ACCESSBUILDER 4000 ISDN BASIC RATE INTERFACE (BRI) MODULE GUIDE

Software version 6.0

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ABOUT THIS GUIDE

Introduction

This guide describes how to install, operate, and troubleshoot the 3Com AccessBuilder 4000 ISDN BRI Module. This manual is for the user who installs and manages the AccessBuilder hardware and software. It also describes conceptual information that the administrator needs to know about ISDN before installing the AccessBuilder hardware module and software.

The administrator should fill out the ISDN Configuration Worksheet before installing the software (provided in Appendix B).

If the information in the Release Notes shipped with your product differs from the information in this guide, follow the Release Notes. Be sure to read the readme.txt or Read Me files on the applicable software diskette for the latest product information.

How to Use This Guide

The following table shows where to find specific information in this guide.

If you are looking for:	Turn to:
General information about ISDN and how the AccessBuilder provides ISDN support	Chapter 1
Instructions for installing the ISDN BRI module	Chapter 2
Instructions for configuring the AccessBuilder for ISDN support of individual-to-LAN or LAN-to-LAN connections	Chapter 3
Troubleshooting tips	Chapter 4
Instructions for ordering ISDN service for your ISDN BRI Module	Appendix A
Worksheets to help you gather the information needed to complete installation of ISDN on your AccessBuilder	Appendix B

Other User Documentation	These following documents contain the information you will need to configure the AccessBuilder for ISDN.

AccessBuilder Server Documentation

Basic hardware installation steps and configuration using the Transcend AccessBuilder Manager (TABM) Windows® configuration utility are described in the following guide:

- AccessBuilder™ 4000 Installation Guide (Part no. 09-0753-000.)

The following AccessBuilder Server user documents contain useful installation, configuration, and operation information if using the command line interface:

- AccessBuilder Server Configuration Guide (Part no. 09-0751-000)
- AccessBuilder Administrator's Guide (Part no. 09-0750-000)
- AccessBuilder Command Line Interface Quick Reference (Part no. 09-0784-000)

AccessBuilder Remote Client Documentation

AccessBuilder Remote Client software documentation includes the following:

- AccessBuilder Remote Client Quick Installation Guide (Part no. 09-752-000)
- AccessBuilder Remote Client Quick Reference Card (Part no. 09-0758-000)

Conventions

Table 1 and Table 2 list conventions that are used throughout this guide.

Table 1   Notice Icons

Icon	Type	Description
	Information Note	Information notes call attention to important features or instructions.
	Caution	Cautions alert you to personal safety risk, system damage, or loss of data.
	Warning	Warnings alert you to the risk of severe personal injury.

Table 2   Text Conventions

Convention	Description
"Enter" vs. "Type"	When the word "enter" is used in this guide, it means type something, then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says "type."
Keys	When specific keys are referred to in the text, they are called out by their labels, such as "the Return key" or "the Escape key," or they may be shown as [Return] or [Esc].
	If two or more keys are to be pressed simultaneously, the keys are linked with a plus sign (+), for example:
	Press [Ctrl]+[Alt]+[Del].
Italics	*Italics* are used to denote *new terms* or *emphasis.*

1

INTRODUCTION

This chapter provides an introduction to the AccessBuilder 4000 ISDN Basic Rate Interface (BRI) module. It also provides conceptual information about the ISDN (Integrated Services Digital Network) standard defined by the ITU (International Telecommunications Union, formerly CCITT) in the "ISDN Overview" section. Further, it provides an overview of features and possible connectivity configurations supported by the AccessBuilder 4000 ISDN BRI module.

Introduction

The AccessBuilder 4000 ISDN BRI module provides support for ISDN BRI services. This plug-in module has four ports. Each port connects to one ISDN BRI line with each ISDN BRI line having two 64Kbps B-channels and one 16Kbps D-channel. The B-channels carry user information such as voice and data while the D-channel carries signalling information. Figure 1-1 shows the major components of the ISDN BRI module and the four external ports.
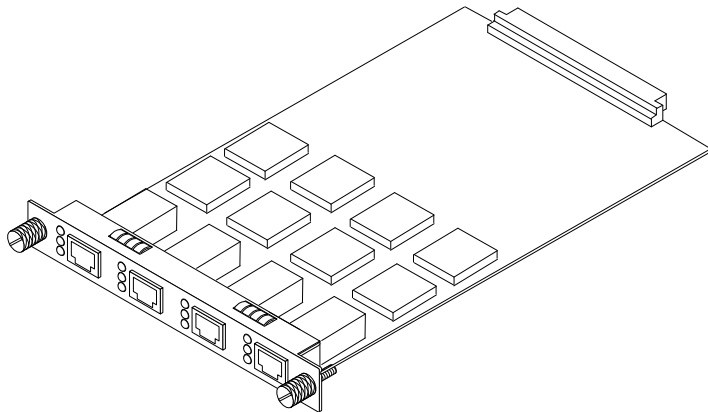
Figure 1-1   ISDN BRI Module Major Components and Ports

Figure 1-2 shows the external ports on the ISDN BRI Module.

Status LEDs
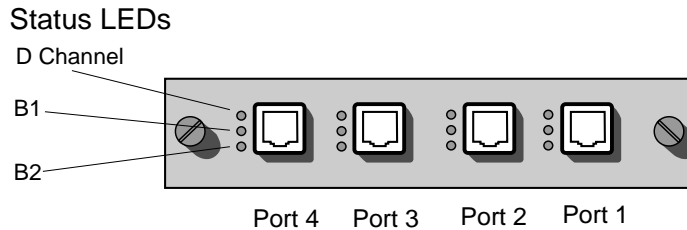
Figure 1-2   External Ports on the ISDN BRI Module

The AccessBuilder 4000 supports up to two ISDN BRI modules that interface to the ISDN network. The ISDN BRI modules can installed in either Slot 1, or Slot 2, or both. The ISDN BRI module is available with an S/T interface (primarily used for countries outside of the United States) or a U interface (for countries in North America including the United States and Canada.)

The AccessBuilder 4000 ISDN Server software features the following:

- Individual-to-LAN connectivity
- LAN-to-LAN connectivity
- Automatic detection of the S/T or U interface at startup
- Support of multiple switch types (ATT5ess, NI1, DMS100, INS64, VN3, and NET3)
- ISDN Certification in many countries (see the Release Notes for a list of the current ISDN certifications)
- Support of synchronous (raw) and V.120 encapsulation protocol modes

In addition, to the above listed features, the ISDN BRI module can be configured with the following:

- Basic ISDN features (PPP Multilink and Caller ID security)
- Advanced ISDN features (Dial-on-Demand (Spoofing), Bandwidth-on-Demand, and data compression)

Advanced ISDN features can be configured in individual-to-LAN configurations only if the 3Com Impact ISDN ISA adapter is installed in the remote client and in LAN-to-LAN configurations only if connecting to a remote AccessBuilder 4000 with ISDN.

For a description of these features and how to configure them, see Chapter 3 "Configuration."

ISDN Overview

ISDN provides digital connectivity and supports integrated voice, data, imaging, and other services. ISDN also defines an internationally standardized user-network interface that can provide connectivity to a wide range of network features and services. Figure 1-3 shows the type of equipment that can connect a customer site to ISDN services and the relevant CCITT Physical Interface Reference Points.
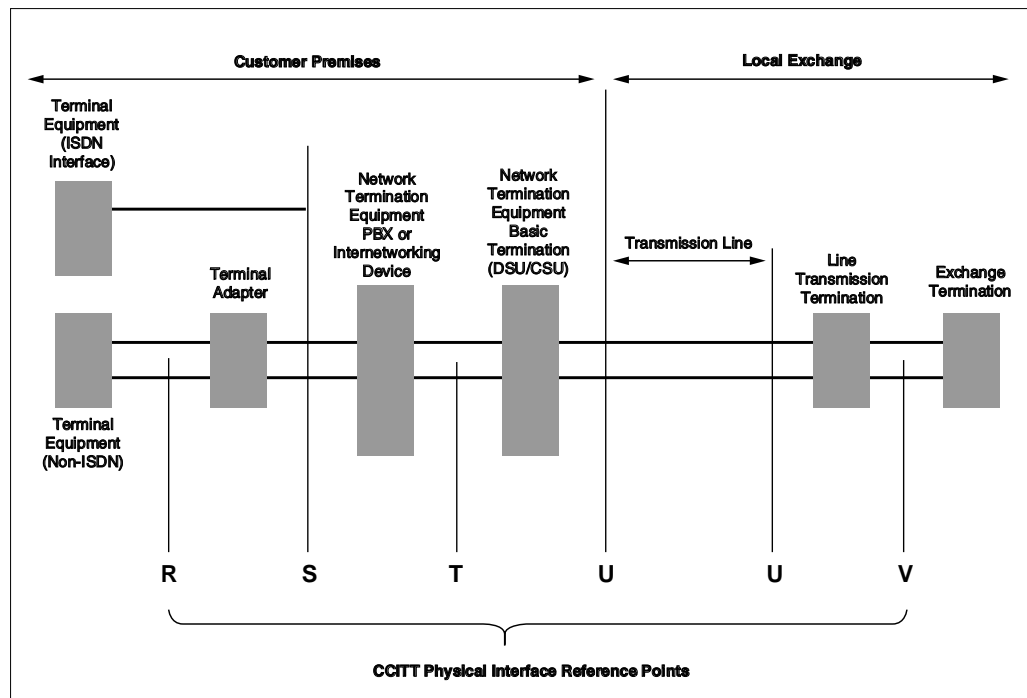
Figure 1-3   CCITT Physical Reference Points When Connecting to ISDN

i *The S and T reference points are part of the local exchange outside of North America.*

ISDN Equipment The CCITT physical reference points shown in Figure 1-3 are implemented by means of various ISDN equipment as follows:

- A Terminal Adapter (TA) is a device which provides the interface between reference points R and S. It connects a non-ISDN device to the ISDN line and converts the data into a format that is suitable for transmission over the ISDN network. TAs can provide an S/T or U interface. If the TA provides an S/T interface, an NT1 (Network Termination Equipment) device is required. If the TA provides a U interface, the TA has a built in NT1. In addition, a TA can be a standalone physical device or an internal device.

- A Network Termination Equipment (NT1) is device which provides the interface between reference points S/T, and U. It provides the interface between the two-wired twisted pairs used by telephone companies in their ISDN BRI network and an end-user's four-wire terminal equipment.

  The NT1 also supplies power for the terminal equipment if necessary.

i *The AccessBuilder ISDN BRI module that provides an S/T interface (3C7540) requires that the NT1 provide phantom power when used outside of North America.*

  The NT1 is usually a device with LEDs, which can be fastened to the wall. If you are using a large number of ISDN lines, racks that hold many NT1s with a built in power supply are available.

- Terminal equipment are devices which provide an interface to the S/T reference points. The AccessBuilder 4000 ISDN BRI module is an example of this type of equipment. This module can also provide a built-in NT1 extending its implementation to include reference point U. The ISDN BRI module is available with an S/T or U interface.

ISDN BRI Channels   The interface to the ISDN line is channelized to allow for varying types of information as well as varying levels of usage. The following types of channels are provided by the BRI:

- Two B-channels that operate at 64 Kbps each. These channels carry circuit-switched information, such as voice, data, fax, and video.

- A D-channel that operates at 16 Kbps. It carries packetized signalling information to control call setup and teardown. The D-channel can also carry packet-switched data.

The BRI channels are packaged as shown in Figure 1-4.

2B Voice or Data Channels   **(64 Kbps)**

1D Signaling/Control Channel   **(16 Kbps)**

Basic Rate Interface (BRI)
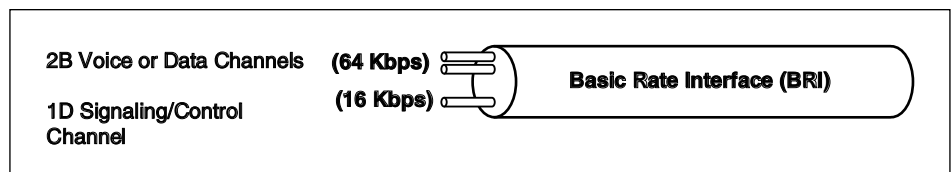
Figure 1-4   BRI Channels

BRI can support up to eight terminal equipment (TE) devices on the same line. This means that each device has one directory number (phone number) and you can have up to as many as eight ISDN devices hooked up to the same ISDN line. This type of configuration is called multipoint. If you have one ISDN device hooked up to an ISDN line, this type of configuration is called point-to-point.

Whether you are using point-to-point or multipoint, each B-channel is allocated to a specific TE device for the duration of the call.

Most switch types offered by phone companies provide only multipoint. However, some phone companies require that you request either point-to-point or multipoint. Ask whether your phone company has such a requirement. If your phone company offers only lines configured with multipoint, it is possible and very common to have only one device attached to an ISDN line. Using a multipoint line in this way, is effectively using that ISDN line in a point-to-point configuration.

Possible Applications of ISDN

ISDN can have several applications. Among the possible applications of ISDN are the following:

Integrated voice and data, which provides the physical convenience of a common distribution media and a single plug in the wall, allows the two information types to combine to provide high function telephones and electronic directories, or voice-annotated electronic mail.

Resource sharing which provides high speed connectivity for LAN-to-LAN and individual-to-LAN connections. Bridges and routers with ISDN interfaces can effectively use the fast dialing capabilities of ISDN to transfer data from LAN-connected client workstations to servers at remote sites, and vice versa. Resource sharing over ISDN lines can cut transmission costs and increase response time.

ISDN Service Offerings

Your configuration needs depend on the ISDN service provided by the phone company in your country. In most countries, such as Japan, Europe (including Germany, and France, etc.) the phone company offers end users an S/T interface. This means that although an NT1 is in the configuration, it is transparent to the end user; the NT1 is fully maintained by the phone company.

In North America (United States and Canada), the phone company offers end users a U interface. The end user must either purchase ISDN equipment that offers a U interface such as the AccessBuilder 4000 ISDN BRI Module or purchase NT1s for equipment that offers an S/T interface.

Supported Connectivity Configurations	The AccessBuilder 4000 ISDN BRI module supports configurations using ISDN for Individual-to-LAN and LAN-to-LAN connectivity. This section describes the possible configurations.

Individual-to-LAN Connectivity	For individual-to-LAN connections, the ISDN AccessBuilder setup is made up of an AccessBuilder 4000 and a remote client (PC, Macintosh, or UNIX workstation) having ISDN access. The remote client can access the AccessBuilder 4000 with the AccessBuilder 4000 ISDN BRI module installed by means of an ISDN TA (for example, 3Com Impact ISDN External Digital Modem) or an internal ISDN adapter (for example, the 3Com Impact ISDN ISA Adapter.)

A TA interfaces to the serial interface of the remote client. The TA can be either internal or external to the remote client and can provide an S/T or U interface. An ISDN adapter interfaces to the PC bus. An ISDN adapter is always internal to the remote client and can also provide an S/T or U interface.

If the TA or adapter provides an S/T interface, the TA or adapter does not contain a built-in NT1 and the configuration to the ISDN line must contain a separate NT1 device.

If the TA or adapter provides a U interface, the TA or adapter has a built-in NT1 device and the configuration to the ISDN line does not contain a separate NT1 device.

Figures 1-5 and 1-6 show the possible configurations for Individual-to-LAN connectivity.
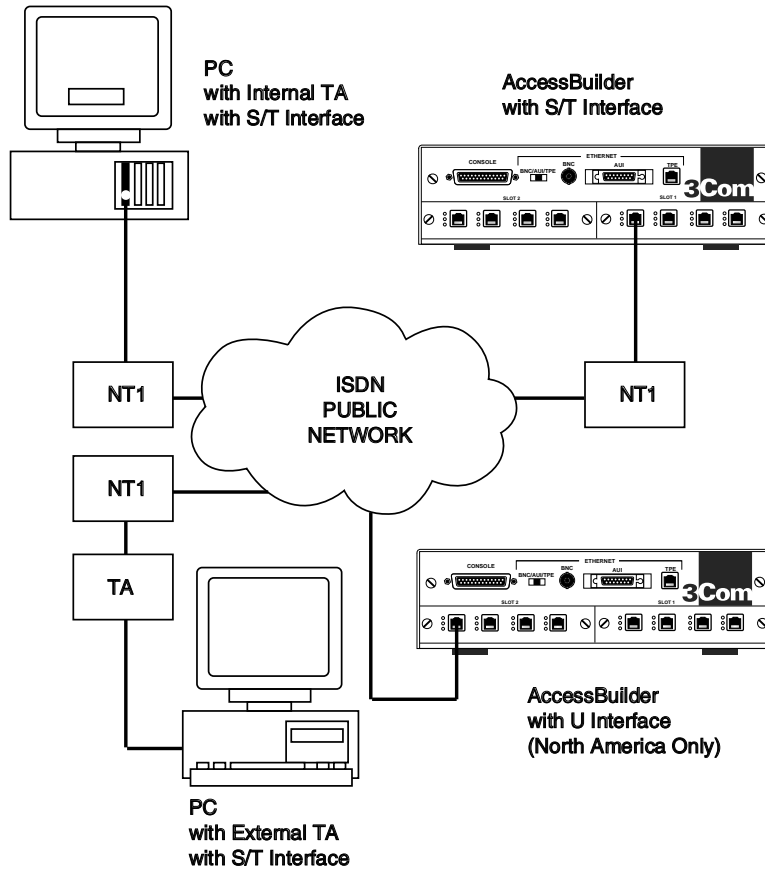
Figure 1-5   Supported TA Configurations for Individual-to-LAN ISDN Connectivity
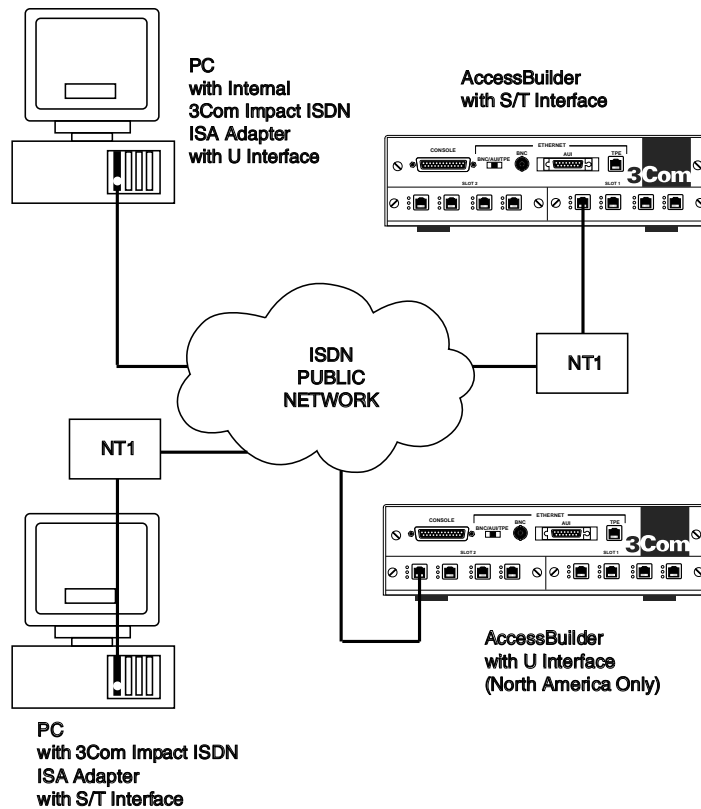
Figure 1-6 Supported ISDN ISA Adapter Configurations for Individual-to-LAN ISDN Connectivity

LAN-to-LAN Connectivity

For LAN-to-LAN connections, the ISDN AccessBuilder setup is made up of two AccessBuilder 4000s each having ISDN access. Each AccessBuilder 4000 has at least one AccessBuilder 4000 ISDN BRI module installed. The ISDN BRI module is available with an S/T or U interface.

If the ISDN BRI module provides an S/T interface, the module does not contain a built-in NT1 and the configuration to the ISDN line must contain a separate NT1 device.

If the ISDN BRI module provides a U interface, the module contains a built-in NT1 and the configuration to the ISDN line does not contain a separate NT1 device.

Figure 1-7 shows some of the possible configurations for LAN-to-LAN connectivity.
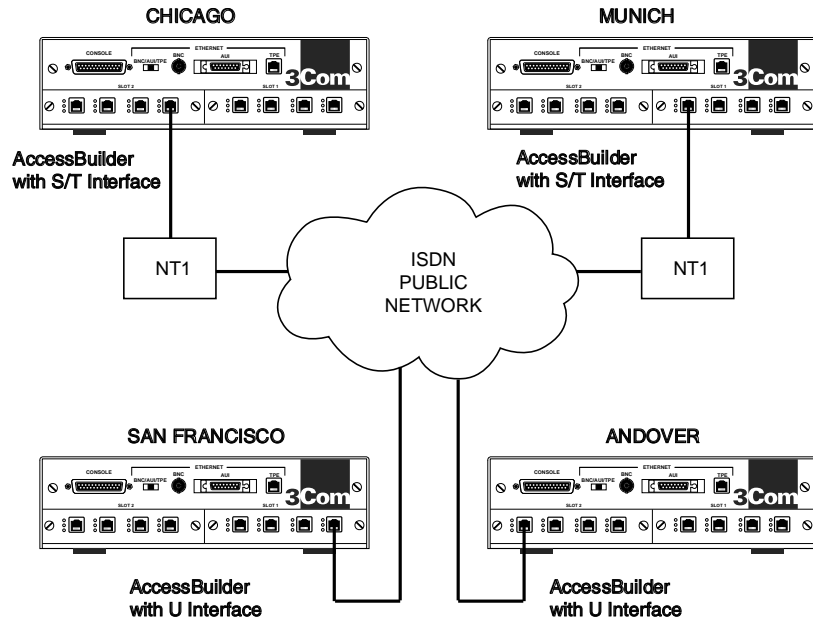
Figure 1-7   Supported Configurations for LAN-to-LAN Connectivity

2

INSTALLATION

This chapter describes the software requirements, hardware requirements and the installation process for getting your AccessBuilder 4000 with the ISDN BRI Module up and running and ready to configure.

Software Requirements

To use ISDN services on the AccessBuilder 4000, you must have the following software:

- AccessBuilder Server Software Version 6.0 or later
- Transcend AccessBuilder Manager Version 3.0 or later

If you have recently purchased a new AccessBuilder 4000 ISDN, Version 6.0 or later of the server software is preloaded in the internal flash memory; you will not need to install the software. However, backup diskettes containing the server software are provided for your convenience. In addition, the Transcend AccessBuilder Manager (TABM) , a GUI-based configuration utility is included on two separate diskettes.

If you are upgrading to Software Version 6.0 or later, you will need to upgrade your server. For complete upgrade instructions, refer to the documentation supplied with the AccessBuilder 4000 upgrade kit.

Hardware Requirements

To use ISDN services on the AccessBuilder 4000, you must have the following hardware:

- AccessBuilder 4000
- AccessBuilder 4000 ISDN BRI module
- ISDN BRI line services from your phone company
- Optionally, an NT1 device, if you have an S/T interface (phone companies outside North America provide this device to end users)

Installing ISDN Support onto the AccessBuilder

Installing ISDN support onto the AccessBuilder 4000 is an easy process. The basic steps for installing ISDN on an AccessBuilder are as follows:

1 Order ISDN services

2 Install the ISDN BRI module into your AccessBuilder

3 Connect the cables to the ISDN BRI module(s)

Once you have completed the installation process, you can configure the AccessBuilder ISDN software to meet your needs. See Chapter 3, "Configuration."

For details on these installation steps, continue reading.

Ordering ISDN Services   Before installing the AccessBuilder ISDN BRI module, you must have ISDN phone lines installed at the server location.

Ordering in North America

In North America, order ISDN services from the phone company as follows:

1 Call the telephone company and ask for the ISDN representative.

2 Tell the representative that you want to place an order for ISDN service for a 3Com AccessBuilder 4000 ISDN BRI Module and that you have line provisioning and ISDN outlet type information that the phone company requires.

3 If you are ordering in the United States, give the representative the 3Com AccessBuilder 4000 ISDN BRI Module product Bellcore code name **3ComA *J6**.

> *If you are ordering in Canada or your phone company does not know the **3ComA *J6** ordering code, you will need to see the ordering information detailed in Appendix A.*

4 Ask the representative which ISDN switch type your ISDN line will be using.

5 Ask the ISDN representative to provide information you need to fill out the ISDN Information Sheet in Appendix A.

For detailed information about filling out the ISDN Information Sheet and about the ISDN switch types, See Appendix A.

Proceed to the next section "Installing the ISDN BRI module" .

Ordering Outside of North America

In countries other than the United States and Canada, order ISDN services from the phone company as follows:

1 Call the telephone company.

2 Tell the representative that you want to place an order for ISDN service for a 3Com AccessBuilder 4000 ISDN BRI Module.

3 Ask the representative which ISDN switch type your ISDN line will be using. The AccessBuilder supports the following switch types:

- INS 64 (Japan)
- NET3 (Europe, if in Germany specify multipoint only)
- VN3 (France)
- All other countries support Euro ISDN, if given a choice select NET3.

i *You will not need SPID and Directory numbers outside North America.*

Proceed to "Installing the ISDN BRI module" section

Installing the ISDN BRI Module

You can install the ISDN BRI module in Slot 1, Slot 2, or both located below the main processor board on the AccessBuilder 4000.

The installation procedures for all cards is basically the same and involves these steps:

1 Installing

2 Connecting

Installing

To install an ISDN BRI module do the following:

1 Remove the module from its antistatic bag.

Do not touch pins, leads, or solder connections on the card. Handle the module by the edges only.

2 Inspect the module for shipping damage.

If you find any damage, contact the shipping company to file a report. If the module must be returned to the factory, ship it in the original shipping carton and antistatic bag. If the original carton was damaged in shipment, repack the module in a carton that provides equivalent protection.

3 If you have not already done so, write down the serial number shown on the component side of the module. You will need this information if you have to contact your supplier for a replacement.

4 If you will be using the AccessBuilder 4000 with the ISDN BRI S/T module, check that only one device on the line has termination resistance.

Whether using a multipoint or point-to-point configuration, only one device on the ISDN line can provide termination resistance. A multipoint configuration means that you are connecting more than one device to a single ISDN line. For example, if you are connecting an AccessBuilder ISDN BRI Module and an ISDN telephone to the same ISDN line you have a multipoint configuration. A point-to-point configuration means that only one device is connected to the ISDN line.

If the ISDN BRI module will be the device providing the termination resistance for the ISDN line in a multipoint configuration, you must keep the jumpers capped. If another device on the ISDN line is providing the termination resistance, you must remove the jumpers.

Jumpers are present only on the ISDN BRI module (3C7540) that provides an S/T interface.

The factory default for all the ports on the ISDN BRI module with an S/T interface is that the jumpers are capped. The jumper pairs are JP13-14, JP3-4, JP7-8, JP11-12.

Figure 2-1 shows an ISDN BRI module that provides an S/T interface.
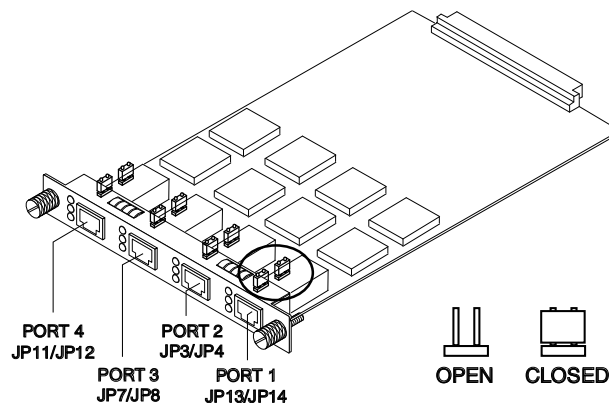
Figure 2-1   ISDN BRI Module (3C7540) with S/T interface and Jumpers

To remove the jumper cap, gently grasp the jumper and pull upward until the jumper disengages from the module. Store the jumper in a safe place in the event you wish to change the configuration of your installation.

5 Select a slot for the I/O card, either slot 1 or 2.

6 Remove the face plate from the slot you have selected.

To remove the plate, loosen the captive screws and slide the face plate away from the slot, as shown in Figure 2-2.
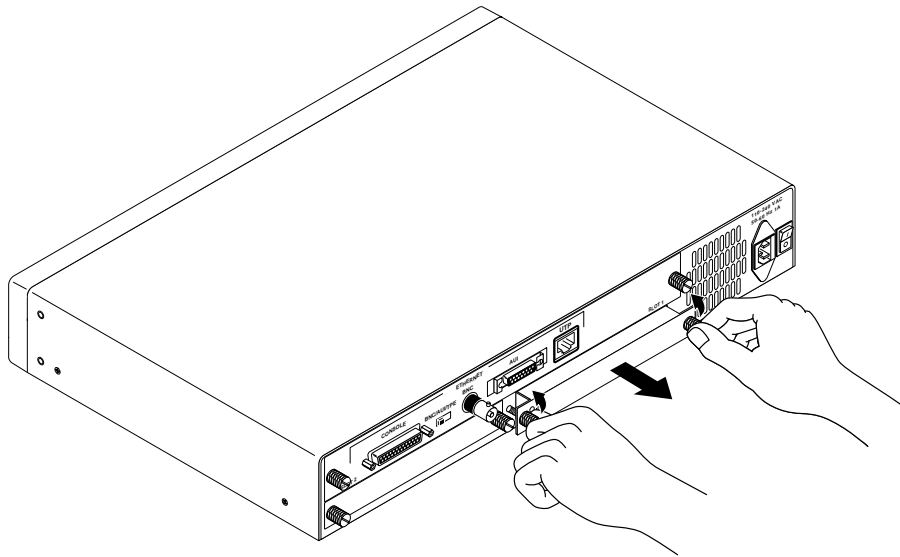
Figure 2-2   Removing a Face Plate

Only remove the face plate from the slot you are planning to use. All unused slots must have the face plate installed to maintain proper cooling of the unit and regulatory compliance. Failure to cover open slots can result in overheating and void the warranty.

7 Insert the ISDN module into the uncovered slot as follows:

   a With the connector end toward the backplane and the module panel facing you, grasp the left and right sides of the back panel and fit the module into the module guides in the slot opening.

   The module fits in only one way, the labels on the back panel should be right side up.

   b Slide the module into the chassis until the module engages the backplane connectors.

   c Secure the module in the slot by tightening the captive screws as shown in Figure 2-2.

   A solid connection of the module to the chassis is required for proper operation, but the screws should not be used to force the card into place.

> *If the resistance is too great as you slide the module into position, it may mean that the module and backplane connectors are not aligned. Forcing the module can cause damage. If necessary, remove and reinsert the module, making sure the module is properly aligned in the module guides.*

8 Check that the face of the newly inserted module is flush with the AccessBuilder chassis and is aligned with the adjacent slot.

Once the module is inserted and secured in the slot, you are ready to attach the external cables as shown in Figure 2-3.

Connecting the Cables to the Module

Connect each port to its respective ISDN line.

In North America, you should have ordered the ISDN BRI module that provides a U type ISDN interface because phone companies in North America provide a U type ISDN interface to end users.

> *For ISDN BRI modules providing a U type interface, an internal NT1 is built into the module. Do not connect the ISDN port to a standard analog telephone jack or to an external NT1 device. Connect the ISDN BRI module to the ISDN wall jack using the RJ-45 cables provided with your module.*
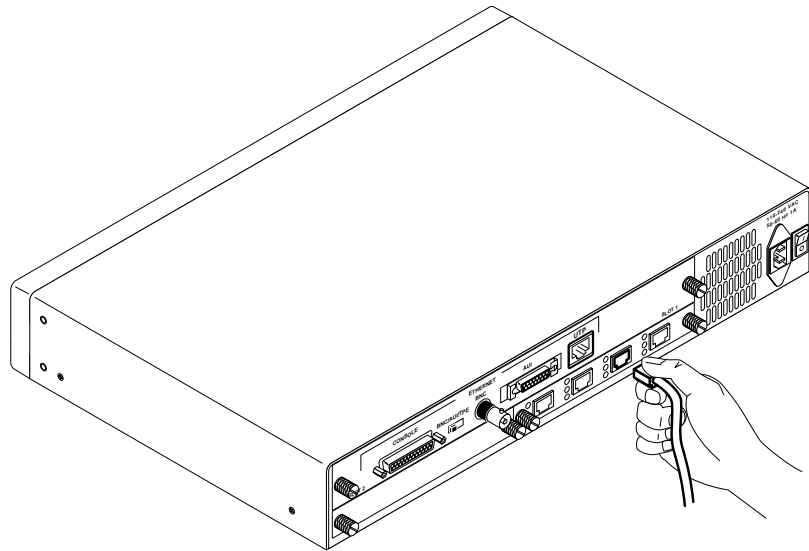
Figure 2-3   Attaching the ISDN Line

Selecting the U Type ISDN BRI Module is recommended in North America because you will not be required to purchase and maintain a separate an NT1 device. If however, you have ordered the ISDN BRI module that provides an S/T interface, you will need to provide and maintain an NT1 device.

Phone companies outside North America provide an S/T interface to end users. However, they also provide and maintain the NT1 device transparently to the user. You do not need to be concerned about ordering or maintaining an NT1 device. Connect the ISDN BRI module to the ISDN wall jack using the RJ-45 cables provided with your module.

You can now configure the AccessBuilder. Proceed to Chapter 3, "Configuration."

3

CONFIGURATION

About Configuration

There are two ways to configure your AccessBuilder 4000. You can use the Transcend AccessBuilder Manager (TABM) to perform your ISDN configuration by selecting from menus and buttons, or you can type commands at the AccessBuilder's command line. This chapter only describes the configuration using TABM.

For information about configuring the server using TABM, see TABM on-line help. For information about how to install TABM and the on-line help, see the *AccessBuilder 4000 Installation Guide*. For information about configuring the AccessBuilder 4000 using the command line interface, see the *AccessBuilder Server Configuration Guide* which can be ordered through your 3Com reseller.

For all ISDN connections, you need to complete the basic configuration steps. If your AccessBuilder 4000 will be communicating with another AccessBuilder 4000 (LAN-to-LAN operation) or a client using the 3Com Impact ISDN Adapter, you can configure advanced features like bandwidth-on-demand, dial-on-demand (spoofing), or data compression.

3Com provides ISDN internal adapters and Terminal Adapters (TAs). The internal adapter is the 3Com Impact ISDN ISA Adapter (3C862). For information about installing, configuring and troubleshooting the 3C862, refer to the *3Com Impact ISDN ISA Adapter User Guide*. The external TAs are the 3Com Impact ISDN External Digital Modem (for PC or Macintosh). For information about the external TAs, refer to the *3Com Impact ISDN External Digital Modem User Guide*.

For information on setting up third-party TAs or adapters, refer to the documentation provided by your supplier.

Basic Configuration

For all ISDN communications you need to configure the ports on the AccessBuilder server and make sure the device is set up correctly on the remote client or server. Basic configuration includes configuring the following:

- AccessBuilder ISDN ports
- Idle Timer
- PPP Multilink
- Caller ID security

i *The PPP Multilink feature is not configured by the administrator. An AccessBuilder 4000 running Server Software Version 6.0 or later always supports PPP Multilink. However, information about the protocol is provided in the "Configuring PPP Multilink" section later in this chapter.*

After completing basic configuration or at least configuring ISDN ports, test the line. See Chapter 4, "Troubleshooting" for information.

Configuring AccessBuilder ISDN Ports

Use TABM's ISDN Port Configuration Dialog box to configure the AccessBuilder ISDN BRI ports. Because each physical ISDN line can support up to two devices on the AccessBuilder (one per B channel), this dialog box allows you to configure two separate channels. Note that the information does not correspond to particular B channels for that line.

Appendix B provides worksheets that are a convenient way to collect and organize all necessary prerequisite information before beginning the installation and configuration.

To configure an ISDN port on the AccessBuilder 4000 using TABM:

1 From the Single Server View Configuration menu, choose ISDN Configuration>ISDN Port.

The ISDN Port dialog box appears.

2 Select the Incoming Baud Rate. Note that this parameter applies to all the ISDN ports on the AccessBuilder, not just the port you are configuring. If you set the incoming baud rate to Auto, the AccessBuilder will detect the incoming baud rate. Auto is the default and is recommended.

Baud rate depends on the location of both parties. Ask your ISDN provider what baud rate your ISDN line supports (typically 64 Kbps).

3 In the Port Name scroll list at the bottom of this dialog box, select the port you want to configure. Any current settings for that port will be shown in the dialog box.

4 Select the Protocol Mode to be used for the remote connection. Select raw mode if you are setting up an ISDN LAN-to-LAN connection or if the remote client will be dialing in through an internal ISDN card such as the 3Com Impact ISDN ISA Adapter. In most cases, you should select V.120 if the remote access client will be dialing in from a terminal adapter. However, some TAs support synchronous (raw) mode. Refer to your client documentation to determine the protocol mode it supports.

> *V.120 is used mainly in North America.*

5 Select the Switch Type. Your service provider should tell you which switch type is being used to dial in. You can select from AT&T 5ESS, DMS100, NI1, INS64, VN3, and NET3.

> *If you are connected to an NI1 line, select NI1 as your switch type, regardless of the manufacturer of the switch (Siemens, AT&T, or Northern Telecom). For example, if your switch type is Northern Telecom's DMS100, you will select NI1.*

6 In North America, enter the SPID and Local Directory Number for each channel, if necessary. These numbers are provided by your phone company.

> *If your phone company uses an NI1 switch type, you must append a Terminal Identifier (TID) to the SPID number. Be sure to get the TID from your phone company when ordering in North America. FOr example if your SPID is 4085551212 and your TID is 00, the number provided to you will be 408555121200.*

7 Enter the Local Subaddress for each channel, if any. A subaddress is a unique local address used to identify devices on a single ISDN line; these addresses can be assigned by the local user. Local subaddresses are typically used outside of North America.

8 Enter the Access Type for each channel. Select Auto for individual-to-LAN configurations. Select Router for LAN-to-LAN use.

9 Click the Change button to save the changes you have made to the port.

10 Click Apply to apply the changes you have made to the port. Continue configuring the rest of the ISDN ports on the AccessBuilder repeating steps 1 through 10 for each port.

11 When you have finished configuring the ports, click OK.

You must reboot the server for these settings to take effect. See TABM on-line help for function information.

After configuring ISDN ports, test the line. See Chapter 4, "Troubleshooting" for information.

Configuring Idle Timer   The AccessBuilder provides a mechanism by which an idle timer can be defined. The purpose of this idle timer is to allow the administrator to define the amount of idle time that the AccessBuilder is to permit on an individual-to-LAN or LAN-to-LAN connection before tearing down the connection. If the dial-on-demand (spoofing) feature is configured, this timer is used to trigger spoofing of the connection. For details about the dial-on-demand feature, see "Configuring Dial-On-Demand" later in this chapter.

Procedure for Configuring the Individual-to-LAN Idle Timer

To configure the Idle Timer for individual-to-LAN configurations follow these steps:

1 On the AccessBuilder, from the Single Server View System menu, choose System Parameters.

The System Parameters dialog box appears.

2 Enter a Remote Access Client Idle Time. The default is five minutes.

3 Click OK.

4 Reboot the server for the changes to take effect.

Procedure for Configuring the LAN-to-LAN Idle Timer

To configure the Idle Timer for LAN-to-LAN configurations follow these steps:

1 On the AccessBuilder, from the Single Server View System menu, choose System Parameters.

The System Parameters dialog box appears:

2 Enter a LAN-to-LAN Router Idle Time to define how long a connection is torn down. The default is 5 minutes

3 Click OK.

4 Reboot the server for the changes to take effect.

Configuring PPP Multilink

The supported implementation of the PPP Multilink protocol over multiple links conforms to Internet Engineering Task Force (IETF) RFC 1717. PPP Multilink allows multiple links to be treated as one logical link providing additional bandwidth for the logical link. Multilink is supported for both individual-to-LAN and LAN-to-LAN configurations.

ℹ️ *The PPP Multilink feature is not configured by the administrator. An AccessBuilder 4000 running Server Software Version 6.0 or later always supports PPP Multilink. PPP Multilink is negotiated by the two ends of the connection. Both must support PPP Multilink for the feature to be used*

If two AccessBuilder 4000 ISDN servers are connected in a LAN-to-LAN configuration, both must be running server software Version 6.0 or later. Server software prior to Version 6.0 do not support PPP Multilink. Therefore, multiple links are not supported. However, single link connections maintain backward compatibility.

If an AccessBuilder 4000 ISDN server running Version 6.0 software is connected to a remote client in an individual-to-LAN configuration, the AccessBuilder 4000 although it always supports PPP Multilink, will not use this feature unless the remote client also supports it and negotiates with the AccessBuilder to use it. Some clients may require that PPP Multilink be enabled by the administrator. Refer to your client documentation to determine how PPP Multilink feature is supported on your client.

Also, binding multiple links across system boundaries is not supported.

Configuring Caller ID Security (Optional)

Remote connections made to the local AccessBuilder 4000 through an ISDN port are subject to a variety of authentication methods. The one specific to ISDN is Caller ID security.

Caller ID security is beneficial to the user in that the remote caller's calling information is sent over the D-channel. The incoming Caller ID can be used to determine whether the ISDN BRI Module should accept or reject the incoming call before the call is picked up. Caller ID is recommended only as the first line security method with other security mechanisms in place such as name, and password.

The availability of Caller IDs for residential phones depends on the capabilities of the local phone network and any legislation allowing or disallowing Caller ID. You should contact your local telephone company for more information on Caller ID availability.

The Caller ID represents a user who has permission to access the AccessBuilder through an ISDN connection. The Caller ID table maintained by the AccessBuilder 4000 contains a maximum of 512 entries. If the Caller ID security feature is enabled, the AccessBuilder will check that the Caller ID of the incoming call is in the Caller ID table.

The call will be accepted under any of the following circumstances:

- If no caller ID information is present in the incoming call
- If no entries exist in the Caller ID table
- If entries exist in the Caller ID table and the Caller ID information in the incoming call matches information maintained in the table.
- If the Caller ID Enabled box is not checked

The call will be rejected if the Caller ID feature is enabled, and the incoming caller ID is not in the table.

Once the call is accepted based on the Caller ID, the session will be subject to the other security mechanisms that are in place before allowing the session to be connected to the network.

Procedure for Configuring Caller ID Security

To configure Caller ID Security follow these steps:

1 Display the ISDN Caller ID Table dialog box.

2 Check the Caller ID Check Enabled box if you want to enable Caller ID checking on the AccessBuilder.

3 Add any new callers to the Caller ID table.

    a Type the number the remote user's Caller ID in the Caller ID field.

    b Type a description for example, name or location (up to 10 characters long) of the Caller ID in the Comments field to help identify the user.

    c Click Add to add the information in the Caller ID information area to the caller ID table. (You can have up to 512 users in the caller ID table.)

4 Click Apply to apply the changes to the AccessBuilder.

You can also delete or change the entry displayed in the caller ID information area. To change an already added entry, select it in the scroll list, then click the appropriate button. After finishing your changes, click the Apply button to apply the changes to the AccessBuilder.

Configuring Advanced Features

These advanced features only apply if you are using the 3Com Impact ISDN ISA Adapter for Individual-to-LAN connectivity or two AccessBuilders for LAN-to-LAN connectivity.

These advanced features can only be configured once you have successfully installed the ISDN BRI module and have completed the basic configuration described in the "Basic Configuration" section above.

Refer to the *3Com Impact ISDN ISA Adapter User Guide* for configuration information specific to that adapter.

The advanced features available include the following:

- Bandwidth-on-demand
- Dial-on-Demand (spoofing)
- Data Compression

Before you perform any of the following types of configuration, make sure you have configured the ISDN ports using the ISDN Ports dialog box.

Configuring Bandwidth on Demand

The ISDN BRI Module supports bandwidth-on-demand (BoD) for both the individual-to-LAN and LAN-to-LAN connections between to AccessBuilder servers. Two or more ISDN channels must exist for this feature to be put into effect. Both sides must support PPP Multilink, see "Configuring PPP Multilink" for more information.

Bandwidth-on-demand for ISDN connections dynamically determines if one or two links are required, based on bandwidth, for a remote client.

Support for dynamic bandwidth allocation is negotiated at connect time between the two ends of the connection. Because of this, it is very important that both ends be properly configured. The client in these situations can be another AccessBuilder or the 3Com Impact ISDN ISA.

The high link utilization threshold defines the percentage of the link capacity that must be in use before the AccessBuilder software requests another link to service this traffic. The low utilization threshold defines the percentage of link capacity that must be in use before a link will be torn down by the AccessBuilder.

In this implementation, the AccessBuilder monitors the link to determine link utilization. If the Access Builder determines that a link must be brought up because the high link utilization threshold has been exceeded, the AccessBuilder sends a request to the client. The client then brings up another link.

If the AccessBuilder determines that a link must be torn down because the link utilization has dropped below the low link utilization threshold, the AccessBuilder sends a message to the client that the link will be torn down. When the client returns an acknowledgment, the AccessBuilder tears down the link.

Procedure for Configuring BoD for Individual-to-LAN

To configure the AccessBuilder for individual-to-LAN bandwidth on demand follow these steps:

1 On the AccessBuilder, from the Single Server View System menu, choose System Parameters.

The System Parameters dialog box appears.

2 Enter a Link Utilization High threshold and a Link Utilization Low Threshold. The default 80% for the Link Utilization High threshold is and 20% for the Link Utilization Low threshold.

i *These thresholds apply to both Individual-to-LAN and LAN-to-LAN connections supported by the AccessBuilder 4000.*

3 Click OK.

4 Reboot the server for the changes to take effect.

On the 3Com Impact ISDN ISA Adapter client

1 Select a transmission rate.

Note that if the remote client selects a transmission rate of 128K, each session will use both B-channels, regardless of bandwidth demands. This means that dynamic bandwidth allocation will be effectively disabled, since an additional B-channel cannot be brought up or torn down.

2 Enable Bandwidth on Demand.

3 Select an encapsulation type.

For dynamic bandwidth allocation, the remote client should choose PPP Multilink encapsulation. Multilink is the mechanism that combines multiple links into one logical link.

i *If the remote client is not properly configured, BoD may not function as expected. Both ends of the connection must agree to support BoD.*

Procedure for Configuring BoD for LAN-to-LAN

To configure the AccessBuilder for LAN-to-LAN multilink and bandwidth-on-demand follow these steps:

> *PPP Multilink will be negotiated by the two ends of the connection. Both must support PPP Multilink.*

1 On the AccessBuilder, from the Single Server View System menu, choose System Parameters.

The System Parameters dialog box appears.

2 Enter a Link Utilization High threshold and a Link Utilization Low Threshold. The default 80% for the Link Utilization High threshold is and 20%for the Link Utilization Low threshold.

> *These thresholds apply to both Individual-to-LAN and LAN-to-LAN connections supported by the AccessBuilder 4000.*

3 Click OK.

4 You must reset the server for these changes to take effect.

**Configuring
Dial-on-Demand
(Spoofing)**

Dial-on-demand (spoofing) is supported for IP and IPX in individual-to-LAN configurations and IPX for LAN-to-LAN configurations. Spoofing allows the AccessBuilder to keep a logical ISDN line open while temporarily tearing down the physical link.The spoofing function saves on remote user line connection charges by disconnecting the remote users call during periods of inactivity, even though the remote user appears to maintain a logical connection to the LAN.

In typical client-server environments, when a connection between a server and client is idle, packets are often sent between network nodes. In a LAN-only environment, these packets do not cause a problem. But when used across a WAN link, such as ISDN (where line charges are the most significant cost in providing a remote connection), these packets can significantly increase the costs of operating a network. "Spoofing" is a method of responding locally to these "keep-alive" packets, thereby minimizing WAN costs.

The AccessBuilder 4000 monitors traffic on the link and is able to distinguish data packets from keep-alive packets. When no data traffic, that is, traffic other than keep-alive packets, is present on the link for a time greater than the defined Idle Timer, the link is torn down. The AccessBuilder begins to "spoof" the network by generating keep-alive packets to the network resource. When the client attempts to access a remote network resource, the physical link is immediately brought back up and the AccessBuilder automatically restores the connection. For information about setting the Idle Timer see "Configuring Idle Timer" in this chapter in the "Basic Configuration" section.

By default, spoofing is enabled on the AccessBuilder, and disabled on the 3Com Impact ISDN ISA Adapter. Spoofing on the AccessBuilder can be disabled by setting the Spoofing time to 0 (in the System Parameters dialog box).

For individual-to-LAN connections spoofing is controlled by two parameters: **RAsIdleTime** and **RAsSpoofTime**. For LAN-to-LAN connections, the parameters are: **RouterIdleTime** and **RouterSpoofTime** for LAN-to-LAN connections. These parameters are set on both the remote side and the AccessBuilder side.

The idle timer determines how long the connection can be idle (that is, no traffic being passed between the client and the AccessBuilder) before the link will be torn down. This timer triggers spoofing. The spoofing time determines how long a spoofed session will be maintained.

If spoofing and idle time is not negotiated between the AccessBuilder and the remote client, the Idle Timer set on the AccessBuilder will be used to tear down the link.

During connect time, the remote client and the AccessBuilder negotiate the values of these parameters and settle on the lowest common value. For example, if the remote side has set an idle time of 10 minutes, and the AccessBuilder has set an idle time of 20 minutes, the idle time for that session will be 10 minutes.

In addition, the AccessBuilder assigns a Spoof ID to the session. This spoof ID is used by the AccessBuilder to keep track of the remote session during spoofing and to allow for a quick re-establishment of the connection.

During the remote client session, if the AccessBuilder detects that the idle time has been exceeded, it tears down the physical link and begins spoofing. During spoofing, the AccessBuilder maintains a logical link with the remote client and reserves a single B-Channel for the session. This means that if there are simultaneous spoofed sessions on the AccessBuilder, new remote clients dialing in may be rejected because all the channels are being used or reserved for spoofed sessions.

The AccessBuilder reserves a single B-channel for each spoofed session, but not a specific B-channel. As a result, for the demand (spoofing) to function properly, you will need a hunt group (rotary) for your ISDN lines.

If the remote client attempts to access a remote resource (such a file server or email) while the connection is being spoofed, the physical connection is automatically reestablished (dial-on-demand) based on the information in the session Spoof ID. At reconnection time, the idle timer and spoofing timer are restarted.

If the spoofing session time limit is reached, the 3Com Impact ISDN ISA Adapter will automatically reconnect to the server, this resetting the idle and spoofing timers. This eliminates the possibility that the remote clients will lose unsaved work if the session is terminated.

Spoofing parameters are configured in the Transcend AccessBuilder Manager System Parameters dialog box

Spoofing is not supported across system boundary because another AccessBuilder will not recognize the Spoof ID.

Procedure for Configuring Individual-to-LAN Spoofing

To configure the AccessBuilder for individual-to-LAN spoofing follow these steps:

1 On the AccessBuilder, from the Single Server View System menu, choose System Parameters.

The System Parameters dialog box appears.

2 Enter a Remote Access Client Idle Time. The default is five minutes.

3 Enter a Remote Access Client Spoof Time. The default is five minutes.

4 Click OK.

5 Reboot the server for the changes to take effect.

On the 3Com Impact ISDN ISA Adapter

1 Enable spoofing.

2 Select an Idle Disconnect Time.

3 Select a spoofing time.

Procedure for Configuring LAN-to-LAN Spoofing

To configure the AccessBuilder for LAN-to-LAN spoofing follow these steps:

1 On the AccessBuilder at each end, from the Single Server View System menu, choose System Parameters.

The System Parameters dialog box appears.

2 Enter a LAN-to-LAN Router Idle Time to define how long a connection is torn down. The default is 5 minutes

3 Enter an IPX LAN-to-LAN Spoof Time to define how long a logical connection is spoofed. The default is 1440 minutes.

4 Click OK.

5 Reboot the server for the changes to take effect and make sure that each AccessBuilder is set up as a remote user.

Data Compression   AccessBuilder interoperates with Stacker LZS software compression that has been implemented for the ISDN interface by supporting the PPP Compression Control Protocol (CCP) data compression. For individual-to-LAN connections, CCP data compression cannot be configured for the client at the AccessBuilder. However, CCP compression must be enabled at the AccessBuilder. CCP data compression usage must be negotiated by the client; the AccessBuilder is passive in determining CCP data compression. CCP data compression is supported by the 3Com Impact ISDN ISA Adapter.

For LAN-to-LAN connections, CCP data compression must be enabled at each AccessBuilder.

The CCP has been implemented in conformance with the Internet draft "PPP Compression Control Protocol."

4

TROUBLESHOOTING

General

For troubleshooting ISDN connections, you need to establish a console port connection. For information about establishing a console port connection to the Accessbuilder, refer to the *AccessBuilder 4000 Installation Guide.*

Setting Console Message Level

You can set up the Access Builder Manager console to display status information. Enter the following command at the command line interface to establish the console management display level:

```
set cml = status
```

When observing the console display, you may see cause code values displayed as a result of ongoing or failed connection attempts. Refer to Table 4-1 for ISDN cause code values and descriptions.

Additionally, ISDN specific error messages reported to the console can be a quick means of identifying specific problems. A list of these messages may be found in Table 4-1.

Testing the ISDN Line

You can verify that the ISDN lines you have configured are working properly by performing a loopback test. To perform a loopback test follow these steps:

1 Toggle the power switch on the back panel to the ON position.

2 After ISDN line is plugged in and the power is turned on, wait for line activation to occur. (The ISDN BRI module with a U interface takes longer than a module with an S/T interface.

3 At the command line, set the protocol mode to synchronous (raw) mode.

```
SET PM =raw
```

4 Reboot the server for changes to take effect.

5 At the console port, enter the following command to perform a loopback test from B1 to B2:

```
CALL [Speed] [Channel Port] [Phone Number]
```

Speed can be either 56 or 64. Channel Port is from 1-16 (where 1 is Slot 1, Dsl 1, and Channel 1, and 16 is Slot 2, Dsl 4, Channel 2). For Phone Number, use the number provided for the ISDN line; you can use either number if two numbers are provided for the line.

6 To perform a data transfer test, enter the following command at the console port:

```
TEST [Source Ch Port] [Destination Ch Port] [Packet Number]
```

Source Ch Port can be from 1-16, and is the sending channel port number. Dest Ch Port can be from 1-16, and is the receiving channel port number. Packet Number can be from 1-50. Both port numbers should be loopback connected ports.

The ISDN testing module generate test results and displays them on the screen. These results are generated whether the loopback test passes or fails.

7 To disconnect the loopback connection, enter the following command at the console port:

```
DISC [Channel Port]
```

Channel port is the same Channel Port as used in Step 5.

If the test is successful, you can continue configuring the AccessBuilder. See the TABM on-line help for more information about configuration.

Checking the ISDN Connection

For the ISDN connection to be up and operation three conditions must be met:

- The physical line (Layer 1) must be synchronized before any Layer 2 handshake with the ISDN carrier can take place. The status must be activated. To check this, using the command line interface, look at the PhysicalLineStatus parameter located in the \port\s#_br# directory.

  In North America, you can check the physical line by verifying that the amber light on each connected port is either flashing or off. A solid amber light on a port indicates that Layer 1 is down. This is not a valid diagnostics tool in many European countries.

- The Terminal Equipment Identifier (for the AccessBuilder ISDN BRI Module) must successfully handshake with the ISDN carrier must be assigned. For switches such as NI1, ATT5ESS and DMS100, the TEI state (indicating the state of the ISDN Layer 2 (CCITT Q.921) must be assigned to communicate over ISDN lines. Other switches do not require an assigned state to communicate over ISDN line. To check this, look at the TEIState parameter located in the \port\s#_br# directory.

- For switches such as NI1, ATT5ESS and DMS100, the Layer3Status state (indicating the state of the ISDN Layer 3 (CCITT Q.921) must be initialized to communicate over ISDN lines. Other switches do not require an initialized status to communicate over ISDN line. To check this, look at the Layer3Status parameter located in the \port\s#_br# directory.

  You can also verify the status of Layer 3 by checking the amber light next to each port. The light is off when Layer 3 is initialized. This is not a valid diagnostic tool in many European countries.

ISDN Cause Codes

During call setup, when a call is in progress, or during call disconnecting, the ISDN network may return a message indicating the reason for a call failure, the progress of a call, or the presence of an incoming call. These messages, called cause codes are reported as numeric values. These cause numbers and definitions are found in the ETS300 102-1, CCITT Q931 specification and are summarized in Table 4-1.

Table 4-1   ISDN Cause Codes

Cause Number	Cause	Definition
1	Unallocated (unassigned) number	Indicates that the destination requested by the calling user cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated).
2	No route to specified transit network	Indicates that the equipment sending this cause has received a request to route the call through a particular transit network, which it does not recognize. The equipment sending this cause does not recognize the transit network either because the transit network does not exist or because that particular transit network, while it does exist, does not service the equipment that is sending this cause. This cause is supported on a network-dependent basis.
3	No route to destination	Indicates that the called user cannot be reached because the network through which the call has been routed does not serve the destination desired. This cause is supported on a network-dependent basis.
6	Channel unacceptable	Indicates the channel most recently identified is not acceptable to the sending entity for use in this call.
7	Call awarded and being delivered in an established channel	Indicates that the user has been awarded the incoming call, and that the incoming call is being connected to a channel already established to that user for similar calls.
16	Normal call clearing	Indicates that the call is being cleared because one of the users involved in the call has requested that the call be cleared. Under normal situations, the source of this cause is not the network.
17	User busy	Used when the called user has indicated the inability to accept another call. The user equipment is compatible with the call.
18	No user responding	Used when a user does not respond to a call establishment message with either an alerting or connect indication within the prescribed period of time allocated.
19	No answer from user (user alerted)	Used when a user has provided an alerting indication but has not provided a connect indication within a prescribed period of time.

<div align="center">**Table 4-1**   ISDN Cause Codes</div>

Cause Number	Cause	Definition
21	Call rejected	Indicates that the equipment sending this cause does not wish to accept this call, although it could have accepted the call because the equipment sending this cause is neither busy nor incompatible.
22	Number changed	Returned to a calling user when the called party number indicated by the calling user is no longer assigned. If a network does not support this capability, cause #1 "unallocated (unassigned) number" shall be used.
26	Non-selected user clearing	Indicates that the user has not been awarded the incoming call.
27	Destination out of order	Indicates that the destination indicated by the user cannot be reached because the interface to the destination is not functioning correctly. The term "not functioning correctly" indicates that a signalling message was unable to be delivered to the remote user; for example, a physical layer or data link layer failure at the remote user, user equipment off-line, and so forth.
28	Invalid number format	Indicates that the called user cannot be reached because the called party number is not in a valid format or is not complete.
29	Facility rejected	Returned when a facility requested by the user cannot be provided by the network.
31	Normal, unspecified	Used to report a normal event only when no other cause in the normal class applies.
34	No circuit/channel available	Indicates that there is no appropriate circuit/channel presently available to handle the call.
38	Network out of order	Indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time; for example, immediately retrying the call is not likely to be successful.
41	Temporary failure	Indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time; for example, the user can try another call attempt almost immediately.
42	Switching equipment congestion	Indicates that the switching equipment generating this cause is experiencing a period of high traffic.
43	Access information discarded	Indicates that the network could not deliver access information to the remote user as requested; for example, a user-to-user information, low layer compatibility, high layer compatibility, or subaddress.

Table 4-1 ISDN Cause Codes

Cause Number	Cause	Definition
44	Requested circuit/channel not available	Returned when the circuit or channel indicated by the requesting entity cannot be provided by the other side of the interface.
47	Resources unavailable, unspecified	Used to report a resource unavailable event only when no other cause in the resource unavailable class applies.
49	Quality of service not available	Used to report that the requested quality of service, as defined in CCITT Recommendation X.213, cannot be provided (for example, throughput or transit delay cannot be supported).
50	Requested facility not subscribed	Indicates that the requested supplementary service could not be provided by the network because the user has not completed the necessary administrative arrangements with its supporting network.
57	Bearer capability not authorized	Indicates that the user has requested a bearer capability that is implemented by the equipment, which generated this cause, but the user is not authorized to use.
58	Bearer capability not presently available	Indicates that the user has requested a bearer capability that is implemented by the equipment, which generated this cause, but which is not available at this time.
63	Service or option not available, unspecified	Used to report a service or option not available event only when no other cause in the service or option not available class applies.
65	Bearer capability not implemented	Indicates that the equipment sending this cause does not support the bearer capability requested.
66	Channel type not implemented	Indicates that the equipment sending this cause does not support the channel type requested.
69	Requested facility not implemented	Indicates that the equipment sending this cause does not support the requested supplementary service.
70	Only restricted digital information bearer capability is available	Indicates that one equipment has requested an unrestricted bearer service but that the equipment sending this cause only supports the restricted version of the requested bearer capability.
79	Service or option not implemented, unspecified	Used to report a service or option not implemented event only when no other cause in the service or option not implemented class applies.
81	Invalid call reference value	Indicates that the equipment sending this cause has received a message with a call reference that is not currently in use on the user-network interface.

Table 4-1 ISDN Cause Codes

Cause Number	Cause	Definition
82	Identified channel does not exist	Indicates that the equipment sending this cause has received a request to use a channel not activated on the interface for a call. For example, if a user has subscribed to those channels on a primary rate interface numbered from 1 to 12 and the user equipment or the network attempts to use channels 13 through 23, this cause is generated.
83	A suspended call exists, but this call identity does not	Indicates that a call resume has been attempted with a call identity, which differs from that in use for any presently suspended call(s).
84	Call identity in use	Indicates that the network has received a call suspend request. The call suspend request contained a call identity (including the null call identity) that is already in use for a suspended call within the domain of interfaces over which the call might be resumed.
85	No call suspended	Indicates that the network has received a call resume request. The call resume request contained a call identity information element that presently does not indicate any suspended call within the domain of interfaces over which calls may be resumed.
86	Call having the requested call identity has been cleared	Indicates that the network has received a call resume request. The call resume request contained a call identity information element that once indicated a suspended call; however, that suspended call was cleared while suspended (either by network timeout or by the remote user).
88	Incompatible destination	Indicates that the equipment sending this cause has received a request to establish a call that has low layer compatibility, high layer compatibility, or other compatibility attributes (for example, data rate), which cannot be accommodated.
91	Invalid transit network selection	Indicates that a transit network identification was received that is of an incorrect format.
95	Invalid message, unspecified	Used to report an invalid message event only when no other cause in the invalid message class applies.
96	Mandatory information element is missing	Indicates that the equipment sending this cause has received a message that is missing an information element, which must be present in the message before that message can be processed.
97	Message type non-existent or not implemented	Indicates that the equipment sending this cause has received a message with a message type it does not recognize either because this is a message not defined or defined but not implemented by the equipment sending this cause.

Table 4-1   ISDN Cause Codes

Cause Number	Cause	Definition
98	Message not compatible with call state or message type non-existent or not implemented	Indicates that the equipment sending this cause has received a message such that the procedures do not indicate that this is a permissible message to receive while in the call state, or s STATUS message was received indicating an incompatible call state.
99	Information element non-existent or not implemented	Indicates that the equipment sending this cause has received a message, which includes information elements not recognized because the information element identifier is not defined or it is defined but not implemented by the equipment sending the cause. However, the information element is not required to be present in the message in order for the equipment sending the cause to process the message.
100	Invalid information element contents	Indicates that the equipment sending this cause has received an information element that it has implemented; however, one or more of the fields in the information element are coded in such a way that has not been implemented by the equipment sending this cause.
101	Message not compatible with call state	Indicates that a message has been received, which is incompatible with the call state.
102	Recovery on timer expiry	Indicates that a procedure has been initiated by the expiry of a timer in association with ETS 300 102-1 error handling procedures.
111	Protocol error, unspecified	Used to report a protocol error event only when no other cause in the protocol error class applies.
127	Interworking, unspecified	Indicates that there has been interworking with a network that does not provide causes for actions it takes; thus, the exact cause for a message that is being sent cannot be determined.

A
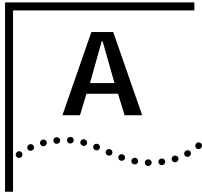
ORDERING ISDN SERVICE IN NORTH AMERICA FOR THE ISDN BRI MODULE

MODELS: 3C7540 and 3C7541US/Canada

Overview

Ordering ISDN service is new for you *and* the telephone companies. But don't worry. When you follow the instructions provided here, you will get the exact service you need for the 3Com® AccessBuilder 4000 ISDN BRI module product to work successfully. This document describes how to order ISDN service for the 3Com AccessBuilder 4000 ISDN BRI module product in North.

The telephone company "provisions" your ISDN telephone line when you place your order for ISDN service. Line provisioning accommodates both the telephone company ISDN switch type and the 3Com AccessBuilder 4000 ISDN BRI module product.

This document includes a 3Com AccessBuilder 4000 ISDN BRI module provisioning information table for each ISDN switch type. These tables provide the provisioning information the telephone company needs to provision your ISDN line for the 3Com AccessBuilder 4000 ISDN BRI module. Instead of learning complex codes, photocopy the table and fax it to the telephone company when you place your ISDN order.

Follow the steps in the next section to order ISDN service for the 3Com AccessBuilder 4000 ISDN BRI module.

If your line is not provisioned correctly, you will not be able to use the 3Com AccessBuilder 4000 ISDN BRI module.

Placing the ISDN Order

To order the ISDN service from the telephone company for the 3Com ISDN BRI Module product, follow these easy steps:

1 Call the telephone company and ask for the ISDN representative.

2 Tell the representative that you want to place an order for ISDN service for a 3Com AccessBuilder 4000 ISDN BRI module and that you have the line provisioning, and ISDN outlet type information that the telephone company requires.

3 Give the representative the 3Com AccessBuilder 4000 ISDN BRI module Bellcore code name 3ComA * J6.

4 Ask the representative which ISDN switch type your ISDN line will be using. Place a check mark in the appropriate box on the supplied ISDN Information Sheet.

5 Look for the ISDN switch type table in this document and photocopy the table.

6 Fax the table to the telephone company to use to provision your line correctly.

i *If you don't have a facsimile machine, read the information to the telephone representative instead.*

i *The 3Com AccessBuilder 4000 BRI module U interface has a built-in network terminator (NT1); therefore, an external NT1 is not required. It connects to an RJ-45 jack. The S/T interface does not have a built-in NT1 and therefore requires an NT1. Be sure to ask your phone company for an RJ-45 jack.*

7 Ask the ISDN representative to provide the information you need to fill out the ISDN Information Sheet shown below. Each item is described in the next section.

```
ISDN Information Sheet
3Com AccessBuilder 4000 ISDN BRI Module
(Ask the telephone company ISDN representative)


ISDN Switch Type

    AT&T 5ESS NI1

    AT&T 5ESS Custom

    Northern Telecom DMS 100

    Siemens EWSD


Number of ISDN Telephone Numbers (1 or 2) _____

Phone Number #1_____

SPID Number for Phone Number #1_____

Phone Number #2_____

SPID Number for Phone Number #2_____

TID Number_____
```

ℹ️ *A TID number is required only if using an NI1 switch type. You must get this TID from the phone company. The AccessBUilder will not work properly without this information. This information is always appended to the SPID in the AccessBuilder implementation. The TID is typically a two digits, but can be 1 through 3 digits. See SPID 1 and SPID 2 in TABM on-line help.*

This completes the ISDN ordering process for the 3Com AccessBuilder 4000 ISDN BRI module product. Keep this sheet handy. You need this information to install the 3Com AccessBuilder 4000 ISDN BRI module product.

ISDN Switch Type. Ask your telephone company ISDN representative which ISDN switch type you will be connected to when your ISDN line is activated.

Place a check mark next to the appropriate ISDN switch on the supplied ISDN Information Sheet. Each switch type has a corresponding provisioning table in this document.

Photocopy the appropriate table and fax it to the telephone company when you place your ISDN order to ensure that you get the correct ISDN service for the 3Com AccessBuilder 4000 ISDN BRI module.

Number of ISDN Local Directory Numbers. Your one ISDN telephone line can support two local directory numbers (telephone numbers). If you ordered one ISDN local directory number, write in 1. If you ordered two ISDN lcaol directory numbers, write 2. Obtain the ISDN local directory numbers from the telephone company ISDN representative.

Local Directory Numbers. If you ordered one ISDN local directory number, write that number. If you ordered two ISDN local directory numbers, write in the second number too. The ISDN local directory number is supplied to you by the telephone company ISDN representative.

Service Profile ID (SPID) Number. Fill in the SPID number for each ISDN directory number. This number is supplied to you by the telephone company ISDN representative. There are 10-15 characters in the SPID number. Your telephone company may not require the SPID number.

Terminal ID (SPID) Number. A TID number is required only if using an ATT5ESS NI1 switch. You must get this TID from the phone company. The AccessBuilder will not work properly without this information. This information is always appended to the SPID in the AccessBuilder implementation. The TID is typically a two digits. See SPID 1 and SPID 2 in TABM on-line help.

AT&T 5ESS Switch National ISDN-1

To order ISDN service for the AT&T 5ESS switch, supply the telephone company with the information provided in Table A-1. Photocopy Table A-1 and fax it to the telephone company.

Table A-1   3Com ISDN BRI Module Line Configuration for AT&T 5ESS NI1

Required Information	Specification
Line Type	Standard (2B+D) National ISDN-1 line
Line Code	2B1Q
Interface Type	S/T interface with an RJ-45 jack (3C7540)
	U interface with an RJ-45 jack (3C7541)
Directory Numbers	1
Maximum Terminals	1
Maximum B Channels	2
Actual User	Yes
Circuit-switched Voice	1
Circuit-switched Voice Channel	Any
Circuit-switched Data	2
Circuit-switched Data Channel	Any
Terminal Type	A (Basic Terminal)
Display	Yes
Circuit-switched Voice Limit	1
Circuit-switched Data Limit	2
Voice or Data	Both
Call Appearance Preference	Idle

AT&T 5ESS Custom Switch

To order ISDN service for the AT&T 5ESS Custom switch, supply the telephone company with the information provided in Table A-2. Photocopy Table A-2 and fax it to the telephone company.

Table A-2 3Com ISDN BRI Module Line Configuration for AT&T 5ESS Custom

Required Information	Specification
Line Type	Standard (2B+D) ISDN line with point-to-point configuration
Line Code	2B1Q
Interface Type	S/T interface with an RJ-45 jack (3C7540)
	U interface with an RJ-45 jack (3C7541)
Directory Numbers	1
Maximum Terminals	1
Maximum B Channels	2
Actual User	Yes
Circuit-switched Voice	1
Circuit-switched Voice Channel	Any
Circuit-switched Data	2
Circuit-switched Data Channel	Any
Terminal Type	A (Basic Terminal)
Display	Yes
Circuit-switched Voice Limit	1
Circuit-switched Data Limit	2
Voice or Data	Both
Call Appearance Preference	Idle

DMS 100 Switch   To order ISDN service for the DMS 100 switch, supply the telephone company with the information provided in Table A-3. Photocopy Table A-3 and fax it to the telephone company.

Table A-3   3Com ISDN BRI Module Line Configuration for DMS 100

Required Information	Specification
Line Type	Standard (2B+D) National ISDN-1 line
Line Code	2B1Q
Interface Type	S/T interface with an RJ-45 jack (3C7540)
	U interface with an RJ-45 jack (3C7541)
Directory Numbers	2
Circuit-switched Option	Yes
Bearer Restriction Option	No packet mode data (NOPMD)
Protocol	Functional version 2 (PVC 2)
SPID Suffix	1
Terminal Endpoint Identifier (TEI)	Dynamic
Maximum Keys	64
Ring	No
Key System (EKTS)	No
Voice or Data	Both
Data Option	Lower layer compatibility

Siemens EWSD Switch

To order ISDN service for the Siemens EWSD switch, supply the telephone company with the information provided in Table A-4. Photocopy Table A-4 and fax it to the telephone company.

Table A-4   3Com ISDN BRI Module Line Configuration for EWSD

Required Information	Specification
Line Type	Standard (2B+D) National ISDN-1 line
Line Code	2B1Q
Interface Type	S/T interface with an RJ-45 jack (3C7540)
	U interface with an RJ-45 jack (3C7541
Directory Numbers	1
Circuit-switched Data and Voice	Yes
Bearer Restriction Option	No packet mode data (NOPMD)
Protocol	Functional
SPID suffix	1
Terminal Endpoint Identifier (TEI)	Dynamic
Key System (EKTS)	No
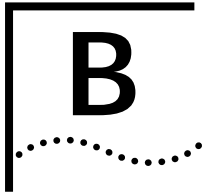
B CONFIGURATION WORKSHEET

This Appendix provides a sample configuration worksheet as a convenience in assisting to successfully configure the AccessBuilder servers and the remote user's AccessBuilder Remote Access Client software for ISDN. This information can then be transferred to the screens that appear during the configuration procedure and may be photocopied and filled in for each server or remote user.

Instructions

AccessBuilder Server Worksheet

Photocopy the page for each server you plan to configure or maintain for ISDN. Once completed, the form can be used as a ready reference when you perform the actual configuration. You may wish to retain the form (in a secure place, of course) as a record of specific AccessBuilder configuration details.

AccessBuilder Server

ISDN Information

Local Switch Type: •ATT5ESS •NI1 • DMS100 •INS64 •VN3 •NET3

SPID Number(s)_____   _____

Directory Number(s)_____   _____

Point-to-point? _____
If yes, no SPIDs or Directory numbers required in North America

U or S/T Interface_____

Rotary/Hunt Group Number (if used) _____

Table B-1 AccessBuilder ISDN Port Setup (Slot 1)

Port	Directory Number	SPID	Router/Auto	V.120 or raw
1, Ch 1				
1, Ch 2				
2, Ch 1				
2, Ch 2				
3, Ch 1				
3, Ch 2				
4, Ch 1				
4, Ch 2				

Table B-2 AccessBuilder ISDN Port Setup (Slot 2)

Port	Directory Number	SPID	Router/Auto	V.120 or raw
1, Ch 1				
1, Ch 2				
2, Ch 1				
2, Ch 2				
3, Ch 1				
3, Ch 2				
4, Ch 1				
4, Ch 2				

C
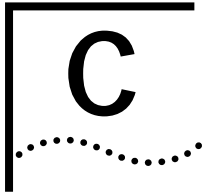
COMPLIANCE NOTICES

This appendix provides several compliance notices. These statements indicate that the Access Builder ISDN BRI Module meets certain requirements etablished by the issuer of the statement. The notices contained are as follows:

- French Compliance Statement
- Canadian Notice
- FCC Class B Certification Statement

DIRECTION DE LA REGLEMENTATION GENERALE TERMINAUX RNIS

Dossier No: 735758TD

Constructeur

3Com Corporation
5400 Bayfront Plaza
Santa Clara, CA 95052-8145
Etats Unis
1-800-764-5000

Identification du matérial

AccessBuilder 4000   ACCB-100

Accord 95199B	Ed: A	Date de l'accord 19/11/95 Date de fin: 19/11/97

Nature du matériel/charactéristiques techniques

Niveau/Réseau interface réseau: S0, T0   Version: Numeris, Euro-Numéris

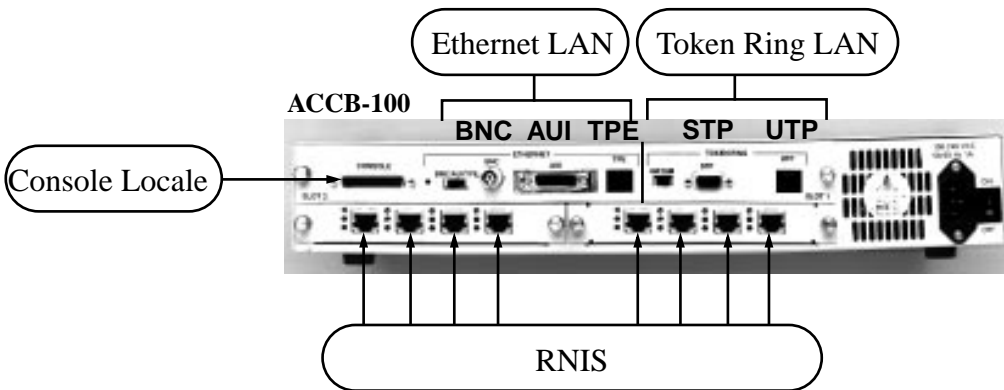Niveau 2 SAPI. S   Niveau 3: VN3 + points sensibles

Numérotation: Bloc sur canal D   Alimentation en énergie: Secteur 220V

Schema de raccordement

CANADIAN NOTICE The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

⚠️ *CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.*

CE NOTICE Marking the symbol CE indicates compliance of this 3Com system to the EMC directive of the European Community. Such marking is indicative that this 3Com system meets or exceeds the following technical standards:

■ EN 55022 —"Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment."

■ EN 50082-1 —"Electromagnetic compatibility -- Generic immunity standard Part 1: Residential, commercial, and light industry."

■ IEC 801-2 —"Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements." —Severity level 3.

■ IEC 801-3 —"Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiated electromagnetic field requirements." —Severity level 2.

■ IEC 801-4 —"Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/burst requirements." —Severity level 2.

■ A "Declaration of Conformity" in accordance with the above standards has been made and is on file at 3Com.

FCC CLASS B CERTIFICATION STATEMENT

3Com Corporation
Model Nos: 3C7540 (S/T Interface), 3C7541 (U Interface)
Made in U.S.A.

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

1. this device may not cause harmful interference, and

2. this device must accept any interference received, including interference that may cause undesired operation.

WARNING: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules, and the Canadian Department of Communications Equipment Standards entitled, "Digital Apparatus," ICES-003. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

n Reorient or relocate the receiving antenna.

n Increase the separation between the equipment and receiver.

n Connect the equipment into an outlet on a circuit different from the one which the receiver is connected to.

n Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful:

The Interference Handbook

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 004-000-00345-4.

NOTE: In order to maintain compliance with the limits of a Class B digital device, 3Com requires that you use quality interface cables when connecting to this device. Changes or modifications not expressly approved by 3Com could void the user's authority to operate this equipment. Refer to the manual for specifications on cabling types.

11/93

D
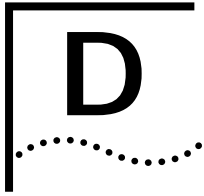
TECHNICAL SUPPORT

3Com provides easy access to technical support information through a variety of services. This appendix describes these services.

On-line Technical Services

3Com offers worldwide product support seven days a week, 24 hours a day, through the following on-line systems:

- 3Com Bulletin Board Service (3ComBBS)
- World Wide Web site
- Ask3Com℠ on CompuServe®
- 3ComFacts℠ automated fax service

3Com Bulletin Board Service

3ComBBS contains patches, software, and drivers for all 3Com products, as well as technical articles. This service is available via modem seven days a week, 24 hours a day. To reach the service, set your modem to 8 data bits, no parity, and 1 stop bit. Call the telephone number nearest you:

Country	Baud Rate	Telephone Number
Australia	up to 14400 baud	(61) (2) 955 2073
France	up to 14400 baud	(33) (1) 69 86 69 54
Germany	up to 9600 baud up to 9600 baud	(49) (89) 627 32 188 (49) (89) 627 32 189
Hong Kong	up to 14400 baud	(852) 537 5601
Italy (fee required)	up to 9600 baud	(39) (2) 273 00680
Japan	up to 14400 baud	(81) (3) 3345 7266
Singapore	up to 14400 baud	(65) 534 5693
Taiwan	up to 14400 baud	(886) (2) 377 5838 (886) (2) 377 5840
U.K.	up to 14400 baud	(44) (144) 227 8278
U.S.	up to 14400 baud	(1) (408) 980 8204

World Wide Web Site   Access the latest networking information on 3Com's World Wide Web site by entering our URL into your Internet browser:

http://www.3Com.com/

This service features news and information about 3Com products, customer service and support, 3Com's latest news releases, selected articles from 3TECH™, 3Com's award-winning technical journal, and more.

Ask3Com on CompuServe   Ask3Com is a CompuServe-based service containing patches, software, drivers, and technical articles about all 3Com products, as well as an interactive forum for technical questions. To use Ask3Com, you need a CompuServe account.

To use Ask3Com:

1 Log on to CompuServe.

2 Enter **go threecom**

3 Press [Return] to see the Ask3Com main menu.

3ComFacts Automated Fax Service   3Com Corporation's interactive fax service, 3ComFacts, provides data sheets, technical articles, diagrams, and troubleshooting instructions on 3Com products 24 hours a day, seven days a week. Within this service, you may choose to access CardFacts® for adapter information, or NetFacts® for network system product information.

■ **CardFacts** provides adapter installation diagrams, configuration drawings, troubleshooting instruction, and technical articles.

Document 9999 provides you with an index of adapter documents.

■ **NetFacts** provides data sheets and technical articles on 3Com Corporation's hub, bridge, router, terminal server, and software products.

Document 8888 provides you with an index of system product documents.

Call 3ComFacts using your touch-tone telephone. International access numbers are:

Country	Fax Number
Hong Kong	(852) 537 5610
U.K.	(44) (144) 227 8279
U.S.	(1) (408) 727 7021

Local access numbers are available within the following countries:

Country	Fax Number	Country	Fax Number
Australia	800 123853	Italy	1678 99085
Denmark	800 17319	Netherlands	06 0228049
Finland	98 001 4444	Norway	800 11062
France	05 90 81 58	Sweden	020 792954
Germany	0130 8180 63	U.K.	0800 626403

Support from Your Network Supplier

If additional assistance is required, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

When you contact your network supplier for assistance, have the following information ready:

- Diagnostic error messages
- A list of system hardware and software, including revision levels
- Details about recent configuration changes, if applicable

If you are unable to contact your network supplier, see the following section on how to contact 3Com.

Support from 3Com

If you are unable to receive support from your network supplier, technical support contracts are available from 3Com.

In the U.S. and Canada, call **(800) 876-3266** for customer service.

If you are outside the U.S. and Canada, contact your local 3Com sales office to find your authorized service provider:

Country	Telephone Number	Country	Telephone Number
Australia (Sydney)	(61) (2) 959 3020	Mexico	(525) 531 0591
(Melbourne)	(61) (3) 653 9515	Netherlands	(31) (3) 402 55033
Belgium	(32) (2) 7164880	Singapore	(65) 538 9368
Brazil	(55) (11) 241 1571	South Africa	(27) (11) 803 7404
Canada	(905) 882 9964	Spain	(34) (1) 3831700
France	(33) (1) 69 86 68 00	Sweden	(46) (8) 632 91 00
Germany	(49) (89) 6 27 32 0	Taiwan	(886) (2) 577 4352
Hong Kong	(852) 868 9111	United Arab Emirates	(971) (4) 349049
Italy	(39) (2) 273 02041	U.K.	(44) (1628) 897000
Japan	(81) (3) 3345 7251	U.S.	(1) (408) 492 1790

Returning Products for Repair

A product sent directly to 3Com for repair must first be assigned a Return Materials Authorization (RMA) number. A product sent to 3Com without an RMA number will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, call or fax:

Country	Telephone Number	Fax Number
U.S. and Canada	(800) 876 3266, option 2	(408) 764 7120
Europe	(44) (1442) 278000	(44) (1442) 236824
Outside Europe, U.S. and Canada	(1) (408) 492 1790	(1) (408) 764 7290

LIMITED WARRANTY

HARDWARE: 3Com warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for the following lengths of time from the date of purchase from 3Com or its Authorized Reseller:

Internetworking products	One year
Network adapters	Lifetime
Ethernet stackable hubs and	
Unmanaged Ethernet fixed port repeaters	Lifetime* (One year if not registered)
*Power supply and fans in these stackable hubs and unmanaged repeatersOne year	
Other hardware products	One year
Spare parts and spares kits	90 days

If a product does not operate as warranted during the applicable warranty period, 3Com shall, at its option and expense, repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or refund to Customer the purchase price paid for the defective product. All products that are replaced will become the property of 3Com. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer.

3Com shall not be responsible for any software, firmware, information, or memory data of Customer contained in, stored on, or integrated with any products returned to 3Com pursuant to any warranty.

SOFTWARE: 3Com warrants that the software programs licensed from it will perform in substantial conformance to the program specifications therefor for a period of ninety (90) days from the date of purchase from 3Com or its Authorized Reseller. 3Com warrants the magnetic media containing software against failure during the warranty period. No updates are provided. 3Com's sole obligation hereunder shall be (at 3Com's discretion) to refund the purchase price paid by Customer for any defective software products, or to replace any defective media with software which substantially conforms to 3Com's applicable published specifications. Customer assumes responsibility for the selection of the appropriate applications program and associated reference materials. 3Com makes no warranty that its software products will work in combination with any hardware or applications software products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. For any third party products listed in the 3Com software product documentation or specifications as being compatible, 3Com will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a "bug" or defect in the third party's product.

STANDARD WARRANTY SERVICE: Standard warranty service for hardware products may be obtained by delivering the defective product, accompanied by a copy of the dated proof of purchase, to 3Com's Corporate Service Center or to an Authorized 3Com Service Center during the applicable warranty period. Standard warranty service for software products may be obtained by telephoning 3Com's Corporate Service Center or an Authorized 3Com Service Center, within the warranty period. Products returned to 3Com's Corporate Service Center must be pre-authorized by 3Com with a Return Material Authorization (RMA) number marked on the outside of the package, and sent prepaid, insured, and packaged appropriately for safe shipment. The repaired or replaced item will be shipped to Customer, at 3Com's expense, not later than thirty (30) days after receipt by 3Com.

WARRANTIES EXCLUSIVE: IF A 3COM PRODUCT DOES NOT OPERATE AS WARRANTED ABOVE, CUSTOMER'S SOLE REMEDY SHALL BE REPAIR, REPLACEMENT, OR REFUND OF THE PURCHASE PRICE PAID, AT 3COM'S OPTION. THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. 3COM NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE OR USE OF ITS PRODUCTS.

3COM SHALL NOT BE LIABLE UNDER THIS WARRANTY IF ITS TESTING AND EXAMINATION DISCLOSE THAT THE ALLEGED DEFECT IN THE PRODUCT DOES NOT EXIST OR WAS CAUSED BY CUSTOMER'S OR ANY THIRD PERSON'S MISUSE, NEGLECT, IMPROPER INSTALLATION OR TESTING, UNAUTHORIZED ATTEMPTS TO REPAIR, OR ANY OTHER CAUSE BEYOND THE RANGE OF THE INTENDED USE, OR BY ACCIDENT, FIRE, LIGHTNING, OR OTHER HAZARD.

LIMITATION OF LIABILITY: IN NO EVENT, WHETHER BASED IN CONTRACT OR TORT (INCLUDING NEGLIGENCE) SHALL 3COM BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, OR PUNITIVE DAMAGES OF ANY KIND, OR FOR LOSS OF REVENUE, LOSS OF BUSINESS, OR OTHER FINANCIAL LOSS ARISING OUT OF OR IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE, USE, PERFORMANCE, FAILURE, OR INTERRUPTION OF ITS PRODUCTS, EVEN IF 3COM OR ITS AUTHORIZED RESELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES

Some states do not allow the exclusion of implied warranties or the limitation of incidental or consequential damages for consumer products, so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights which may vary from state to state.

GOVERNING LAW: This Limited Warranty shall be governed by the laws of the state of California.

3Com Corporation
5400 Bayfront Plaza
Santa Clara, CA 95052-8145
(408) 764-5000
1/1/94