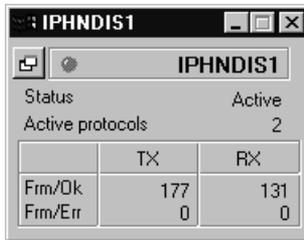


Figure 5-5. NDIS Logical Adapter Status

For all channels associated with the logical adapter, this dialog box displays the total numbers of frames transmitted and received successfully and with errors. The transmit and receive counters are dynamically refreshed every second. Use this information to detect an abnormal rate of communication errors.

Setting Up Channels for Logical Adapters

Channel definitions specify the connection properties that enable NDIS logical adapters to communicate with remote computers. Channel definitions tell the NDIS driver how to reach a given TCP/IP or IPX/SPX address through X.25 or Frame Relay networks, or through PPP connections. Each TCP/IP or IPX/SPX address represents a stand-alone workstation or a gateway.

The NDIS Driver Setup dialog box defines channels and channel properties associated with an NDIS logical adapter.

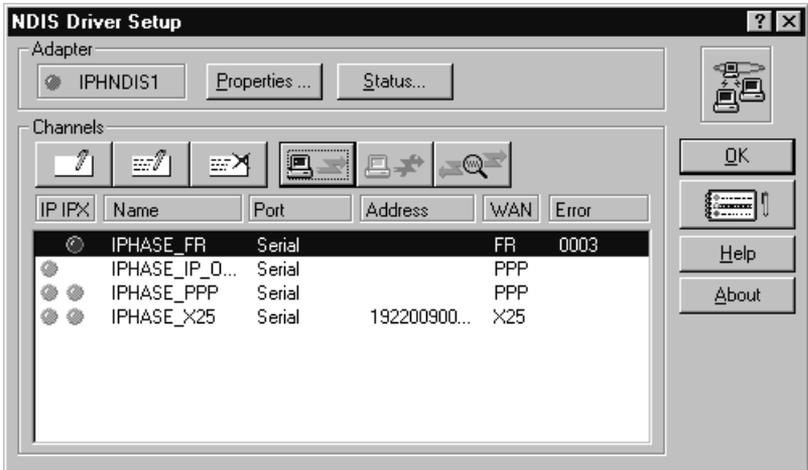


Figure 5-6. NDIS Driver Setup Dialog Box

The NDIS Driver Setup dialog box appears automatically after you add a logical adapter using Windows NT.

If you need to set up channels for an existing logical adapter, open this dialog box by starting the NDIS Driver Setup utility as described in [Starting the NDIS Driver Setup Utility on page 64](#).

To create or modify a channel for an NDIS logical adapter, do the following:

1. In the Channels section of the NDIS Driver Setup utility, select to add or edit a channel, as follows:
 - To add a channel, click the  (**Create**) icon.
 - To edit an existing channel, select the channel and click the  (**Edit**) icon.

The Channel properties dialog box appears.

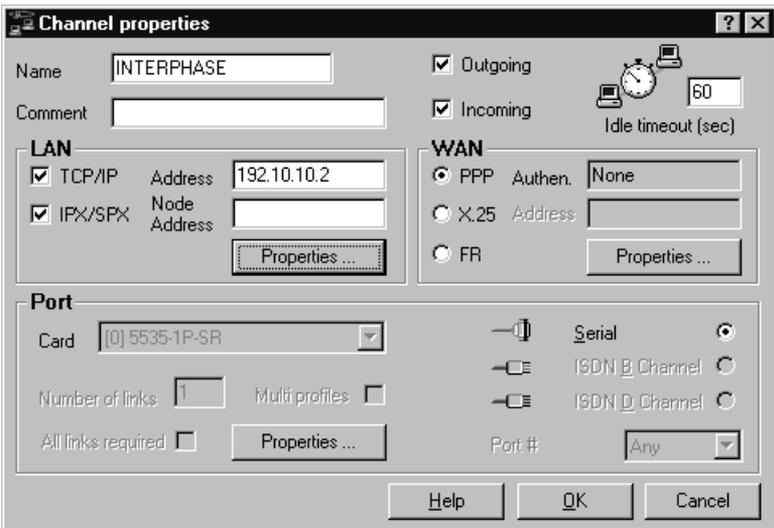


Figure 5-7. Channel Properties Dialog Box

This dialog box includes four groups of properties:

- General
- LAN
- WAN
- Port

The topics that follow explain how to set up each group of channel properties.

Setting Up General Properties

The following illustration shows the general section of the Channel properties dialog box.

Name	<input type="text" value="INTERPHASE"/>	<input checked="" type="checkbox"/> Outgoing	 <input type="text" value="60"/> Idle timeout (sec)
Comment	<input type="text" value="European operation CHAVILLE"/>	<input checked="" type="checkbox"/> Incoming	

Figure 5-8. General Channel Properties

To set up general channel properties, do the following:

1. In the **Name** field, identify the name of the channel being set up.
2. In the **Comment** field, enter optional comments or relevant information.
3. Check either or both the **Outgoing** and **Incoming** fields to specify the use of the channel. A channel can be used for outgoing calls only, for incoming calls only, or for outgoing and incoming calls.
4. In the **Idle timeout** field, set the channel inactivity timer by entering the length of time after which to automatically disconnect the channel due to inactivity. Or to disable the inactivity counter, enter **0**.

If the inactivity counter is disabled, only the remote peer or local user intervention can disconnect the channel.

Setting Up LAN Properties

The following illustration shows the LAN section of the Channel properties dialog box.

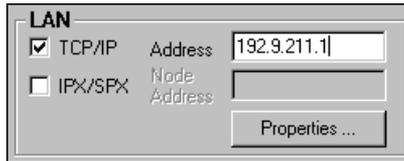


Figure 5-9. LAN Channel Properties

To set up LAN properties for the channel, do the following:

1. Complete information in the fields in the LAN section of the Channel properties dialog box as follows:
 - a. Check the **TCP/IP** and/or **IPX/SPX** fields to select the protocols to be routed through this channel. At least one protocol must be selected.
 - b. If the TCP/IP protocol is selected, in the TCP/IP **Address** field, enter the TCP/IP address of the remote equipment in dotted decimal format.
 - c. If the IPX/SPX protocol is selected, in the IPX/SPX **Node Address** field, enter the IPX/SPX address of the remote equipment (12 hexadecimal digits).
2. To set up properties for the selected LAN protocol(s), do the following:
 - a. In the LAN section of the Channel properties dialog box, click the **Properties** button.

The LAN Properties dialog box appears.

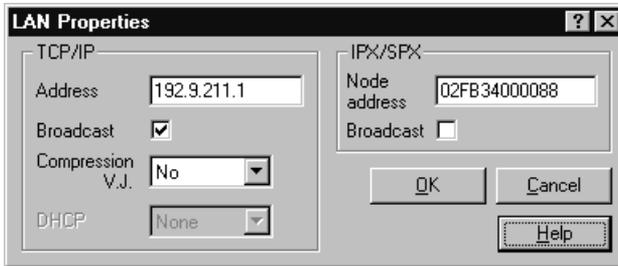


Figure 5-10. LAN Properties Dialog Box

- b. If the TCP/IP protocol is selected, in the TCP/IP fields, specify the channel's TCP/IP address, the broadcast option, and the Van Jacobson compression mode.



NOTE

The DHCP (Dynamic Host Configuration Protocol) is not supported in the current version of NDIS Driver and is unavailable in the dialog box.

- c. If the IPX/SPX protocol is selected, in the IPX/SPX fields, specify the IPX/SPX node address and the broadcast option.
- d. Click **OK** to save the LAN properties and return to the Channel properties dialog box.

Setting Up WAN Properties

The following illustration shows the WAN section of the Channel properties dialog box.

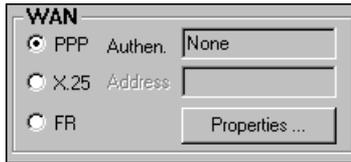


Figure 5-11. WAN Channel Properties

To set up WAN properties for the channel, do the following:

1. Complete information in the fields in the WAN section of the Channel properties dialog box as follows:
 - a. Check the **PPP**, **X.25**, or **FR** field to select the WAN protocol to transport the selected LAN protocol(s).
 - b. If the X.25 protocol is selected, in the **X.25 Address** field, enter the remote equipment address to use for the X.25 protocol.
2. To set up properties for the selected WAN protocol, click the **Properties** button in the WAN section.

The PPP Properties, X.25 Properties, or Frame Relay dialog box appears, depending on the WAN protocol.

The topics that follow provide instructions for setting up WAN protocol properties for a channel.

- To set up PPP properties, continue to the next topic, [PPP WAN Properties](#).
- To set up X.25 properties, skip to [X.25 WAN Properties on page 83](#).
- To set up Frame Relay properties, skip to [Frame Relay WAN Properties on page 85](#).

PPP WAN Properties

The PPP Properties dialog box enables you to set up WAN properties for a channel that uses the PPP protocol. Use this dialog box to specify PPP authentication, negotiation, and idle timeout methods.

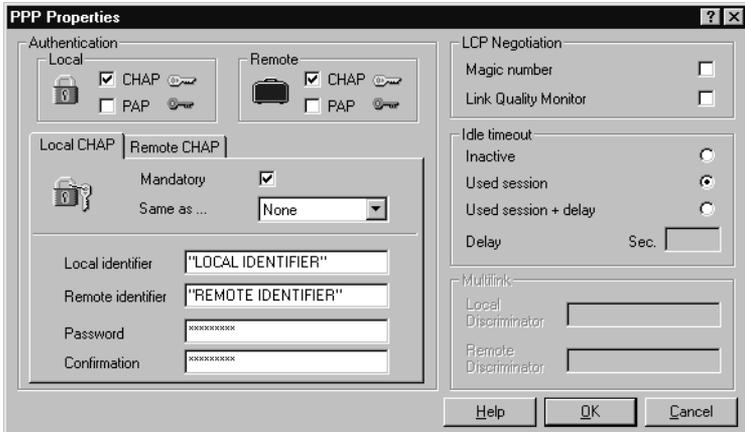


Figure 5-12. PPP Properties Dialog Box

For detailed information about setting up protocol parameters using this dialog box, see online help.

To set up PPP WAN properties for the channel, do the following:

1. In the Authentication section, set up authentication requirements as follows:
 - a. Select the authentication methods to be used for the local and remote peers. You can select either or both of the following: CHAP (Challenge Handshake Authentication Protocol) or PAP (Password Authentication Protocol).

For each authentication method chosen, a tabbed section appears under the checkbox fields, enabling you to specify additional authentication properties.

- b.** In the tabbed fields for each authentication method, identify whether the method is mandatory. Specify whether to use the same properties as another method. Also enter the local and remote identifiers and the password to use for authentication.
- 2.** In the LCP Negotiation section, select parameters to be used during Link Control Protocol (LCP) negotiation.
- 3.** In the Idle timeout section, select a parameter that determines when the link will be disconnected.
 - To deactivate the idle timeout counter so that only the remote peer or the network can close the PPP link, select **Inactive**.
 - To close the PPP link and physical connection as soon as the channel is deactivated, select **Used session**.
 - To close the PPP link and physical connection after the channel remains deactivated for a specified time, select **Use session + Delay** and enter the delay time in seconds.



NOTE

The multi-link group of properties can be used only with adapters that have multiple ports. They are unavailable in the dialog box.

- 4.** Click **OK** to save the PPP properties and return to the Channel properties dialog box.

Next, if you want to set up PPP port properties, skip to [Setting Up Port Properties on page 86](#).

X.25 WAN Properties

The X.25 Properties dialog box enables you set up WAN properties for a channel that uses the X.25 protocol. Use this dialog box to define the properties of outgoing calls and choose how to filter incoming calls.

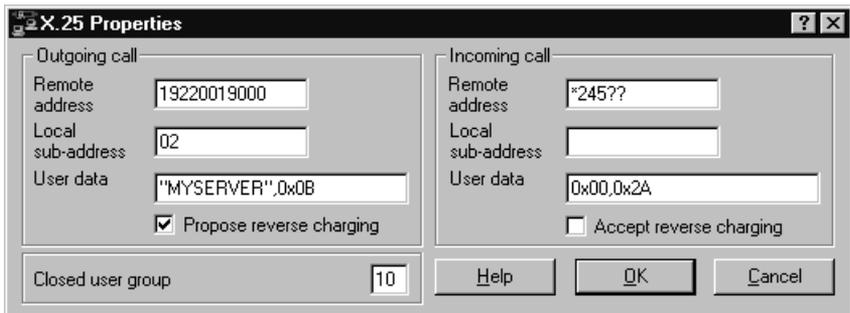


Figure 5-13. X.25 Properties

For detailed information about setting up protocol parameters using this dialog box, see online help.

To set up X.25 WAN properties for the channel, do the following:

1. In the **Outgoing call** section, set up properties for outgoing calls as follows:
 - a. In the **Remote address** field, to route the outgoing call to the remote peer, enter the address of the remote peer. You can add a one or two-digit sub-address to connect to a specific workstation or application on a LAN.
 - b. In the **Local sub-address** field, if you want the network to provide the local sub-address to the

For incoming calls, this number determines from which group the incoming call will be accepted.

4. Click **OK** to save the X.25 properties and return to the Channel properties dialog box.

Next, if you want to set up X.25 port properties, skip to [Setting Up Port Properties on page 86](#).

Frame Relay WAN Properties

The Frame Relay dialog box enables you set up WAN properties for a channel that uses the Frame Relay protocol. Use this dialog box to specify the channel's virtual circuit properties. Only the permanent virtual circuit (PVC) is available.

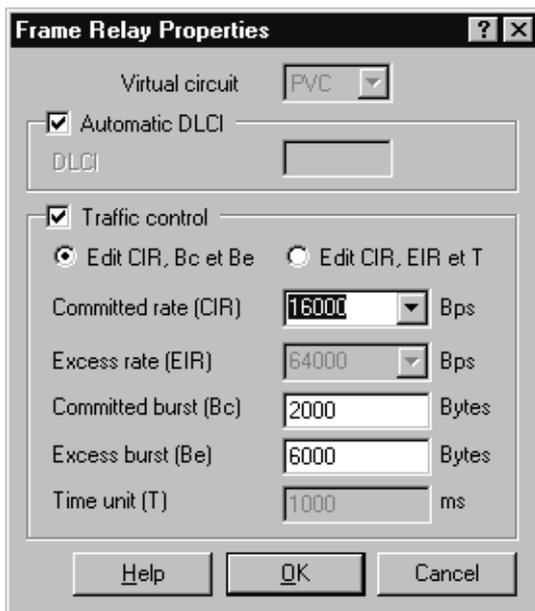


Figure 5-14. Frame Relay Properties Dialog Box

For detailed information about setting up protocol parameters using this dialog box, see online help.

To set up Frame Relay WAN properties for the channel, do the following:

1. In the DLCI and Traffic control sections of the Frame Relay dialog box, make sure that properties match those of your Frame Relay provider subscription.

Check with your Frame Relay provider to determine the appropriate parameters. See online help for a detailed description of each property.

2. Click **OK** to save the Frame Relay properties and return to the Channel properties dialog box.

Next, if you want to set up Frame Relay port properties, continue to the next topic, *Setting Up Port Properties*.

Setting Up Port Properties

The fields included in Port section of the Channel properties dialog box depend on whether the PPP, X.25, or Frame Relay WAN protocol is selected for the channel.

The topics that follow provide instructions for setting up port properties for a channel.

- To set up PPP port properties, continue to the next topic, *PPP Serial Port Properties*.
- To set up X.25 port properties, skip to *X.25 Port Properties on page 88*.
- To set up Frame Relay port properties, skip to *Frame Relay Port Properties on page 89*.

PPP Serial Port Properties

The following illustration shows the Port section of the Channel properties dialog box when the PPP WAN protocol is selected.

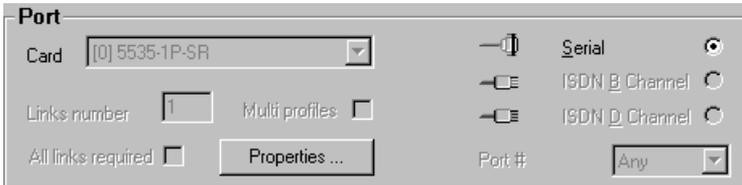


Figure 5-15. PPP Channel Port Properties

To set up port properties for a channel using the PPP protocol, do the following:

1. In the **Card** field, if more than one physical *iSPAN*-Serial WAN adapter is installed, select the physical adapter to be used by the channel.
2. To specify serial port properties for the selected adapter, do the following:
 - a. Click the **Properties** button in the Port section of the Channel properties dialog box.

The Serial Line Properties dialog box appears.

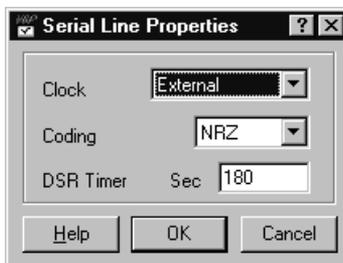


Figure 5-16. Serial Line Properties

- b. Specify the clock, coding, and DSR Timer properties for the serial line.
- c. Click **OK** to save the serial line properties and return to the Channel properties dialog box.

X.25 Port Properties

The following illustration shows the Port section of the Channel properties dialog box when the X.25 WAN protocol is selected.

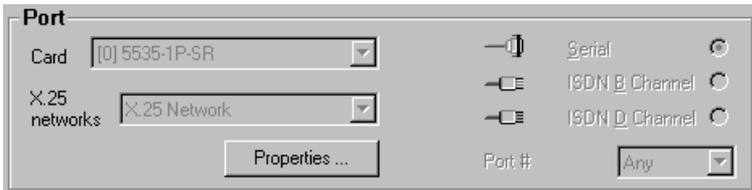


Figure 5-17. X.25 Channel Port Properties

To set up port properties for a channel using the X.25 protocol, do the following:

1. In the **Card** field, if more than one physical *i*SPAN-Serial WAN adapter is installed, select the physical adapter to be used by the channel.
2. In the **Network** field, if more than one X.25 network configuration has been created for use by the NDIS driver, select the network configuration to be used by this channel.
3. If you need to create, edit, or remove a network configuration to be used for driver connections, do the following:
 - a. Click the **Properties** button in the Port section of the Channel properties dialog box.

- b. On the X.25 protocol properties dialog box, configure the X.25 network properties to use with this channel. For instructions, see [Setting Up X.25 Network Properties on page 150](#).

All X.25 network configurations created in this dialog box are available for use by all of the adapter's NDIS channels and SNA link services.

- c. Click **OK** to save the X.25 protocol properties and return to the Channel properties dialog box.



NOTE

Because changing the X.25 network configuration changes the adapter firmware, use the WAN Adapters Setup utility to reload the firmware after making this change, as described in [Saving WAN Adapters Setup Properties on page 163](#).

Frame Relay Port Properties

The following illustration shows the Port section of the Channel properties dialog box when the Frame Relay (FR) WAN protocol is selected.

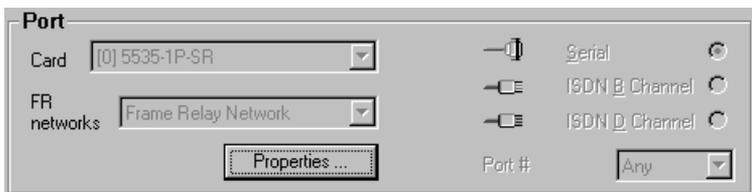


Figure 5-18. Frame Relay Channel Port Properties

To set up port properties for a channel using the Frame Relay protocol, do the following:

1. In the **Card** field, if more than one physical iSPAN-Serial WAN adapter is installed, select the physical adapter to be used by the channel.
2. In the **Network** field, if more than one Frame Relay network configuration has been created for use by the NDIS driver, select the network configuration to be used by this channel.
3. If you need to create, edit, or remove a network configuration to be used for driver connections, do the following:
 - a. Click the **Properties** button in the Port section of the Channel properties dialog box.
 - b. On the Frame Relay protocol properties dialog box, configure the Frame Relay network properties to use with this channel. For instructions, see [Setting Up Frame Relay Network Properties on page 155](#).

All Frame Relay network configurations created in this dialog box are available for use by all of the adapter's NDIS channels and SNA link services.
 - c. Click **OK** to save the Frame Relay protocol properties and return to the Channel properties dialog box.



NOTE

Because changing the Frame Relay network configuration changes the adapter firmware, use the WAN Adapters Setup utility to reload the firmware after making this change, as described in [Saving WAN Adapters Setup Properties on page 163](#).

Viewing Channel Status

To view channel status information, do the following:

1. If needed, start the NDIS driver Setup utility, as described in *Starting the NDIS Driver Setup Utility* on page 64.
2. In the Channels section of the NDIS Driver Setup dialog box, select the channel and click  (**Status**).

This channel status dialog box appears.

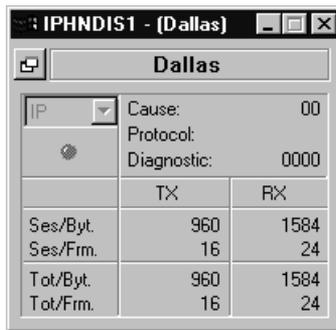


Figure 5-19. Channel Status Dialog Box

This dialog box displays channel status information and data traffic counters. Information is refreshed every second. You can open multiple occurrences of the channel status box for multiple channels simultaneously.

To keep this window on top of other windows, click  (**Keep on Top**). Click the icon again to return the window to its normal state.

The following table describes channel status parameters.

Parameter	Description
IP IPX or IP+IPX	Protocol field. Allows you to select the LAN protocol to view for the channel: IP, IPX, or the sum of IP and IPX links.
Cause	Displays the internal cause code of the NDIS Driver in case of channel or outgoing call disconnection.
Protocol	Displays the protocol originating the diagnostic code.
Diagnostic	Displays the internal protocol diagnostic code. This code is protocol-dependent.
Ses/Byt	Displays the total number of bytes transmitted and received during the current or last session for this channel using the selected LAN protocol(s).
Ses/Frm	Displays the total number of frames transmitted and received during the current or last session for this channel using the selected LAN protocol(s).
Tot/Byt	Displays the total number of bytes transmitted and received since the last system startup for this channel using the selected LAN protocol(s).
Tot/Frm	Displays the total number of frames transmitted and received since the last system startup for this channel using the selected LAN protocol(s).

Deleting Channels from Logical Adapters

To delete a channel from a logical adapter configuration, do the following:

1. If needed, start the NDIS driver Setup utility, as described in [Starting the NDIS Driver Setup Utility on page 64](#).

2. In the Channels section of the NDIS Driver Setup dialog box, select the channel and click  (**Delete**).

Manually Connecting a Channel

A channel connection is usually established automatically when LAN frames are routed to the NDIS driver. You can manually create a channel connection to use for testing the physical port connection and WAN protocol level.

To manually connect a channel, do the following:

1. If needed, start the NDIS driver Setup utility, as described in [Starting the NDIS Driver Setup Utility on page 64](#).
2. In the Channels section of the NDIS Driver Setup dialog box, select the channel and click  (**Activate**).



NOTE

The Activate button is enabled only when you select outgoing call channels with a disconnected status.

Manually Disconnecting a Channel

A channel connection is usually disconnected automatically due to inactivity. You can manually disconnect a channel to use for testing the physical port at the WAN protocol level.

To manually disconnect an active channel, do the following:

1. If needed, start the NDIS driver Setup utility, as described in [Starting the NDIS Driver Setup Utility on page 64](#).
2. In the Channels section of the NDIS Driver Setup dialog box, select the channel and click  (**Release**).



NOTES

This button is enabled for connected channels only.

If a connected channel contains data traffic, manual disconnection can cause data loss.

If LAN protocol broadcast frames are enabled, the channel can immediately reconnect.

Logging NDIS Driver Events

6

Overview

The NDIS Driver Log utility is installed when you install the NDIS driver. The NDIS Driver Log records NDIS driver event information, and stores the information in the Windows NT log. The NDIS Driver Log enables you to select the types of events to be saved. It extracts NDIS driver events from the following sources:

- Local Windows NT computer application log
- Remote Windows NT computer application log
- Both a local and remote Windows NT Log saved in an event (*.evt*) file

The events can be viewed using either the NDIS Driver Log dialog box or the Windows NT Event Viewer. The NDIS Driver Log dialog box provides more details about NDIS driver events than the Windows NT Event Viewer provides.

This chapter explains how to do the following NDIS Driver Log tasks:

- Access online help
- Use NDIS Driver Log menus
- Customize NDIS events in the Interphase NDIS Driver Log
- View NDIS events in the Windows NT Event Viewer

Accessing Online Help

For detailed information about the functions and dialog boxes described in this chapter, see the NDIS Driver Log online help. You can access online help in the following ways:

- Press **F1** to display field-level contextual help in a pop-up window.
- Click the **Help** button.
- Click the Help icon  , and then select the topic you want to read about.

Starting the NDIS Driver Log

To start the NDIS Driver Log, do either of the following:

- From the **Start** menu, select **Programs, Interphase WAN Adapters**, and then **NDIS Driver Log**.
- In the NDIS Driver Setup dialog box, click the **Log** icon  .

When you start the utility, the NDIS Driver Log dialog box appears.

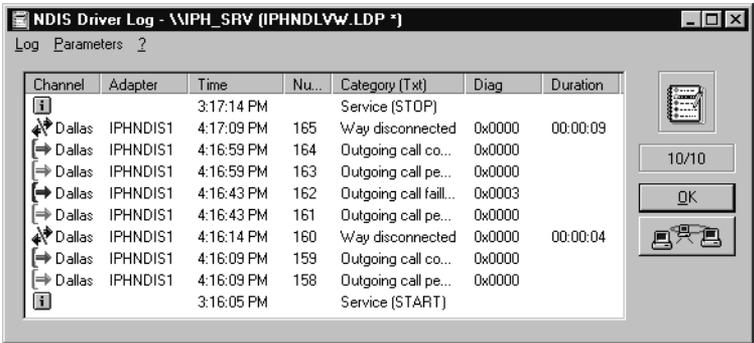


Figure 6-1. NDIS Driver Log Dialog Box

Viewing Events in the NDIS Driver Log

The events displayed on the NDIS Driver Log dialog box correspond to the filter and display settings configured for the NDIS Driver Log. The types of details depend on the network protocol being used by the driver.

To see the original channel settings used when the event occurred, in the **Channel** column, double-click on the event.

Customizing NDIS Driver Log Settings

In addition to the Help menu, the NDIS Driver Log window provides the Log menu and Parameters menu. Use these menus to customize NDIS Driver Log event categories, filters, and display settings to suit your requirements.

Log Menu

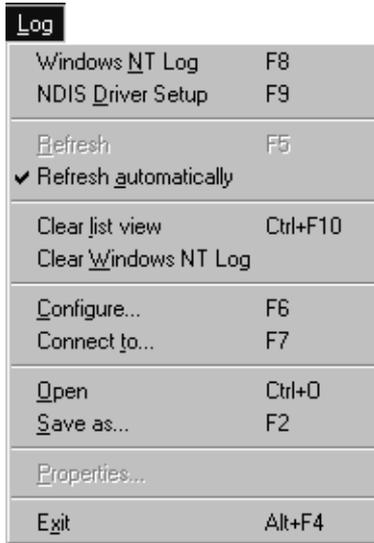


Figure 6-2. Log Menu

Use the **Log** menu to navigate to the Windows NT Log or the NDIS Driver Setup utility, refresh or clear event information, connect to a remote station log, and customize the logging process.

The **Save as** option allows you to save the log with the current selected format in a text-delimited file, which can be exported to another software program such as a spreadsheet. The **Open** option enables you to open a saved log file.

Parameters Menu

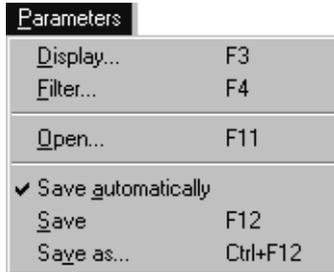


Figure 6-3. Parameters Menu

Use the **Parameters** menu to customize the NDIS Driver Log event list in either or both of the following ways:

- Specify events to be displayed in the event list.
- Choose the parameter used in each column.

Specifying Events to Log to Windows NT

To specify the events to be logged to the Windows NT log, do the following:

1. In the NDIS Driver Log dialog box, select the **Log** menu; then select the **Configure** option.

The Configure Logging dialog box appears.

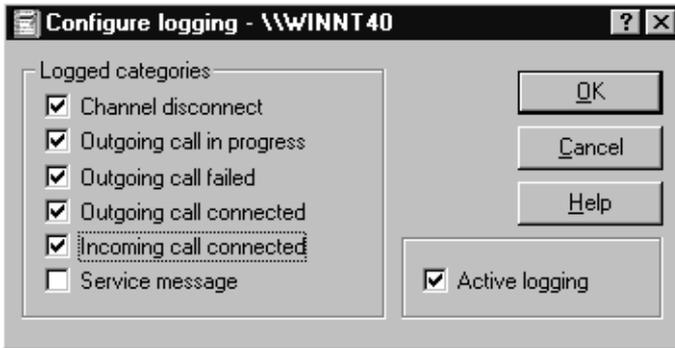


Figure 6-4. Configure Logging Dialog Box

2. Select the event categories to be logged from the NDIS driver into the Windows NT log.
3. To make logging functions available, select the **Active logging** checkbox in the lower right of the dialog box. (Or deselect the checkbox to make logging functions unavailable.)

Setting Up Event List Display Properties

For each event category to be logged by the NDIS Driver Log, you can select columns of information to be displayed in the event list. You can also customize the display order and format. To customize the displayed event information, do the following:

1. In the NDIS Driver Log dialog box, select the **Parameters** menu; then select the **Display** option.

The Display dialog box appears.

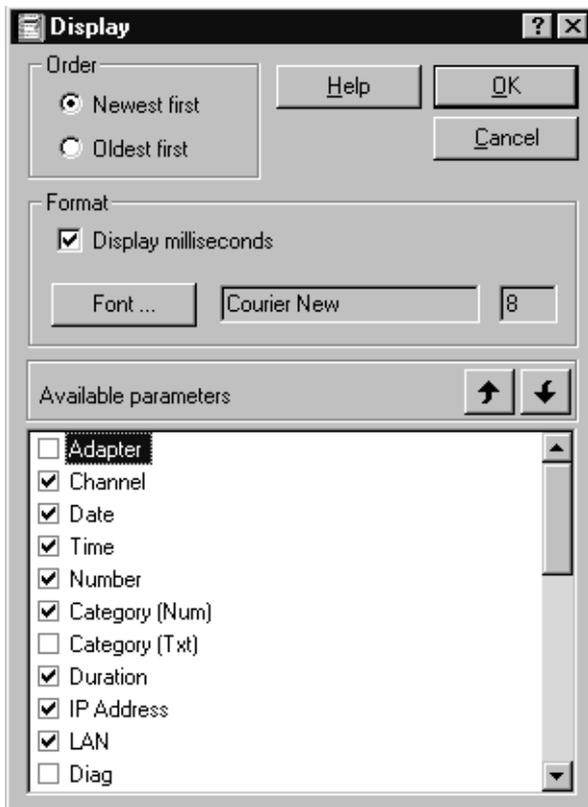


Figure 6-5. Display Dialog Box

2. Select the chronological order in which to display events—whether newest to oldest, or oldest to newest.
3. Select the **Display milliseconds** checkbox to display event times and intervals in milliseconds.

4. To change the font, click the **Font** button. Then on the Windows NT Font dialog box, change the font style and size as needed. Click **OK** to return to the Display dialog box.
5. Select the column headings to be displayed on the NDIS Driver Log event list.
6. If you want to change the order of the display parameters, do the following:
 - a. Select the parameter you want to move, and click the up or down arrow.
 - b. Click **OK**.

These parameters are saved when you use the **Save** or **Save as** option on the NDIS Driver Log dialog box to save your Log Display Parameters (.ldp) file.

For information about event display properties, see the online help provided with the NDIS Driver Log.

Setting Up Event Filtering Criteria

To set up event filtering criteria used to create the NDIS Driver Log event list, do the following:

1. In the NDIS Driver Log dialog box, select the **Parameter** menu; then select the **Filter** option.

The Filter dialog box appears.

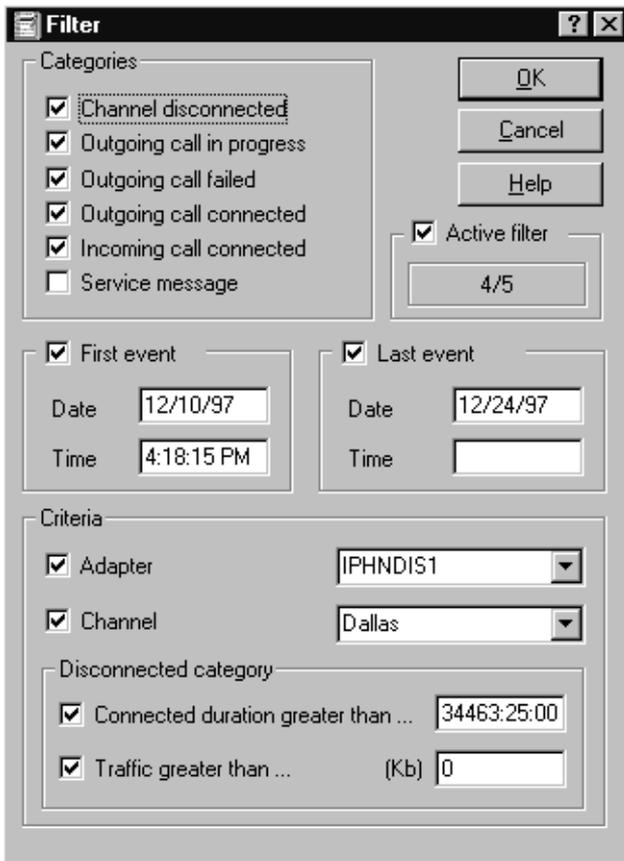


Figure 6-6. Event Filters Dialog Box

2. Enter filtering criteria to be used with your event list.

You can save these criteria when you use the **Save** or **Save as** option on the NDIS Driver Log dialog box to save your Log Display Parameters (.ldp) file.

For detailed information about filtering criteria, see the NDIS Driver Log online help.

Viewing Events in the NT Event Viewer

In addition to the NDIS Driver Log dialog box, you can also use the Windows NT Event View to view NDIS driver events. The Event Viewer is a standard feature of Windows NT.

To display the Event Viewer, from the **Log** menu, select **Windows NT Log**. (Or from the Windows NT **Start** menu, select **Programs, Administrative Tools (Common)**, and then **Event Viewer**.)

Various events are recorded in the Windows NT Event Viewer, as shown in the following illustration.

The screenshot shows the Windows NT Event Viewer window with a menu bar (Log, View, Options, Help) and a table of events. The table has columns for Date, Time, Source, Category, and Event. The events listed are:

Date	Time	Source	Category	Event
10/9/98	3:47:11 PM	IPHNDLOG	(1)	1
10/9/98	3:47:09 PM	IPHNDLOG	(4)	4
10/9/98	3:47:09 PM	IPHNDLOG	(2)	2
10/9/98	3:47:01 PM	IPHNDLOG	(3)	3
10/9/98	3:47:01 PM	IPHNDLOG	(2)	2
10/9/98	3:46:45 PM	IPHNDLOG	(1)	1
10/9/98	3:46:36 PM	IPHNDLOG	(4)	4
10/9/98	3:46:36 PM	IPHNDLOG	(2)	2
10/9/98	3:46:30 PM	IPHNDLOG	(1)	1
10/9/98	3:46:21 PM	IPHNDLOG	(4)	4

Figure 6-7. Windows NT Event Viewer

The following table describes the events recorded in the Event Viewer and the icons that represent the events.

Icon	Event
	Beginning of logging process. Indicates when the NDIS logging process starts.
	Successful connection.

Icon	Event
	Channel disconnection. Indicates when a channel has been disconnected for any reason. This event is recorded even when a time-out disconnection is issued by the driver.
	Trying to connect to an outgoing channel. Indicates each attempt to connect to any destination. This message is usually followed by a Successful connection event.
	Failure to establish communication. Indicates any failure to connect a channel.

Double-clicking one of the events in the list opens the following dialog box, which shows detailed information about the selected event.

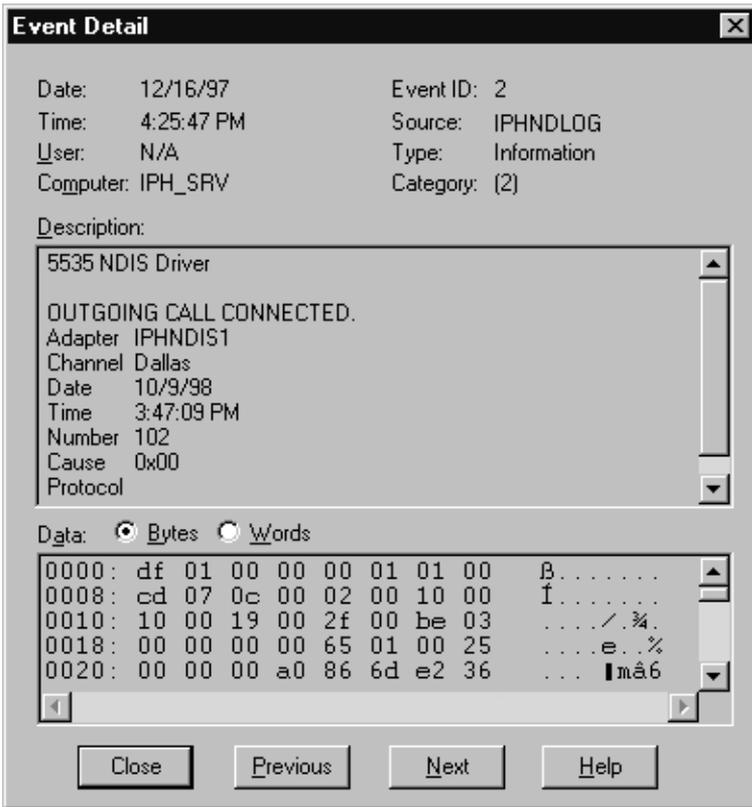


Figure 6-8. Windows NT Event Detail Dialog Box

To interpret the Data part of the dialog box, you must use the NDIS Driver Log, described in [Customizing NDIS Driver Log Settings on page 97](#). The data is interpreted by the NDIS Driver log program.

Installing SNA Server Link Services Software

7

Overview

SNA Server link services allow you to connect a Windows NT SNA Server to SNA hosts over a dedicated SDLC, X.25, or Frame Relay line, or across a Frame Relay or X.25 network. This chapter describes the process for installing and setting up SNA Server link services software for your adapter on Microsoft Windows NT 4.0 systems.

To install the SNA link services software, follow these basic steps:

1. Verify that your system meets minimum requirements.
2. Install the Base driver.
3. Install SNA Server link services.

This chapter also explains how to remove the Base driver software. However, it does not provide instructions for removing SNA link services because they can be removed only by removing the Microsoft SNA Server software package.

Review the *Read Me* text file on the *iSPAN-Serial WAN* installation CD before installing the adapter software. The *Read Me* file contains information about the files included on the CD. Also, if *Read Me First* documentation is included in your installation kit, review it for information about changes and updates made to this Users Guide after the print date.



NOTE

The *iSPAN-Serial WAN* adapter is named *5535-1P-SR* in the software installation and configuration dialogs.

Verifying Minimum Requirements

If you have not already done so, verify that your system meets the minimum requirements described in [Minimum System Requirements](#) on page 9.

Installing the Base Driver



NOTE

If the NDIS driver software is installed on this system, the Base driver is already installed. Base driver software is automatically installed during NDIS driver installation. If the Base driver is already installed, skip to [Installing Interphase SNA Link Services](#) on page 113.

To install the Base driver software, complete the following tasks:

1. Run the Base driver Setup program and start the installation.
2. Set up WAN properties.
3. Complete the Base driver installation.

Running the Setup Program

To install the Base driver software, do the following:

1. From the Windows **Start** menu, choose **Run**. The Run dialog box appears.
2. Insert the SNA Server CD-ROM.
3. Enter `[drive] : \5535SR\base\setup.exe` (where *[drive]* is the CD-ROM drive), and click **OK**.

The Interphase 553X Base Driver dialog box appears.



Figure 7-1. Base Driver Installation Dialog Box

4. If needed, change the default installation path in the **Copy To** field to the desired pathname. (The default path is `C:\WANSETUP`.)
5. Click **Continue** to install the driver.

The installation program copies product files to the directory specified in the **Copy To** field, and creates a program group in the Windows NT **Start** menu.

To continue the software installation, set up the adapter's port properties as described in the next section, *Setting Up WAN Properties*.

Setting Up WAN Properties

After the Base driver software is installed as described in *Running the Setup Program*, the WAN Adapters Setup dialog box appears, as shown in the following illustration.



Figure 7-2. WAN Adapters Setup Dialog Box

The card name is displayed in the **Cards** section. Use the Cards section to set up the card's port properties.



NOTE

If the Cards list is empty, the adapter might not be properly installed. See [Problems and Solutions on page 166](#) for information to correct the problem.

When configuring the adapter's serial port properties, if you are not sure which options to select, use the default values. You can change the settings later. For detailed information about setting up WAN properties, press the **F1** key to view field-level help, or see [Setting up Firmware and Hardware on page 145](#).

To configure the WAN properties, make sure the appropriate adapter is selected in the Cards list of the WAN Adapters Setup dialog box. Then do the following:

1. Select the serial port you want to configure and click **Properties**.

The SR Port Properties dialog box appears.

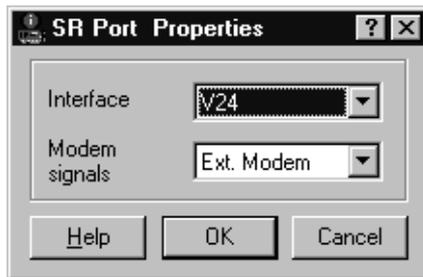


Figure 7-3. SR Port Properties Dialog Box

2. In the **Interface** field, select the Serial Line interface type to be used with the adapter.

3. In the **Modem signals** field, select the method for handling modem signals. (In most cases, the default option, *External modem*, is appropriate.)
4. Click **OK** to return to the WAN Adapters Setup dialog box.
5. When WAN adapter properties are configured as needed, click **OK** in the WAN Adapters Setup dialog box.

Continue to the next section, *Completing the Base Driver Installation*.

Completing the Base Driver Installation

After you finish the WAN port properties setup for the adapter, a message indicates that the system is updating the appropriate firmware for the adapter. The setup software automatically finds the firmware for the adapter. It updates the Windows NT registry and dynamically installs the drivers.

When the software configuration is finished, the following message informs you that the driver is running.



Figure 7-4. Message Indicating Successful Configuration

To complete the Base driver installation, do the following:

1. Click **OK**.

A message informs you that the Base driver package has been successfully installed.



Figure 7-5. Successful Base Driver installation Message

2. Click **OK**.

Now install the SNA Server link services. Continue to the next section, *Installing Interphase SNA Link Services*.

Installing Interphase SNA Link Services

To install Interphase SNA link services for Microsoft SNA Server, you must use the Microsoft SNA Server Manager.



CAUTION

Before you can install Interphase link services, Microsoft SNA Server must be installed, with default link services configured. For information about the SNA Server installation process, see your Microsoft SNA Server documentation.

To install Interphase SNA link services, do the following:

1. To start the Microsoft SNA Server Manager, from the Windows **Start** menu, select **Programs, Microsoft SNA Server**, and then **Manager**.

The Microsoft SNA Server Manager window appears.

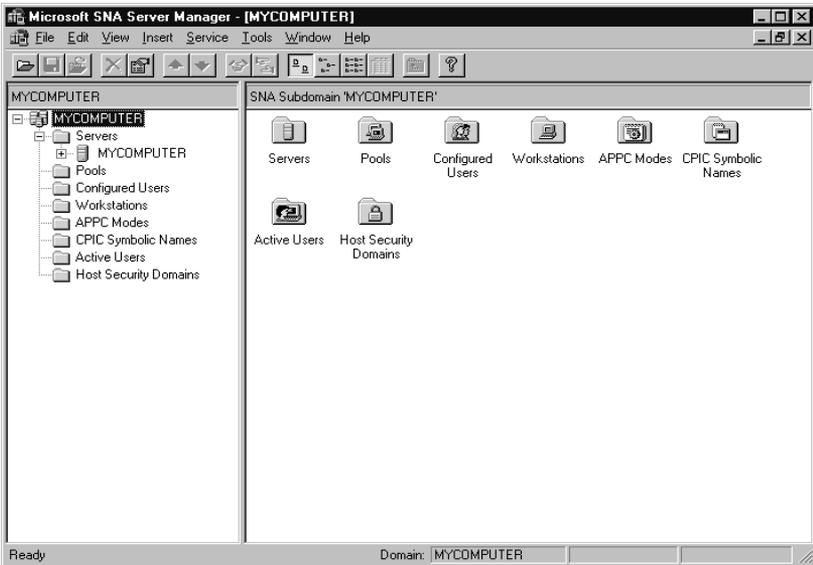


Figure 7-6. Microsoft SNA Server Manager Window

2. From the **Tools** menu, select **External Link Services**.

The Microsoft SNA Server Setup welcome dialog box appears.



Figure 7-7. SNA Server Setup Dialog Box

3. Click **Continue**.

The Setup Options dialog box appears.

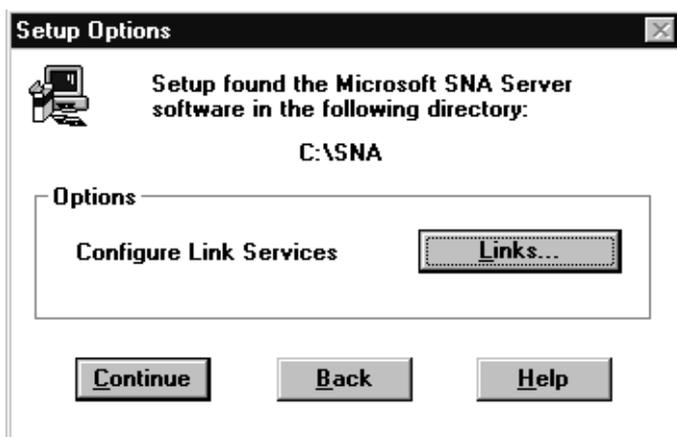


Figure 7-8. Setup Options Dialog Box

4. Click **Links** to configure link services.

The Link Service Installation dialog box appears, listing available link services.

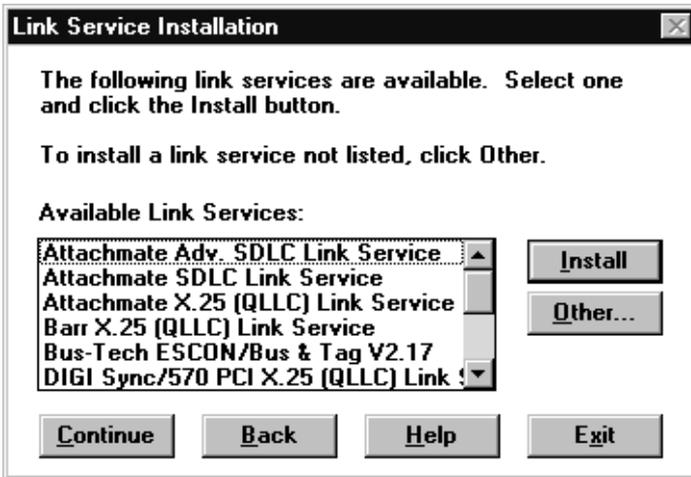


Figure 7-9. List of Available Link Services

5. Click **Other** to install services other than the listed ones.

SNA Server setup requests the software path in the Link Service Import dialog box.

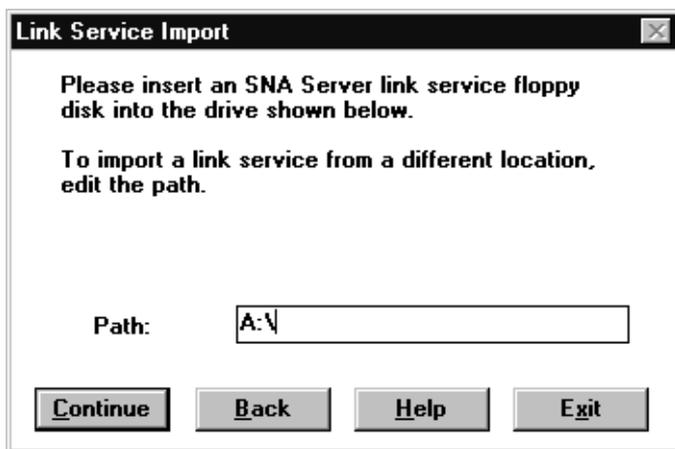


Figure 7-10. Link Service Import Dialog Box

6. Insert the 5535 SNA Link Services CD-ROM, and enter `[drive]:\5535SR` in the **Path** field. (where *[drive]* is the CD-ROM drive—for example `D:\5535SR`).
7. When you have entered the path, click **Continue**.



NOTE

If you enter the pathname incorrectly on the first attempt, you might need to click the **Back** button after entering the pathname correctly to exit the Link Service Import dialog box.

8. The Link Service Installation dialog box reappears, listing Interphase link services.

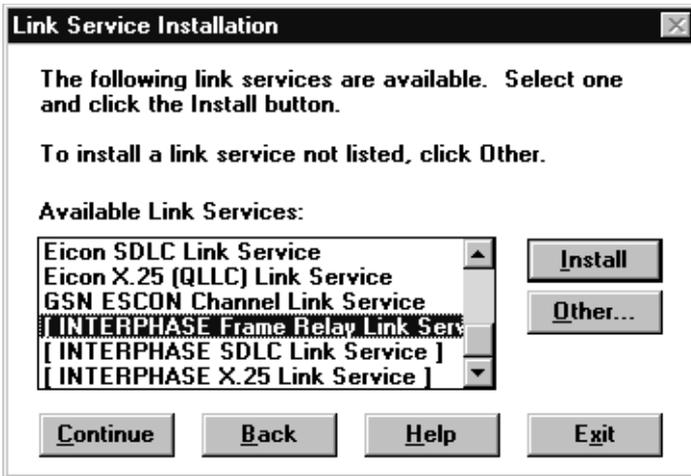


Figure 7-11. Interphase Link Service Installation Dialog Box

These include the following:

- Interphase Frame Relay link service
- Interphase SDLC link service
- Interphase X.25 link service

You can add all three Interphase link services (Frame Relay, SDLC and X.25), but you can add only one at a time.

9. Select the Interphase link service you want to install and click **Install**.

After all necessary files are copied for the selected link service, the following setup message appears.



Figure 7-12. Successful Link Service Setup Message

10. Click **OK** to complete the Interphase link service installation and return to the Microsoft SNA Server Manager window.
11. If you need to install another Interphase link service, repeat steps 2 through 11, starting on page 114.

To set up your new Interphase link service(s), see [Setting up SNA Server Link Services](#) on page 123.

Removing Base Driver Software

You cannot remove SNA link services without removing the entire SNA Server software package. Only removal of the Base driver is discussed in this chapter. See your Microsoft SNA Server software documentation for information about removing the SNA Server software package.

You can remove the Base driver without removing the SNA Server software. However, if you remove the Base driver, Interphase SNA Server link services will no longer be available.



CAUTION

If any other software requiring the Base driver (such as the Interphase NDIS driver) is installed in your system, do not remove the Base driver.

If you no longer need to use the adapter, do the following to remove the Base driver software from your system:

1. From the Windows **Start** menu, select **Settings**, and then **Control Panel**.
2. Double-click the **Add/Remove Programs** icon, then select the **Install/Uninstall** tab.
3. Select **Interphase 553X Base driver**, and click **Add/Remove**.

The following message asks whether you want to remove the software.

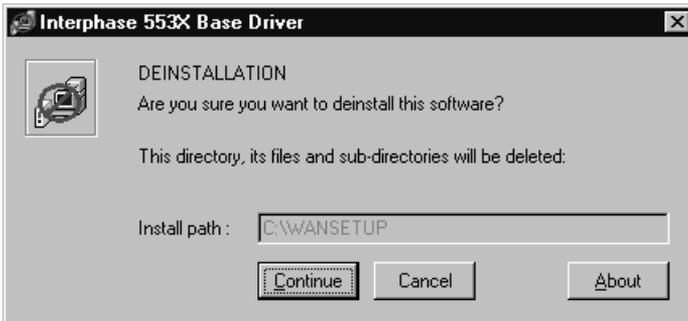


Figure 7-13. Base Driver Removal Prompt

4. Click **Continue** to confirm the removal.

5. When a dialog box prompts you to confirm the card removal and driver deletion, click **Yes**.

Next, a series of messages informs you that the software is being removed. The final message informs you that the Base driver has been successfully deinstalled.

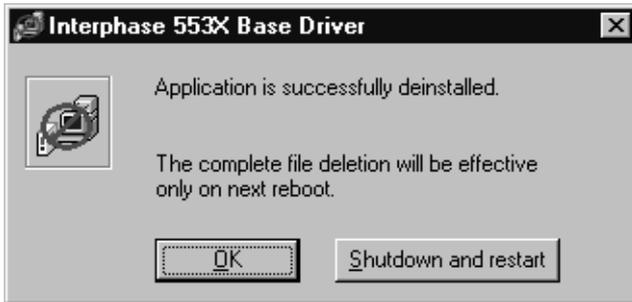


Figure 7-14. Base Driver Removed Successfully

This message also prompts you to shut down and restart your computer to make changes take effect.

6. Continue as follows:
 - Click **Shutdown and restart** to reboot your computer and apply changes.
 - Click **OK** to continue without applying changes. Changes will be applied when the machine is rebooted.

Setting up SNA Server Link Services

8

Overview

This chapter explains how to insert and set up Interphase SNA Server link services and connections for the *iSPAN*-Serial WAN adapter. The setup procedure is described for SNA Server 4.0 (with Microsoft SNA Server Service Pack 1).

This chapter explains how to do the following SNA Server link services setup tasks:

- Access online help
- Insert and set up an Interphase Frame Relay, SDLC, or X.25 SNA Server link service
- Insert and set up a Frame Relay, SDLC, or X.25 connection

This chapter does not include a detailed description of Microsoft's SNA Server software, interface, or configuration. As a general rule, verify default values that appear in Microsoft NT dialog boxes, referring to your SNA Server administrator for assistance. For a complete description of the SNA Server configuration procedure, see the latest Microsoft SNA Server documentation, or follow the appropriate links at the Microsoft web site: <http://www.microsoft.com/products>.

Microsoft SNA Server, Interphase SNA Server link services and the standard Base driver (along with the WAN adapter firmware) must already be installed before setting up SNA Server link services for the adapter. For installation instructions, see [Installing SNA Server Link Services Software on page 107](#).

Accessing Online Help

For detailed information about the functions and dialog boxes described in this chapter, see the SNA Server Manager online help. You can access online help in the following ways:

- Press **F1** to display field-level contextual help in a pop-up window.
- Click **Help** to display the main online help.

Starting the SNA Server Manager

To insert and set up SNA Server link services for the adapter, use the Microsoft SNA Server Manager. To start the SNA Server Manager, from the Windows **Start** menu, choose **Programs, Microsoft SNA Server, and then Manager.**

The **Microsoft SNA Server Manager** window appears.

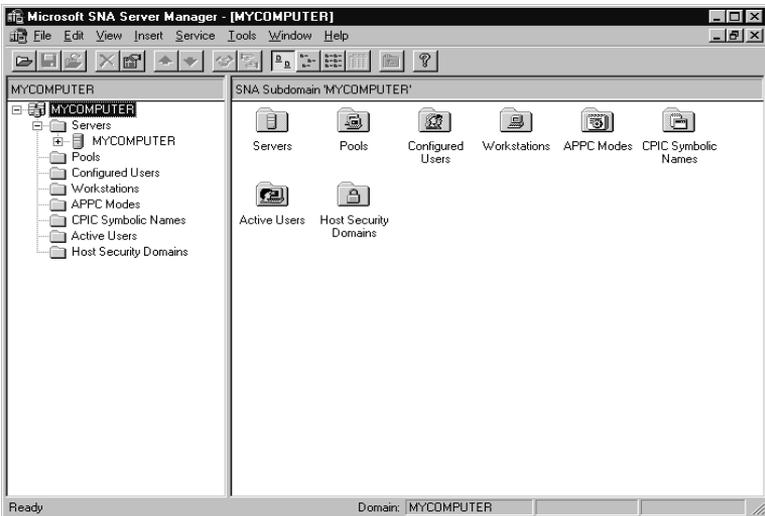


Figure 8-1. Microsoft SNA Server Manager Window

Inserting and Setting Up Interphase Link Services

Use the SNA Server Manager to add and set up the Interphase link services. This section explains how to do the following:

- Insert a Frame Relay, SLDC, or X.25 link service
- Edit a previously inserted link service
- Set up an inserted Frame Relay link service
- Set up an inserted SLDC link service
- Set up an inserted X.25 link service

Inserting an Interphase Link Service

To insert an Interphase link service, do the following:

1. Open the Microsoft SNA Server Manager window as described in *Starting the SNA Server Manager on page 124*.
2. Open the **Servers** directory, and select the server on which you are inserting link services.
3. If the server is running, stop the server. (From the **Service** menu, select **Stop**.)
4. On the SNA Server Manager window, from the **Insert** menu, select **Link Service**.

The Insert Link Service dialog box appears, prompting you to select a link service from the list.

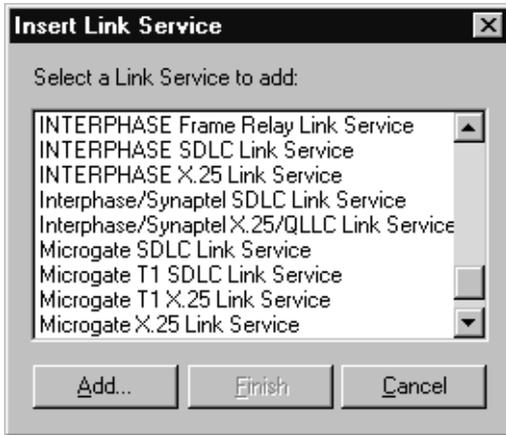


Figure 8-2. Insert Link Service Dialog Box

5. Select the Interphase link service you want to insert:
 - INTERPHASE Frame Relay link service
 - INTERPHASE SLDC link service
 - INTERPHASE X.25 link service
6. Click **Add** to insert the service.

The Interphase Link Service Properties dialog box appears.

The settings in the Interphase Link Service Properties dialog box depend on the link service you inserted. The default service name is displayed in the title bar. To configure settings for the inserted service, continue as follows:

- To set up a Frame Relay link service, skip to [Setting Up a Frame Relay Link Service on page 128](#).
- To set up an SDLC link service, skip to [Setting Up an SDLC Link Service on page 132](#).
- To set up an X.25 link service, skip to [Setting Up an X.25 Link Service on page 136](#).

Editing an Interphase Link Service

To edit an existing Interphase link service, do the following:

1. Open the Microsoft SNA Server Manager window as described in [Starting the SNA Server Manager on page 124](#).
2. Open the **Servers** directory, and select the server for which you are editing a link service.
3. If the server is running, stop the server. (From the **Service** menu, select **Stop**.)
4. Open the **Link Services** directory.
5. Double click the link service you want to edit.
6. Continue as follows:
 - To edit properties of a Frame Relay link service, continue to [Setting Up a Frame Relay Link Service on page 128](#).
 - To edit properties of an SDLC link service, skip to [Setting Up an SDLC Link Service on page 132](#).
 - To edit properties of an X.25 link service, skip to [Setting Up an X.25 Link Service on page 136](#).

Setting Up a Frame Relay Link Service

After you insert or select to edit an Interphase Frame Relay link service, the Interphase FR Link Service Properties Mode Settings dialog box appears.

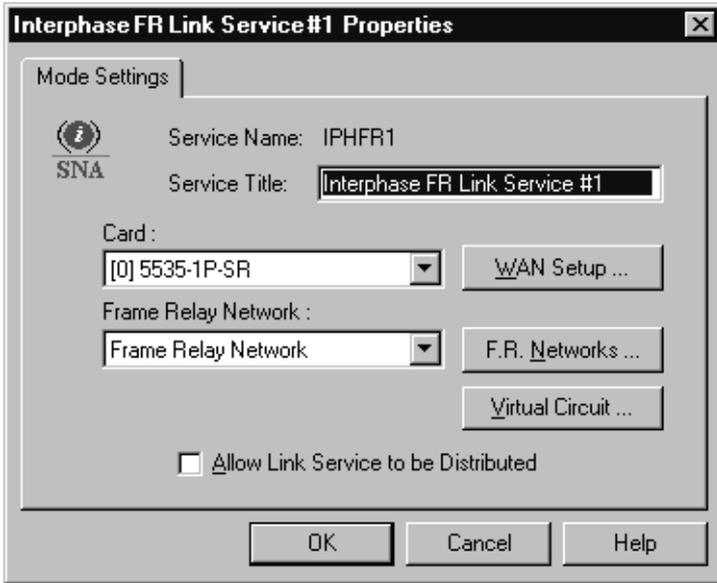


Figure 8-3. Frame Relay Link Service Properties Dialog Box

Use this dialog box to configure the inserted link service, as follows:

1. In the **Service Title** field, change the service title as needed. This is the title that appears in the title bar of the dialog box.
2. In the **Card** field, make sure the appropriate adapter is selected (*5535-1P-SR*).

3. If you want to change the default firmware or hardware properties of the adapter, click the **WAN Setup** button to display the WAN Adapters Setup utility. Then follow the instructions in *Setting up Firmware and Hardware* on page 145.
4. In the **Frame Relay Network** field, select the frame relay network configuration to be used with the service.
5. If you need to create, edit or remove a network configuration to be used with the service, do the following:
 - a. Click the **FR Networks** button.
 - b. On the Frame Relay protocol properties dialog box, configure the Frame Relay network to use with this service. For instructions, see *Setting Up Frame Relay Network Properties* on page 155.

All Frame Relay network configurations created in this dialog box are available for use by all of the adapter's SNA link services and NDIS channels.
 - c. Click **OK** to save the Frame Relay protocol properties and return to the FR Link Service Mode Settings dialog box.
6. To verify or change the virtual circuit properties used with the Frame Relay service, do the following:
 - a. Click the **Virtual Circuit** button.

The following dialog box appears, showing Virtual Circuit properties.

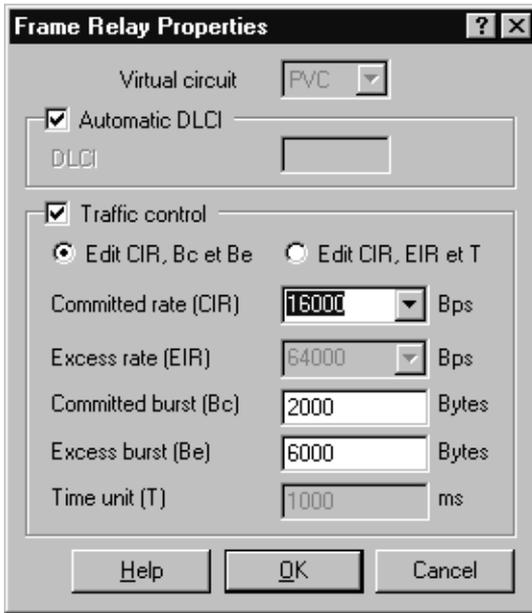


Figure 8-4. Frame Relay Virtual Circuit Properties

- b.** Make sure DLCI and Traffic control properties match the properties of your Frame Relay provider subscription.

Check with your Frame Relay provider to determine the appropriate parameters. See online help for a detailed description of each property.
- c.** Click **OK** to save the Frame Relay properties and return to the Frame Relay Properties dialog box.
- 7.** If you want to use this link service remotely from another SNA Server, select **Allow Link Service to be Distributed**.

8. Click **OK** to save the link service configuration.
 - If you edited the Frame Relay link service, the SNA Server Manager reappears.
 - If you inserted the Frame Relay link service, the Insert Link Service dialog box reappears.
9. If you inserted the Frame Relay link service, continue as follows:
 - If you need to insert another Interphase link service, on the Insert Link Service dialog box, select the service and click **Add**. Then complete setup steps for that link service, as described in [Setting Up an SDLC Link Service on page 132](#) or [Setting Up an X.25 Link Service on page 136](#).
 - If you have finished configuring Interphase link services, click **Finish** to return to the SNA Server Manager. Then skip to [Inserting a Connection on page 139](#).

Setting Up an SDLC Link Service

After you insert or select to edit an Interphase SDLC link service, the Interphase SDLC Link Service Properties Mode Settings dialog box appears.

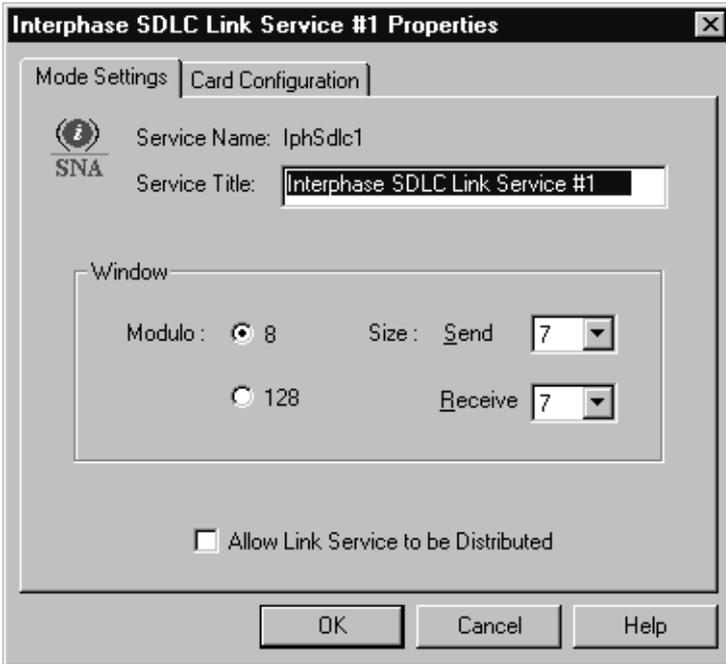


Figure 8-5. SDLC Link Service Mode Settings

Use this dialog box to configure the SDLC link service mode settings and card configuration settings, as described in the topics that follow.

Configuring SDLC Mode Settings

To configure SDLC mode settings, do the following:

1. In the **Service Title** field, change the service title as needed. This is the title that appears in the title bar of the dialog box.
2. In the **Window** section, make sure that the SDLC modulo and size properties match the SDLC properties of the SDLC link service at the remote end.
3. If you want to use this link service remotely from another SNA Server, select **Allow Link Service to be Distributed**.

Configuring SDLC Card Configuration Settings

To configure SDLC card configuration settings, do the following:

1. Select the **Card Configuration** tab to display the Card Configuration dialog box.



Figure 8-6. SDLC Link Service Card Configuration

2. In the **Card** field, make sure the appropriate adapter is selected (*5535-IP-SR*).
3. If you want to change the default firmware or hardware properties of the adapter, click the **WAN Setup** button to start the WAN Adapters Setup utility. Then follow the instructions in [Setting up Firmware and Hardware on page 145](#).

4. To configure the Serial line properties for the SDLC link service, do the following:
 - a. In the Port section, click the **Port Settings** button.
The Serial Line Properties dialog box appears.

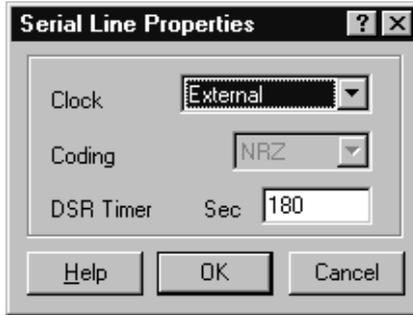


Figure 8-7. Serial Line Properties Dialog Box

- b. Select the correct **Clock** value for this service, if needed. For other properties, accept the default values.
 - c. Click **OK** to save the serial line properties and return to the SDLC Link Service Properties Card Configuration dialog box.
5. Click **OK** to save the link service configuration.
 - If you edited the SDLC link service, the SNA Server Manager reappears.
 - If you inserted the SDLC link service, the Insert Link Service dialog box reappears.
6. If you inserted the SDLC link service, continue as follows:
 - If you need to insert another Interphase link service, on the Insert Link Service dialog box, select the service and click **Add**. Then complete setup steps for

that link service, as described in [Setting Up a Frame Relay Link Service on page 128](#) or [Setting Up an X.25 Link Service on page 136](#).

- If you have finished configuring Interphase link services, click **Finish** to return to the SNA Server Manager. Then skip to [Inserting a Connection on page 139](#).

Setting Up an X.25 Link Service

After you insert or select to edit an Interphase X.25 link service, the Interphase X.25 Link Service Properties Mode Settings dialog box appears.

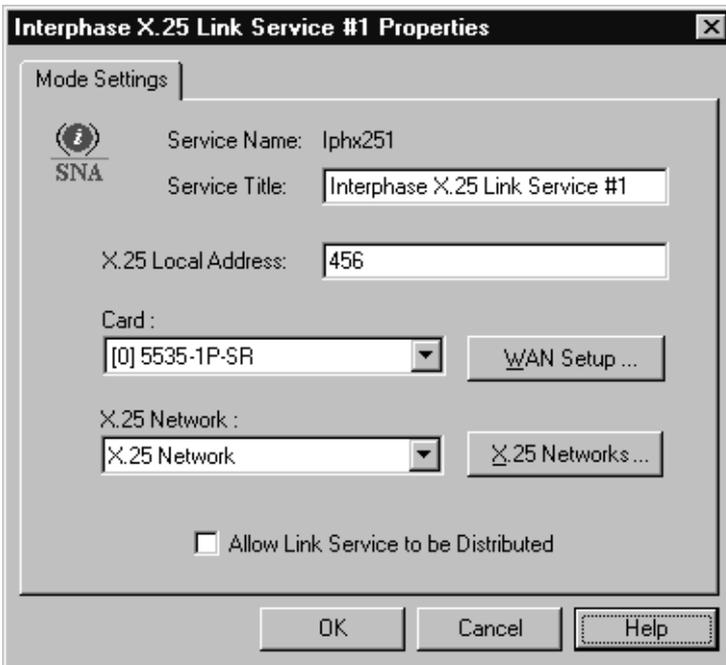


Figure 8-8. X.25 Link Service Properties Dialog Box

Use this dialog box to configure the inserted link service, as follows:

1. In the **Service Title** field, change the service title as needed. This is the title that appears in the title bar of the dialog box.
2. In the **X.25 Local Address** field, to configure the service for back-to-back use, enter the X.25 local address. The remote computer will use this as the remote X.25 address to establish the connection.
3. In the **Card** field, make sure the appropriate adapter is selected (*5535-IP-SR*).
4. If you want to change the default firmware or hardware properties of the adapter, click the **WAN Setup** button to start the WAN Adapters Setup utility. Then follow the instructions in *Setting up Firmware and Hardware on page 145*.
5. In the **X.25 Network** field, select the X.25 network configuration to be used with the service.
6. If you need to create, edit or remove a network configuration to be used with the service, do the following:
 - a. Click the **X.25 Networks** button.
 - b. On the X.25 protocol properties dialog box, configure the X.25 network to use with this service. For instructions, see *Setting Up X.25 Network Properties on page 150*.
All X.25 network configurations created in this dialog box are available for use by all of the adapter's SNA link services and NDIS channels.

- c. Click **OK** to save the Frame Relay protocol properties and return to the X.25 Link Service Mode Settings dialog box.
7. If you want to use this link service remotely from another SNA Server, select **Allow Link Service to be Distributed**.
8. Click **OK** to save the link service configuration.
 - If you edited the X.25 link service, the SNA Server Manager reappears.
 - If you inserted the X.25 link service, the Insert Link Service dialog box reappears.
9. If you inserted the X.25 link service, continue as follows:
 - If you need to insert another Interphase link service, on the Insert Link Service dialog box, select the service and click **Add**. Then complete setup steps for that link service, as described in [Setting Up a Frame Relay Link Service on page 128](#) or [Setting Up an SDLC Link Service on page 132](#).
 - If you have finished configuring Interphase link services, click **Finish** to return to the SNA Server Manager. Then continue to [Inserting a Connection on page 139](#).

Inserting a Connection

The Microsoft SNA Server Manager window displays a tree view of inserted Interphase link service(s), as shown in the following illustration.

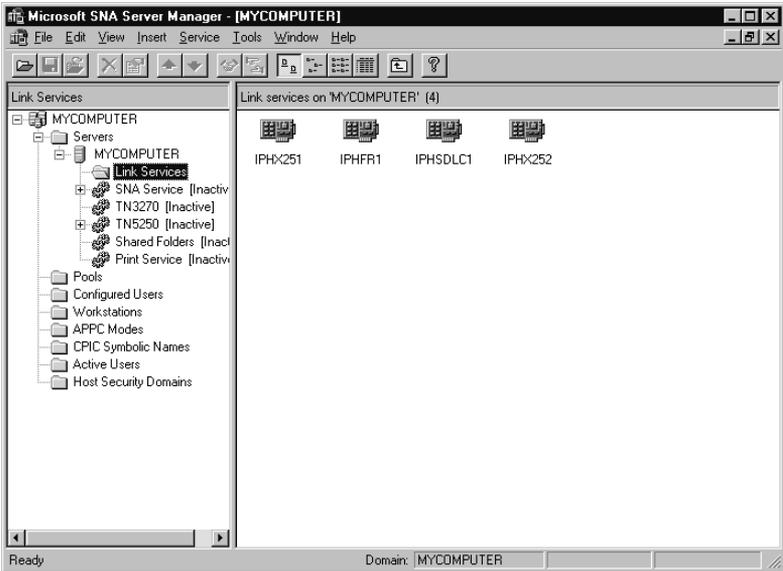


Figure 8-9. Displaying Interphase Link Services

To use an Interphase SNA link service, you must insert a connection. This connection is used to establish communications with another system. (See your SNA Server documentation for additional information.)

To insert connections, do the following:

1. If needed, open the Microsoft SNA Server Manager window as described in [Starting the SNA Server Manager on page 124](#).
2. Open the **Servers** directory, and select the server for which you are inserting the connection.

3. Select the **SNA Service** icon.
4. From the **Insert** menu, select **Connection**. Then select one of the following options, depending on the type of connection you need to insert:
 - To insert a Frame Relay connection, select **802.2**. (To exchange Frame Relay data properly, SNA Server requires the reliable transport guaranteed by the 802.2 protocol, which is provided by Interphase.)
 - To insert an SDLC connection, select **SDLC**.
 - To insert an X.25 connection, select **X.25**.

The Connection Properties General dialog box appears.

The screenshot shows the 'Connection Properties' dialog box with the 'General' tab selected. The dialog has four tabs: 'General', 'Address', 'System Identification', and '802.2 DLC'. The 'General' tab contains the following fields and options:

- Name:** An empty text input field.
- Link Service:** A dropdown menu showing 'PHFR1' and a 'Token Ring' label to its right.
- Comment:** An empty text input field.
- Remote End:** A group box containing four radio buttons: 'Host System' (selected), 'Peer System', 'Downstream', and 'PU Passthrough'.
- Allowed Directions:** A group box containing three radio buttons: 'Outgoing Calls' (selected), 'Incoming Calls', and 'Both Directions'.
- Activation:** A group box containing three radio buttons: 'On Server Startup' (selected), 'On Demand', and 'By Administrator'.
- Passthrough via Connection:** A dropdown menu showing '<None>'.
- Supports Dynamic Remote APPC LU Definition:** An unchecked checkbox.

At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help'.

Figure 8-10. Connection Properties



NOTE

Properties in the Connection Properties General dialog box apply to the selected Interphase connection.

Properties in the associated Address, System Identification, and the 802.2 DLC, SDLC, or X.25 dialog boxes are SNA Server properties. Verify default SNA values with your SNA Server administrator or SNA Server documentation. See your SNA Server documentation for information about the SNA properties.

5. In the **Name** field, enter the name of the connection to be created.
6. In the **Link Service** field, select the Interphase link service that will use the connection.
Multiple link services of the same type might be configured. The number at the end of the link service name indicates the service number.
 - Select the appropriate **IPHFR** option to insert the connection for an Interphase Frame Relay service.
 - Select the appropriate **IPHSDLC** option to insert the connection for an Interphase SDLC service.
 - Select the appropriate **IPHX25** option to insert the connection for an Interphase X.25 link service.
7. If you plan to use Permanent Virtual Circuit connections, make sure the **Allowed Directions** option is set to **Outgoing Calls**.
8. Click **OK** to complete the connection insertion.

9. If you need to insert another connection, repeat steps 4 through 8.

After you have inserted and set up connections for the Interphase SNA link services, the SNA Server link services setup for the adapter is complete.

Setting up Firmware and Hardware

9

Overview

The WAN Adapters Setup utility enables you to manage hardware and firmware for *iSPAN*-Serial WAN adapters, and make configuration changes after completing the software installation. Use this utility to add *iSPAN*-Serial WAN adapters and their firmware to the operating system. Also use this utility to remove *iSPAN*-Serial WAN adapters or to make other changes to adapter firmware and hardware properties.

The chapter explains how to do the following WAN Adapters Setup tasks:

- Access online help
- Start the utility
- Manage adapter firmware properties, including X.25 and Frame Relay network properties
- Manage adapter hardware properties, including card and port properties
- Save adapter firmware and hardware properties according to your needs



NOTE

If you change any firmware, card, port, or WAN Network properties, you must apply changes, reload the firmware, save properties, and restart the system, as described in [Saving WAN Adapters Setup Properties on page 163](#).

Accessing Online Help

For detailed information about the functions and dialog boxes described in this chapter, see the WAN Adapters Setup online help. You can access online help in the following ways:

- Press **F1** to display field-level contextual help in a pop-up window.
- Click **Help** to display the main online help.

Starting the WAN Adapters Setup Utility



NOTE

The *i*SPAN-Serial WAN adapter is listed as the **5535-1P-SR** in WAN Adapters Setup dialog boxes.

Start the WAN Adapters Setup utility in either of the following ways:

- From the **Start** menu, select **Settings**, and then **Control Panel**. Then double-click the **WAN Setup** icon.
- From the **Start** menu, select **Programs**, then **Interphase WAN Adapters**, and then **WAN Setup**.

When you start the utility, the WAN Adapters Setup dialog box appears.



Figure 9-1. WAN Adapters Setup Dialog Box

The WAN Adapters Setup dialog box contains two sections:

- The **Firmware** section is for firmware management.
- The **Cards** section is for hardware management. This section displays the Interphase WAN adapters you have installed and their communication ports.



NOTE

If the Cards list is empty, and the Add button is disabled, the adapter might not be properly installed. Click *OK*. Then see [Problems and Solutions on page 166](#) for information about correcting the problem.



NOTE

If you change any firmware, card, or port properties, you must apply changes, reload the firmware, save properties, and restart the system, as described in [Saving WAN Adapters Setup Properties on page 163](#).

Firmware Management

The Firmware section of the WAN Adapters Setup dialog box displays firmware information for the WAN adapter selected in the Cards section. It displays the protocols you can use with the adapter, and their status. You can view the firmware status, reload the firmware, or change the firmware. If the **Configure** icon  appears beside a protocol name, you can also configure firmware properties for the protocol.

The firmware status is represented by a general LED color for the firmware and individual LEDs for each protocol, as follows.

LED Color	General Firmware	Protocol LEDs
Red	No firmware file for the selected card is found on the hard disk. (The firmware list is empty.) This is typically the case for a newly added adapter before the WAN setup is applied (with the Apply button).	N/A
Gray	Firmware is found on the hard disk but is not loaded into the card. (The firmware list is empty.) Either no WAN adapter is installed, or the selected adapter is not running.	The protocol layer is inactive.
Yellow	Firmware is running on the card, but differs from the firmware on the hard disk for this card. The firmware on the disk has been updated but not loaded onto the adapter. Although the firmware list displays updated firmware, older firmware is running on the adapter.	Changes to the firmware layer have been applied, but have not been loaded and saved to the disk.
Green	The firmware is running.	The protocol layer is active.

Use the following buttons to set up firmware information.

Click...	To do this...
Load	Download the current firmware to the selected adapter. CAUTION: This option disconnects all connected channels and resets the SNA link services.

Click...	To do this...
New	Set alternate firmware as the current firmware. This option does not load the alternate firmware onto the card. (Use the Load button to load the alternate firmware.)
Properties	Display the properties of a selected firmware layer, and change firmware properties if needed. This option is available for X.25 and Frame Relay layers.

Setting Up X.25 Network Properties

To connect your adapter to an X.25 network, you must create one or more X.25 network configurations with properties that match the subscription properties of your X.25 provider. These network configurations are available for NDIS and/or SNA X.25 network connections.



NOTE

Before you configure your X.25 packet level, X.25 frame level and serial line properties, first obtain the X.25 parameters from your provider. For a detailed description of properties on each dialog box, see online Help.

To set up X.25 subscription network configurations, do the following:

1. Start the WAN Adapters Setup utility, if needed, as described in [Starting the WAN Adapters Setup Utility on page 146](#).
2. In the Firmware section of the WAN Adapters Setup dialog box, select **X.25 Layer**, and click the **Properties** button.

The X.25 Protocol Properties dialog box appears.

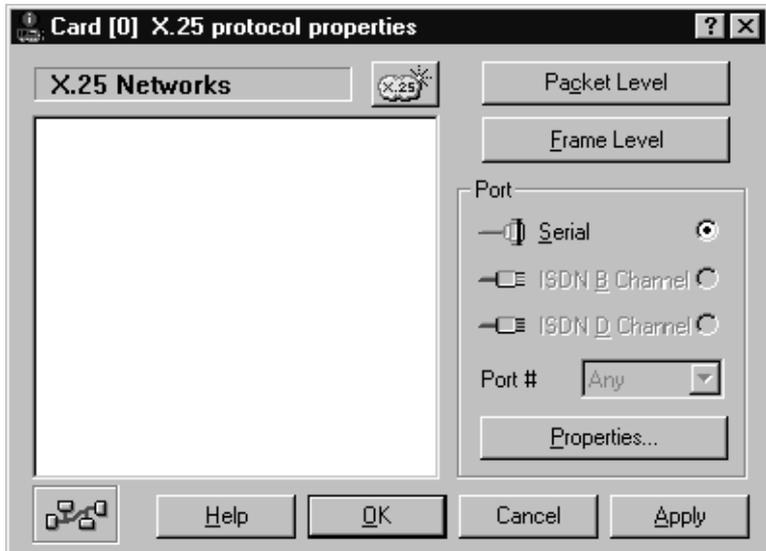


Figure 9-2. X.25 Protocol Properties Dialog Box

3. To create a new X.25 network configuration, click the **X.25** icon . Then in the **X.25 Networks** list, enter a name for the X.25 network configuration (for example, your provider company name).
4. To change default packet level properties for an X.25 network configuration, do the following:
 - a. Select the X.25 configuration and click the **Packet Level** button.

Setting Up Frame Relay Network Properties

To connect your adapter to a Frame Relay network, you must create one or more Frame Relay network configurations with properties that match the subscription properties of your Frame Relay provider. These network configurations are available for NDIS and/or SNA Frame Relay network connections.



NOTE

Before you configure your Frame Relay data link level and serial line properties, first obtain the Frame Relay parameters from your provider. For a detailed description of properties on each dialog box, see online Help.

To set up Frame Relay subscription network configurations, do the following:

1. Start the WAN Adapters Setup utility, if needed, as described in [Starting the WAN Adapters Setup Utility on page 146](#).
2. In the Firmware section of the WAN Adapters Setup dialog box, select **FR Layer**, and click the **Properties** button.

The Frame Relay protocol properties dialog box appears.

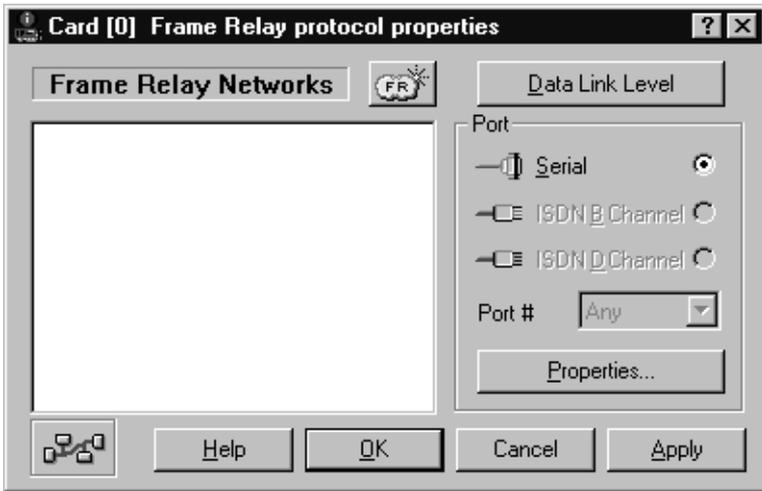


Figure 9-6. Frame Relay Protocol Properties Dialog Box

3. To create a new Frame Relay network configuration, click the **Frame Relay** icon  . Then in the **Frame Relay Networks** list, enter a name for the Frame Relay network configuration (for example, your provider company name).
4. To change default data link level properties for a Frame Relay network configuration, do the following:
 - a. Select the Frame Relay configuration and click the **Data Link Level** button.

The Frame Relay Data Link Properties dialog box appears.

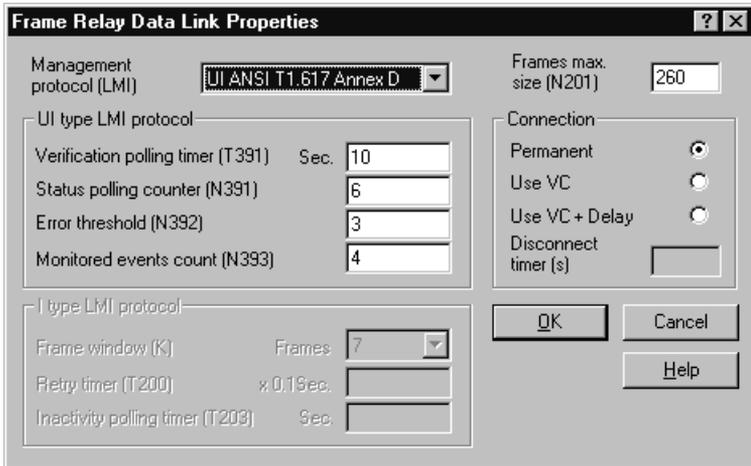


Figure 9-7. Frame Relay Data Link Properties

- b. Select the link management protocol, frame size, and connection values that match the parameters of your Frame Relay provider.
 - c. Click **OK** to save the data link properties and return to the Frame Relay Protocol Properties dialog box.
5. To change default serial line properties for a Frame Relay network configuration, do the following:
 - a. Select the Frame Relay configuration, and then click the **Properties** button in the Port section.

The Serial Line Properties dialog box appears.

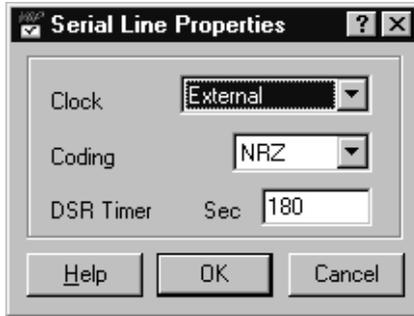


Figure 9-8. Serial Line Properties

- a. Select the serial line clock, coding, and DSR timer values that match the parameters of your Frame Relay provider.
 - b. Click **OK** to save the network properties and return to the Frame Relay Protocol Properties dialog box.
6. Click **OK** to save the Frame Relay Protocol Properties configuration and return to the WAN Adapters Setup dialog box.



NOTE

If you need to remove a Frame Relay network configuration, select the configuration in the Frame Relay Protocol Properties dialog box and press the Delete key.

7. Save the protocol changes on the adapter by reloading the firmware as described in [Saving WAN Adapters Setup Properties](#) on page 163.

Hardware Management

The Cards section of the WAN Adapters Setup dialog box displays all the *iSPAN* WAN adapters installed in the machine, their status, and their available communication ports. The Firmware section displays information about the adapter selected in the Cards section. You can use the buttons in the Cards section to add, remove, or configure WAN adapters.

The adapter status is represented by its icon color, as described in the following table.

Icon Color	Meaning
Gray	The adapter is detected but is not working.
Yellow	The hardware configuration has been changed but not applied.
Green	The adapter is running.

Use the following buttons to set up adapter hardware.

Click...	To do this...
Add	Add a new adapter to the operating system. This option is enabled if one or more Interphase adapters can be installed.
Remove	Remove an existing adapter. This option removes an adapter and its drivers from the operating system.
Properties	View an adapter's hardware properties or configure serial port properties.

Viewing Card Properties

To view the card's hardware properties, in the Cards section of the WAN Adapters Setup dialog box, select the *iSPAN*-Serial WAN card and click the **Properties** button.

The Card properties dialog box appears.

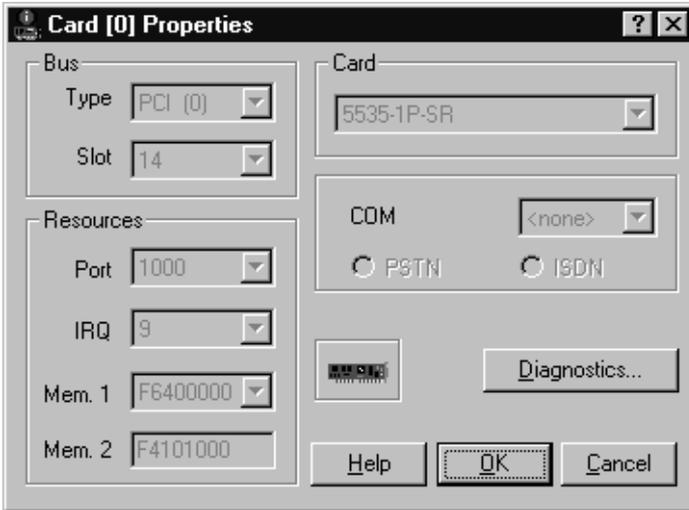


Figure 9-9. Card Properties Dialog Box

The fields in the Bus, Resources, and Card sections of the Card Properties dialog box provide general information about the adapter hardware. These properties are determined by hardware features and cannot be changed for this adapter.

The only available option is the **Diagnostics** button, which displays the Windows NT Diagnostics window.

The following table describes card properties.

Field or Option	Description
Bus: Type	Displays your adapter bus type.
Bus: Slot	Displays the number of the bus slot where the adapter is installed.
Card	Displays name and serial number of the adapter that has been installed and detected in your computer

Field or Option	Description
Resources: Port	Displays the first port address reserved by the Base driver for the selected adapter.
Resources: IRQ	Displays the IRQ (<i>Interrupt ReQuest</i>) number reserved by the Base driver for your selected adapter.
Resources: Mem 1	Displays the memory address reserved by the Base driver for the selected adapter's first memory window.
Resources: Mem 2	Displays the memory address reserved by the Base driver for the selected adapter's second memory window.
COM properties	Not applicable to the <i>iSPAN</i> -Serial WAN adapter. COM properties are displayed for WAN Adapters with a standard COM port system interface.
 (the only available option)	Click this button to display the Diagnostics window (which is also accessible by selecting Start/Programs/Administrative Tools (Common)/Windows NT Diagnostics). Use this window to resolve hardware conflicts.

Setting Up Serial Port Properties

Use the SR Port Properties dialog box to view and set up the adapter's serial port properties



NOTE

Before you configure your serial port, first obtain the WAN serial line port information from your provider.

To display the SR Port Properties dialog box:

1. Start the WAN Adapters Setup utility, if needed, as described in [Starting the WAN Adapters Setup Utility on page 146](#).
2. In the Cards section of the dialog box, select the adapter's serial port:

The SR Port Properties dialog box appears.

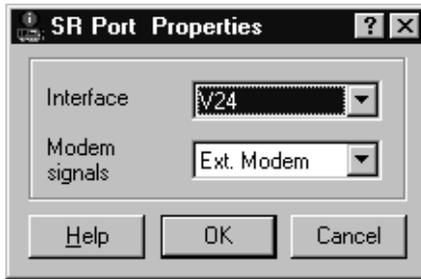


Figure 9-10. SR Port Properties Dialog Box

3. In the **Interface** field, select the serial line interface type that matches your provider's serial line interface.
4. In the **Modem signals** field, select how you want modem signals to be handled. (If you are unsure which option to select, use the default option, **External modem**.)
5. Click **OK** to save the serial port properties.

If you are installing the NDIS driver software, return to step 4 of [Setting Up WAN Properties](#) on page 43.

If you are installing SNA Server Link Services software, return to step 4 of [Setting Up WAN Properties](#) on page 112.

Saving WAN Adapters Setup Properties

Save any change to WAN adapter firmware, card, and port properties as follows:

1. Apply the changes by clicking the **Apply** button.
2. Reload the firmware on the card by clicking the **Load** button. Then follow the onscreen instructions.
3. After the properties have been loaded, click **OK** to save the reloaded configuration and close the WAN Adapters Setup dialog box.

The configuration software automatically finds the relevant firmware for the adapter. It updates the registry and dynamically updates the drivers.

4. If the Microsoft Windows NT Service Pack is installed, reinstall the Service Pack. (Service Pack 3 or higher is recommended.)
5. To activate new settings, restart your computer. (If you reinstalled the Service Pack, restart the system when prompted at the end of the Service Pack installation.)

After you have set up firmware and hardware properties, if have not completed the software installation procedure, return to the installation steps in the appropriate chapter:

Overview

This chapter provides possible solutions for common problems you might encounter while installing and operating your adapter. Before proceeding with troubleshooting, make sure you have carefully followed the steps for installing and setting up the hardware and the software, and have rebooted the system. Also, check the system log, using the Windows NT Event Viewer, to see what kind of errors, if any, are being recorded.

If the information in this appendix does not solve the problem, contact Interphase Technical Support at one of the locations listed in the *Assistance* section at the beginning of this *iSPAN-Serial WAN Adapter Users Guide*.

Problems and Solutions

Problem	Possible Solution(s)
Adapter is not detected during NDIS driver installation	<p>This problem occurs if the system does not detect the adapter after the setup program copies driver files to the installation directory. (The cards list is empty on the WAN Adapters Setup dialog box, as described in Setting Up WAN Properties on page 41.)</p> <p>When a message tells you to add a card, do the following:</p> <ol style="list-style-type: none">1. Click OK.2. Install (or reinstall) the adapter, as instructed in Installing the Hardware on page 11.3. If the WAN Adapters Setup utility still cannot detect the adapter, see Computer does not boot up or host adapter not found on page 168. <p>When the adapter is installed, continue as follows:</p> <ol style="list-style-type: none">1. From the Start menu, select Programs, then Interphase WAN Adapters, and then WAN Setup.2. Click Add on the WAN Adapters Setup dialog box to add the card to the system.3. Complete the software installation, as described in Setting Up WAN Properties on page 41.

Problem	Possible Solution(s)
<p>Undetected adapter during SNA Server Link Services software setup</p>	<p>This problem assumes you followed the installation steps in <i>Inserting an Interphase Link Service</i> on page 125 and message informed you: <i>The INTERPHASE WAN Adapters driver is not installed.... You must install this product before adding the link service. Please insert the INTERPHASE CD-ROM packaged with your WAN adapter, and install this driver.</i></p> <p>This warning message can have two causes:</p> <ul style="list-style-type: none"> • The Base driver is not installed. Click OK, then install the Base driver, as described for SNA link services in <i>Installing the Base Driver</i> on page 108. • The WAN Adapters Setup utility did not detect the adapter during the software installation (the Cards list is empty). Do the following: <ul style="list-style-type: none"> a. Install (or reinstall) the adapter, as instructed in <i>Installing the Hardware</i> on page 11. b. If the WAN Adapters Setup utility still cannot detect the adapter, see <i>Computer does not boot up or host adapter not found</i> on page 168. <p>When the adapter is installed, continue as follows:</p> <ul style="list-style-type: none"> a. From the Start menu, select Programs, then Interphase WAN Adapters, and then WAN Setup. b. Click Add on the WAN Adapters Setup dialog box to add the card to the system. c. Complete the software installation, as described in <i>Setting Up WAN Properties</i> on page 110.

Problem	Possible Solution(s)
<p>Computer does not boot up or host adapter not found</p>	<p>Your PCI bus automatically configures the hardware resources used by the adapter. Therefore, a resource conflict (address or IRQ) is probably not the problem.</p> <p>To solve the problem:</p> <ol style="list-style-type: none"> 1. Check to see whether the adapter is properly seated in the PCI slot. 2. Try a different PCI slot. 3. Contact Interphase Technical Service.
<p>No valid configuration message in SynWatch panel</p>	<ol style="list-style-type: none"> 1. Check whether the adapter and associated drivers are installed correctly. (See Quick Reference of Common Tasks on page 181.) 2. Start the WAN Adapters Setup utility, and check that the appropriate network layer is present in the adapter firmware. (From the Start menu, select Programs, then Interphase WAN Adapters, and then WAN Setup.)
<p>Problem occurring during data transfer</p>	<p>If a data transfer problem occurs while loading adapter firmware, open the Windows NT Event Viewer, and check for the following warning message:</p> <p><i>Warning: <sys>[WNTAdapterInit] Latency Timer lower than 0x40</i></p> <p>If the Event Viewer displays this message and if your computer stops responding while transferring data, contact Interphase Technical Service for assistance.</p>

Specifications

A

Adapter Specifications

Host Bus Interface	PCI Local Bus Revision 2.1
PCI Form Factor	Length: 174.6 mm/6.9 inches Width: 106.7 mm/4.2 inches Depth: 17.2 mm./0.9 inches
Host Data Transfer	32-bit master direct memory access (DMA) up to 132 MBps
Local Memory	4 MB dual port DRAM
Optional Functions	32-bit, 33-MHz local bus
Operating Power	1 A maximum @ 5.0 VDC

Operating Environment

Temperature	32–131° F / 0–55° C
Relative humidity	10–95% noncondensing
Altitude	0–15,000 feet / 5,000 meters

Storage Environment

This section assumes the adapter is stored in its original anti-static bag and box.

Temperature	-40–85° C / -42–185° F
Relative humidity	WAN adapters: 5–95% noncondensing
Altitude	0–50,000 feet / 16,500 meters

Overview

SynWatch is a protocol analyzer that enables you to watch frames exchanged between the *iSPAN*-Serial WAN adapter and the network. This powerful utility helps you track communication establishment and data traffic on the adapter's Serial port. SynWatch assists with detection of communication problems when using the NDIS driver or SNA Server Link Services. It provides diagnostics for network connection failures; it also provides troubleshooting tips when needed.

SynWatch interprets exchanged frames according to several protocols. It displays frames in the language used by the appropriate protocol.

This appendix explains how to do the following tasks:

- Access online help
- Start the utility
- Watch the Serial port
- Stop and freeze the display
- Change watch display settings
- Modify Event Buffer parameters
- Save and edit frames

Accessing Online Help

For detailed information about the functions and dialog boxes described in this appendix, see the SynWatch online help. You can access online help in the following ways:

- Use the **Help** menu to display the main online help.
- Press **F1** to display field-level contextual help.

Starting SynWatch



NOTE

The *iSPAN-Serial WAN adapter* is listed as the *5535-1P-SR adapter* in SynWatch dialog boxes.

To start SynWatch, from the **Start** menu, select **Programs**, then **Interphase WAN Adapters**, and then **SynWatch**. The main SynWatch dialog box appears.

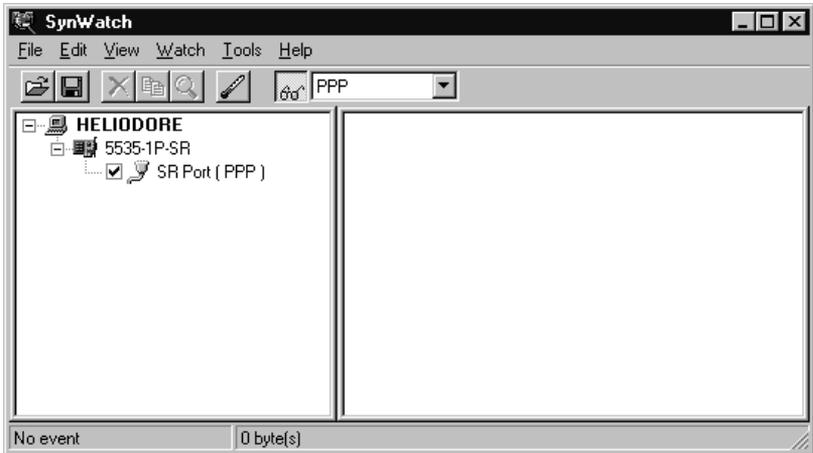


Figure B-1. Main SynWatch Dialog Box

The main SynWatch dialog box has two sections:

- The left side is the *configuration panel*. It displays the adapter description. The configuration panel is used to activate or deactivate frame watching.
- The right side is the *monitor panel*. It displays exchanged frames.

The configuration panel displays the adapter description in a tree view with the following levels:

- **First level:** Name of the computer
- **Second level:** Board system name
- **Third level:** Serial port on the board (SR port)

Watching the Serial Port

SynWatch provides several options for watching the serial port, which is used to transmit data frames.

To activate frame watching on the serial port, select the port in the configuration panel. Use the left or right mouse button as follows to start or change watch activity:

- To start watch activity on an *unwatched* port, left- or right-click the checkbox beside the port.
- To change the watch mode of a *watched* port without disrupting its watch state, right-click the checkbox beside the port.

When you select the port, a menu of watch modes appears. The modes available depend on the installed driver(s) and driver setup, as follows:

- For the NDIS driver, select **PPP Analysis, X.25 Analysis, or Frame Relay.**
- For SNA Server Link Services, select **SDLC Analysis, QLLC, or Frame Relay.**

For detailed information about each watch mode, see SynWatch online help.



NOTE

If the right mouse button on your mouse is not activated, use the Watch menu to change watch settings.

Stopping and Freezing the Display

To stop frame watching and discard all frame information for a watched port, left-click the checkbox beside the port.

To temporarily stop watch activity without discarding frame information, freeze the display. Freezing the display allows you to read information more easily in the monitor panel.

To freeze the display, from the **Watch** menu, select **Freeze**. To resume display at the point where it stopped, from the **Watch** menu, deselect **Freeze**.

Changing Watch Display Settings

The SynWatch window displays information about each exchanged frame in text lines in the monitor panel. You can change watch parameters, such as the size of a watched frame and the character set used to display raw data. You can also change the appearance of the text that describes the monitored events on the port.

Changing Watch Parameters

To change the port's watch parameters, do the following:

1. In the configuration panel, right-click the port, and select **Settings** from the pop-up menu. (Or left click the port and select **Settings** from the **Watch** menu.)

The Watch dialog box appears.

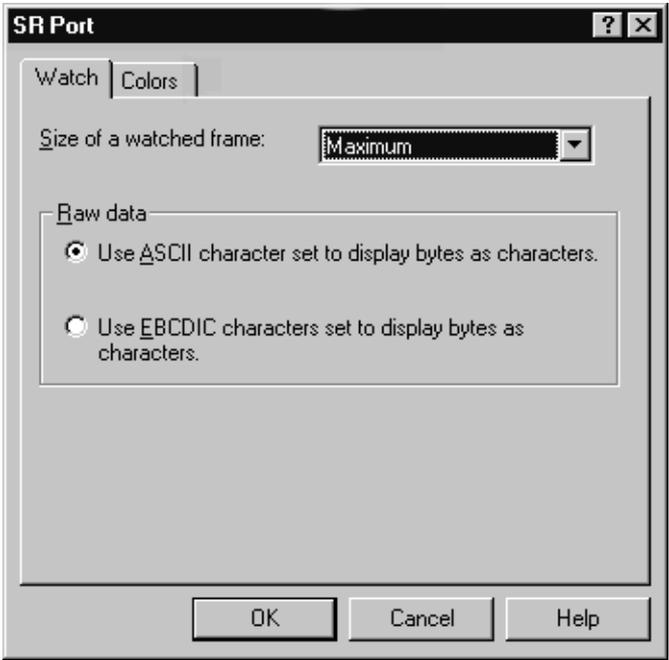


Figure B-2. Watch Settings

2. In the **Size of a watched frame** field, select the number of bytes to be interpreted in a frame.
3. In the Raw data section, select either the ASCII or EBCDIC option to display dumped events.

For detailed information about these options, see SynWatch online Help.

Changing Fonts Used for Display Text

To change the font color or style of the text associated with the port in the monitor panel:

1. In the configuration panel, right-click the port, and then select **Settings** from the pop-up menu. (Or left-click the port and select **Settings** from the **Watch** menu.)
2. When the SynWatch dialog box appears, select the **Colors** tab to display the Colors dialog box.



Figure B-3. Synwatch Colors In The Colors Dialog Box

3. Select the color(s) to use for the port.

4. To change the font for all display text, click the **Font** button. On the Font dialog box, select the font style to use and click **OK** to return to the Colors dialog box.
5. Click **OK** to save the display settings and return to the SynWatch window.

SynWatch immediately updates the monitor panel with the new settings.

Modifying Event Buffer Parameters

You can modify the number of low-level events you want SynWatch to keep in its buffer. In some cases, decreasing the SynWatch buffer size can help avoid system overload during data exchanges.

To modify the SynWatch buffer size, do the following:

1. From the **Tools** menu, select **Options**.

The Buffer dialog box appears:

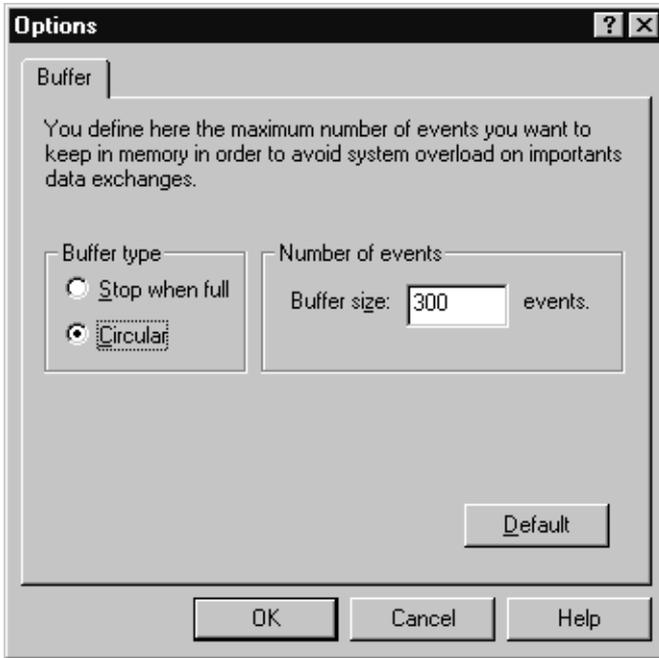


Figure B-4. SynWatch Buffer Settings

2. In the **Buffer Type** section, select one of the following options:
 - Select **Stop when full** to have SynWatch store only the first events up to the specified number in the Buffer Size field.
 - Select **Circular** to have SynWatch store new events after reaching the number specified in the Buffer Size field by deleting the older events to maintain the limit.
3. In the **Number of Events** section, enter the number of low-level events to be stored in the internal buffer.

Saving and Editing Frames

Use the SynWatch **Save** option to save all frame information recorded in the monitor panel as an ASCII (text) or binary file.

You can read a text file using any text editor, but SynWatch cannot read or reinterpret text file directly. On the other hand, SynWatch can read or edit a binary file.

Quick Reference of Common Tasks



Overview

This chapter explains how to complete common tasks associated with the *iSPAN*-Serial WAN adapter.

Index of Common Tasks

For information about how to...	See page...
Determine which version of Windows NT Service Pack is installed	182
Make sure that drivers are running	183
Enable IPX routing	184
Enable IP routing	184

Procedures



NOTE

The *iSPAN*-Serial WAN adapter is listed as the *5535-1P-SR* in software dialog boxes.

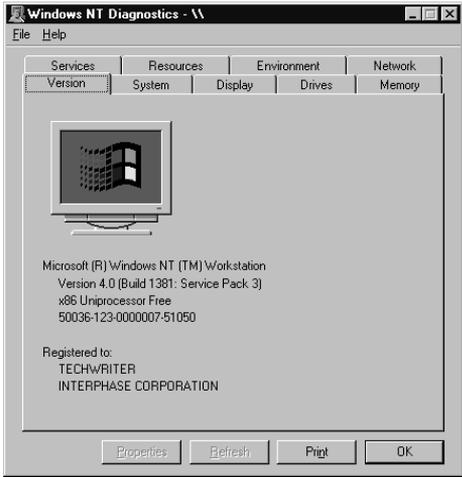
If you want to...	Do this...
<p>Determine which version of Windows NT Service Pack is installed</p>	<ol style="list-style-type: none">1. From the Start menu, select Programs, then Administrative Tools (Common), and then Windows NT Diagnostics.2. Select the Version tab. The Service Pack currently installed is displayed just after the Windows NT version.  <p>The screenshot shows the 'Windows NT Diagnostics' window with the 'Version' tab selected. The window title is 'Windows NT Diagnostics - \\'. The menu bar includes 'File' and 'Help'. Below the menu bar are tabs for 'Services', 'Resources', 'Environment', and 'Network'. Under 'Resources', there are sub-tabs for 'Version', 'System', 'Display', 'Drives', and 'Memory'. The main area displays the Windows logo and the following text: 'Microsoft (R) Windows NT (TM) Workstation', 'Version 4.0 (Build 1381: Service Pack 3)', 'x86 Uniprocessor Free', and '50036-123-0000007-51050'. Below this, it says 'Registered to: TECHWRITER INTERPHASE CORPORATION'. At the bottom are buttons for 'Properties', 'Refresh', 'Print', and 'OK'.</p>

Figure C-1. Windows NT Version

If you want to...	Do this...																		
<p>Make sure that drivers are running</p>	<ol style="list-style-type: none"> From the Start menu, select Programs, then Administrative Tools (Common), and then Event Viewer. The following messages must appear: <ul style="list-style-type: none"> <i>SynSV6 The Device \Device\SynSV6 has been successfully created. Its symbolic link name is \DosDevices\SynSV6.</i> <i>SynSYS adapter 0 opened.</i> <i>SynSYS SynSys Driver Loaded.</i> From the Start menu, select Settings, and Control Panel. Then double-click the Devices icon. The following devices must appear in the Devices list with a status of <i>Started</i>: <div data-bbox="385 727 951 1024" data-label="Image"> <table border="1"> <thead> <tr> <th>Device</th> <th>Status</th> <th>Startup</th> </tr> </thead> <tbody> <tr> <td>Other Devices ...</td> <td></td> <td></td> </tr> <tr> <td>Interphase 5535 NDIS Driver</td> <td>Started</td> <td>Automatic</td> </tr> <tr> <td>Interphase Base Driver</td> <td>Started</td> <td>Automatic</td> </tr> <tr> <td>Interphase Base Driver API</td> <td>Started</td> <td>Automatic</td> </tr> <tr> <td>Other Devices ...</td> <td></td> <td></td> </tr> </tbody> </table> </div> <p style="text-align: center;">Figure C-2. Devices List</p> <p>In addition, the software LEDs must be green in the WAN Adapters Setup dialog box and the NDIS Driver Setup dialog box.</p>	Device	Status	Startup	Other Devices ...			Interphase 5535 NDIS Driver	Started	Automatic	Interphase Base Driver	Started	Automatic	Interphase Base Driver API	Started	Automatic	Other Devices ...		
Device	Status	Startup																	
Other Devices ...																			
Interphase 5535 NDIS Driver	Started	Automatic																	
Interphase Base Driver	Started	Automatic																	
Interphase Base Driver API	Started	Automatic																	
Other Devices ...																			

If you want to...	Do this...
Enable IPX routing	<p>First, the RIP for NWLink IPX Service must be installed in the Windows NT Network Services list. To enable IPX routing:</p> <ol style="list-style-type: none"><li data-bbox="359 363 905 418">1. From the Start menu, select Settings, and then Control Panel.<li data-bbox="359 440 894 495">2. Double-click the Network icon, and select the Protocol tab.<li data-bbox="359 516 929 602">3. From the protocols list, select NWLink IPX/SPX Compatible Transport, and then click Properties.<li data-bbox="359 623 929 678">4. Select the Routing tab, and select the Enable RIP Routing option. <p>NOTE: IPX routing is activated only if different IPX internal network numbers are assigned between the two network adapters. For more detailed information, see the Microsoft networking online help.</p>
Enable IP routing	<ol style="list-style-type: none"><li data-bbox="359 867 905 922">1. From the Start menu, select Settings, and then Control Panel.<li data-bbox="359 943 894 998">2. Double-click the Network icon, and select the Protocol tab.<li data-bbox="359 1019 919 1075">3. From the protocols list, select TCP/IP Protocol, and then click Properties.<li data-bbox="359 1096 929 1151">4. Select the Routing tab, and enable the Enable IP Forwarding option.

This appendix provides a short overview of the following protocols used by the *iSPAN*-Serial WAN adapter:

- X.25
- Frame Relay
- Point-to-point

For detailed information, refer to relevant network protocol documentation.

X.25 Protocol

X.25 packet switched networks allow remote devices to communicate across high-speed digital links without the expense of individual leased lines. Packet switching is a technique whereby the network routes individual packets of HDLC data between different destinations based on addressing within each packet. The X.25 protocol encompasses the first three layers of the OSI 7-layered architecture defined by the International Standards Organization (ISO).

Layer 1: Physical Layer

The Physical Layer is concerned with electrical or signaling. It includes several standards such as V35, RS232, and X.21.

Layer 2: Frame Level Layer

The Frame Level layer is an implementation of the ISO HDLC standard called Link Access Procedure Balanced (LAPB).

This layer provides an error-free link between two connected devices.

Layer 3: Network Layer

The Network layer provides communication between devices that are connected to a common network. In the case of X.25, this layer is referred to as the X.25 packet.

Logical Channels

The user end of the network is known as Data Terminal Equipment (DTE) and the carrier's equipment is Data Circuit-terminating Equipment (DCE). The X.25 protocol layer permits a DTE user on an X.25 network to communicate with a number of remote DTEs simultaneously.

Connections occur on logical channels of two types:

- Switched virtual circuits (SVCs)
- Permanent virtual circuits (PVCs)

SVCs

SVCs are much like telephone calls; a connection is established, data is transferred, and then the connection is released. Each DTE on the network is given a unique DTE address, which can be used much like a telephone number.

PVCs

PVCs are similar to leased lines because the connection is always present. The logical connection is established permanently by the Packet Switched Network administration. Therefore, data may always be sent, without any call setup.

Frame Relay Protocol

Frame Relay is defined as a protocol-oriented packet-switched technology offered by telephone companies.

Frame Relay depends on the concepts of Permanent Virtual Circuits (PVCs) and Committed Information Rate (CIR).

A PVC is virtual because no wires or cables directly hook up the local and remote peers (for example, your branch library and the central library). The connection occurs in the *cloud* or switch at the telephone company. A PVC is permanent because as long as the computer at the telephone company is turned on, the circuit remains established.

The CIR is the contracted communication rate (bandwidth) you have negotiated with the telephone company, guaranteeing your ability to transmit at a specified minimum speed all the time. It is generally possible to transmit at much higher speeds, by virtue of the nature of frame relay, but you will always attain the CIR you negotiated.

PPP Protocol

The Point-to-Point Protocol (PPP) provides a standard method for transporting multi-protocol datagrams over point-to-point links.

PPP includes the following main components:

- Method for encapsulating multi-protocol datagrams
- Link Control Protocol (LCP) for establishing, configuring, and testing the data-link connection
- Family of Network Control Protocols (NCPs) for establishing and configuring different Network layer protocols

PCI/PMC Technology Overview



PCI/PMC Technology

Intel® Corporation's Architecture Lab, along with leading computer vendors (the PCI SIG), designed the Peripheral Component Interconnect (PCI) bus as the next generation I/O expansion bus. Its predecessors were the ISA, EISA, and MCA buses. The PCI bus is a high-performance bus found in systems ranging from low-end PCs to high-end servers.

PCI was developed to overcome the bottlenecks associated with traditional 16-bit expansion slots operating at 8 MHz, or, essentially, 5 megabytes per second. The result was a local bus system capable of transferring 32 bits of data at 33 MHz for a maximum data transfer rate of 132 MBps. The PCI Local Bus takes peripherals off the I/O bus and connects them together with the CPU and the memory subsystem. This provides a wider, faster pathway for data, which is especially important for servers, graphic-intensive software, high-speed networks, and other high-performance peripherals.

Features of the PCI Local Bus architecture include:

- Processor-independent bridge between the CPU and high-speed peripherals that serves as traffic controller between buses
- 32-bit memory addressing for CPU, Direct Memory Access (DMA) devices, and bus masters
- 32-bit data transfers at 33 MHz for CPU, DMA, and bus master devices
- 132 MBps maximum data transfer rate
- Data are written and read from peripherals in linear bursts at every clock cycle

- Buffers located between peripherals and the CPU that allow multiple, high-speed peripherals to be attached to the same PCI local bus
- Automatic configuration of system and expansion boards.

Three sizes of PCI add-in boards are defined: long, short, and variable short length. Systems are not required to support all board types. To accommodate 5V and 3.3V signalling environments and to facilitate a smooth migration path between the voltages, three add-in board electrical types are specified: a “5 volt” board which plugs into only 5V connectors, a “universal” board which plugs into both 5V and 3.3V connectors, and a “3.3 volt” board which plugs into 3.3V connectors only.

The PMC bus was designed for embedded environments. It implements PCI bus logic in a daughtercard (mezzanine) form factor.

CompactPCI is another PCI form factor which implements PCI bus logic in a Eurocard 3U or 6U format with a high-density connector. This form factor is used in environments similar to the more traditional VME bus. The PCI Industrial Computer Manufacturers Group (PICMG®) is currently developing the CompactPCI standard.

FCC

5535 SR Adapter

FCC Part 15 Regulatory Compliance

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

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This equipment may not cause harmful interference, and
- (2) This equipment must accept any interference received, including interference that may cause undesired operation.

Canadian

Tested to Comply with Canadian Standards

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

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

Europe

Regulatory Information for Europe

This equipment displays the CE 165 X mark to show that it has been tested and found to be in full compliance with the requirements of the Terminal Equipment, EMC and Low Voltage Directives (91/263/EEC, 89/336/EEC and 72/23/EEC, as amended by Directive 93/68/EEC).

EN60950–IEC950 Safety Standard

This equipment complies with the EN60950–IEC950 safety standard, with the following restrictions:

- The PVC card must be used only in a data terminal equipment (DTE)—for example, a computer—with a screw-down cover or lid. Because unsafe voltages (TNV) exist on the PVC card, disconnect the PVC card from the telephone line while the cover (lid) of the DTE (computer) is removed.
- The card must be installed in the DTE in a way that ensures at least 2 mm of air space between the PCB card and any other components in the DTE.
 - and any other components in the DTE.



These cards are for use only with UL Listed personal computers that have instructions detailing installation of accessories by the user.

Glossary

2B+D ♦ See *BRI (Basic Rate Interface)*.

23B+D ♦ See *PRI (Primary Rate Interface)*.

30B+D ♦ See *PRI (Primary Rate Interface)*.

802.2 IEEE ♦ Standards that govern the *LLC (Logical Link Control)* within the Data Link layer of the OSI model. LLC frames carry user information between the nodes on a network and define the transmission of a frame between two stations. These standards are common across the various lower level standards within the Data Link and the Physical layers.

802.3 IEEE ♦ Standards that govern the use of the CSMA/CD (Carrier Sense Multiple Access/Collision Detection) network access method used by Ethernet networks.

802.5 IEEE ♦ Standards that govern the use of the token ring indicator and frame priority.

Adapter ♦ A device, usually a user interface card, that physically connects an end station to the network medium (for example, twisted pair, coaxial, fiber).

Advanced Program-to-Program Communication ♦ See *APPC*.

AIS (Alarm Indication Signal) ♦ PRI alarm, also known as *Keep Alive* or *Blue* signal.

AMI (Alternate Mark Inversion) ♦ A method of digitally encoding data as electrical signals on a link.

ANSI (American National Standards Institute) ♦ An organization which coordinates, develops, and publishes standards used in the United States.

APPC ♦ Advanced Program-to-Program Communications. The general facility characterizing the LU 6.2 architecture and its various implementations in products. 2. Sometimes used to refer to the LU 6.2 architecture and its product implementations as a whole, or to an LU 6.2 product feature in particular, such as an APPC application programming interface.

Asynchronous Transmission ♦ Method of sending data in which the interval between characters may be of unequal length. The characters transmitted include a start bit and one or more stop bits, which define the beginning and ending of the character. No synchronizing or timing signals need to be sent. Contrast with *Synchronous Transmission*.

AT&T® 5ESS ♦ The name of a central office switch manufactured by AT&T. These switches use Custom (proprietary) or National ISDN-1 (NI-1) software. ESS stands for *Electronic Switching System*.

Attenuation ♦ Signal power lost in a transmission medium as the signal travels from sender to receiver.

B8ZS (Bipolar with 8 Zeros Substitution) ♦ A method of digitally encoding data on a link. A modified form of AMI used in USA.

Backward Explicit Congestion Notification (BECN) ♦ A bit set by a frame relay network to notify an interface device (DTE) that congestion avoidance procedures should be initiated by the sending device.

Bandwidth ♦ Capacity for transmitting data through a given circuit. Generally, the greater the bandwidth, the more information can be sent through a circuit during a given amount of time.

Basic Transmission Unit (BTU) ♦ In SNA, the unit of data and control information passed between control components. A BTU can consist of one or more patch information units (PIUs).

Bc (Committed Burst Size) ♦ For *Frame Relay*, the maximum amount of data in bits that a network agrees to transfer under normal conditions over a measurement interval (T). Data may or may not be contiguous. Bc is negotiated with the carrier provider.

B Channel ♦ A 56 Kbps or 64 Kbps bearer channel. Typically used for delivering data or voice over ISDN.

Be ♦ See *Excess Burst Size*.

BECN ♦ See *Backward Explicit Congestion Notification (BECN)*.

Bearer Service ♦ A type of telecommunications service that provides the capability to transmit a specific type of data such as voice or fax.

Bonding ♦ Bonding is the act of combining two 64Kbps B-channels to derive a 128 Kbps channel. This is done by establishing two B-channel circuit switched calls and combining them in the customer's equipment (using Multilink PPP or the bonding specification) or by associating multiple B-channels in the network (multirate services).

BRI (Basic Rate Interface) ♦ A defined ISDN interface that includes two B channels and one D channel. Also known as *2B+D*. B channels are used for voice and data while the D channel is generally used only for signalling within the telephone network.

Broadcast ♦ LAN transmission method used in bus topology networks that sends messages to all stations even though the messages are addressed to specific stations.

BTU ♦ See *Basic Transmission Unit (BTU)*.

CALC (Customer Access Line Charge) ♦ A Federal tariff charge, also referred to as an *End User Common Line Charge (EUCL)*, or *Subscriber Line Charge (SLC)*. Every ISDN line is charged one CALC or EUCL.

Call Bumping ♦ The ability to receive an incoming call during a bonded outbound call.

CCITT (International Telephone and Telegraph Consultative Committee) ♦ See *ITU (International Telecommunication Union)*.

CD (Carrier Detect) ♦ RS-232 (V.24) control signal (on pin 8) that indicates that the local data communications equipment is receiving a signal from the remote DCE. (See *RS-232*.) Also called *Received Line Signal Detector (RLSD)* and *Data Carrier Detect (DCD)*.

Centrex ♦ Local Public Exchange incorporating *PBX (Private Branch Exchange)* facilities.

Channel ♦ 1) A path along which signals can be sent, for example data channel, output channel. 2) In data communication, a means of one-way transmission. 3) A function unit, controlled by the processor, that handles the transfer of data between processor storage and local peripheral equipment.

Channel Aggregation ♦ Channel aggregation combines multiple physical channels into one logical channel of greater bandwidth. With BRI ISDN connections, channel aggregation would combine the two 64 Kbps B channels into a single, logical 128 Kbps channel.

Circuit Switching ♦ Technique in which physical circuits (as opposed to virtual circuits) are transferred to complete connections. Contrast with *packet-switched networks*.

Clock ♦ Timing signal used in synchronous transmission.

CO (Central Office) ♦ The site where the local Telco switches reside for the telephone system's call routing and all other functions. This is the Telco side of the local loop. If the distance between your location and the central office switch exceeds 18,000 feet and/or the signal loss exceeds 35.0 dB, a repeater must be installed to allow ISDN service.

Configuration Cycle ♦ A type of I/O cycle provided on the PCI bus to facilitate system configuration.

CPE (Customer-Premises Equipment) ♦ All equipment that resides past the telephone service demarcation point. In the U.S. this typically includes the NT1 and all ISDN devices. Customer equipment may also include inside wiring as well as telephone modems, and ISDN equipment.

CRC (Cyclic Redundancy Check) ♦ A bit errors detection technique that employs an algorithm to calculate a value for the information bits in a packet. The receiver, using the same algorithm, recalculates that value and compares it to the value received. If the two values do not agree, the transmitted packet is considered to be in error.

CSD (Circuit Switched Data) ♦ A dial-up data communications channel which, once established, looks like a transparent data pipe. Also, the type of ISDN service required to utilize this capability of an ISDN circuit. Contrast with *CSV*.

CSU/DSU (Channel Service Unit/ Data Service Unit) ♦ A device that incorporates the functions of a CSU and a DSU, and interfaces between a switched-56 (or Dedicated Digital Service) line and a user's data equipment.

CSV (Circuit Switched Voice) ♦ A dial-up communications circuit for voice grade communication. Also, the type of ISDN service required to use this capability of an ISDN circuit. Contrast with *CSD*.

CTS (Clear To Send) ♦ RS-232 (V.24) interface control signal (sent from the data communications equipment to the data terminal equipment on pin 5) indicating that the attached DTE may begin transmitting. Issued in response to the DTE's request-to-send. (See *RS-232*.)

Data Link Control (DLC) ♦ A set of rules used by nodes on a data link (such as an SDLC link or a token ring) to accomplish an orderly exchange of information.

Data Link Control Identifier (DLCI) ♦ The numeric identifier of a frame-relay subport or PVC segment in a frame-relay network. Each subport in a single frame-relay port has a unique DLCI. The following table, excerpted from the American National Standards Institute

(ANSI) Standard T1.618 and the International Telegraph and Telephone Consultative Committee (CCITT) Standard Q.922, indicates the functions associated with certain DLCI values:

DLCI Values	Function
0	In-channel signalling
1-15	Reserved
16-991	Assigned using frame-relay connection procedures
992-1007	Layer 2 management of frame-relay bearer service
1008-1022	Reserved
1023	In-channel layer management

DCD (Data Carrier Detect) ♦ See *CD (Carrier Detect)*.

DCE (Data Communications Equipment, Data Circuit-Terminating Equipment) ♦ Equipment that provides the functions required to establish, maintain, and terminate a connection (including signal conversion) for communications between the data terminal equipment and the telephone line or data circuit. Also, interface signals typically presented by this equipment.

D Channel ♦ Standard channel on an ISDN PRI or BRI line. At 16 Kbps, a D channel carries all signalling information and can carry low-speed packet data such as X.25 packet switching.

DE ♦ See *Discard Eligibility (DE)*.

Demarc (Demarcation Point) ♦ The point on a customer's premises where the line from the telephone company meets the customer's wiring at the customer's premises.

DFT ♦ See *Distributed Function Terminal (DFT)*.

Directory Number ♦ Your seven-digit telephone number (without the area code), as found in the telephone directory. Each BRI connection can have up to two Directory Numbers, one for each B channel.

Discard Eligibility (DE) ♦ A bit indicating that a frame may be discarded in preference to other frames if congestion occurs to maintain the committed information rate. See also *Excess Burst Size* and *CIR*.

Distributed Function Terminal (DFT) ♦ 1) A protocol used for communication between a terminal and an IBM 3270 or IBM 3174 control unit that allows multiple concurrent logical terminal sessions. 2) A mode of operation that uses this protocol.

DLC ♦ See *Data Link Control (DLC)*.

DLCI ♦ See *Data Link Control Identifier (DLCI)*.

DMA (Direct Memory Access) ♦ A fast method of moving data between two subsystems without processor intervention.

DMS/DMS100 ♦ The name of a central office switch manufactured by Northern Telecom. These switches use custom (proprietary) or National ISDN-1 (NI-1) software.

DSR, Data Set Ready ♦ RS-232 (V.24) interface control signal, sent from the data communications equipment to the data terminal equipment on pin 6. Indicates that the DCE is connected to the telephone circuit. Usually a prerequisite to the DTE issuing request-to-send. (See *RS-232*.)

DSU ♦ See *CSU/DSU (Channel Service Unit/ Data Service Unit)*.

DTE (Data Terminal Equipment) ♦ Equipment serving as the data source, the data sink, or both. Refers to terminals, computer ports, and printers. Also interface signals typically presented by this equipment.

DTR (Data Terminal Ready) ♦ RS-232(V.24) interface control signal, sent from the data terminal equipment to the data communications equipment on pin 20. Indicates the DTE is ready for data transmission and requesting connection of the DCE to the telephone circuit. (See *RS-232*.)

EIR ♦ Excess Information Rate

EIS ♦ The SNA Server Emulator Interface Specification.

Encapsulation ♦ Process by which an interface device places an end device's protocol-specific frames inside a Frame Relay, X.25, or PPP frame to a frame relay network must perform encapsulation.

ETS ♦ European Telecommunications Standard from ETSI

ETSI ♦ The European Telecommunications Standards Institute

EuroISDN ♦ The European implementation of Q.931, providing a common standard for ISDN signalling within Europe. Issued by ETSI under the ETS 300 series standards. Net3(BRI) and Net5(PRI). See *NET (Normes Europeennes de Telecommunication)*.

Excess Burst Size ♦ (Be) The maximum amount of uncommitted data (in bits) in excess of Bc that a frame relay network can attempt to deliver during a time interval Tc. This data (Be) generally is delivered with a lower probability than Bc. The network treats Be data as discard eligible. See also *committed burst size* (Bc).

Exchange Identification (XID) ♦ A specific type of basic link unit that is used to convey node and link characteristics between adjacent nodes. XIDs are exchanged between link stations before and during link activation to establish and negotiate link and node characteristics. They are exchanged after link activation to communicate changes in these characteristics.

FCC (Federal Communication Commission) ♦ The U.S. government agency that regulates the telephone industry.

FECN ♦ See *Forward Explicit Congestion Notification (FECN)*.

Firmware ♦ A computer program or software stored permanently in flash memory, Read-Only Memory (ROM), Programmable Read-Only Memory (PROM), or stored semi-permanently in Erasable Programmable Read-Only Memory (EPROM).

Forward Explicit Congestion Notification (FECN) ♦ A bit set by a frame relay network to notify an interface device (DTE) that congestion avoidance procedures should be initiated by the receiving device. See also *BECN*.

Frame Relay ♦ A wide area networking connection to leased lines, providing multiple permanent virtual circuits or data link connections within the same physical access line.

Gateway ♦ Equipment that provides interconnection between two networks with different communications protocols. Two examples are packet assembler/disassemblers and protocol converters. Gateways operate at the 4th through 7th layers of the Open Systems Interconnection model. Contrast with *bridge, router, repeater*.

HDB3 (High Density Bipolar 3) ♦ A method of digitally encoding data on a link. A modified form of AMI used in Europe.

HDLC (High-level Data Link Control) ♦ An International standard communications bit oriented protocol developed by the International Standards Organization. HDLC manages synchronous, code transparent, serial information transfer over a link connection.

Host Name ♦ A unique name that identifies each host machine on a network.

IEC ♦ International Electrotechnical Commission.

IEEE (Institute of Electrical and Electronic Engineers) ♦ An information exchange organization. Among other functions, it coordinates, develops, and publishes network standards for use in the United States, following ANSI rules.

IETF (Internet Engineering Task Force) ♦ Organization responsible for all Internet protocols (for example, IP, TCP, FTP).

IP (Internet Protocol) ♦ A networking protocol for providing a connectionless (datagram) service to the higher transport protocol. It is responsible for discovering and maintaining topology information and for routing packets across homogeneous or heterogeneous networks. Combined with TCP, it is commonly known as the *TCP/IP* platform.

IPX (Internetwork Packet eXchange Protocol) ♦ A connectionless Network layer protocol similar to IP.

IPX/SPX ♦ Novell's proprietary LAN protocol.

ISDN (Integrated Services Digital Network) ♦ An early, CCITT-adopted protocol reference model intended to provide a ubiquitous, end-to-end, interactive digital service for data, audio, and video. Synonym: *narrowband ISDN*.

ISO (International Standards Organization) ♦ An international body that creates networking standards, including the OSI model.

ITC (Independent Telephone Company) ♦ Any telephone company that was not originally part of AT&T.

ITU (International Telecommunication Union) ♦ The international standards organization for telecommunications, previously known as the *CCITT (International Telephone and Telegraph Consultative Committee)*. For more information, see <http://www.itu.ch>

KB (Kilobytes) ♦ One kilobyte is equivalent to 1024 bytes when referring to memory size, and 1000 bytes when referring to speed.

Kbps ♦ (Kilobits per second)

KBps ♦ (Kilobytes per second)

LAN (Local Area Network) ♦ A data communications system designed to operate over a limited geographic distance, such as a single building.

LAP-B (Link Access Procedure Balanced) ♦ For Frame Relay, the balanced-mode, enhanced version of HDLC. Used in X.25 packet-switching networks. Contrast with *LAP-D*.

LAP-D (Link Access Procedure-D) ♦ For ISDN, Data Link layer procedure using D channel communications. For Frame Relay, a protocol that operates at the data link layer (layer 2) of the OSI architecture. LAPD is used to convey information between layer 3 entities across the frame relay network.

LATA (Local Area Transport Area) ♦ The territory covered by an individual local telephone operating company.

LEC (Local Exchange Carrier) ♦ The local phone companies—either a Regional Bell Operating Company (RBOC) or an independent phone company—that provide local transmission services.

LED (Light Emitting Diode) ♦ Semiconductor device used for display purposes in electronic equipment.

LLC (Logical Link Control) ♦ The upper half of the Data Link layer in LANs. Performs error control, broadcasting, multiplexing, and flow control functions. See *MAC (Medium Access Control)*.

Leased Line ♦ Telephone line reserved for the exclusive use of a leasing customer without interexchange switching arrangements. A leased line may be point-to-point or multipoint. Also called *dedicated* or *private* line.

LLC/SNAP ♦ Logical Link Control/SubNetwork Attachment Point

Local ♦ Describes files and devices, such as disk drives, that are attached to your machine.

Logical Unit (LU) ♦ A type of network accessible unit that enables users to gain access to network resources and communicate with each other.

Loop Qualification ♦ This is a test done by the phone company to make sure the customer is within the maximum distance of 18,000 feet from the central office that services that customer. Note, however, that ISDN service could be available at a longer distance than that with a repeater.

LOS (Lost Of Signal) ♦ PRI alarm.

LT (Line Termination) ♦ The equivalent of the NT1 function at the CO.

LU ♦ See *Logical Unit (LU)*.

MAC (Medium Access Control) ♦ A set of protocols that are the lower part of the Data Link layer and comprise the basis of the IEEE LAN specifications. In general, MAC determines the way devices can transmit in a broadcast network. See *LLC (Logical Link Control)*.

Mbps (Megabits per second) ♦ Transmission speed or rate of one million bits per second.

MBps (Megabytes per second) ♦ Transmission speed or rate of one million bytes per second or 8 Mbps.

Medium ♦ Physical means used to carry transmissions. Examples include coaxial cable, fiber optics, microwave, satellite, or twisted pair.

MIB (Management Information Base) ♦ The specification that defines objects for referencing variables such as integers and strings. In general, it contains information about the network's management and performance (for example, traffic parameters). See *IP (Internet Protocol)*.

Modem (MODulator-DEModulator) ♦ Device that converts serial digital data from a transmitting terminal to a signal suitable for transmission over a telephone channel (analog), and then reconverts the signal to serial digital data for the receiving terminal.

MTU (Maximum Transmission Unit) ♦ The largest packet that can be sent over a given medium.

Multicast ♦ A technique that allows copies of a single packet or cell to be passed to a set of destinations.

Multi-link PPP ♦ Allows you to combine two or more B-channels into a single, faster PPP connection. With Multi-link PPP, you can have a 128 Kbps PPP connection over a Basic Rate ISDN line.

NDIS ♦ See *Network Driver Interface Specification (NDIS)*.

NET (Normes Europeennes de Telecommunication) ♦ European standards for approving and testing equipment.

Network ♦ An interconnection of multiple stations or systems that are able to send messages to and receive messages from one another.

Network Driver Interface Specification (NDIS) ♦ An Application Programming Interface (API) definition that allows DOS, OS/2, or Windows systems to support one or more network adapters and protocol stacks.

NDIS defines a specific way for writing drivers for layers 1 and 2 of the OSI model. NDIS also handles the configuration and binding of these network drivers to multiple protocol stacks.

NI-1 (National ISDN1) ♦ A specification for a standard ISDN phone line. National ISDN 1 is intended to be a set of standards to which every manufacturer's equipment should conform for maximum interoperability. NI-2 and NI-3 are future standards currently under development.

NRZI (Non Return to Zero Inverted) ♦ Encoding technique in which a change in state represents 0. Also known as *invert-on-zero* coding.

NSAP (Network Services Access Point) ♦ In the OSI environment, it is the *SAP* between the network and the transport layers. It identifies a Data Terminal Equipment by a unique address.

NT1 (Network Termination 1) ♦ The device that connects to your ISDN hardware and also works as a converter between an ISDN U-interface and an ISDN S/T-Interface. An NT1 converts a line from a 2-wire to a 4-wire connection. Some ISDN adapters have a NT1 already built into them.

NT2 (Network Termination 2) ♦ An NT2 handles termination for multiple B channels on a PRI line. NT2s are typically found embedded into PBXs or switches on network servers which support Primary Rate Interface (PRI).

OSI (Open Systems Interconnection) Model ♦ The 7-layer protocol model defined by the ISO for data communications.

PABX ♦ Private Automatic Branch Exchange.

PBX (Private Branch Exchange) ♦ PBX is a private telephone switch. It is connected to groups of lines from one or more central offices and to all of the telephones at the location served by the PBX.

PCI (Peripheral Component Interconnect) (bus) ♦ A high-performance multiplexed address and data bus. Supporting 32-bit with optional 64-bit data transfers, the PCI bus is intended to be an interconnect between peripheral controllers, peripheral add-in boards, and processor/memory systems. The PCI bus operates at up to 66 MHz, providing burst transfer rates up to 264 MBps 32 bits wide, or up to 528 MBps 64 bits wide.

PDU (Protocol Data Unit) ♦ Data in a highly-structured format for the purpose of transmission. *Frame*, *packet*, and *PDU* are equivalent in most contexts.

PHY (Physical Layer) ♦ Layer 1 of the OSI model. Defines and handles the electrical and physical connections between systems. The Physical layer can also encode data in a form that is compatible with the medium (coaxial, twisted pair, fiber, and so on).

PMC (PCI Mezzanine Card) ♦ A daughter-card form factor implementation of the PCI bus specification.

POTS (Plain Old Telephone Service) ♦ Conventional voice grade service and cabling infrastructure.

PPP (Point-to-Point Protocol) ♦ A dial-up protocol that allows a computer to use TCP/IP networking to connect remote access devices, such as modems, to the Internet or other TCP/IP based networks.

PPP/MP (Point-to-Point Protocol/Multilink Protocol) ♦ See *Multi-link PPP*.

PRI (Primary Rate Interface) ♦ A type of ISDN service that offers 23 B-channels at 64 Kbps and one D-channel at 64 Kbps (23B+D). In Europe, PRI provides for 30 B-channels and two D-channels (30B+1D).

Private Line ♦ Synonym for a leased line. Dial voice line that does not terminate at the voice private automatic branch exchange or that does not appear on other sets in a key system.

Protocols ♦ A set of rules that define how different computer systems and other devices interoperate with each other.

PSTN ♦ Public Switched Telephone Network.

PVC (Permanent Virtual Circuit) ♦ A logical link whose endpoints and class of service are defined by network management.

For Frame Relay, analogous to an X.25 permanent virtual circuit, a PVC consists of the originating frame relay network element address, originating data link control identifier, terminating frame relay network element address, and termination data link control identifier. Originating refers to the access interface from which the PVC is initiated. Terminating refers to the access interface at which the PVC stops. Many data network customers require a PVC between two points.

QLLC (Qualified Logical Link Control) ♦ An X.25 protocol that allows the transfer of data link control information between two adjoining SNA nodes that are connected through an X.25 packet-switching data network. The QLLC provides the qualifier *Q* bit in X.25 data packets to identify packets that carry logical link protocol information.

Q.921 ♦ This is the link layer protocol for ISDN.

Q.931 ♦ This is the network layer protocol for ISDN. Q.931 was developed for out-of-band call control.

RAI (Remote Alarm Indication) ♦ PRI alarm, also known as *Yellow* signal. This alarm indicates a carrier failure.

RBOC (Regional Bell Operating Company) ♦ This refers to the original seven regional telephone companies created by the AT&T divestiture: Nynex, Bell Atlantic, Bell South, Southwestern Bell, US West, Pacific Telesis and Ameritech.

RD (Received Data) ♦ RS-232 (V.24) data signal, sent from the data communications equipment to the data terminal equipment on pin 3. (See [RS-232](#).)

REN (Ringer Equivalence Number) ♦ A standard requirement of the FCC. For devices such as a telephone or answering machine. The REN requirement can be found on a label on the bottom of the analog device.

Repeater ♦ Device that acts as an amplifier. Also known as a *Line Extender*. This device is needed when the distance between the phone company's Central Office and your premises exceeds distance or dB loss limits.

RFC (Request for Comment) ♦ *IETF (Internet Engineering Task Force)* documents that contain proposed standards and specifications. RFCs can be either approved, or simply archived as historical recommendations.

RI (Ring Indicator) ♦ RS-232 (V.24) control signal, sent from the data communications equipment to the data terminal equipment on pin 22. Indicates an incoming call is present. (See [RS-232](#).)

RIP (Routing Information Protocol) ♦ Within IP networks, RIP is an interior gateway protocol used by routers and host systems to exchange information about reachable networks. RIP uses a distance-vectoring algorithm to establish and maintain network routes.

RJ-45 ♦ Standard 8-wire connector for IEEE 802.3 networks and some telephone applications.

Router ♦ Hardware device that connects two or more networks. A router determines where the destination computer is located, and then finds the best way to get there.

Routing ♦ Selecting the path to be taken by packets as they traverse the network.

Routing tables ♦ Stored in voice/data switches or routers to determine which of several possible paths will be taken through the network.

RS-232 ♦ Universally accepted Electronics Industries Association standard that defines the signals between data terminal equipment and data communications equipment. Uses a 25-pin connector; theoretically limited to distances of 50 feet; functionally identical to standards V.24/V.28.

RS-422 ♦ Electronics Industries Association standard for balanced transmission at distances greater than 50 feet. Compatible with V.11.

RTS (Request To Send) ♦ RS-232 (V.24) control signal, sent from the data terminal equipment to the data communications equipment on pin 4. Indicates that the DTE has data to transmit. (See [RS-232](#).)

Rx ♦ Abbreviation meaning *receive, receiver, or reception*.

SAP ♦ Service Access Point

SAPI (Service Access Point Identifier) ♦ Part of the address in an ISDN signalling frame. Identifies the service that the signalling frame is intended for.

SDLC ♦ See [Synchronous Data Link Control \(SDLC\)](#).

Serial Transmission ♦ Technique in which each bit of information is sent sequentially on a single channel. Serial transmission is the normal mode for data communications. Contrast with *parallel transmission*.

SDU (Service Data Unit) ♦ User data passed through a SAP between the layers of the OSI or a similar model.

Signalling ♦ An ATM connection procedure that dynamically implements explicit routes through switches to establish a communication link with another station on the network.

S Interface ♦ The interface point between an ISDN device and the user premises network termination.

SDLC ♦ See [Synchronous Data Link Control](#).

SNA ♦ IBM's Systems Network Architecture. The part of a user-application network that conforms to the formats and protocols of Systems Network Architecture. It enables reliable transfer of data among users and provides protocols for controlling the resources of various network configurations. The SNA network consists of Network Accessible Units (NAUs), boundary function, gateway function, and intermediate session routing function components, and the transport network.

SNMP (Simple Network Management Protocol) ♦ A high-level, standards-based protocol for network management, usually used in TCP/IP networks. An SNMP manager controls and measures the activities

of SNMP agents that are embedded in nodes and network devices on the network. SNMP relies on MIBs embedded in the network resources to monitor and control the network.

SPID (Service Profile Identifier) ♦ An alphanumeric string that uniquely identifies the service capabilities of an ISDN terminal. This is an identifier that points to a particular location in the Telco's central office switch memory where relevant details about the device are stored. Each BRI connection can have up to two SPIDs, one for each B channel.

SS7 (Signalling System 7) ♦ This is a common channel signalling system used to establish ISDN call functions.

SVC (Switched Virtual Circuit) ♦ Used in packet data networking technology. Temporary virtual circuit between two users.

Switch Type ♦ The type of equipment that the telephone company uses to provide you with ISDN service.

Synchronous Data Link Control (SDLC) ♦ A discipline conforming to subsets of the Advanced Data Communications Control Procedures (ADCCP) of the American National Standards Institute (ANSI) and High-level Data Link Control (HDLC) of the International Standards Organization (ISO).

Used for managing synchronous code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multi-point, or loop.

Contrast with *binary synchronous communication*.

Synchronous Transmission ♦ A data transmission scheme where the interval between transmitted characters is fixed so that start and stop bits are not required. In contrast with asynchronous transmissions, synchronous transmissions are guaranteed a specific percentage of bandwidth on the network medium.

TCP/IP (Transmission Control Protocol/Internet Protocol) ♦ Protocol for internetwork routing and reliable message delivery. TCP/IP functions at the 3rd and 4th layers of the Open Systems Interconnection model.

IP is the low level protocol for the TCP/IP protocol set. IP provides packet delivery services between nodes. On the same level as IP are ARP and RARP.

TCP is a reliable stream-delivery, virtual circuit connection-oriented protocol that runs on top of IP. Telnet, FTP, and login use TCP connections.

TEI (Terminal Endpoint Identifier) ♦ The Terminal Endpoint Identifier is used to identify a specific piece of equipment on an ISDN connection.

Telco ♦ Telco is a popular abbreviation for telephone company. The RBOCs are a subset of all telcos.

T Interface ♦ The interface point between the user premises network termination (NT1) and a switching or concentration point (NT2) such as PBX.

Tx ♦ Abbreviation meaning *transmit*, *transmitter*, or *transmission*.

U Interface ♦ The interface point between the user premises network termination (NT1) and the local digital exchange.

UNI ♦ See *User to Network Interface*.

User to Network Interface (UNI) ♦ The interface between the ATM end system (user) and the ATM network.

V.11 ♦ International interface recommendation electrically similar to RS-422.

V.24 ♦ International interface recommendation that defines interchange circuits. Similar to and operationally compatible with RS-232. (See [RS-232](#).)

V.25 ♦ International interface recommendation for dial lines.

V.25 bis ♦ International interface recommendation for dial lines that includes an auto-dial command and response language.

V.28 ♦ International interface recommendation that defines electrical characteristics for the interchange circuits defined by V.24. Similar to and operationally compatible with RS-232. (See [RS-232](#).)

V.35 ♦ International recommendation for a wide-band interface modem.

VN3/VN4 ♦ VN3 and VN4 are the French ISDN standards.

WAN (Wide Area Network) ♦ A network spanning a large geographical area that provides communications among devices on a regional, national, or international basis.

Workstation ♦ Networked computer typically reserved for end-user applications.

X.21 ♦ (Packet-switched networks) International recommendation that defines a physical interface for X.25, using a 15-pin connector equivalent to V.11.

X.21 bis ♦ (Packet data networking) International recommendation that defines the most popular physical interface for X.25. Equivalent to RS-232 and V.24.

X.21 (bis) link ♦ Commonly used in European countries, this is a *pay as you go* link. When a signal is raised, the network automatically establishes a link to the remote unit.

X.25 ♦ Packet switching protocol that lets computers communicate via wide area packet switched data networks

XID ♦ See *Exchange Identification (XID)*.

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