Pipeline 15 User's Guide

Ascend Communications, Inc.
Part Number: 7820-0504-001
For software version 5.1A
October 3, 1997

Contacting Ascend Customer Service

You can request assistance or additional information by telephone, email, fax, or modem, or over the Internet.

Obtaining Technical Assistance

If you need technical assistance, first gather the information that Ascend Customer Service will need for diagnosing your problem. Then select the most convenient method of contacting Ascend Customer Service.

Information you will need

Before contacting Ascend Customer Service, gather the following information:

- Product name and model
- Software and hardware options
- Software version
- Service Profile Identifiers (SPIDs) associated with your product
- Your local telephone company's switch type and operating mode, such as AT&T 5ESS Custom or Northern Telecom National ISDN-1
- Whether you are routing or bridging with your Ascend product
- Type of computer you are using
- Description of the problem

How to contact Ascend Customer Service

After you gather the necessary information, contact Ascend in one of the following ways:

Telephone in the United States	800-ASCEND-4 (800-272-3634)
Telephone outside the United States	510-769-8027 (800-697-4772)
Austria/Germany/Switzerland	(+33) 492 96 5672
Benelux	(+33) 492 96 5674

France	(+33) 492 96 5673
Italy	(+33) 492 96 5676
Japan	(+81) 3 5325 7397
Middle East/Africa	(+33) 492 96 5679
Scandinavia	(+33) 492 96 5677
Spain/Portugal	(+33) 492 96 5675
UK	(+33) 492 96 5671
Email	support@ascend.com
Email (outside US)	EMEAsupport@ascend.com
Facsimile (FAX)	510-814-2312
Customer Support BBS by modem	510-814-2302

You can also contact the Ascend main office by dialing 510-769-6001, or you can write to Ascend at the following address:

Ascend Communications, Inc.,
One Ascend Plaza,
1701 Harbor Bay Parkway,
Alameda, CA 94502

Need information about new features and products?

Ascend is committed to constant product improvement. You can find out about new features and other improvements as follows:

- For the latest information about the Ascend product line, visit our site on the World Wide Web:

  `http://www.ascend.com`

- For software upgrades, release notes, and addenda to this manual, visit our FTP site:

  `ftp.ascend.com`

Contents

Introduction

1

The Pipeline is a cross-platform ISDN Terminal Adapter. Cross-platform support is provided via a standard serial port interface for PC, Macintosh, and UNIX workstations. The Pipeline comes standard with dual analog ports for phone and fax machine support.

The Pipeline is intended for:

- Telecommuting, with full data and analog phone and fax support for the complete home office.
- Internet access, with dynamic bandwidth for cost-effect, yet high-speed web access.
- On-line services access, with compatibility with all major service providers, such as Microsoft Network, AOL, and CompuServe.
- Peer-to-peer networking, for direct file transfers between small offices or remote customers.
- Remote access, with up to 128Kbps transfer rates.

Pipeline 15 features

The Pipeline connects your PC, Mac, or UNIX machine to an ISDN line at rates up to 128Kbps for high speed, cost effect network or Internet access, plus supplies you with two phone jacks that can each be attached to a phone or fax machine which can be used at the same time you are transmitting data over the ISDN line.

Incoming voice calls are automatically directed to one of the analog phone ports, and data calls are handled by the customizable digital services of the Pipeline.

The Pipeline is ready for telecommuting and Internet connections with built-in support for PPP, MP, MP+, BACP, and V.120.

On the accompanying CD you'll find an easy-to-use setup program that can detect most of your setup information for you—you supply your ISDN phone number(s) and the number you want to call and you're on your way.

Additionally, the Pipeline features:

- Advanced calling features, such as call hold, drop, transfer, and Caller ID
- Support for Microsoft Dial-Up Networking
- A customizable Idle Timer that hangs up calls after a specified period of inactivity
- Support for both PAP and CHAP security
- On-board software can be upgraded in moments after downloading updates from ftp.ascend.com
- CD-ROM with MAXLink Pro client software, MS Internet Explorer, Microsoft Network, QuickLink II Fax, TurboComm/2 (remote access tools to help you reach other computers and transfer data)

What you need to start using the Pipeline

You need the following hardware and software before you can use the Pipeline.

System requirements

In order to install the Pipeline, you must have ISDN service, an available serial port on your computer, and for advanced customization, you will need communications software. Additionally, you need a CD-ROM drive to access the installation software. The customized settings for the Pipeline are stored on-board the Pipeline in flash memory (which is *not* erased when the Pipeline is off).

Finding a serial port

On a PC a serial port is usually a DB25- or DB9-pin connector labeled COM, Serial, or RS-232-D. On a Macintosh, a serial port is a mini DIN 8-pin connector

with a phone icon. The cable provided with the Pipeline is a 25-pin male to 9-pin female serial cable.

You may need a cable or cable adapter

Check your computer's serial connector and compare it to the cable provided. The Pipeline side of the connection uses the 25-pin connector. Depending on the type of serial connector on your computer, you may need a 25-pin to 9-pin adapter. If you have a Macintosh, you will need to supply a 25-pin to mini DIN 8-pin cable.

Communications software

To customize the Pipeline you need communications software that can emulate a VT100 terminal (that is, display a screen that uses character-mode input). For Windows users, the Hyperterm program that ships with Windows can be used. For the Macintosh, if you need communications software, use the Zterm communications package, available at ftp.ascend.com/pub/Utilities.

Box contents

The Pipeline package contains one each of the following:

- Pipeline 15 ISDN Terminal Adapter.
- Power cable with an AC wall transformer.
- RJ-45 to RJ-11 ISDN cable. The wider end is the RJ-45, which plugs into the Pipeline. The narrower end is a standard RJ-11, which plugs into the ISDN outlet installed by your service provider.
- Pipeline Companion CD-ROM, which contains the setup software for the Pipeline.
- Start Here installation and quick reference card.
- Pipeline 15 User's Guide.

If you are missing any item, or if you need diskettes instead of the CD-ROM, please call Ascend's Technical Assistance Center. The number in the US is (800) 272- 3634. Outside the US, call (510) 814-2333.

The big picture

2

How to use ISDN

If you have ever used a modem to communicate with a remote computer, you will find that using an ISDN modem, or terminal adapter, is very similar. To use the Pipeline 15 to connect to another computer:

- Dial the remote computer.
- Connect using an agreed upon security protocol and transport protocol (described below).
- Transfer data.

The big difference when using ISDN is that both ends of a data connection must be digital and able to communicate in ISDN format. So whenever you receive data calls, the calling end needs to be on an ISDN line. If you are using your Pipeline 15 to connect to the Internet, your Internet Service Provider must be able to accept ISDN calls, and you might need a new account to use with your ISDN line. And if you are using your Pipeline 15 to telecommute, your corporate system administrator needs to be able to accept an ISDN call, and needs to give you information about how to configure your Pipeline so that your connection can be authenticated (pass a security check) before you can access the corporate network.

The Pipeline 15 is often referred to as an ISDN terminal adapter. A terminal adapter is a device that allows both voice (analog) and data (digital) connections to be made from a single device. A very useful feature of ISDN is that it integrates voice call services with digital data call services.

ISDN basics

Ordering ISDN service is called “provisioning the line.” If you need help provisioning your ISDN line, refer to Ascend’s web site at www.ascend.com where you can find an html page all about provisioning an ISDN line in North America. Additionally, Ascend’s Technical Assistance Center can give you all the information you’ll need when you talk to your phone company.

If you need help with some of the terms associated with ISDN or with basic networking functions, please see the Networking Glossary on the Pipeline Companion CD. The Networking Glossary is an HTML title that you read with a web browser. Refer to the A-to-Z section for an explanation of hundreds of terms. The Basics section shows you how ISDN works in full color, animated segments.

Basic Rate Interface (BRI)

When you order ISDN service for your home or small office, you get what is known as Basic Rate Interface. This gives you three channels: 2 B channels with a capacity of 64 kbps each, and a single D channel with a capacity of 16 kbps.

Whenever you make an ISDN call, you start with one B channel. If the receiving end can accept the other B channel, and if the data requirements of your call need the extended bandwidth, your Pipeline uses the second B channel. But you can set up the Pipeline to use only one B channel when connected to a given phone number. Bringing up the second B channel costs more. Sometimes there is a premium charge from the phone company for the first minute, so be aware that bringing up two channels can cost more even though the call is shorter. Also check with the remote end to see if there are additional charges when connecting with both B channels, and to make sure the remote end can handle a two-channel call.

The D channel is used by the ISDN service for administrative tasks. It is generally not used by the consumer (although there are some commercial applications, such as credit card approvals, that make use of the narrow bandwidth of the D channel). You can make or receive voice calls while data calls are in progress if your ISDN service is provisioned for both voice and data.

Integrated digital and analog services

ISDN service can be customized. You can choose whether each of your B channels can be used for just data, data or voice, or just voice. In this context, voice means plain old telephone service (and is actually called POTS). POTS services are analog instead of digital. Analog service is what your phone, fax, and ordinary modem use. If you choose to have voice integrated into your ISDN line (which is the standard), you can make and receive calls by plugging a phone (or two) into the back of the Pipeline. In fact, you can plug in any analog phone device, including a fax machine or a modem. For a small office, this gives you one phone-service account for all your telephone usage, plus your Internet and corporate dial-up charges.

Connecting to a switch

Ordering ISDN service is actually requesting a line from a *switch* at your local telephone company. The most common switches in North America are the AT&T Electronic Switching System (known as AT&T 5ESS) and Northern Telecommunication's DMS-100 switch. These switches are actually computers that route calls between their sources and destinations. They use different types of software. When you set up your Pipeline, you will be asked to identify the switch, which actually refers to the switch-software combination.

Switches (and their software combinations) supported by the Pipeline are:

- AT&T Point-to-Point
- AT&T Custom Multipoint (sometimes called AT&T Custom or AT&T Multipoint)
- National ISDN-1 (commonly called NI-1, which runs on either the AT&T or DMS-100 switch)
- DMS-100 Custom.

The phone company will tell you which type of service you have.

Directory numbers and SPIDs

Every service from the phone company comes with a number. In the case of ISDN, there are a lot of numbers:

- Two directory phone numbers, one for each B channel, in standard phone number format, with an area code, prefix, and local number.
- Two service profile identifiers, called SPIDs, that come in a variety of formats. The important thing to remember about SPIDs is that every digit is important—don't think of them in terms of area codes or prefixes. Think of them as an ID that just looks like a phone number.

The Pipeline comes with an AutoSPID utility that tries to guess the SPID, basing its guess on the switch type and the directory number. But because SPID formats are not 100% standard, you should know the SPIDs associated with your ISDN service. The directory numbers and SPIDs are needed during set up. (They enable your Pipeline to connect to the switch at the central office.)

There is one exception: AT&T Point-to-Point comes with only one directory number and no SPIDs. It only has one B channel.

Security and Transport protocols

The Pipeline supports two types of logon security protocols:

- Password Authentication Protocol (PAP)
- Challenge Handshake Authentication Protocol (CHAP)
- Microsoft CHAP (MS-CHAP)

These are commonly used security programs. They reside in the Pipeline's on-board memory. They help you get connected to the remote computer without any need for input on your part. They are automatically available when using MP or MP+ (described below).

Depending on which method is used, the Pipeline negotiates with the other end to exchange your name, password, and other necessary information.

Once you get connected, both ends need to agree on how to transport the data. Both the dialing end and the answering end of the link must support which ever protocol is decided on. The Pipeline supports the following transport protocols:

[2]Point-to-Point Protocol (PPP) is the industry-standard for encapsulating data packets (imagine small chunks of data being put into electronic envelopes) to send over a single-channel connection. PPP is the most common protocol used

when dialing from a personal computer to a corporate LAN or Internet Service Provider.

- Multilink Point-to-Point Protocol (MP) is a method of combining individually dialed channels into a single, higher-speed data stream. So if you have one B channel connected, and you use MP, a second B channel can be linked to the same connection.
- Ascend's Multilink PPP (MP+) lets a Pipeline add or remove channels from a connection as bandwidth needs change, without disconnecting the link. This is called Dynamic Bandwidth Allocation and is not available with MP (above).
- Bandwidth Allocation Control Protocol (BACP) is the industry standard for bundling two B channels together, evaluating the traffic demands, and adding or dropping the second B channel as needed.
- V.120 (pronounced V dot one twenty) converts data from a PC's COM port into ISDN data format. PCs send data in asynchronous mode, that is, they use start and stop bits to mark the ends of a byte of data, and sometimes they add a parity bit for error checking. ISDN sends data in synchronous mode, that is, in long streams, with much less overhead.

Now what?

After you configure your Pipeline to connect to your corporate office or to the Internet, what software can you actually use to make things happen? The Pipeline Companion CD comes with MAXLink Pro, a library of software packages and documentation, including telnet, ping, finger, gopher, ftp, email, and more, to help you reach other computers and transfer data. Plus, the CD-ROM includes software to browse the web so you can do all the things you bought your Pipeline to do.

Using the Pipeline 15 Setup Wizard 3

Configuration

The Pipeline 15 Setup Wizard requires that the Pipeline 15 be connected to a PC running Windows 3.1, 95, or NT 3.51 or 4.0. TCP/IP must be installed on your computer to connect to the Internet or a TCP/IP network. For Windows NT, also install Remote Access software. Dial-Up Networking is supported on Windows 95 and NT.

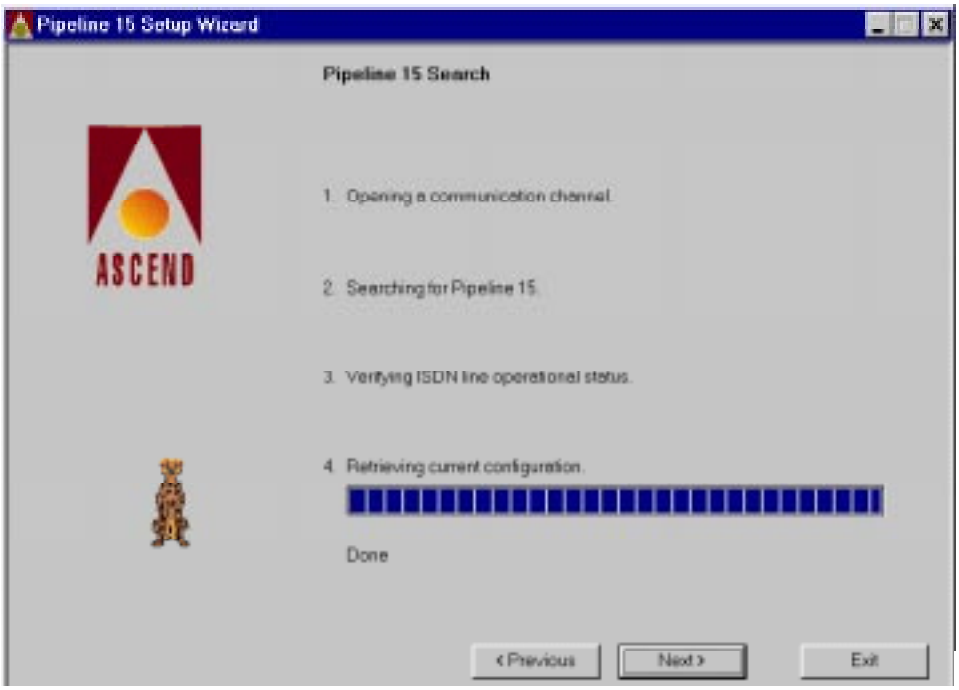
Configuring your Pipeline consists of the following general steps, each of which is described in greater detail in the next section:

- Run the setup wizard to identify the switch, directory phone numbers, and SPIDs associated with your ISDN service. You can also use the setup wizard to register your Pipeline and download a new version of the Pipeline 15 unit's on-board software.
- Next, define the Pipeline 15 as a modem on your computer. You define a modem for each type of transfer protocol, that is, one for PPP, one for V.120, and so forth.
- For Windows 95 and NT, create Dial-Up Networking shortcuts to automate calling. For Windows 3.1, create connection settings in your communications software, and add the required initialization strings used by the Pipeline 15.
- Customize the Pipeline connection settings. Use HyperTerminal (which ships with Windows 95 and NT), the Windows 3.1 Terminal accessory, or any communication software that supports VT100 emulation. Use AT commands to create a custom connection environment and save the connection information as a numbered profile. The Pipeline stores profiles in non-volatile RAM (NVRAM), which retains the data even if the power to the

Pipeline is turned off. The AT Commands section describes how to customize the Pipeline.

Using Pipeline 15 Setup Wizard

The Pipeline 15 Setup Wizard opens a communication channel and attempts to make a direct connection to the Pipeline. The Pipeline is found if it is powered on and the serial cable is securely fastened at both ends to an enabled port on your computer.



When the wizard finds the Pipeline, it reads any settings currently stored on the Pipeline and attempts to detect an ISDN signal. If the service is not installed, you can manually configure your Pipeline, but you won't be able to test it.

Troubleshooting tips

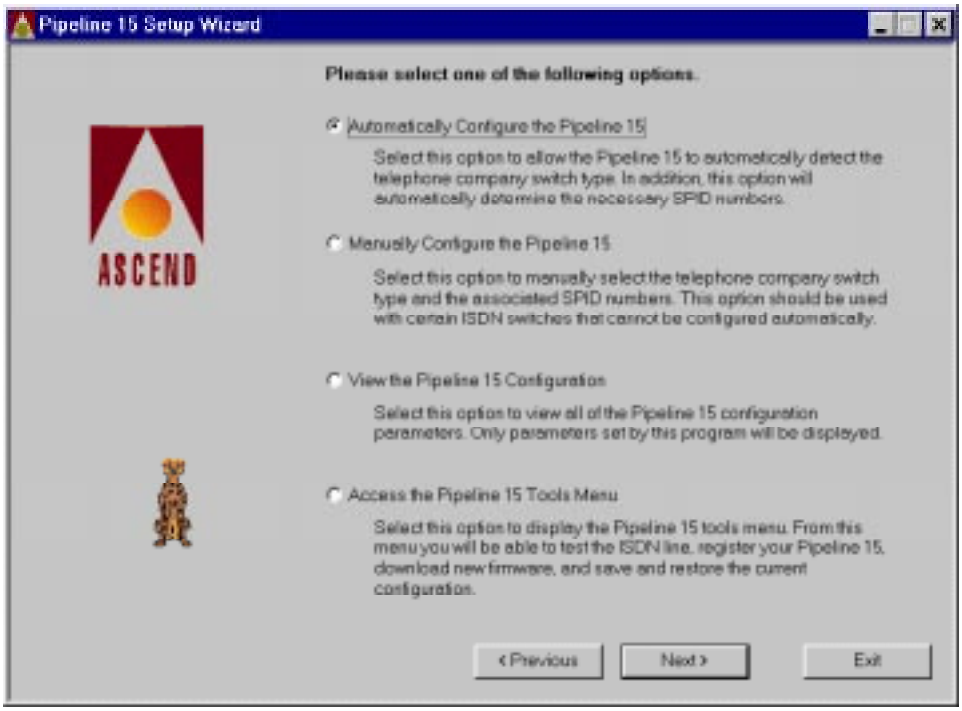
If the wizard cannot find the Pipeline, it lists available ports and waits for you to specify the port of the Pipeline. If the port of the Pipeline is not on the list, the port is occupied by another device or process. In this case, double check your port settings.

Be sure there is no activity on the Pipeline's port. For example, if a communications program is connected to the Pipeline, the wizard sees the port as busy, so won't detect the Pipeline. If this is the case, quit the communications program and restart the wizard.

A port can be enabled or disabled on the basis of a system setting. Check the control panel settings for the available ports to be sure you are using one that is enabled.

If the ISDN signal cannot be detected, make sure the cable is securely attached at both ends, and that it is plugged into the ISDN port on the back of the Pipeline. If you think there a problem with the line, call the telephone company and have it tested. Keep your Pipeline powered on in case the test needs to reach it.

Finally, power off the Pipeline and power it back on. Wait until the lights on the front of the Pipeline indicate carrier detected (third light on), the Pipeline is clear to send (5th light on), and the ISDN status is on or blinking (6th light). Try the wizard again.

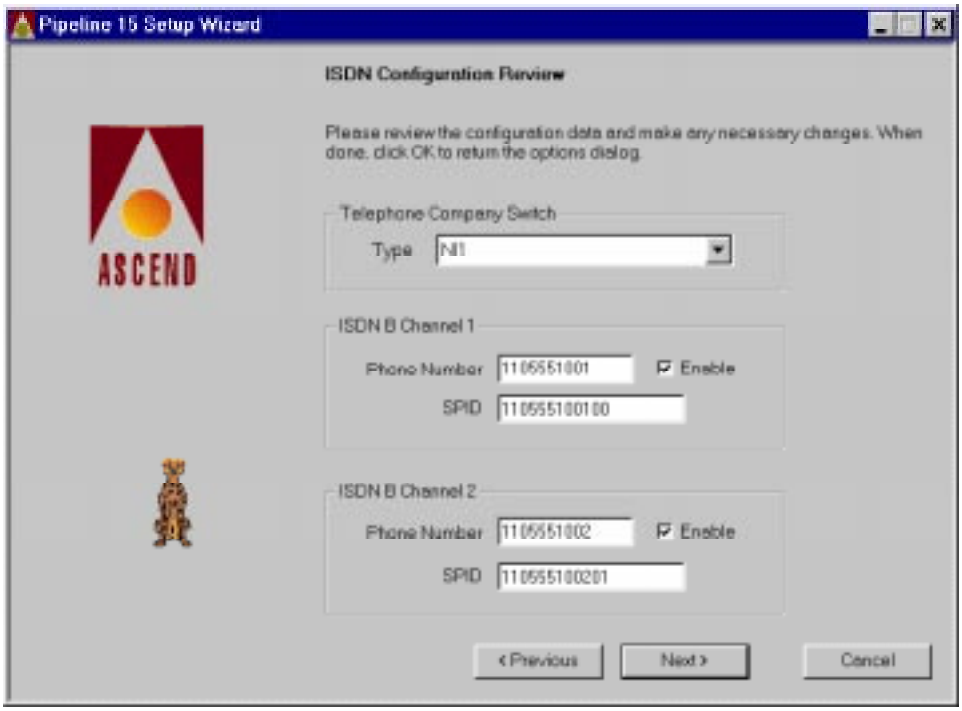


Select Automatically Configure the Pipeline. Make a different selection at anytime by returning to this screen. Simply click the Previous button as many times as needed.

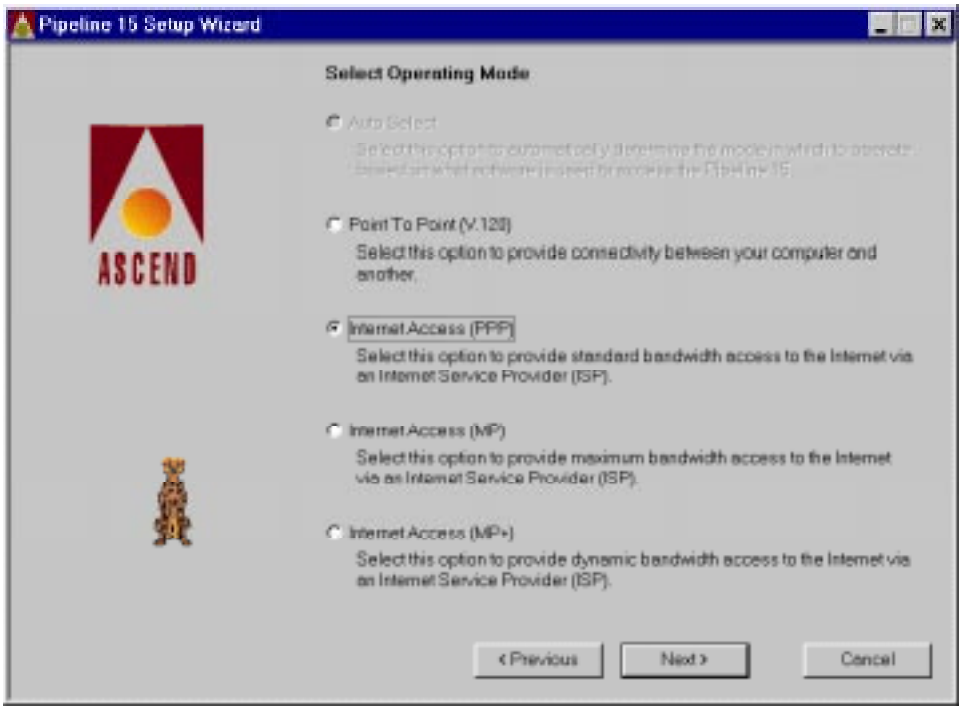
Other options let you:

- Manually configure the Pipeline to change one or all settings.
- View the configuration to see what is currently saved.
- Make another test call.
- Register the Pipeline.
- Update the unit's on-board software with new software obtained from ftp.ascend.com.
- Save a configuration stored on the Pipeline to a file on your computer.
- Load a configuration file from disk to the Pipeline.

Enter the phone numbers and enable the line(s) you want the Pipeline to use for data calls. You can make and receive voice calls even if a data call is in progress, so you can enable both lines for data and still use all the voice features of the Pipeline. See the section on Voice calls to see how the Pipeline handles voice calls.

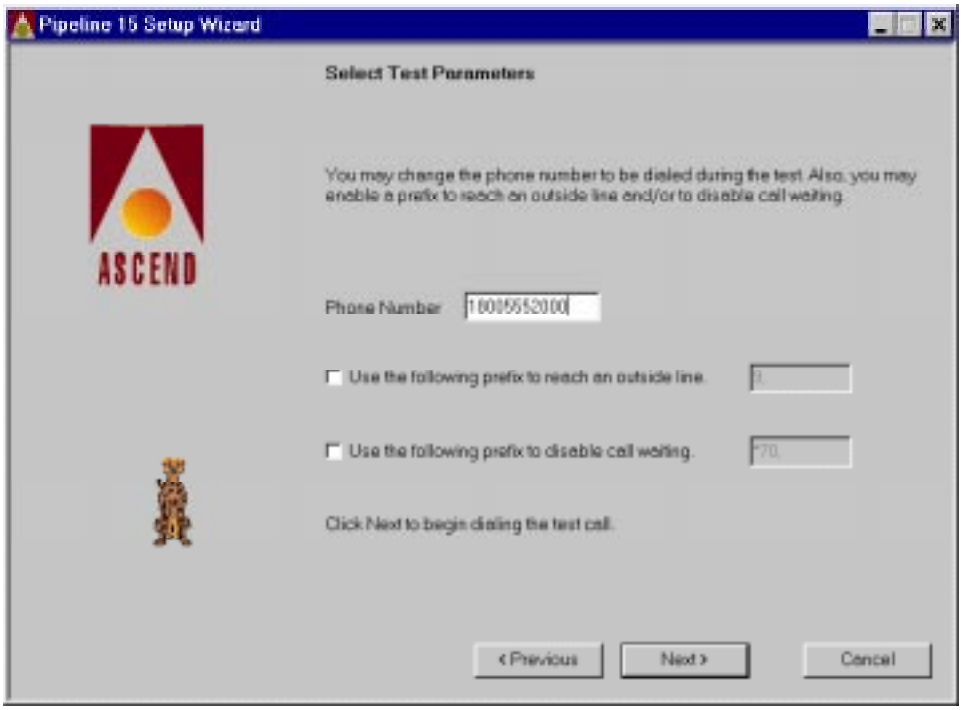


The wizard contacts the switch and determines its type, then it guesses the SPIDs. Double check the numbers very carefully. Most ISDN setup problems are due to incorrectly entered SPIDs. If the SPIDs offered by the wizard are different from the SPIDs the telephone company gave you, carefully enter the numbers from the phone company. (But if your test call fails, have the wizard guess the SPIDs again, accept them, and make another test call.)



If you are going to be connecting to the Internet or a TCP/IP network

- Choose PPP to use a single B channel (this is your only option if you enabled only one phone number).
- Choose MP to use two B channels. If the far end cannot accept a two-channel call, the protocol automatically switches to PPP.
- Choose MP+ to use Dynamic Bandwidth Allocation, which uses one or two B channels as needed. If the far end cannot negotiate an MP+ connection, the protocol automatically switches to MP.
- If you are going to be dialing another personal computer with an ISDN line, choose V.120.



The sample number was set up expressly for testing your Pipeline, and you can use it. You can also make a test call to the number you plan to use to make ISDN calls.

When you click Make Call, depending the on the calling mode, one or two of the B-channel lights on the front of the Pipeline go on. Then the transmit data (tx) light goes on momentarily. The test can take up to 90 seconds. A dialog will tell you if the test was successful or not.

If the test failed, do the following:

- Try another number. Go back to the previous screen, enter another number, click Next and Make Call.
- Click Cancel to go back to the screen where you can View the Pipeline 15 Configuration. If any item is incorrect, correct it by selecting Manually Configure the Pipeline 15, then make another test call.

This completes the Pipeline configuration.

Next you'll add the Pipeline as a modem to your computer.

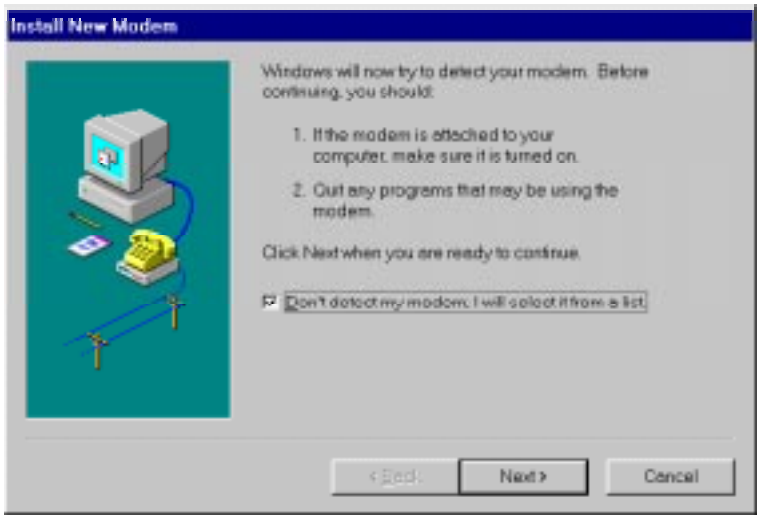
Windows 95 and NT Modem Setup

4

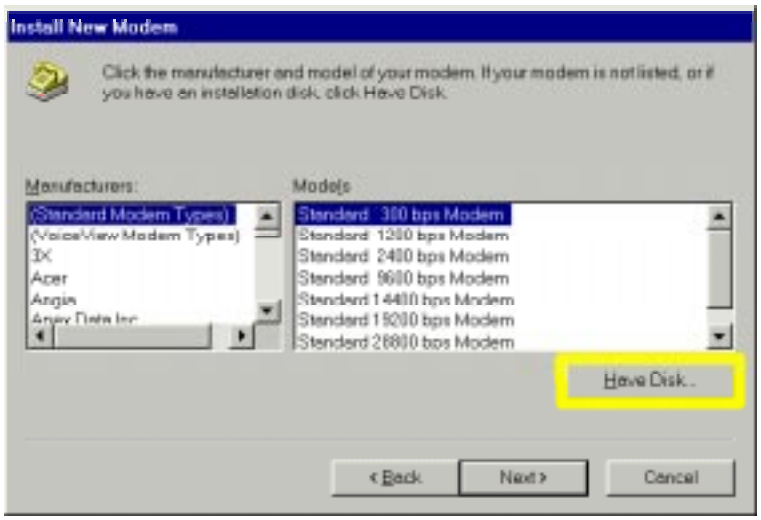
Adding the Pipeline as a modem

To add a modem to Windows 95 or NT 4.0, start by opening the Control Panel, and double clicking the Modem icon. From the Modem Properties dialog, select Add.

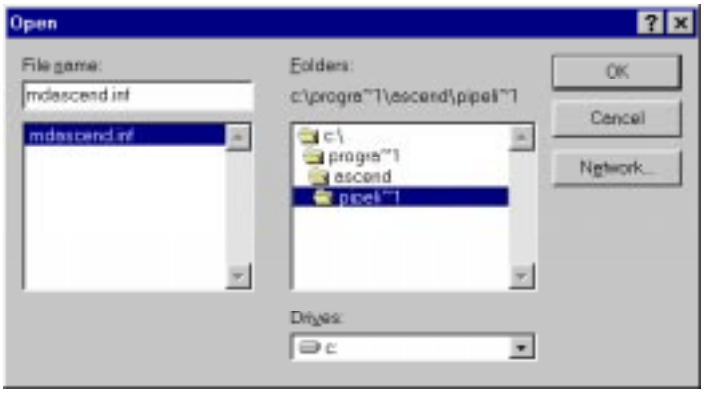
Click “Don’t detect my modem; I will select it from a list.”



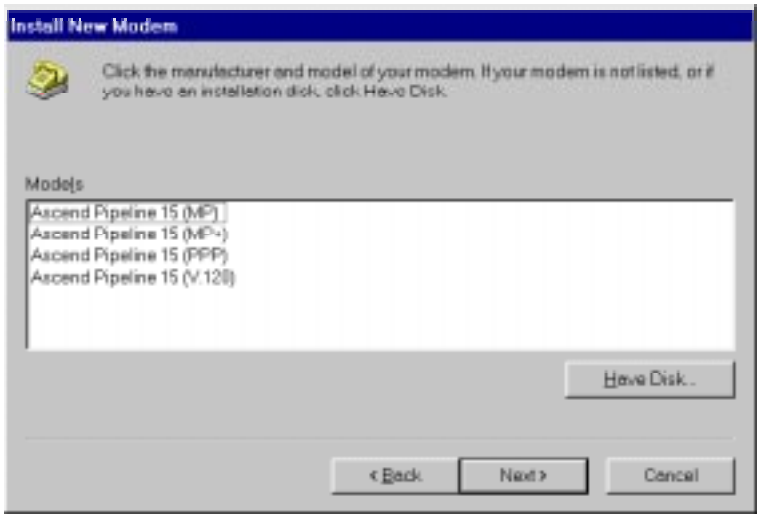
On the next panel, click Have Disk.



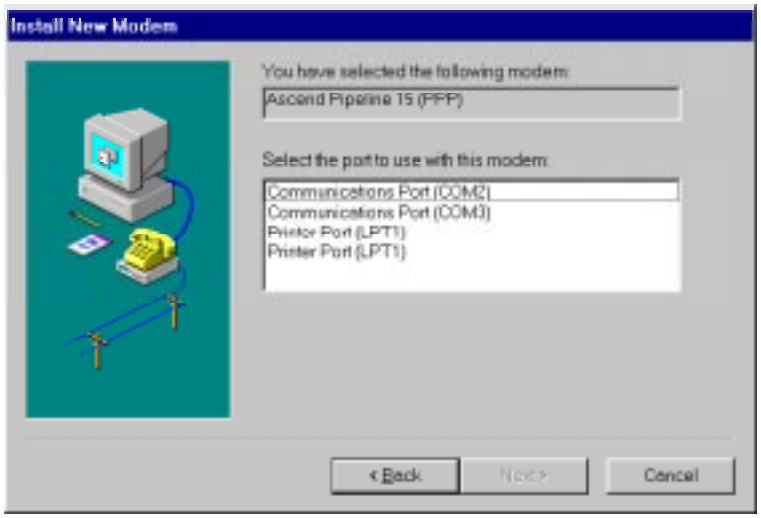
Specify the location of the Pipeline 15 modem information file (named MdAscend.inf) in the Install from Disk dialog box.



Create a Pipeline modem for each type of transport protocol you plan to use. For Internet and remote ISDN access, create Pipeline modems which use PPP, MP, or MP+. For connecting to another PC, create a modem that uses V.120.



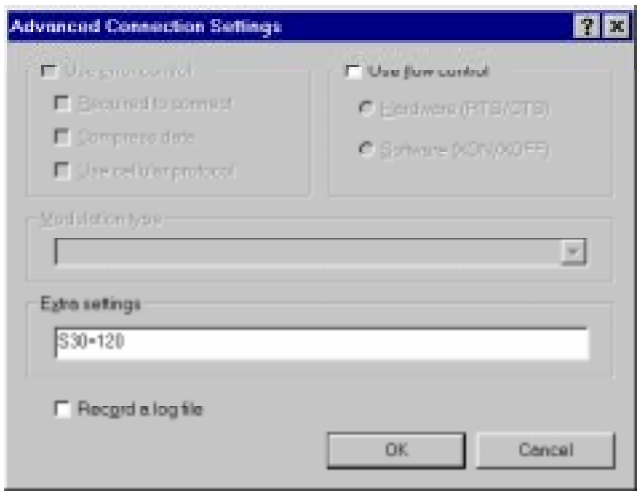
Identify the COM port of the Pipeline. Be sure it's the same one you used in the setup wizard. All modems for the Pipeline use the same COM port.



Since the Pipeline can be customized to use a number of options, you might want to set up multiple versions of each modem, with special AT commands associated with each one. To do so, open the properties window for a modem. (From the Control Panel, double click the Modems icon, select a Pipeline modem, and click Properties.)

Click the Connection tab, and then click Advanced.

Here you can enter the unique AT commands for this Pipeline modem. (See the AT Commands section for information about selecting AT commands for specific results.)



With these Pipeline modems, you can set up Dial-up Networking shortcuts to initiate calls automatically.

Windows NT and Remote Access Service

Adding a modem in Windows NT 4.0 and Windows 95 is the same, except that in NT only one modem can be defined per COM port. Additionally, when modem information changes, NT needs to reboot and Dial-up Networking needs to be reconfigured. Follow the on-screen prompts to remove, then add, and reconfigure Dial-up Networking to swap modems.

To minimize rebooting, define an MP+ modem for Internet and TCP/IP connections, and a V.120 modem for PC-to-PC connections. When necessary, MP+ automatically drops down to MP, which in turn automatically drops down to PPP as needed. This gives you the fastest possible connection on every call, and all the swapping takes place in the Pipeline.

Windows 3.51 modem setup

5

Adding the Pipeline as a modem

After using the Pipeline 15 Setup Wizard to configure the settings on the Pipeline, you need to add the Pipeline as a modem. This section describes how to use the Remote Access Service (RAS) to add a modem.

You need to append the Pipeline modem information file to the RAS modem information file in order to define the Pipeline as a modem. To accomplish this, perform the following steps:

1 From the Windows desktop, open Notepad. If the program is not on the desktop, select Run from the File menu, type Notepad, and press Enter.

2 From Notepad's File menu, open the Pipeline modem information file. The name of the file is MdAscend.inf and is located in the directory where you installed the setup wizard. If you did not install the wizard, but ran it from the CD, search for the file, using File Manager, on the CD.

3 Select the entire contents of the MdAscend.inf file and copy it to the clipboard. (The menu commands to do this are, Edit > Select All, Edit > Copy.) Close the file.

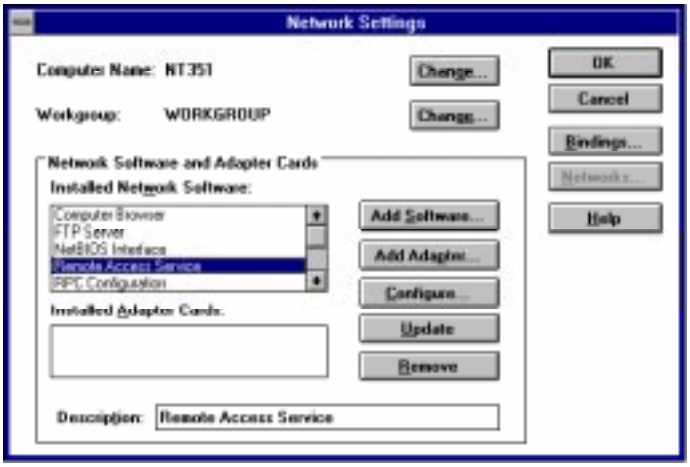
4 Open the RAS modem information file called modem.inf. Go to C:\WINNT35\SYSTEM32\RAS (where C:\WINNT35 is the location of your Windows NT operating system).

5 At the end of the file, paste the contents of the Pipeline modem file by selecting Edit > Paste. Close the file and save it.

Now the Pipeline will be listed from the modem selection dialog, whenever you add a new modem in RAS.

Defining the Pipeline as a modem

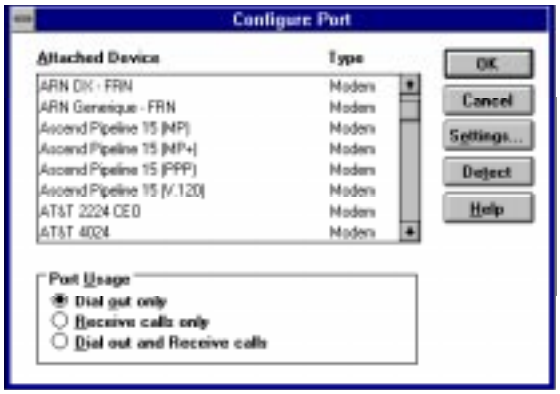
From the Control Panel, select Network settings. Select Remote Access Service and click Configure.



In the Remote Access Setup dialog, if a modem was previously defined on the port the Pipeline is now attached to, remove it. Click Add to define the Pipeline. Select the port to which the Pipeline is attached.

Next, choose cancel from the information dialog suggesting that Remote Access search for the new modem.

In the Configure Port dialog, select the type of Pipeline modem you want to define.



In the Remote Access Setup dialog, the type of Pipeline you selected will be listed. Click Continue.

Whenever a new modem is added, Windows NT needs to reboot.

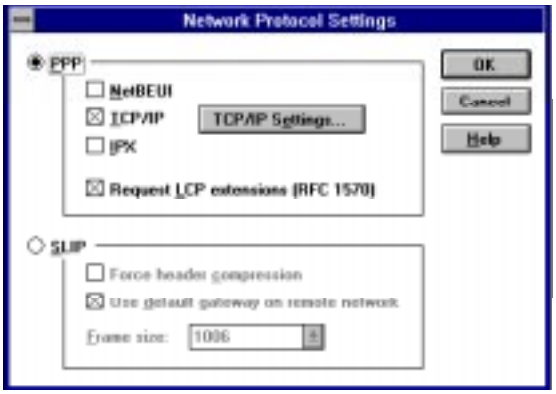
Set up a connection and dial

In the Remote Access Service program group, select Remote Access to use the Pipeline to dial a call.

Each connection you make is an entry in the Remote Access Phone Book.

Supply an Entry name, phone number, and description. If you click “Authenticate using current user name and password,” the uses your Windows NT sign-on user name and password. Be sure the COM port setting is correct.

Click on the Network icon to access the Network Protocol settings.



Be sure to find out from the administrator of the remote system how you should configure your PPP TCP/IP settings. The settings for IP address and Server assignments will be given to you by the administrator of the remote system.

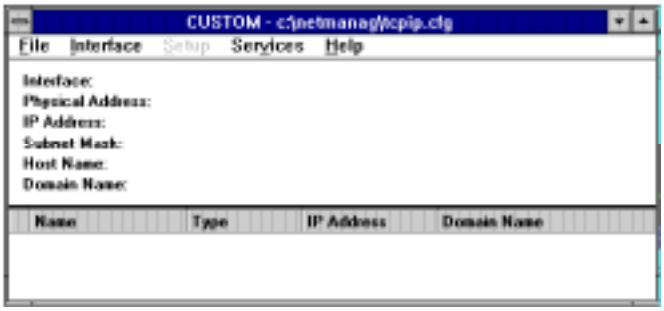
You can now use the Pipeline to make calls.

Windows 3.1 and 3.11 modem setup 6

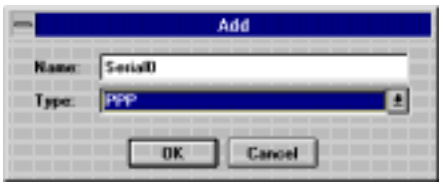
Adding the Pipeline as a modem

After using the Pipeline 15 Setup Wizard to configure the settings on the Pipeline, you need to add the Pipeline as a modem. This section describes how to configure a TCP/IP interface (which in this context, is a Pipeline modem), and use it to make dial-up connections.

First install TCP/IP from MAXLink Pro, which is included on the Pipeline Companion CD. Next, customize TCP/IP, by clicking on the Custom/Configure icon. From the Inteface menu, select add.

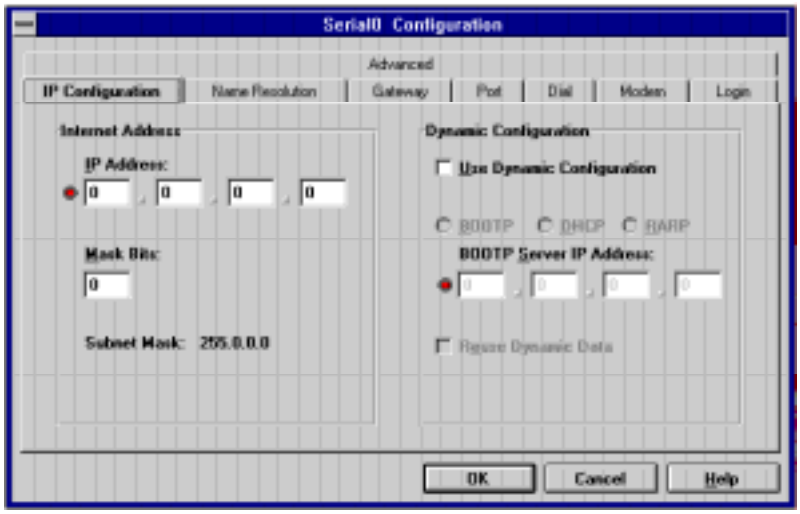


Create a new Serial interface. Use the drop-down arrow at the end of the Type field to select PPP as the type of interface. You can start with this selection for each modem you create, regardless of the type of protocol the modem will actually use. For example, if you are adding a modem to make V.120, PPP, MP, or MP+ calls, use these settings to start.



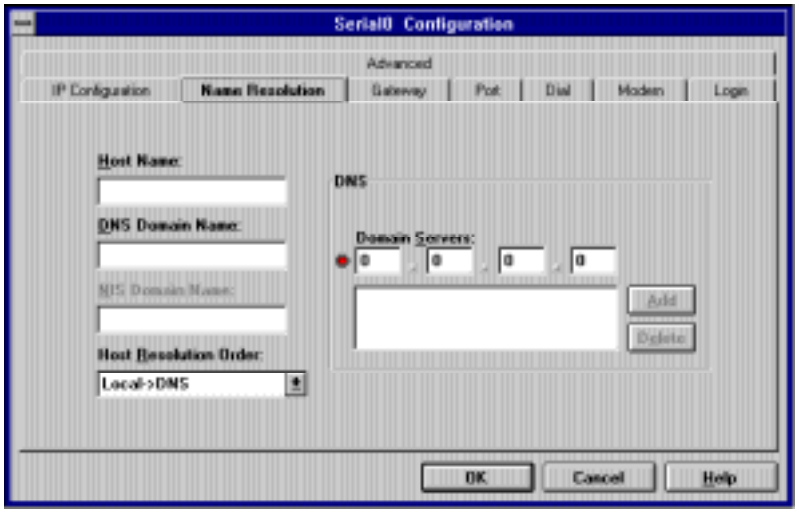
Click OK to add the interface. Double click on the new interface to begin configuring it. This brings up a tabbed dialog that is filled in as described next.

In the IP Configuration tab, if the administrator of the remote system gives you a specific IP address, enter it in the Internet Address box. Otherwise, in the Dynamic Configuration box, specify how your IP address is assigned. Find out from the remote administrator which method the server uses. Leaving all settings blank (as shown here) lets the server choose the method.

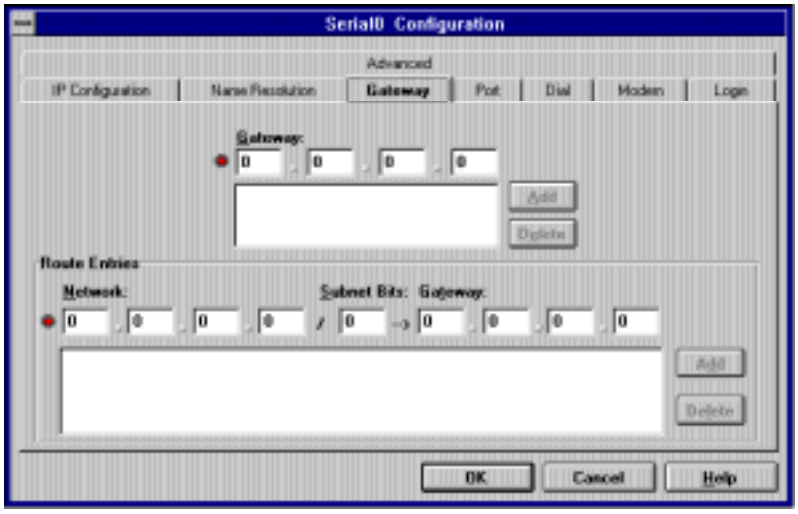


The administrator of the remote system must supply Name Resolution information. The Name Resolution tab assigns the IP address of a Domain Name Server. This information may not be required if you obtain your IP address automatically. If you sign up for an ISDN account with an Internet Service Provider, ask your account administrator for this information (or if it is needed).

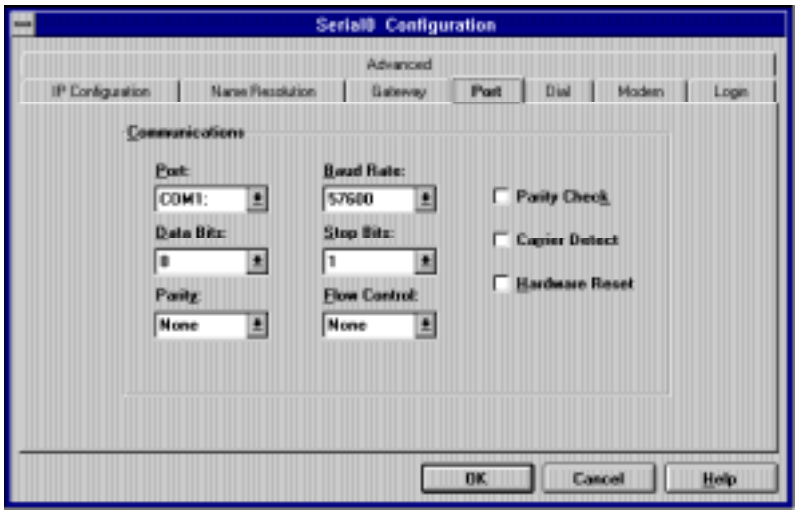
If you are using your ISDN line to connect to a corporate LAN, your system administrator will supply you with this information. For information on what a Domain Name Server is, refer to the Networking Glossary on the Pipeline Companion CD-ROM.



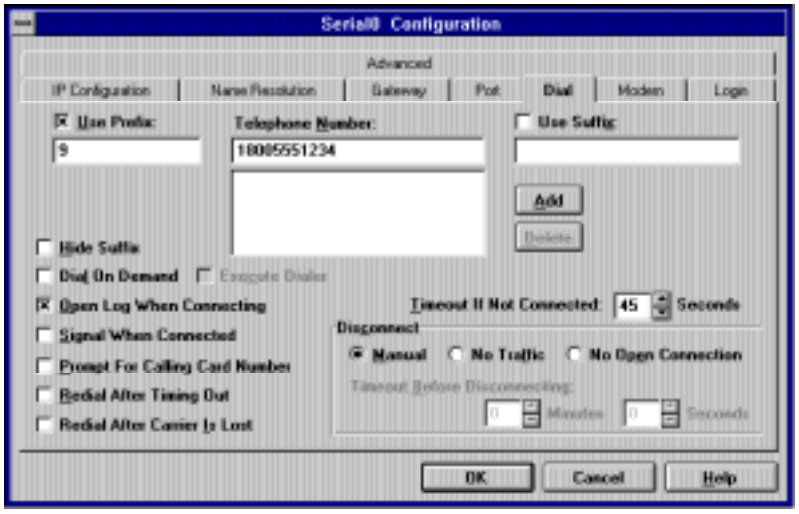
The administrator of the remote system must supply Gateway information. The Gateway tab lets you define the IP address of the system you will call into. It may not be required if you obtain your IP address automatically. If you sign up for an ISDN account with an Internet Service Provider, ask your account administrator for this information (or if it is needed). If you are using your ISDN line to connect to a corporate LAN, your system administrator will supply you with this information. For information on what a Gateway is, refer to the Networking Glossary on the Pipeline Companion CD-ROM.



In the Port tab, specify the COM port to which the Pipeline is attached. Note that on some systems, you need to select a baud rate no greater than 57600 so that your computer can detect the COM port. Reducing the rate here does not affect the transfer rate of connections made with the Pipeline.



Use the Dial tab to set up the number you are going to call. (Alternatively, add the number to dial in an address book entry of the Dialer program.)

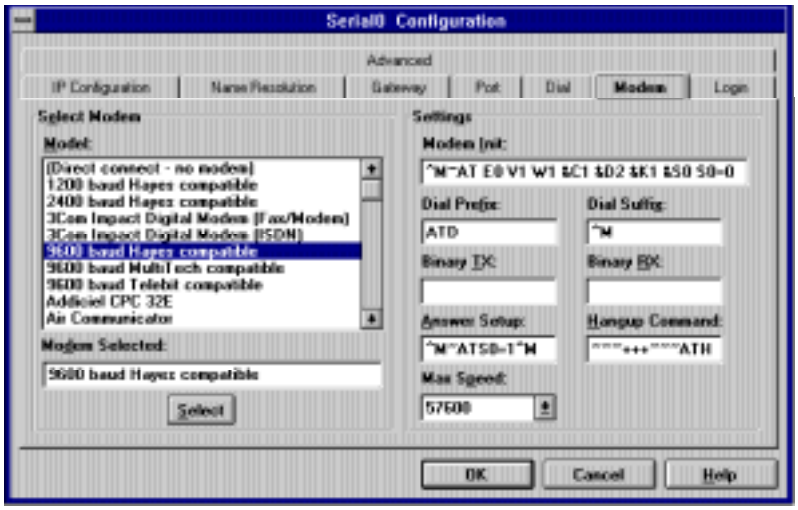


In the Modem tab, for the model, select the 9600 baud Hayes-compatible modem. For the settings, enter the AT commands used by the Pipeline, as

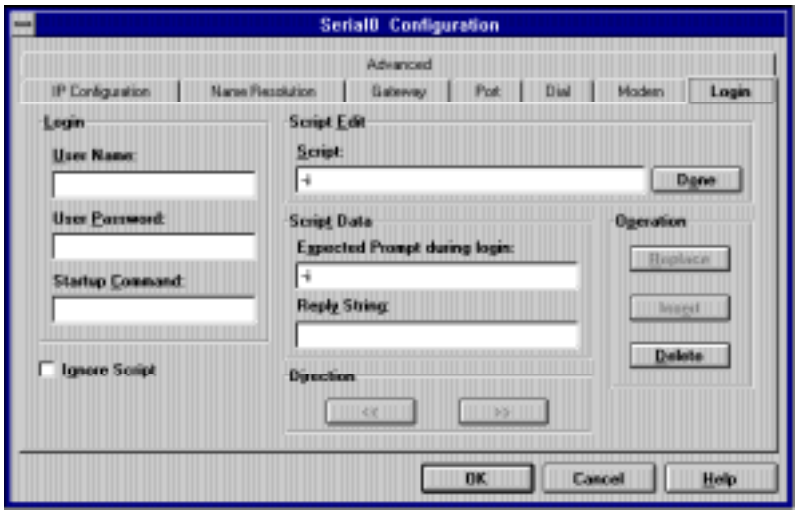
described in the following table. (Note that not all the settings show in the Modem Init field in the illustration. Be sure to use the settings from the table below.)

When used:	AT command settings:
V.120	^M~AT E0 V1 W1 &C1 &D2 &K1 &S0 S0=0 S71=2 S73=0 S95=47^M
PPP ISDN	^M~AT E0 V1 W1 &C1 &D2 &K1 &S0 S0=0 S71=1 S73=0 S95=47^M
MP ISDN	^M~AT E0 V1 W1 &C1 &D2 &K1 &S0 S0=0 S71=3 S73=0 S95=47^M
MP+ ISDN	^M~AT E0 V1 W1 &C1 &D2 &K1 &S0 S0=0 S71=4 S73=0 S95=47^M
Dial Prefix	ATD
Dial Suffix	^M
Answer Setup	^M~ATS0=1^M
Hangup	~~~+++~~~ATH

In the Login tab, optionally enter your user name and password. You can be prompted for a user name and password as you indicate for each address book entry in the Dialer.

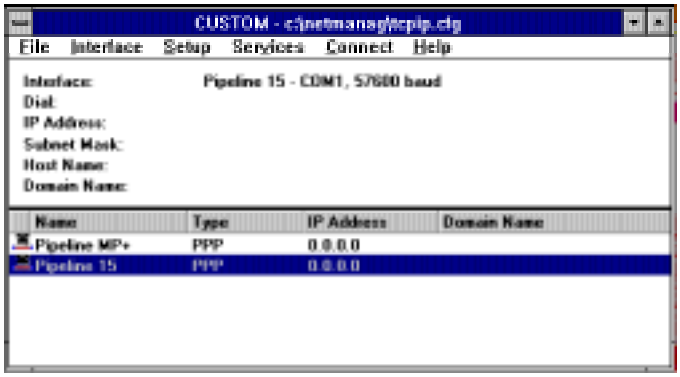


You must enter the two characters -i (minus lowercase i) in the Script field, as shown. Then click Done.



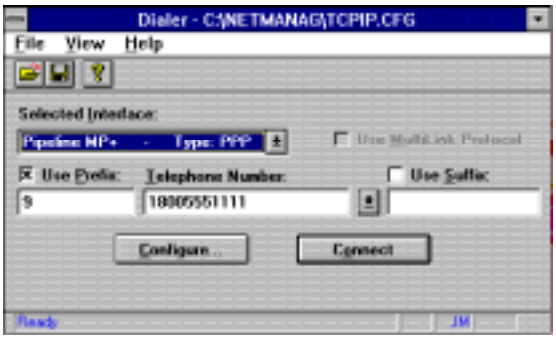
When all the tabs are filled in as needed, click OK. If you entered a number to dial, to make a test call, from the Custom dialog, select the new interface (click

once on the line item) and click Connect from the title bar. If you selected “Open log when connecting” in the Dial tab, you will see the progress of the call.



In this illustration, two interfaces have been set up.

From the Custom/Configure program group, select the Dialer. You can set up custom connections to various remote sites, using the Pipeline modems defined here as interfaces. The configure button will give you a number of options to customize each connection. Refer to the on-line documentation for the Dialer for more details.



This completes the Pipeline configuration for Windows 3.1 and Windows for Workgroups.

Macintosh Modem Setup

7

Adding the Pipeline as a modem

To use the MacTCP/IP software from Apple, you need System 6.0.5 or later. Open Transport is the TCP/IP stack shipped with System 7.5.2 and later. These instructions are based on System 7.5.2 and the Zterm communications package (available on the Ascend ftp site).

To define the Pipeline as a modem, access TCP/IP from the Apple Menu > Control Panel > Open Transport. A single dialog is displayed.

Connect via MacPPP. From the File menu, select Configurations and make a new connection for the Pipeline, which is the equivalent of a modem that you can use when dialing from your communications package.

The administrator of the remote system will give you all the information you need to specify which protocol to use to obtain your IP address.

Next, in your communications package, create a new connection. For example, in Zterm, select Dial > Manual, and fill in the number to dial and other options.

The settings for the modem should be as follows:

- Data rate 57600
- Data bits 8
- Stop bits 1
- Parity none

Flow control is not required.

Selecting a data rate of 57600 enables the communications software to find the modem port. It does not control the transfer rate used by the Pipeline.

You can now use the Pipeline to make calls over your ISDN line in the same way you would make calls with a modem.

Voice Features

8

Analog services

An ISDN telephone line can carry data or voice or both at once. You can use the Phone 1 and Phone 2 jacks on the Pipeline to connect standard telephones, fax machines, or other analog telephone equipment to the same ISDN line you use for data.

How the Pipeline handles outgoing voice calls

ISDN service can be provisioned so that each B channel can carry either voice or data. When used for voice, a B channel can carry a single voice call.

The voice-handling features of the Pipeline make it easy to make outgoing voice calls. If either of the B channels is currently not in use, you can dial a voice call from a telephone connected to either phone port. If you pick up the receiver of the phone connected to the channel that is in use, the Pipeline uses the other one. There are only two exceptions:

- If the type of ISDN service is AT&T Custom Point-to-Point, there can be only one voice call at a time. Because AT&T Custom Point-to-Point service includes only one telephone number, all outgoing voice calls use that number.
- If the switch is a Northern Telecom DMS-100, and Phone Number Binding is enabled (by setting S55 to 1), you cannot make the call if the currently used B channel and the analog port to which the phone is connected both use the same telephone.

But in the latter case, pick up the receiver of the phone connected to the other channel.

You can place a voice call if both B channels are in use for a data call to the same location. Pick up the receiver of a telephone connected to either analog port. The Pipeline automatically borrows one of the B channels for the voice call. This feature works for outgoing calls on all types of ISDN service and all switches.

You cannot place a voice call if both B channels are engaged in voice calls, one voice call and one data call, or two data calls to different locations.

How the Pipeline handles incoming voice calls

The voice-handling features of the Pipeline make it easy to receive incoming voice calls. In the most common configuration, where each analog port is assigned to a different telephone number, the Pipeline handles incoming voice calls as follows (except with AT&T Custom Point-to-Point service, discussed below):

- If neither B channel is currently in use, you can receive a voice call on either telephone number.
- If a single B channel is currently in use for a data call, you can receive a voice call on either telephone number. The unused B channel carries the voice call, but the Pipeline routes the call to the analog port that is assigned to the telephone number dialed by the caller.
- If a single B channel is currently in use for a voice call, you can receive a voice call for the telephone number not used by the current voice call.
- If a single B channel is currently in use for a voice call, and there is an incoming call to the same telephone number as the current call, the caller receives a busy signal.
- If both B channels are in use for a data call to the same location, you can receive a voice call to either telephone number. The Pipeline automatically borrows one B channel for the voice call, and routes the call to the analog port assigned to the telephone number.
- If both B channels are used for any other combination of calls—for two voice calls, for one voice call and one data call, or for two data calls to different locations—the Pipeline cannot handle another voice call, and callers to either telephone number receive a busy signal.

Incoming voice calls are handled differently with AT&T Custom Point-to-Point service. Because this service includes only one telephone number, it can accommodate only one voice call at a time. Therefore:

- If a single B channel is currently in use for a data call, you can receive a voice call. The call is routed to the Phone 1 port.
- If a B channel is currently in use for a voice call, a caller to the telephone number receives a busy signal.
- If both B channels are in use, a caller to the telephone number receives a busy signal.

Note: If you have enabled Data Over Voice (by setting S register 61 to1), the Pipeline receives an incoming voice call as a data call, not as a voice call.

Using Call Waiting

The Pipeline supports Call Waiting, a feature that generates a distinctive tone when you are using a telephone number for a voice call and another voice call is made to the same telephone number. The Call Waiting tone, which is generated by the Pipeline, is either an approximation of the Call Waiting tone provided by most telephone companies or, on a Pipeline with a U interface, a brief “burr” tone.

To use Call Waiting:

1 When you hear the call waiting tone, decide whether you want to answer the new call.

2 If you do want to answer the new call, put the current call on hold by quickly pressing and releasing your telephone’s switchhook (the button that is depressed when you hang up the telephone).

3 To return to the first call, quickly press and release your telephone’s switchhook again. This puts the second call on hold.

Using Call Hold

The Pipeline lets you put the current call on hold, using the following steps:

1 Quickly press and release your telephone’s switchhook (the button that is depressed when you hang up the telephone). You can now make another call.

2 To return to the call you put on hold, quickly press and release your telephone's switchhook again. If you have a second call, this puts the second call on hold while you take the first call.

Call conferencing

If your ISDN service includes the Call Conferencing feature, you can use the Pipeline to establish conference calls. Conference calls allow more than two callers to converse at the same time. If the Call Conferencing feature is available from your telephone company, it allows either three-way conference calls (which include you and up to two other callers) or six-way conference calls (which include you and up to five other callers).

To establish a conference call, follow these steps:

1 Call a person to include in the conference, or have that person call you.

2 Put the call on hold by quickly pressing and releasing your telephone's switchhook (the button that is depressed when you hang up the telephone).

3 Call another person to include in the conference, or have that person call you.

4 Add anyone on hold to the call by quickly pressing and releasing your telephone's switchhook twice.

5 To add more callers to the conference call, repeat steps 2-4.

A caller normally leaves a conference call by hanging up. You can also drop the most recently added caller to a conference call by following this step:

Quickly press and release your telephone's switchhook twice.

Caller ID supported

The number of the calling party is included in the ISDN BRI data stream. You can capture the number, unless the caller has blocked it, by attaching a CallerID device to the POTS ports on the unit.

AT Commands

9

The Pipeline 15 provides an extended AT command set. AT commands are standard software commands used to control modems (AT stands for ATtention). You enter the commands in a terminal emulation window (available in HyperTerminal, which ships with Windows 95 and NT, Terminal, which ships with Windows 3.1, or Zterm for the Mac). You can use the special AT commands developed for the Pipeline 15 to configure phone connections and ISDN connections. Enter the commands directly when setting up a call, or include them in your modem settings to set up custom configurations for each connection. (See "Using AT commands," at the end of this section for examples.)

Command	**Description**
A	Answers offered call.
Ds	Dials a string of numbers.
Ds;	Returns to command mode after dialing.
DS	Dials stored number.
DL	Redials last number.
E0	Disable echo.
E1	Enable echo (default).
F255	Clears non-volatile RAM (nvram).
H	Switch hook control—disconnects an active data call.
I*n*	Return information about the unit as follows:

I0	Returns product code.
I1	Returns ROM CRC. (Always returns zero.)
I2	Test ROM CRC. (Always returns OK.)
I3	Returns firmware revision.
I4	Returns feature ability bitmap. (Always returns zero.)
I6	Returns a page of statistics on connection status.
I7	Returns the unit's serial number.
O	Returns to online mode from data mode
Q*n*	Enable/disable result codes. Used to configure the S-registers as follows:
Q0	Result codes enabled (default).
Q1	Result codes disabled.
Q2	Result codes enabled when in originate mode.
Sr=*n*	Sets S-register number.
Sr?	Reads the S-register number's configuration.
V0	Result code format: number code.
V1	Result code format: long form (default—see table below).
W*n*	Negotiation progress code format. Result code formats may be selected using S95 (see below). Note: Short form result codes are defined by the AT modem standard. ISDN short form codes must be selected.
W0	Negotiation progress messages disabled (default).
W1	Negotiation progress messages enabled. CONNECT messages show DTE speed.
W2	Do not return negotiation progress messages. CONNECT messages show DCE speed.

X0	Enable Result Number Codes 0 - 4.
X1	Enable All Result Number Codes except Busy (7).
X2	Enable All Result Number Codes.
Y0	Long space disconnect function disabled (default).
Y1	Disconnect on BREAK received from remote. Duration 1.6 sec. Send BREAK on disconnect. Duration 4 sec.
Z*n*	Resets the Pipeline and restores the nth profile. The n parameter selects a stored profile. (See S Registers for information about stored profiles.)
&C*n*	Reports the state of Receive Line Signal Detect (RLSD–signal V.24, pin 8).
&C0	Force RLSD ON (default).
&C1	Follow remote RLSD.
&C2	RLSD always on, until DISConnect received (ISDN option), until remote RLSD absent.
&D*n*	Selects Data Terminal Ready (DTR) option (signal V.24, pin 20).
&D0	Ignore DTR. (default)
&D1	Monitor DTR, DTR ON to OFF transition: enter command mode.
&D2	Monitor DTR, DTR ON to OFF transition: disconnect, and enter command mode.
&D3	Monitor DTR, DTR ON to OFF transition: disconnect.
&F*n*	Loads one of six factory profile settings into the active profile.
&F0	Hayes-compatible profile.
&F1	IBM PC compatible profile.
&F2	Macintosh software handshake compatible profile.
&F3	Macintosh hardware handshake compatible profile.
&F4	Motorola Bit Surfer compatible profile.

&F5	3-com Impact compatible profile.
&F6	Adtran Express compatible profile.
&K*n*	Local and end-to-end flow control options. (Also see \Qn commands)
&K0	Disable local flow control.
&K1	Enable RTS/CTS flow control (default).
&K2	Enable XON/XOFF flow control.
&K3	Enable RTS/CTS flow control.
&S*n*	Data Set Ready (DSR–signal V.24, pin 6) options.
&S0	DSR always ON (default).
&S1	DSR on after Data Mode.
&S2	DSR on after protocol successfully established.
&V*n*	Views the nth stored profile.
&W	Writes a subset of the parameters from the active configuration profile into nonvolatile RAM (NVRAM). The information in NVRAM is retained (even when you turn off the Pipeline) and can be recalled later using the Z command. The n parameter lets you save configurations. If you don't specify a value for n, the configuration is saved as 0. The &W command saves S registers S0, S7, S18, and S25 and saves the settings for commands E, Q, V, Y, &C, &D, &G, &S, %A, and %E.
&Y*n*	Selects a stored profile on power up.
&Y	Same as &Y0.
&Y0	Selects profile 0 (previously saved using &W0) at power on (default).
&Y1	Selects profile 1 (previously saved using &W1) at power on.
&Zi=*n*	Stores a phone number and its dial modifiers in nonvolatile RAM (NVRAM). NVRAM retains the stored number even when the Pipeline is turned off. To dial a number stored in NVRAM with the &Z command, use the DS command.

&Z0=	A valid phone number and modifiers < 20 alphanumeric characters
&Z1=	A valid phone number and modifiers < 20 alphanumeric characters
&Z2=	A valid phone number and modifiers < 20 alphanumeric characters
&Z3=	A valid phone number and modifiers < 20 alphanumeric characters
\Q*n*	Local and end-to-end flow control options. (Also see AT&Kn.)
\Q0	Disable local flow control.
\Q1	Enable XON/XOFF flow control.
\Q3	Enable RTS/CTS flow control (default).
$H	Displays help information.

S Registers

These S register commands are a subset of the AT commands created for the Pipeline. They are separated from the main set of AT commands for easy reference.

Command	**Description**
S0=*n*	Controls auto answer and rings to answer.
S0=0	Disable auto answer
S0=1	Enable auto answer
S2	Controls escape characters recognized.
S3	Controls command termination character recognized.
S4	Controls line feed character recognized.
S5	Controls back space character recognized.
S7	Controls the amount of time the originating ISDN modem will wait for RLSD from the answering ISDN modem. The default is 50 seconds, configured in 1 second intervals from 1 to 255.

S12	Controls the inter-character escape sequence timing. The default is 50 Hayes Units (HayU's) configured from 0 to 255. 255 HayU's equal 5.1 seconds.
S25	Controls the DTR guard time. The amount of time DTR must be low for a valid OFF. The default is .05 seconds, configurable in .01-second increments from 0 to 255.
S30	Controls the inactivity time before disconnect. The default is 0 (never disconnect). Configured from 0 to 255 in 10-second increments.
S42=*n*	Holds the current line status of the ISDN line, as follows:
S42=0	No Physical connection detected.
S42=1	Physical connection detected.
S42=2	ISDN Layer 2 active (meaning that the telco switch can be found).
S42=3	Multi Link established.
S42=4	End point initialization completed with telephone switch.
S43	Holds the speed at which the ISDN modem made its most recent connection.
S46=*n*	Controls data compression ON/OFF.
S46=0	No compression.
S46=2	Attempt compression. (default)
S50=*n*	Controls the switch type the Pipeline attempts to use to establish a connection.
S50=0	ATT Point-To-Point.
S50=1	ATT 5ESS Custom.
S50=2	NI-1.
S50=3	DMS-100 Custom.
S50=4	Auto-SPID (default).
S51=	Configures the first ISDN phone number (up to 20 characters).
S52=	Configures the ISDN SPID associated with the first ISDN phone number.

S53=	Configures the second ISDN phone number (up to 20 characters).
S54=	Configures the ISDN SPID associated with the second ISDN phone number.
S55=*n*	ISDN analog port phone number binding. This register selects between statically bound phone number binding and dynamic phone number binding on DMS-100 and NI-1 ISDN switches as follows:
S55=0	Dynamic phone number binding (default).
S55=1	Static phone number binding.
S56=n	Phone port 1 configuration:
S56=1	Associate ISDN phone number A with port 1.
S56=2	Associate ISDN phone number B with port 1.
S56=0	Disable phone port 1.
S57=*n*	Phone port 2 configuration:
S57=1	Associate ISDN phone number A with port 2.
S57=2	Associate ISDN phone number B with port 2.
S57=0	Disable phone port 2.
S58=*n*	Phone number usage.
S58=1	Use ISDN phone number A for data connections.
S58=2	Use ISDN phone number B for data connections.
S58=3	Use ISDN phone number A + B for data connections.
S59=*n*	Phone port 1 call type configuration:
S59=0	Speech
S59=1	Audio
S60=*n*	Phone port 2 call type configuration:
S60=0	Speech

S60=1	Audio
S61=*n*	Configures the Pipeline to allow Data Over Voice (DOV). If you provisioned one B channel for voice (which might be less expensive) you can use this setting to enable data calls over a voice line.
S61=0	Disable
S61=1	Enable
S62	Supplementary service conference ID (0 to 255). The default is 6.
S64	Supplementary service transfer ID (0 to 255). The default is 7.
S65	Supplementary service drop ID (0 to 255). The default is 8.
S66	Supplementary service hold ID (0 to 255).
S68=*n*	Sets the B channel rate as follows:
S68=56	Sets transmission to 56k.
S68=64	Sets transmission to 64k.
S71=*n*	ISDN B-channel rate adaption protocol:
S71=0	AutoSelect (default).
S71=1	Async/Sync PPP conversion.
S71=2	V.120.
S71=4	Multilink PPP (MP).
S71=8	Multilink PPP Plus (MP+ or MPP).
S73=*n*	V.120 frame type configuration:
S73=0	Iframes.
S73=1	UIframes (default).
S74=	V.120 frame size from 240-256. The default is 256 for Adtran compatibility.
S82=*n*	BREAK handling options (note that BREAK handling is protocol specific):

S82=3	BREAK is handled out of band, data integrity is ensured.
S82=7	Destructive timed BREAK.
S82=128	BREAK is handled in band, data integrity is ensured.
S86	Connection failure cause codes. See ISDN cause code table below.
S95=*n*	Negotiation message-option detail reporting when in command mode:
S95=0	Extended messages disabled (default).
S95=1	Use DCE speed when reporting CONNECT messages.
S95=2	Append /ARQ to CONNECT when EC connection is made.
S95=4	Enable CARRIER messages (POTS only)
S95=8	Enable PROTOCOL messages.
S95=32	Enable COMPRESSION.

Result codes

Result codes are visible in a terminal emulation window. The result is for information only. Result codes are not warning or error messages..

No. code	Result code	ISDN meaning
0	OK	Command OK
1	CONNECT	Connect with Far End
2	RING	Incoming Data Call
3	NO CARRIER	Call Not Completed
4	ERROR	Error in Format
5	CONNECT 1200	Connect At 1200
6	NO DIALTONE	Network Failure

No. code	Result code	ISDN meaning
7	BUSY	Far End Busy
8	NO ANSWER	No Answer (@ only)
10	CONNECT 2400	Connect At 2400
11	CONNECT 4800	Connect At 4800
12	CONNECT 9600	Connect At 9600
13	CONNECT 14400	Connect At 14400
14	CONNECT 19200	Connect At 19200
17	CONNECT 56000	Connect At 56000
18	CONNECT 57600	Connect At 57600
19	CONNECT 115200	Connect At 115200
20	CONNECT 230000	Connect At 230000
25	CONNECT 12000	Connect At 12000
28	CONNECT 38400	Connect At 38400
32	CONNECT 48000	Connect At 48000
57	CARRIER 56000	ISDN Connection is 56Kbps
59	CARRIER 64000	ISDN Connection is 64Kbps
	CARRIER 115000	ISDN Connection is 115Kbps
	CARRIER 128000	ISDN Connection is 128Kbps
	COMPRESSION:LZS	LZS Compression Enabled
	COMPRESSION:PPP	PPP Compression Enabled
	COMPRES-SION:NONE	Compression Disabled
83	PROTOCOL:V.120	V.120 Rate Adaption

No. code	Result code	ISDN meaning
	PROTOCOL:PPP	PPP Async To Sync Conversion Enabled
	PROTOCOL:BOND-ING	Bonding Enabled (mode 1)

ISDN Cause Codes

ISDN cause codes are visible when making calls in a terminal emulation window. They enable you to diagnose your ISDN service and the status of an ISDN call.

Code	Cause
0	Valid cause code not yet received
1	Unallocated (unassigned) number
2	No route to specified transit network (WAN)
3	No route to destination
4	Send special information tone
5	Misdialed trunk prefix
6	Channel unacceptable
7	Call awarded and being delivered in an established channel
8	Prefix 0 dialed but not allowed
9	Prefix 1 dialed but not allowed
10	Prefix 1 dialed but not required
11	More digits received than allowed, call is proceeding
16	Normal clearing
17	User busy
18	No user responding

19	No answer from user (user alerted)
21	Call rejected
22	Number changed
23	Reverse charging rejected
24	Call suspended
25	Call resumed
26	Non-selected user clearing
27	Destination out of order
28	Invalid number format (incomplete number)
29	Facility rejected.
30	Response to STATUS ENQUIRY
31	Normal, unspecified
33	Circuit out of order
34	No circuit/channel available
35	Destination unattainable
37	Degraded service
38	Network (WAN) out of order
39	Transit delay range cannot be achieved
40	Throughput range cannot be achieved
41	Temporary failure
42	Switching equipment congested
43	Access information discarded
44	Requested circuit channel not available

45	Pre-emptied
46	Precedence call blocked
47	Resource unavailable, unspecified
49	Quality of service unavailable
50	Requested facility not subscribed
51	Reverse charging not allowed
52	Outgoing calls barred
53	Outgoing calls barred within CUG
54	Incoming calls barred
55	Incoming calls barred within CUG
56	Call waiting not subscribed
57	Bearer capability not authorized
58	Bearer capability not presently available
63	Service or option not available, unspecified
65	Bearer service not implemented
66	Channel type not implemented
67	Transit network selection not implemented
68	Message not implemented
69	Requested facility not implemented
70	Only restricted digital information bearer capability is available
79	Service or option not implemented, unspecified
81	Invalid call reference value
82	Identified channel does not exist

83	A suspended call exists, but this call identity does not
84	Call identity in use
85	No call suspended
86	Call having the requested call identity has been cleared
87	Called user not member of CUG
88	Incompatible destination
89	Non-existent abbreviated address entry
90	Destination address missing, and direct call not subscribed
91	Invalid transit network selection (national use)
92	Invalid facility parameter
93	Mandatory information element is missing
95	Invalid message, unspecified
96	Mandatory information element is missing
97	Message type non-existent or not implemented
98	Message not compatible with call state or message type non-existent or not implemented
99	information element nonexistent or not implemented
100	Invalid information element contents
101	Message not compatible with call state
102	Recovery on timer expired
103	Parameter non-existent or not implemented, passed on
111	Protocol error, unspecified
127	Internetworking, unspecified

Using the custom AT commands

10

How to make a calling profile

To use AT commands in a terminal emulation window, open your communications software and add a connection for the Pipeline. Specify that you are directly connected to the COM port used by the Pipeline. If the software offers a data rate, accet it. Otherwise, use 9600. Then set data bits to 8, parity none, stop bits one, and flow control off (or none). Save the settings. In the terminal window, type AT and press enter. When the Pipeline responds with OK, you are ready to make or receive calls.

Answering an incoming call

To answer a call, open HyperTerminal (or your communication software). An incoming call will appear as:

```
RING RING
```

To answer the call, enter the following AT command:

```
ATA
```

To hang up a call, enter:

```
ATH
```

Storing and dialing phone numbers

To store a phone number as phone number 1, enter the following AT command:

```
AT&Z1=18005551212
```

To recall the number and dial it, enter:

```
ATDS1
```

To dial a number not stored, enter:

```
ATD18005551212
```

Saving a group of AT commands

You can enter a group of AT commands to set up a call, save the commands as a profile, and recall the profile with a single AT command. You can define u pto four profiles using the &W comand, as shown in the following example.

Example profile

Below is an example of how to set up a a call, save the settings as a profile, and reload th eprofile with a single AT command.

Function	**AT command**
Set Idle Timer to 120 seconds.	S30=120
Set the transmission rate of a data call to 64 Kbps.	S68=64
Enable flow control.	&K2

To set up the calling environemtn, start by entering AT, then type the command for each function as shown below:

ATS30=120 S68=64 &K2^M

(^M is a carriage return.) The Pipeline processes each command in the order entered. You can add additional settings as needed.

To see the current settings, including most default settings (some are hidden), enter:

AT&V

To write profile 1 with the above settings, enter:

AT&W1

To load profile 1, enter

AT&Y1

You can add &Yn to a modem definition's additional AT comands. Or use &Yn in a session or connection defined in your communications software.

Loading a profile resets the Pipeline calling environment entirely (that is, you cannot load more than one profile at a time, as each one overwrites the previous one). If you entered a profile, and need to add additional commands, enter S Register commands next, then other AT comands, and end with th enumber to dial.

Specifications

A

Power requirements

Voltage	90-130 VAC, 0.4A 47-63 Hz.
	220-240 VAC, 0.2A 47-63 Hz.
Phase	Single
Frequency	47-63 Hz
Power	11W (nominal) to 13.5W (maximum)

The Pipeline configuration profiles are stored in battery-protected memory. When the Pipeline is turned off, the profiles are not lost. Be sure to use a protected AC power source, or add surge protection between the power source and the Pipeline.

Environmental requirements

For best results, the Pipeline should be installed in a room with constant temperature and humidity. In general, cooler environments are better, and an operating temperature of 32 to 104 Fahrenheit (0 to 40 Celsius) is recommended.

Humidity should be high enough to prevent accumulation of static electricity, but low enough to prevent condensation. An operating relative humidity of up to 90% (non condensing) is acceptable. You can operate the Pipeline at altitudes of 0 to 14800 ft. (0-4500 m).

PC cable specifications

The RS-232 serial port uses a standard DB-25 female connector that conforms to the EIA RS-232 standard for serial interfaces.

DB-9 pin	Function	Description	DB-25 pin
1	DCD	Data Carrier Detect	8
2	RD	Serial Receive Data	3
3	SD	Serial Transmit Data	2
4	DTR	Data Terminal Ready	20
5	GND	Signal Ground	7
6	DSR	Data Set Ready	6
7	RTS	Request to Send	4
8	CTS	Clear to Send	5
9	RI	Ring Indicator	22
-	-	Shield	1

Macintosh cable specifications

8-pin Mini DIN	Function	Description	DB-25 pin
1	DTR	Data Terminal Ready	20, 4
2	CTS	Clear to Send	5
3	SD	Serial Transmit Data	2
4, 8	GND	Signal Ground	7
5	RD	Receive Data	3
7	DCD	Data Carrier Detect	8

Basic Rate interface

The Pipeline BRI interface is a Western Electric-type RJ-45 port. Connection between this port and the wide area network is via a non-integral, interconnecting cable/connector set. U interface cables can be up to 18000 ft (5486m) in length.

U pinouts for BRI	RJ-45 pin
transmit (output) +	3
transmit (output) -	6
transmit/receive (output) +	4
transmit/receive (output) -	5