

RouteAbout Access ISDN

Installation and Configuration

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This manual describes how to install and configure the RouteAbout Access ISDN.

Revision/Update Information: This is a new document.

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Dieses ist ein Gerät der Funkstörgrenzwertklasse B. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

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U.K. Safety Approval

The RouteAbout Access ISDN is manufactured to the International Safety Standard EN 60950 and as such is approved in the U.K. under General Approval number NS/G/1234/J/10003 for indirect connection to the public telecommunication network.

European Community (EC) Mark of Conformity Statement

This product is in conformity with the protection requirements of EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Proteon cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-Proteon option cards.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment.

This product bears the Telecom CE Mark (CE 168 X) for WAN complying with i-CTR1 and i-CTR2 (Bridging measures) per the European Directive 91/263/EEC (TTE Directive).

This product also complies with the Low Voltage Directive 73/23/EEC.

A signed copy of the Declaration of Conformity is on file and available from Digital Equipment Corporation, U.S.A.

This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.

Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse B.

The safety status of interconnection ports is as follows:

Host Connection Port	Safety Extra Low Voltage (SELV)
NTP Port	Telecom Network Voltage (TNV)
Console (maintenance)	SELV

Safety Information

CAUTION

For your personal safety, follow these safety guidelines before installing the RouteAbout Access ISDN.

- Do *not* remove the covers. The unit is self-contained with no user-serviceable parts.
- Use only indoors. The unit is not intended for any other use.
- Disconnect power supply cord in case of emergency.
- Plug the unit directly into a grounded outlet.
- Be sure you have the required power for the RouteAbout Access ISDN. The unit requires 100-240 VAC/50-60 Hz power.
 - For 110 Volt Operation: Use a UL Listed/CSA labelled cord set consisting of a minimum 18 AWG, Type SVT or SJT three-conductor cord terminating in a molded connector body that has an IEC CEE-22 female configuration on one end and a molded-on parallel blade grounding type attachment plug rated 15A, 125V configuration (5-15P) at the other end.
 - For 230 Volt Operation (North America): Use a UL Listed/CSA labelled cord set consisting of a minimum 18 AWG, Type SVT or SJT three-conductor cord terminating in a molded connector body that has an IEC CEE-22 female configuration on one end and a molded-on tandem blade grounding type attachment plug rated 15A, 250V configuration (6-15P) at the other end.
 - For 230 Volt Operation (other than North America): Use a cord set, marked HAR, consisting of a minimum HO5VV-F cord that has a minimum 0.75 square millimeter diameter conductors provided with an IEC 320 receptacle and a male plug suitable for the country of installation.

ACHTUNG

Beachten Sie im Interesse Ihrer eigenen Sicherheit unbedingt die nachstehenden Sicherheitshinweise, bevor Sie den RouteAbout Access ISDN installieren!

- Nehmen Sie auf keinen Fall die Abdeckungen ab. Der RouteAbout Access ISDN enthält keine Teile, die vom Benutzer gewartet oder repariert werden können.
- Einheit nur in geschlossenen Räumen betreiben. Die Einheit ist nur für den vorgesehenen Einsatzzweck zu verwenden.
- Bei Störfällen oder Fehlfunktionen Netzstecker ziehen.
- Netzstecker der Einheit direkt in eine geerdete Steckdose stecken.
- Achten Sie darauf, daß die Stromversorgung für den RouteAbout Access ISDN den technischen Daten der Einheit entspricht. Die Einheit wird mit 100-240 Volt Wechselstrom und 50-60 Hz betrieben.
 - Betrieb mit 110 Volt: Verwenden Sie eine UL-zugelassene Leitungsschnur mit CSA-Kennzeichnung und einem Drahtdurchmesser von mindestens 18 AWG, Typ SVT, oder eine SJT-Dreileiterschnur mit einem anvulkanisierten IEC CEE-22 Buchsenstecker an der einen Seite und einem anvulkanisierten Stiftstecker mit Schutzkontakt für 15 A, 125 V auf der anderen Seite (5-15P).
 - Betrieb mit 230 Volt (Nordamerika): Verwenden Sie eine UL-zugelassene Leitungsschnur mit CSA-Kennzeichnung und einem Drahtdurchmesser von mindestens 18 AWG, Typ SVT, oder eine SJT-Dreileiterschnur mit einem anvulkanisierten IEC CEE-22 Buchsenstecker an der einen Seite und einem anvulkanisierten Stiftstecker mit Schutzkontakt für 15 A, 250 V auf der anderen Seite (5-15P).
 - Betrieb mit 230 Volt (außerhalb Nordamerikas): Verwenden Sie eine Leitungsschnur mit HAR-Kennzeichnung und dem Typenkurzzeichen HO5VV-F, die einen Nennquerschnitt von mindestens 0,75 mm² hat sowie mit einer IEC 320-Steckbuchse und einem im Vertriebsland passenden Stecker ausgestattet ist.

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Preface

This guide contains information on the RouteAbout Access ISDN routers together with instructions for installing hardware and configuring software. You can configure your RouteAbout by using either the RouteAbout Access ISDN Configuration Tool, the graphical configuration utility shipped with your RouteAbout Access ISDN, or a command line interface. The Configuration Tool allows you to configure your RouteAbout Access ISDN interactively. It also provides detailed online Help.

This guide provides information on ISDN and how to work with an ISDN provider to configure an ISDN line.

This preface includes the following topics:

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Audience

This guide is intended for the inexperienced or moderately experienced user who has the support of an Internet Service Provider (ISP), an ISDN provider, or a network administrator and who has the responsibility for installing and configuring the RouteAbout Access ISDN on your local area network.

Related Documents

DIGITAL provides the following sources of information for the RouteAbout Access ISDN:

- This guide
- *Bridging Guide*
- *Event Logging System Messages Guide*
- *LAN/WAN Interface Guide*
- *Protocol Guide*
- *System Software Guide*
- *RouteAbout Access ISDN Release Notes*
- Online Help — integral to the RouteAbout Access ISDN Configuration Tool

Conventions

This section describes the conventions and symbols used in this book.

Typefaces

Bold is used for commands and user input. For example:
Use the **talk** command to switch to other router menus.
Clear statistics? (Yes or No): **yes**

Courier font is used for screen displays. For example:

`BOOT information`

Italics is used for emphasis and for variables. For example:
Do *not* answer yes.
xxxxxxxx will be an eight-digit hexadecimal value.

Symbols

Â Ò „ P Keys that you press appear like this.

Correspondence

Documentation Comments

If you have comments or suggestions about this document, send them to Network Products Engineering.

Attn.: Documentation Project Manager

FAX: (508) 486-6093

E-MAIL: doc_feedback@lkg.mts.dec.com

Online Services

To locate product specific information, refer to the following online service:

BBS To read the Bulletin Board System, set your modem to 8 bits, no parity, 1 stop bit and dial 508-486-5777 (U.S.).

WWW The Digital Equipment Corporation Network Products Business Home Page on the World Wide Web is located at the following addresses:

North America: <http://www.networks.digital.com>

Europe: <http://www.networks.europe.digital.com>

Australia: <http://www.digital.com.au/networks>

You can get additional information on our RouteAbout Access ISDN routers by accessing the Digital Equipment Corporation Network Products Business Home Page on the World-Wide Web . From this Home Page, you can access the following RouteAbout Access ISDN Software V2.3 documents:

RouteAbout Access ISDN Installation and Configuration guide

Bridging Guide

Event Logging System Messages Guide

LAN/WAN Interface Guide

Protocol Guide

System Software Guide

Packing List

Before you begin installing your RouteAbout Access ISDN router, check that you received the following:

- RouteAbout Access ISDN router
- *RouteAbout Access ISDN Installation and Configuration* (this guide)
- *RouteAbout Access ISDN Release Notes*
- *Frequently Asked Questions*
- *Product Warranty/Registration Card*
- *Software License*
- *Software Product Description (SPD)*
- RJ-45 ISDN cable, 3 meters, category 5 (P/N 12-003120-03)
- 5VDC power supply (P/N 40-000200-00)
- Power cord (North America only)
- Console cable and 9-pin to 25-pin console adapter (P/N 12-003130-02)

Chapter 1

Introducing the RouteAbout Access ISDN

The RouteAbout Access ISDN routers are remote access routers that provide connectivity between an Ethernet and an ISDN network. The RouteAbout Access ISDN routers come in two models: U and S/T. The U model has a Network Termination (NT1) device built into the router. The S/T model does not have an NT1 device built into the router.

This chapter introduces you to your RouteAbout Access ISDN routers.

Any reference to the RouteAbout Access ISDN refers to both the /IP and the /MP versions unless specified otherwise. The RouteAbout Access ISDN/IP router provides IP networking capability. The RouteAbout Access ISDN/MP router provides multi-protocol networking capability for IP, IPX, and AppleTalk 2.

This chapter covers the following topics:

Hardware Capabilities	2
Software Capabilities	4
Managing and Monitoring Your RouteAbout Access ISDN	14

Hardware Capabilities

The RouteAbout Access ISDN routers come equipped with an RJ-45 connector for an Ethernet 10BaseT (Unshielded Twisted Pair) LAN connection and an RJ-45 ISDN connector to connect to the WAN.

The only hardware difference between the RouteAbout Access ISDN/IP and the RouteAbout Access ISDN/MP is that the memory of the RouteAbout Access ISDN/MP is double that of the RouteAbout Access ISDN/IP.

	/IP	/MP
Memory DRAM	2 MB	4 MB
Flash	1 MB	2 MB

The RouteAbout Access ISDN routers provide ISDN connectivity through two different models: the U model and the S/T model.

U Model

The U model has a Network Termination (NT1) device built into the router. It provides the power and function for operating the ISDN line. When you use the U model, you cannot use any other ISDN device on the ISDN line. There is no port on the back of the U model for any other ISDN device. Figure 1-1 shows a configuration for connecting the RouteAbout Access ISDN U model to the Internet.

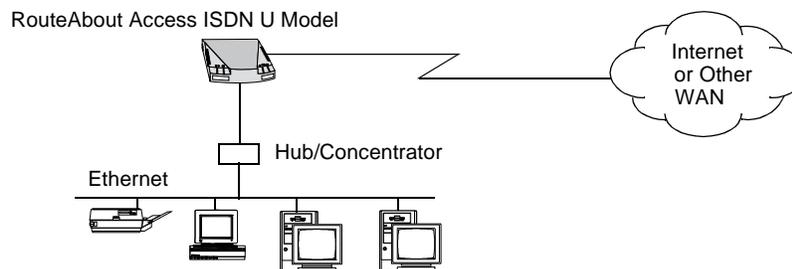


Figure 1-1 Connecting the RouteAbout Access ISDN U Model to the Internet

S/T Model

The S/T model does not have an NT1 device built into the router. You must provide an external NT1 device on the ISDN line.

Caution

DIGITAL recommends that you purchase an NT1 device that has adequate power surge protection.

The S/T model can co-exist with other ISDN equipment using the same ISDN line. Figure 1-2 shows a configuration for connecting the S/T model to the Internet.

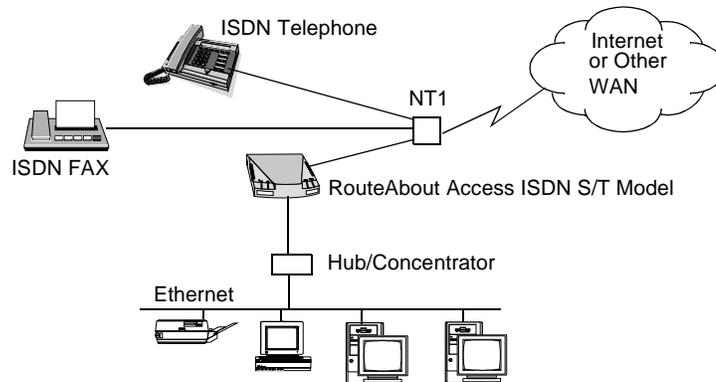


Figure 1-2 Connecting the RouteAbout Access ISDN S/T Model to the Internet

Software Capabilities

There is no need to load any software on your RouteAbout Access ISDN routers. The RouteAbout Access ISDN routers come with a software load. See your *RouteAbout Access ISDN Release Notes* to see the specific list of features and protocols.

To communicate over LANs and WANs, including the Internet, you must assign IP network addresses and configure ISDN on your router. Your Internet Service Provider (ISP) or your network manager can supply you with the IP network addresses and other information that may be pertinent, such as static routes or filters to be enabled. For ISDN details, refer to the “Ordering ISDN” section in Chapter 2.

Table 1-1 lists the RouteAbout Access ISDN routers’ capabilities. The RouteAbout Access/MP has the added capabilities of IPX, AppleTalk 2, and bridging.

Table 1-1 RouteAbout Access ISDN Software Capabilities

Capability	/IP	/MP	Allows you to ...
Split-B channels	X	X	Make two separate connections to different locations at the same time using one ISDN line.
Dial-on-demand	X	X	Make a call when you need it and disconnect the call when you do not need it.
Multilink PPP (MP)	X	X	Combine two 64 Kbps B channels to provide bandwidth up to 128 Kbps.
Bandwidth-on-demand	X	X	Monitor the current traffic utilization of the calls between the RouteAbout Access ISDN and the remote router. If Bandwidth-on-demand is enabled, the Route About Access ISDN can automatically open a second B channel when the first B channel is full.
Data compression	X	X	Achieve speeds of 256 Kbps, or better, over Point-to-Point Protocol (PPP) with ISDN transmission.

Table 1-1 RouteAbout Access ISDN Software Capabilities
(Continued)

Capability	/IP	/MP	Allows you to ...
Security	X	X	Set up access controls, filtering, authentication protocols (PAP and CHAP), and caller ID. For more information, refer to the “Managing and Monitoring Your RouteAbout Access ISDN” section.
Call-back	X	X	Make or accept call-back requests to and from a remote router.
IPX WAN		X	Run the Novell IPX protocol over various WAN media.
Bandwidth Reservation System (BRS)		X	Decide which packets to drop when demand (traffic) exceeds supply (throughput) on a network connection.
Simple Network Management Protocol (SNMP)	X	X	Monitor RouteAbout Access ISDN operating characteristics remotely and get up-to-date information about the router.
Telnet	X	X	Log on to a remote computer and use its resources as though you are directly connected to it, including configuring and managing the router.

The following sections explain these software capabilities in more detail.

Split-B Channels

Allows two separate connections to different sites over the same ISDN line with each connection running over its own 64 Kbps B channel.

Dynamic Bandwidth Management

The RouteAbout Access ISDN routers provide several features that let you have cost-effective performance from your ISDN connection. Review your telephone company’s rate schedule as you read the following summaries of the RouteAbout Access ISDN bandwidth management features.

Dial-on-demand

You can configure the RouteAbout Access ISDN to make an ISDN call to the remote router or ISP only when there is data to transfer from the Ethernet network to the remote router or ISP. The RouteAbout Access ISDN keeps the ISDN call connected until data transfer through the RouteAbout Access ISDN stops for a configurable idle time. Then, the RouteAbout Access ISDN automatically hangs up the ISDN connection. Thus, you do not pay for ISDN connection time when you are not actually transferring data.

The idle-time setting is part of the WAN Manager configuration. Setting the idle time to a brief period, such as several seconds, causes the RouteAbout Access ISDN to hang up the line quickly. When you set the idle time, you should balance the cost, if any, of establishing a telephone call versus the cost of connection time.

Note that setting the idle time to zero disables dial-on-demand. This means the RouteAbout Access ISDN always keeps a call connected.

Multilink Point-to-Point Protocol

ISDN provides two 64 Kilobits per second (Kbps) circuits (B channels). Multilink Point-to-Point Protocol (MP) is a standardized mechanism used to combine multiple physical circuits (B channels) into one logical circuit. This logical circuit is known as a bundle. The RouteAbout Access ISDN supports MP in order to provide the full 128 Kbps of ISDN bandwidth between itself and the remote router or Internet Service Provider (ISP).

You can enable MP as a PPP configuration option. See Chapter 4. MP has several other configuration options:

- The first option defines the initial number of B channels to use when the RouteAbout Access ISDN first makes a call to the remote router. The RouteAbout Access ISDN can use 1 or 2 B channels when it places a call.
- The second option defines the maximum number of B channels that this interface can use. This is usually 2, but you can set the interface to 1 to guarantee that the remote router, when calling the RouteAbout Access ISDN, only gets one of the two available B channels. This is appropriate when you are using the RouteAbout Access ISDN to access two separate remote sites at once.

Bandwidth-on-demand

Bandwidth-on-demand is a feature of RouteAbout Access ISDN Multilink PPP that monitors the current traffic utilization of the calls between the RouteAbout Access ISDN and the remote router. If you enable bandwidth-on-demand, then the RouteAbout Access ISDN can automatically open a second B channel when the data traffic on the first B channel exceeds a user-configurable threshold. Bandwidth-on-demand is valuable when the telephone company charges separately for each B channel.

In Figure 1-3, for example, during periods of heavy demand, the RouteAbout Access ISDN can use the second B channel, as needed, to meet the demand and then drop the second B channel when it no longer needs it.

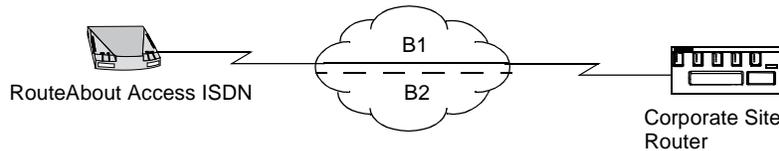


Figure 1-3 RouteAbout Access ISDN in a Multilink PPP Configuration

The RouteAbout Access ISDN determines traffic utilization by measuring the number of bytes per second passing over the ISDN B channel(s). This measurement is computed by using a weighted average of traffic over the last 32 seconds. Three built-in sets of weights provide a Fast, Medium, or Slow response time to changes in traffic load. You enable bandwidth-on-demand by selecting Fast, Medium, or Slow as part of the Multilink PPP configuration.

Multilink PPP decides to add or drop B channel connections by comparing the computed traffic utilization to two user-configurable thresholds. You define these thresholds in percent. For example, the default settings for the low and high utilization thresholds are 35% and 70%, respectively. When traffic on the interface exceeds 70% of its capacity, the RouteAbout Access ISDN uses another B channel (if available) to provide more bandwidth. If traffic on the interface (counting across all B channels currently in use) falls below 35%, then the RouteAbout Access ISDN drops the second B channel connection. (The first B channel is not dropped unless the dial-on-demand idle time expires).

Note: Only the RouteAbout Access ISDN that places the initial call can add a second B channel connection, when needed.

Data Compression

Data compression lets the router software pack more user data into the packets moving through router interfaces. If the rate of packet transfer stays constant, the data transfer rate (throughput) for the router increases proportionally.

Data compression is compatible with PPP interfaces configured for Bandwidth Reservation System (BRS). See the “Bandwidth reservation System” section for more information about BRS. Data compression takes place only after BRS re-orders or drops packets.

Security Features

For security, the RouteAbout Access ISDN routers provide PAP and CHAP authentication protocols, filtering, and access controls. In addition, depending on your telephone company’s switch variant, you can use caller ID to match the caller’s telephone number to the inbound address of a dial circuit.

RouteAbout Access ISDN/IP and /MP

Password Authentication Protocol (PAP)

- Requires the RouteAbout Access ISDN to send a password to the remote router or the RouteAbout Access ISDN can require a password from the remote router.
- Only the answering router can initiate the transaction, not the calling router.
- No data passes between the routers unless this authentication process completes.
- If the answering router accepts the password, communication between the RouteAbout Access ISDN and the connecting router begins.
- If the answering router does not accept the password, the router refuses the connection attempt.

Challenge Handshake Authentication Protocol (CHAP)

- Requires that either the RouteAbout Access ISDN send a challenge to the remote router or that the remote router send a challenge to the RouteAbout Access ISDN.
- No data passes between the routers unless this authentication process completes.
- The RouteAbout Access ISDN anticipates a specific response. If the remote router answers with the anticipated response, communication between the two routers begins. Otherwise, the challenging router refuses the connection.

Caller ID

If the ISDN switch provides the caller's telephone number, the caller ID feature matches that number to the inbound address of a dial circuit. Caller ID uses the internal telephone number directory of the RouteAbout Access ISDN routers to identify the name of the caller by using his/her telephone number.

Filtering

- IP filters start by blocking all traffic. You then create a collection of filters to allow specific traffic based on your organization's security policy.
- Once you set up your filters, you can test and troubleshoot them using Event Logging System (ELS) messages. You can also set up filters to generate ELS messages.
- You can set up an IP filter that prevents people from using a forged IP source address to circumvent security. A packet with a spoofed, that is disguised, IP address appears to come from inside a protected network and to be eligible for forwarding into the network but in reality it is generated on the unprotected side of the network.

RouteAbout Access ISDN/MP Only

Access Controls for IPX

Packet forwarding is based on a global list of criteria. If you enable this feature, each packet is subject to the access control list. Depending on the match, the router can forward or drop the packet. You can filter packets based on source and destination addresses.

Filtering for IPX

Works the same way as IPX access controls. The router discards all packets that the filter does not explicitly include. However, filtering works on a specific interface rather than on the entire router, as do access controls.

You can set up IPX filters to prevent people from using a forged IPX source address to circumvent security. A packet with a spoofed IPX address appears to come from inside a protected network and to be eligible for forwarding into the network but in reality it is generated on the unprotected side of the network.

Call-back Feature

The Call-back feature causes the local RouteAbout Access ISDN to make or accept call-back requests to or from a remote router. The RouteAbout Access ISDN uses the LCP (Link Control Protocol) Call-back option, as defined in RFC 1570, to control call-back processing. When the router successfully negotiates Call-back, this feature uses PAP and/or CHAP for authentication to determine the identity of the calling router. Call-back is typically used with Dial-on-demand, but it is not required.

The default is to have Call-back disabled. If the remote router requests Call-back and Call-back is disabled on the RouteAbout Access ISDN, then the RouteAbout Access ISDN rejects it. The RouteAbout Access ISDN cannot request or accept Call-back when Call-back is disabled.

This feature has three separate, mutually exclusive options when you enable Call-back. The following are the three options:

- *Request.* The local RouteAbout Access ISDN requests the remote router to call back. If the remote router agrees, then the RouteAbout Access ISDN hangs up the line and waits for the return call. If the remote router rejects the Call-back, then the RouteAbout Access ISDN leaves the line connected as if it never requested the Call-back.

This option is useful for a telecommuter who configures an interface to call his/her employer in order to reverse the charges back to the employer.

- *Accept.* You must enable PAP or CHAP before you enable Call-back using the accept option. This guarantees that the RouteAbout Access ISDN is able to identify the remote router that it is supposed to call back. If the remote router asks for a Call-back, then the RouteAbout Access ISDN accepts the request and acknowledges to the remote router that it will call back. The RouteAbout Access ISDN disconnects the telephone line and places a Call-back. The telephone number of the caller (by name) must exist in the ISDN telephone directory of the local RouteAbout Access ISDN.

This option supports the Internet Service Provider (ISP) who wants to connect to the RouteAbout Access ISDN. The ISP can request a Call-back from the RouteAbout Access ISDN to the ISP so the RouteAbout Access ISDN bears the cost of the call. The RouteAbout Access ISDN only calls back the ISP if the ISP requests a Call-back.

- *Always.* This option supports routers that do not use RFC 1570, as well as those that do. The RouteAbout Access ISDN uses PAP or CHAP to determine the identity of the caller and unconditionally calls back the remote router if the remote router is authenticated. There is no RFC 1570 negotiation required, but if the remote router uses RFC 1570, this option supports it and uses it correctly.

DIGITAL does not generally recommend using the *always* option because the remote router does not necessarily know that the RouteAbout Access ISDN will execute a Call-back.

IPX WAN (for RouteAbout Access ISDN/MP Only)

IPX WAN is a point-to-point concept. It is the Novell standard way of running the Novell IPX protocol over various WAN media. It interoperates with any router that supports the IPX WAN Novell standard.

Note: You do not have to use IPX WAN over your WANs. You can still run the broadcast circuit method over your WANs, if you wish. However, IPX WAN is the preferred method.

One of the most important things that IPX WAN does is to set which routing protocol is used over the WAN connection. The possible routing protocols are

- Unnumbered RIP
- Numbered RIP
- On-demand, static routing
- Client-router

Bandwidth Reservation System (for RouteAbout Access ISDN/MP Only)

The Bandwidth Reservation System (BRS) allows you to decide which packets to drop when demand (traffic) exceeds supply (throughput) on a network connection. The router does not use BRS until there are requests for more than 100% of the available line bandwidth.

Bandwidth reservation is really a safeguard. In general, a network should not attempt to use greater than 100% of its line speed. If it does, a faster line is probably needed. The bursty nature of traffic, however, can drive the requested transmission rate to exceed 100% for a short time. In these cases, bandwidth reservation is enabled and the higher priority traffic is ensured delivery (that is, it is not discarded).

Bandwidth reservation is a feature that runs over dial circuits.

Simple Network Management Protocol (SNMP)

SNMP enables network hosts to read and modify some of the settings of the router's operating characteristics. It allows software running on a remote host to contact the router over a network and get up-to-date information about the

router on request. Since SNMP software can access most of the configuration data, you do not have to enter commands at a remote terminal.

SNMP's basic functions include the following:

- Collecting information and modifying router operating characteristics on behalf of remote SNMP users.
- Sending and receiving SNMP packets via the IP protocol.

The software that processes SNMP requests runs on the router. The user program that makes SNMP requests runs on the user's machine elsewhere in the network, not on the router.

Telnet

Attaches you remotely to another router or a remote host. The only optional parameter is the terminal type that you want to emulate. The router forwards the terminal type to the destination.

A router can have a maximum of five Telnet sessions:

- Two servers, inbound to the router
- Three clients, outbound from the router

Note: To use the **telnet** command with a RouteAbout Access ISDN/MP in a pure bridging environment (that is, with IP disabled), you must enable TCP/IP host services. For detailed information on TCP/IP host services, refer to the RouteAbout Access ISDN Software V2.3 *Bridging Guide* on the DIGITAL web site (www.networks.digital.com for North America).

Managing and Monitoring Your RouteAbout Access ISDN

You can manage the RouteAbout Access ISDN routers through an integral RS-232 console port or in-band via Telnet or SNMP. RouteAbout Access ISDN Software V2.3 incorporates a real-time operating system that routes packets and provides configuration and statistical information to you. For details, refer to the “Running Ping and Telnet” section in Chapter 5.

Through the use of lights on the front and back of the router, you can monitor the operation of the RouteAbout Access ISDN routers. For a full description of the lights, refer to the “Monitoring RouteAbout Access ISDN Status Lights” section in Chapter 5.

Use Event Logging System (ELS) messages to assist you in identifying problems with the RouteAbout Access ISDN routers. For details, refer to the “Using Event Logging System” section in Chapter 6.

Chapter 2

Introducing ISDN

Integrated Services Digital Network (ISDN) is a switched digital technology that upgrades an ordinary analog telephone network to an all-digital, end-to-end network. Using ISDN, you can transmit all types of information, such as voice, data, and video. With ISDN, you no longer need to incur the expense of leasing an all-digital line to receive the high-speed benefits of digital technology.

This chapter introduces you to ISDN and assists you with ordering ISDN from your telephone service. It covers the following topics:

Understanding ISDN	16
How ISDN Works	19
Ordering ISDN	29

Understanding ISDN

Digital technology is the basis for ISDN. Digital technology breaks information down into strings of ones and zeros; it does not matter whether the format is voice, video, or data. Digital format results in faster speeds and efficiency than what you can achieve with analog format.

Presently, our telephone system is based on analog systems. Analog systems send voice, video or data in a format that is analogous or similar to the original signal. Analog technology cannot break information down into smaller parts.

Since computers are digital devices, it becomes complicated and cumbersome when they have to transmit data over analog lines. The modem on the sending end takes the computer's binary ones and zeros and converts them to a series of analog tones and then the modem on the receiving end converts the tones back to their digital equivalents. This process is very inefficient because noise on the line corrupts the tones and limits the amount of data that can flow on the line. With digital technology, noise is limited and the amount of data can change on demand.

Routers and other internetworking equipment that use ISDN can take advantage of the high speed Wide Area Network (WAN) services ISDN provides, as well as the ability to send multiple types of data.

Table 2-1 summarizes some of the advantages of ISDN internetworking equipment, such as the RouteAbout Access ISDN routers.

Table 2-1 Digital Versus Analog

Feature	Digital (ISDN)	Analog
Data transmission rate	Faster than analog. B (Bearer) channel used for delivering data over ISDN works at 64 Kbps. If you combine two B channels, you can reach speeds of 128 Kbps (256 Kbps or better with compression).	Modems typically work at 14.4 Kbps or 28.8 Kbps.

Table 2-1 Digital Versus Analog (Continued)

Feature	Digital (ISDN)	Analog
Call (setup) and disconnect (teardown) time	Fast setup or teardown for a call, that is, about one second.	Modem can take up to 30 seconds or longer for these processes.
Information on incoming calls	Uses D channel to provide information, such as telephone numbers and the types of equipment in use at your location and that of the party called. Does not interrupt a call in progress.	Uses in-band signaling to advise of control events, such as call waiting. Interrupts calls or applications.
Simultaneous use of lines	Allows you to dial to an ISDN bridge or router from a remote site and log into a file server at the same time you take a telephone call.	State of the art technology is beginning to offer Frame Relay links to accomplish this. Requires specific hardware.
Voice and/or data	Allows connection with either ISDN or analog users. You can continue to use your existing analog devices with the use of an ISDN Terminal Adapter or other device that handles Plain Old Telephone Service (POTS) connections.	Not available.
Call management	Enables you to handle more than one call at a time and provides caller ID, if your telephone line is provisioned with that feature.	Not available.

Table 2-1 Digital Versus Analog (Continued)

Feature	Digital (ISDN)	Analog
Split-B channels	Allows for two separate connections to different sites over the same ISDN line with each connection running over its own B channel.	Not available.
Ability combine B channels for greater bandwidth	Combines B channels to function as one so that one device can use it with increased data transmission capacity.	Not available.

How ISDN Works

To best understand how ISDN works, it is helpful to understand the following:

- Access Interfaces and Data Transmission Channels
- Functional Devices and Reference Points
- Network Termination (NT1) Devices
- Switch Variants
- ISDN Telephone Numbers
- Point-to-Point and Multipoint Configurations
- Terminal Endpoint Identifier (TEI)
- Service Profile Identifier (SPID)

To configure your RouteAbout Access ISDN, you need to use the numbers, such as, telephone number, TEI, and SPID, that you get from your telephone company when you order ISDN.

Access Interfaces and Data Transmission Channels

An access interface is the connection between you and the telephone company's central switching office. This interface is what allows you to access and obtain ISDN services.

A channel is a conduit through which information flows in both directions. Until the advent of ISDN, people used Plain Old Telephone Service (POTS) lines for WANs and connections to the Internet. POTS transmits analog information through one channel.

ISDN provides two types of access interfaces: Basic Rate Interface (BRI) and Primary Rate Interface (PRI), each of which provides more than one channel.

Basic Rate Interface (BRI)

BRI ISDN transmits and controls information through the use of two 64 Kbps B (bearer) channels and one 16 Kbps D channel. This is called 2B+D. The telephone company provides these three separate channels over the same type of wire that carries only one channel of analog information. The RouteAbout Access ISDN routers support BRI.

BRI is an affordable access interface that most small businesses and individuals use for ISDN. The user-data rate on the BRI for the 2 B channels is 2 x 64 Kbps or 128 Kbps and the signalling rate for the D channel is 16 Kbps.

B Channels

The B channels are the data transmission connections for ISDN. They are circuit-switched digital data flow channels used to carry data, voice, video, or fax across the network.

Circuit-switching is a form of communication in which there is a transmission path between two devices that is routed through one or more switches. The path is assigned for the duration of the call. At this time, the RouteAbout Access ISDN routers transport only data.

D Channel

The D channel is primarily used to control the flow of data through the network: out-of-band call setup and teardown and maintenance of overhead functions, such as signaling between telephone company switches and network monitoring.

Out-of-band signaling uses signaling channels that are separate from the user's data transmission channel. ISDN uses out-of-band signaling via the D channel. This allows for fast call setup, minimizing the amount of time wasted on retries, and much more efficient routing.

Figure 2-1 displays the two B channels and one D channel.

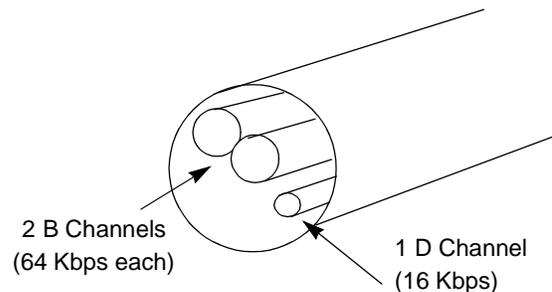


Figure 2-1 A BRI With 2 B Channels and 1 D Channel

Primary Rate Interface (PRI)

PRI ISDN is designed for businesses with large data needs, or that need to set up their own local telephone system. In North America and Japan, PRI has 23 64 Kbps B channels and one 64 Kbps D channel. This is called 23B+D. In Europe, PRI has 30 64 Kbps B channels, and one 64 Kbps D channel. This is called 30B+D. The RouteAbout Access ISDN routers do *not* support PRI.

Functional Devices and Reference Points

Figure 2-2 defines the ISDN connection. It shows the ISDN functional devices and reference points.

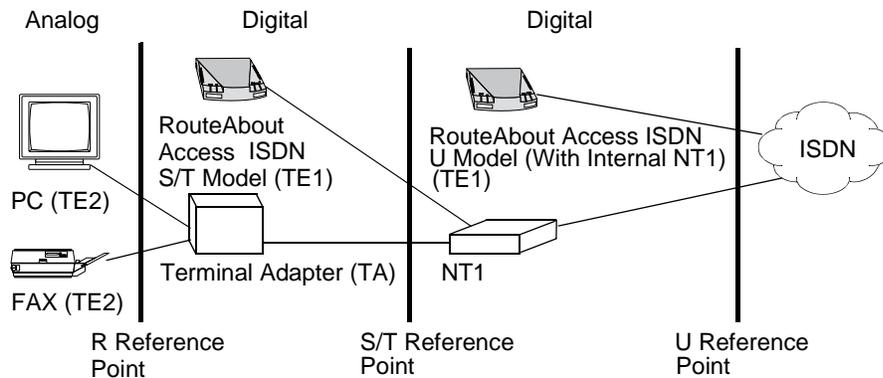


Figure 2-2 The ISDN Connection: ISDN Functional Devices and Reference Points

Functional devices are pieces of hardware that perform tasks on an ISDN. See Table 2-2. The PC and FAX machine are Terminal Equipment 2 (TE2) functional devices that are not capable of connecting to an ISDN without using the Terminal Adapter (TA). The combination of a TE2 and a TA has the same functionality as a Terminal Equipment 1 (TE1).

The ISDN line between the TA and the NT1 can support up to eight devices. You need to bus the devices together.

The RouteAbout Access ISDN routers are TE1 devices that are ISDN-ready. The RouteAbout Access ISDN U models are devices that can carry out more than one function. They combine a TE1 and an NT1. The RouteAbout Access ISDN S/T models are TE1s that require an external NT1.

The following table describes the functional device tasks each performs in an ISDN connection.

Table 2-2 Functional Devices

Functional Device	Description
TE1	Any ISDN-ready device that connects directly to ISDN or connects to ISDN via an NT1. For example: a digital telephone, a RouteAbout Access ISDN router.
TE2	Any non-ISDN device that needs to be used with a Terminal Adapter (TA) to work with ISDN. For example: an analog FAX, PC, or analog telephone.
TA	A device that converts non-ISDN communication to ISDN to allow non-ISDN devices to work with ISDN.
NT1	A device located between the S/T and U reference points that allows communication between functional devices.

Device-to-device interfaces are called reference points. **Table 2-3** explains the location of the reference points in an ISDN connection.

Table 2-3 Reference Points

Reference Point (Interface)	Located between...
R	Non-ISDN Terminal Equipment (TE2) and a Terminal Adapter (TA)
S/T	ISDN user equipment and Network Termination (NT1) equipment
U	NT1 equipment and an ISDN central office

Network Termination (NT1) Devices

An NT1 is the boundary to the ISDN network from the end-user side. It includes the physical and electrical termination functions of ISDN. It provides an interface between the twisted-pair wires used by the telephone company in the BRI and the eight-wire cables used by ISDN equipment. It is located between the S/T and U reference points and is the termination point before the ISDN switch.

Figure 2-3 shows the RouteAbout Access ISDN S/T and U models in relation to the switch within North America and outside North America.

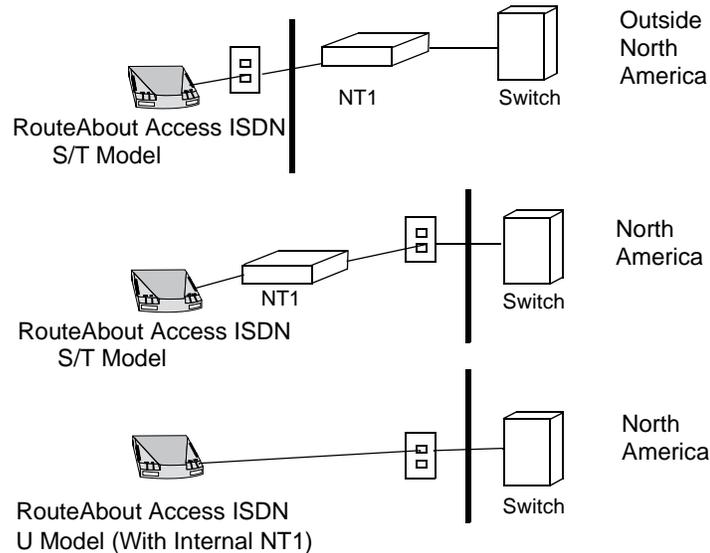


Figure 2-3 Function of NT1

Outside North America, NT1 is provided as part of the telephone company equipment. Inside North America, customers must provide NT1 equipment. The U model has an internal NT1. The S/T model does not come with an NT1; you must provide it. In North America, where the NT1 is not built into the wall, using an integrated piece of equipment, such as the RouteAbout Access ISDN U model, is convenient.

Switch Variants

The telephone company's switch variant, or type of switch, determines the capabilities of your ISDN service. It is your primary connection into the ISDN network. The switch variant determines how many ISDN devices you can handle, as well as what different configuration options you can have. Some switch variants support eight different devices, others limit you to two devices. The switch also determines which B channels support voice, video, data, or both. Most telephone companies provide a switch variant from one of

the following ISDN switch variants. The RouteAbout Access ISDN routers support all of the following:

Table 2-4 ISDN Switch Variants Supported

Location	If you want this switch standard . . .	Set the software to . . .
North America	United States National ISDN-1	USNI1
	United States National ISDN-2	USNI2
	AT&T 5ESS Custom	5ESS
	Northern Telecom DMS-100 Custom	DMS-100
Europe	European ETSI NET3, VN4	NET3
	VN3	VN3
Japan	INSNet64	INS64
Australia	TS013	AUS

Note: As of October 18, 1996, VN3 is obsolete in Europe.

When you call your telephone company, you must ask for the switch variant they use. When you configure the RouteAbout Access ISDN, you need to provide the switch variant.

ISDN Telephone Numbers

When you order ISDN, you need a telephone number (directory number) for the ISDN line assigned to you by the telephone company. Depending on the switch variant your telephone company has, you may need only one for both B channels or one for each B channel. These numbers do not have a direct association with any one of the B channels, but can be used for either.

When you configure the RouteAbout Access ISDN for ISDN, you need to define the ISDN telephone number(s) assigned to the B channels.

Point-to-point and Multipoint Configurations

In the ISDN configuration in Figure 2-4, the RouteAbout Access ISDN S/T model is in a point-to-point configuration, where there is one router on the

ISDN line. A point-to-point configuration for the U model would look the same except the NT1 would be inside the RouteAbout Access ISDN itself.

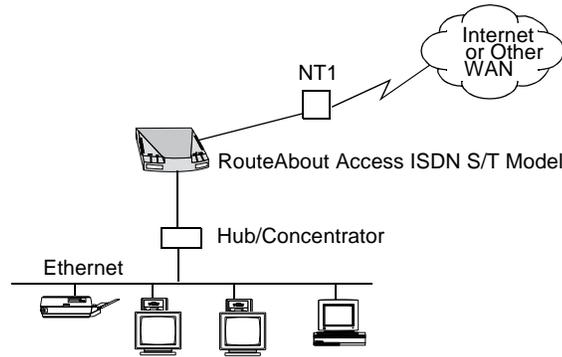


Figure 2-4 ISDN Point-to-point Configuration

In Figure 2-5, the RouteAbout Access ISDN S/T model is sharing the ISDN line with other devices in a multipoint configuration.

Note: When the RouteAbout Access ISDN is the only device at the end of an ISDN line, you would not be sharing the line with other physical pieces of equipment. However, you may need to configure the line for multipoint, if your telephone company uses a switch variant that requires multipoint configuration, regardless of the number of pieces of equipment you have on your ISDN line.

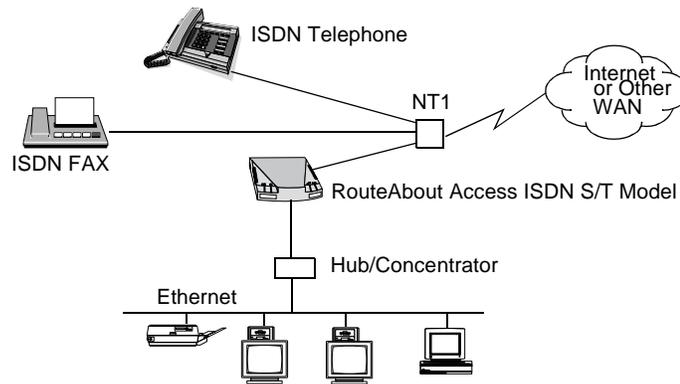


Figure 2-5 ISDN Multipoint Configuration

Terminal Endpoint Identifier (TEI)

Terminal equipment refers to any device you have that is connected to an ISDN line. The Terminal Endpoint Identifier (TEI) is a number that identifies your equipment. In Figure 2-2, the RouteAbout Access ISDN, S/T and U models, as well as the Terminal Adapter, have TEIs. The Terminal Adapter has the TEI for non-ISDN terminal equipment.

The telephone company either automatically assigns TEIs or gives you a pre-assigned value to enter in the configuration of your RouteAbout Access ISDN. When you configure your RouteAbout Access ISDN, you either enter the assigned TEI(s) or select automatic, as directed by your telephone company. TEIs always exist.

Service Profile Identifier (SPID)

A SPID is a number that lets the telephone company know what kinds of ISDN services a given device can access. If your telephone company uses SPIDs, you need a unique SPID for every device you have on the ISDN line or one for each B channel. A SPID is usually a 10-, 12-, or 14-digit number containing the telephone number of the line and a prefix or suffix, or both. For example, 31466699990000. Whether or not your telephone company uses SPIDs depends on the kind of switch in use. The switch variants in North America use SPIDs.

When you configure the RouteAbout Access ISDN, you need to specify the SPIDs used. You can configure up to two SPIDs on the RouteAbout Access ISDN, one for each B channel.

Ordering ISDN

When you configure your RouteAbout Access ISDN, you must know the switch variant your telephone company has, your ISDN telephone number, TEIs, and possibly SPIDs. You can get this information from your telephone company. Be sure to save this information.

To order an ISDN line,

1. Call your telephone company.
2. Ask for their ISDN switch variant.

The telephone company must make certain provisions to ensure that ISDN can work for your needs and configuration. The telephone company's switch (refer to the "Switch Variants" section) must be provisioned to supply the services you need.

You may want to use a Centrex switch, if your local telephone company provides it. Centrex provides switching applications like an on-site Private Branch Exchange (PBX) but all your connections go back to the telephone company office. For Centrex, the telephone company charges an installation and monthly fee and operates much like a leased-line connection so you can use it for your own internal network. The lines remain up all the time and there is no per call usage charge.

3. Get an ISDN telephone number (directory number).

Depending on the switch variant, you may need only one number for both B channels or one for each B channel. The telephone company tells you.

4. Find out how many digits you need to use to dial out.

Your telephone company will tell you the number of digits you need to dial out. Sometimes you need the area code and telephone number, such as for long-distance calls, other times just a seven-digit number, or a 9 + seven digits, or just four digits as in an extension number. The number of digits may vary depending on the call destination.

5. Find out whether you need to configure your ISDN line as point-to-point or multipoint.

Some switches require you to configure your line as multipoint (having multiple devices using the same BRI line) regardless of how many devices you have at the end of your ISDN line.

6. Get a TEI for each device connected to your ISDN line.

Generally, the telephone company tells you to use Automatic TEIs, where the switch assigns the TEI value automatically when the router initializes the ISDN line. However, in some circumstances, the telephone company assigns you a Fixed TEI, a number between 0 and 63, which is permanently assigned to the ISDN line.

7. In North America only, find out whether or not your telephone company uses SPID numbers. If so, you need to know the SPIDs associated with this line and should have at least one SPID for each B channel.

ISDN Call Setup and Teardown

Figure 2-6 illustrates what happens physically when two RouteAbout Access ISDN S/T models, RouteAbout Access ISDN X and RouteAbout Access ISDN Y, make a connection.

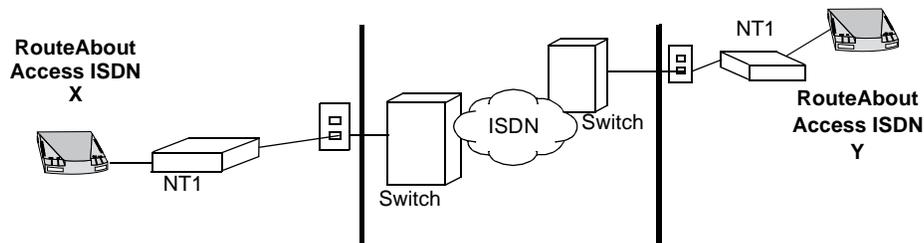


Figure 2-6 Call Setup and Teardown

When you place a call using ISDN equipment, the following steps occur from setup to teardown.

1. A physical/electrical connection is made between each RouteAbout Access ISDN and their local switch.
2. Using the D channel, the switch and each RouteAbout Access ISDN exchange TEI messages so that each RouteAbout Access ISDN ends up with an identifier.

3. Using the D channel, each RouteAbout Access ISDN sends SPIDs up to the switch for initialization. This typically happens for North American switches that are configured for multipoint operation.

If TEIs are assigned and SPIDs are successfully initialized, you are ready to receive or make calls over one or both of the B channels, simultaneously.

4. The control information, which the D channel carries, sets up one or two calls on the B channels, one call per B channel.
5. The two devices, for example, RouteAbout Access ISDN X and RouteAbout Access ISDN Y pass data back and forth on the B-channel calls.
6. Suppose RouteAbout Access ISDN X requests to shut down a call.
7. Using the D channel, the switches disconnect the B channel carrying that call between the two routers. (If two calls are up, the other B channel remains up.)
8. The call is terminated and the B channel is then available for another call. One or both calls can set up or tear down in this manner.

Chapter 3

Setting Up Your RouteAbout Access ISDN Hardware

Your RouteAbout Access ISDN routers provide communication between a LAN and WAN (ISDN). This chapter describes the step-by-step procedures for setting up the necessary connections. It includes the following topics:

Introduction	34
Before You Begin	36
Connecting Your RouteAbout Access ISDN to an Ethernet Network	37
Connecting Your RouteAbout Access ISDN to an ISDN Line	39
Connecting Your RouteAbout Access ISDN to a PC	41
Plugging in the Power Supply	45
Powering Up the RouteAbout Access ISDN	46

Introduction

The RouteAbout Access ISDN routers do not require any special environment. They operate at normal room temperature and humidity and can co-exist with the usual computer equipment and electronic devices found in offices, homes, and classrooms. For complete information about the RouteAbout Access ISDN operating environment, refer to Appendix C, Hardware Specifications.

The following sections show how to connect your RouteAbout Access ISDN to

- An Ethernet network
- An ISDN line
- A PC (console)
- A power supply

The RouteAbout Access ISDN/IP and /MP both come in two models, the U model and the S/T model. To assist you with your setup, Figure 3-1 displays the back panel of the U model and Figure 3-2 displays the back panel of the S/T model.

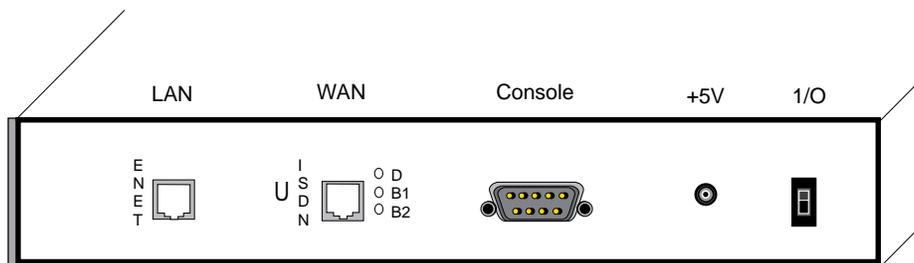


Figure 3-1 RouteAbout Access ISDN U Back Panel

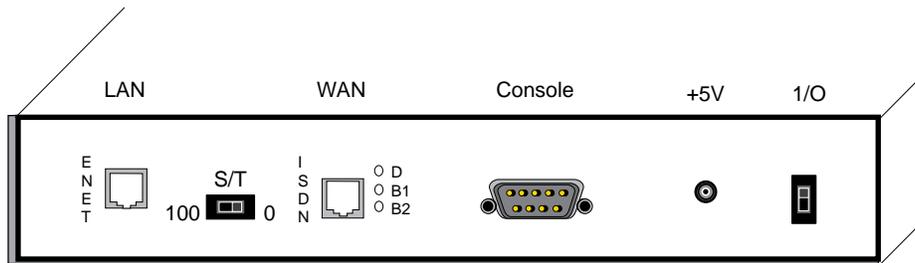


Figure 3-2 RouteAbout Access ISDN S/T Back Panel

Before You Begin

Before you begin installing your RouteAbout Access ISDN, have the following available:

- Ethernet 10BaseT cable
This is also known as Unshielded Twisted Pair (UTP) cable. It is not supplied with your RouteAbout Access ISDN but is readily available at a computer store.
- RJ-45 ISDN cable
This is supplied with your RouteAbout Access ISDN. The part number is 12-003120-03.
- Console cable and 9-pin to 25-pin console adapter
This is supplied with your RouteAbout Access ISDN. The part number is 12-003130-02.
- A PC or terminal to be used as a console

Caution

For your personal safety, follow the safety guidelines in the “Safety Information” section in the front of this guide before installing your RouteAbout Access ISDN.

Connecting Your RouteAbout Access ISDN to an Ethernet Network

You can connect your RouteAbout Access ISDN to an Ethernet network by using 10BaseT (UTP) cable and a hub or using Ethernet crossover cable.

Using a Hub

1. Connect one end of the UTP (10BaseT) Ethernet cable to the RJ-45 ENET connector on the RouteAbout Access ISDN.

Caution

Do not connect this cable to your ISDN port.

2. Connect the other end of the cable to a 10BaseT concentrator or hub.

Figure 3-3 illustrates how to use a 10BaseT cable to connect your RouteAbout Access ISDN to the Ethernet LAN.

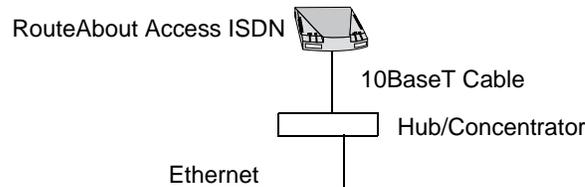


Figure 3-3 10BaseT Connection

Note: The maximum cable length for 10BaseT cable is 100 meters (approximately 328 feet).

Using an Ethernet Crossover Cable

If you want to connect a single PC or terminal directly to your RouteAbout Access ISDN, you can use an Ethernet crossover cable. For pinout information, see Appendix D, Cable Specifications.

1. Connect one end of an Ethernet crossover cable to the RJ-45 ENET connector on the RouteAbout Access ISDN.

Caution

Do *not* connect this cable to your ISDN port.

2. Connect the other end of the cable to the Ethernet port on your PC or terminal

Figure 3-4 is an example of connecting a PC to a RouteAbout Access ISDN with an Ethernet crossover cable.

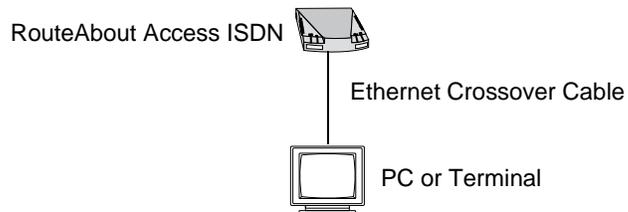


Figure 3-4 Crossover Cable Connection

Connecting Your RouteAbout Access ISDN to an ISDN Line

How you make the connection from your RouteAbout Access ISDN to an ISDN line depends on whether you have a RouteAbout Access ISDN U or S/T model.

U Model

1. Connect one end of the DIGITAL-supplied RJ-45 ISDN cable to the RJ-45 ISDN connector on the RouteAbout Access ISDN. See Figure 3-1.
2. Connect the other end of the DIGITAL-supplied ISDN cable directly into an ISDN wall jack. See Figure 2-3.

Caution

An RJ-11 cable, which is used with a regular telephone, can also be used to connect the RouteAbout Access ISDN to the wall jack. DIGITAL discourages this because you may inadvertently plug the RouteAbout Access ISDN into a normal telephone jack. This may damage the RouteAbout Access ISDN.

S/T Model

1. Connect one end of the DIGITAL-supplied RJ-45 ISDN cable to the RJ-45 ISDN connector on the RouteAbout Access ISDN. See Figure 3-2.
Note: Because the S/T model does not contain an internal NT1 device, you need an external NT1 device to attach to your ISDN line. A typical NT1 device looks like a small modem and has S/T port(s) and a U interface on the back of it. All the ports use RJ-45 jacks. See Figure 2-3.
2. Connect the other end of the DIGITAL-supplied ISDN cable to the S/T port on the NT1 device.

3. Set the S/T terminator switch to the appropriate position. Refer to the “Setting the S/T Switch” section.
4. Connect one end of an ISDN cable into the NT1 U interface port and the other end into the ISDN wall jack. The ISDN cable for this connection is dependent on your NT1 device.

Setting the S/T Switch

There is an S/T switch on the back of the RouteAbout Access ISDN S/T models. See Figure 3-2. You can slide the switch to 100 or 0. Setting the switch to 0 means that no terminating resistor is in use. Setting the switch to 100 means that the RouteAbout Access ISDN S/T model terminates the ISDN cable with a 100-ohm resistor.

For point-to-point connections (as shown in Figure 3-5), set the switch to 100. For all other configurations, consult your NT1 device manual for the proper settings. In a point-to-point connection, there is one ISDN device on an ISDN line.

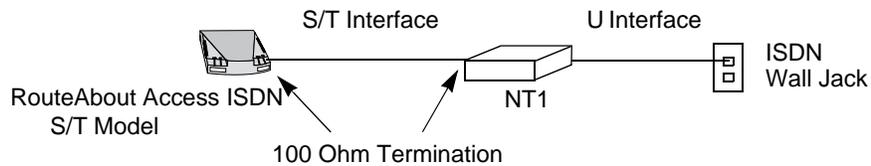


Figure 3-5 Point-to-point Connection

Connecting Your RouteAbout Access ISDN to a PC

In order to set up the network interface for the RouteAbout Access ISDN routers, you must initially configure your RouteAbout Access ISDN from a PC (or terminal) connected to the RouteAbout Access ISDN console port. You can use either the RouteAbout Access ISDN Configuration Tool, Quick Config, or the RouteAbout Access ISDN Software V2.3 Command Line Interface to do this initial configuration.

Use the DIGITAL-supplied console cable and 9-pin to 25-pin console adapter to directly connect a local PC or terminal to the console port. If your PC or terminal has a 9-pin connector, you do not need the adapter.

Figure 3-6 shows three ways to connect a PC to the RouteAbout Access ISDN, as well as a legend that describes the cables and adapter.

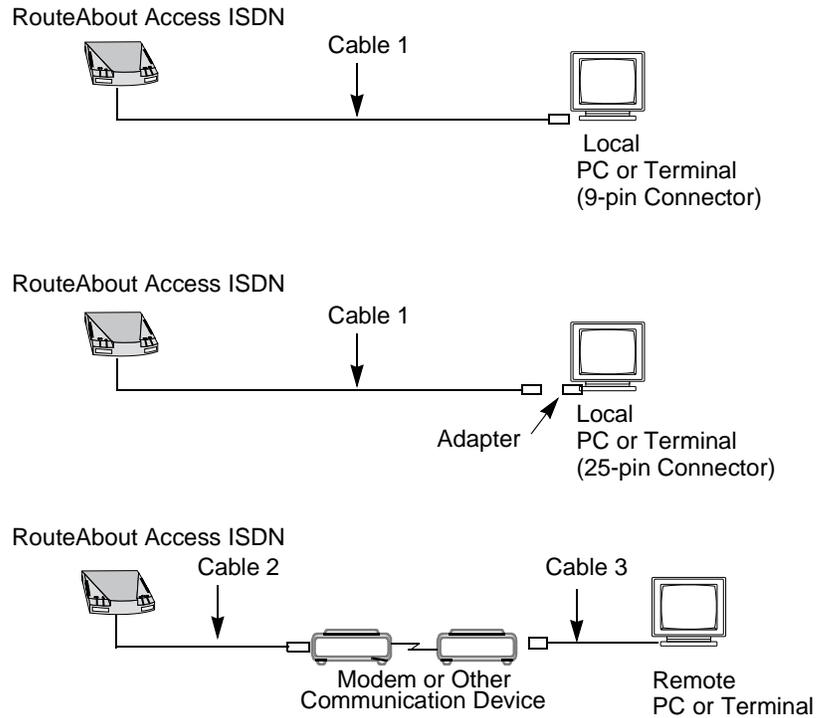


Figure 3-6 Console Connections

Cable 1	DIGITAL-supplied P/N 12-003130-02	9-pin to 9-pin null modem cable
Cable 2	DIGITAL-orderable BC29P-10	9-pin to 25-pin straight-through cable
Cable 3	Available at a computer store	Dependent on your modem and PC
Adapter	DIGITAL-supplied P/N 12-003130-02	9-pin to 25-pin console adapter

Setting Up Your Terminal Application

If you want to configure your RouteAbout Access ISDN by using Quick Config or the Command Line Interface (see Appendix A, Using the Command Line Interface or Appendix B, Using Quick Configuration), connect your PC serial port to the RouteAbout Access ISDN console port and run the Microsoft® Terminal Emulation program. You can use the terminal application for Windows™ 3.1, Windows NT, Windows for Workgroups 3.11, or the HyperTerminal application for Windows™ 95.

Microsoft Windows 3.1 and Windows for Workgroups 3.11 Terminal Application

1. In the Accessories program group, double click the **Terminal** icon.
2. Under the Settings menu, select **Terminal Emulation**. Select **DEC VT-100 (ANSI)**.
3. Under the Settings menu, select **Terminal Preferences . . .** In the Terminal Preferences dialog box, make sure the **Use Function, Arrow, and Ctrl Keys for Windows** item is *not* selected.
4. Under the Settings menu, select **Communications**. Select the following settings:
 - a. Baud Rate: **9600**
 - b. Data Bits: **8**
 - c. Stop Bits: **1**
 - d. Parity: **None**
 - e. Flow Control: **Xon/Xoff**
 - f. Connector: **COM1 or COM2**

Microsoft Windows 95 HyperTerminal Application

1. Click the Start button and select **Programs, Accessories, and HyperTerminal**.
2. In the HyperTerminal window, double click the **Hypertrm.exe** icon.
3. Enter **rai** in the Name field and select any icon to represent your RouteAbout Access ISDN Terminal Emulation.
4. In the Phone Number screen, in the Connect using field, select the appropriate COM port to use, for example, Direct to Com 1.
5. In the COM1 Properties screen, select the following settings:
 - a. Baud Rate: **9600**
 - b. Data Bits: **8**
 - c. Parity: **None**
 - d. Stop Bits: **1**
 - e. Flow Control: **None**

Plugging in the Power Supply

There is a +5V connector in the back of your RouteAbout Access ISDN. Follow these steps to connect the DIGITAL-supplied power supply (P/N 40-000200-00):

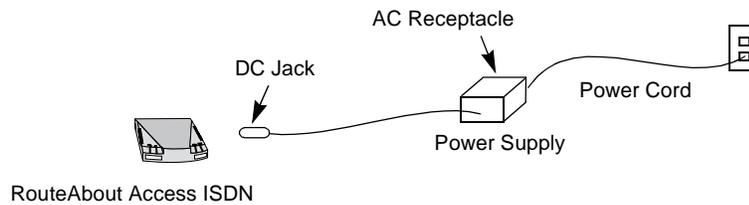


Figure 3-7 Connecting the Power Supply

1. Connect the DC jack end of the DIGITAL-supplied 5VDC power supply to the +5V connector on the back of your RouteAbout Access ISDN. See Figure 3-1 and Figure 3-2.
2. Connect one end of your power cord into the AC receptacle of the power supply.
3. Plug the power cord into the wall outlet.

Powering Up the RouteAbout Access ISDN

After you have secured all your connections, you are ready to power up your RouteAbout Access ISDN. There is a power switch, which is marked I/O, on the back panel of both models of the RouteAbout Access ISDN that controls the power to the router. See Figure 3-1 or Figure 3-2. Once you move the power switch to the “1” position, (switch up for ON), POST (Power On Self Test) begins. POST takes from 10-30 seconds, depending on the size of the RouteAbout Access ISDN memory (DRAM).

During the execution of POST, the OK light flashes at approximately three times per second. Following a successful pass of POST, the RouteAbout Access ISDN starts to boot and the OK light flashes approximately every second.

If POST detects a catastrophic failure, the OK light turns off and the RouteAbout Access ISDN powerup sequence halts.

If POST detects a noncatastrophic failure, the RouteAbout Access ISDN continues to boot and reports a diagnostic failure code on the attached terminal or PC.

If POST fails, restart the powerup sequence. If the RouteAbout Access ISDN continues to fail, contact DIGITAL customer service.

For more information about the status lights, see “Monitoring RouteAbout Access ISDN Status Lights” in Chapter 5.

Chapter 4

Configuring Your RouteAbout Access ISDN

This chapter discusses the tools available for configuring your RouteAbout Access ISDN. It focuses on one of those tools, the RouteAbout Access ISDN Configuration Tool. It includes the following topics:

Introducing Configuration Tools	48
Configuring Your RouteAbout Access ISDN	49
Using the RouteAbout Access ISDN Configuration Tool	51
Using Basic Configuration	58
Using Intermediate Configuration	67
Using Advanced Configuration	82
Saving Your Configuration	85
Loading an Existing Configuration	88

Introducing Configuration Tools

You receive your RouteAbout Access ISDN with software already installed. Configuring the RouteAbout Access ISDN involves setting a few configuration parameters to make it work. You can configure your RouteAbout Access ISDN by using one of the following tools:

Tool	Description
RouteAbout Access ISDN Configuration Tool	A Microsoft Windows-based graphical configurator shipped with your RouteAbout Access ISDN. It runs under Windows 3.1, Windows for Workgroups 3.11, Windows NT, and Windows 95.
Command Line Interface	Allows you to configure and monitor your RouteAbout Access ISDN by entering commands at a terminal or PC. Refer to Appendix A.
Quick Config	A question and answer script that allows you to configure basic device, bridging, routing, and booting information without having to enter and exit the different configuration processes. It is part of the Command Line Interface. Refer to Appendix B.

Note: You can use the RouteAbout Access ISDN Configuration Tool or Quick Config to configure but not monitor your RouteAbout Access ISDN. You can use the Command Line Interface for both configuring and monitoring your router.

Configuring Your RouteAbout Access ISDN

The following sections provide information for configuring your RouteAbout Access ISDN routers.

Before You Begin

To configure your RouteAbout Access ISDN for the first time, you need to do the following:

1. Ask both your Internet Service Provider (ISP) and also your ISDN provider or your network manager for the information that you need for your RouteAbout Access ISDN configuration. For a list of information you need, refer to the “Ordering ISDN” section in Chapter 2.
2. You must use a PC, Macintosh, or a dumb terminal connected to the RouteAbout Access ISDN console port because you have not yet set up your IP address. Without the IP address, the RouteAbout Access ISDN has no way to communicate with the network.
3. You can do this initial configuration in the following ways:
 - If you are using a PC, you can configure your RouteAbout Access ISDN by
 - Running the RouteAbout Access ISDN Configuration Tool and selecting one of the configuration methods -- Basic, Intermediate, or Advanced -- and choosing the Next> button at the bottom of the window.

Be sure you are running the Configuration Tool version that supports the software load in your RouteAbout Access ISDN. Select About in the Help menu in any window to get this information.

Directions for using online Help for the RouteAbout Access ISDN Configuration Tool are in the “Accessing Online Help” section.
 - Running a terminal emulation application to access one of the command line interfaces (the Command Line Interface or Quick Config). For information on terminal emulators, refer to the “Setting Up Your Terminal Application” section in Chapter 3. For information about the Command Line Interface, refer to

Appendix A. For information about Quick Config, refer to Appendix B.

- If you are using a Macintosh, you must run a terminal emulation package to use the Command Line Interface or Quick Config to configure your RouteAbout Access ISDN.
- If you are using a dumb terminal or do not have a PC with Windows, then you must use the Command Line Interface or Quick Config to configure your RouteAbout Access ISDN.

Using the RouteAbout Access ISDN Configuration Tool

This section provides information on using the RouteAbout Access ISDN Configuration Tool for configuring your RouteAbout Access ISDN.

Appendix B provides similar information on using Quick Config.

Before You Begin

To run the RouteAbout Access ISDN Configuration Tool, you need a PC with the following:

- Microsoft Windows Version 3.1, Windows for Workgroups 3.11, Windows 95, or Windows NT
- A 386 processor (minimum). DIGITAL recommends a 486 processor.
- 8 megabytes of RAM (minimum).

Note: If you are running Windows 95 with 8 megabytes of RAM, you may need to shut down other programs.

- If you are running Windows on a PC, and the PC is not connected to the RouteAbout Access ISDN console port, your PC needs the TCP/IP networking software or “stack” (WINSOCK.DLL) in order to communicate with the Internet or other TCP/IP networks and to configure your RouteAbout Access ISDN over the network. Windows 95 includes the TCP/IP software. If you are running an earlier version of Windows (Windows 3.1, Windows for Workgroups 3.11, or Windows NT), be sure that you install TCP/IP software on your PC.

Note: If this is your initial configuration of your RouteAbout Access ISDN, and it does not yet have an IP address configured, you cannot configure your RouteAbout Access ISDN over the network.

Installing the RouteAbout Access ISDN Configuration Tool

To install the RouteAbout Access ISDN Configuration Tool on your PC, do the following:

1. Insert the RouteAbout Access ISDN Configuration Tool disk in your PC floppy drive (A: or B:).
2. From the Windows Program Manager, select the **Run...** command from the File menu.
or
From Windows 95, click the Start button, select the **Run...** command.
3. Type the following command in the text box:
A:\setup or **B:\setup**
4. Execute the command by clicking OK.
5. Choose the Continue button (twice) to complete the installation.

When you install the RouteAbout Access ISDN Configuration Tool, the Setup program creates a directory (raicfg) on your C: drive (or another location that you choose) with all the files needed for running the Configuration Tool (including the executable, raicfg.exe), and Windows 3.1, Windows for Workgroups 3.11, and Windows NT software creates a RouteAbout Access ISDN Setup Group (with an icon called raicfg) in Windows Program Manager. The Setup program also installs a Readme file and the Microsoft Terminal Emulation program with their icons appearing in the RouteAbout Access ISDN Group.

Under Windows 95, the RouteAbout Access ISDN Configuration Tool installation does not set up the icon on your desktop. In Windows 95, you can create a shortcut that points to the executable file (raicfg.exe).

Accessing Online Help

The RouteAbout Access ISDN Configuration Tool provides the following types of online Help:

Type of Help	For information about...
Context	The field in which the cursor is currently active
Window	The entire active window
Overview	A window, family of windows, or a major protocol, such as IP

You can access Help on the context or the active window in either of the following ways:

- Select the Help menu (at the top of each RouteAbout Access ISDN Configuration Tool window) and then select the type of Help you want.
- Press `h` for Help on the current context or `w` for Help on the entire window.

To access Overview Help, choose the Overview button at the top of each Help window.

In the RouteAbout Access ISDN Configuration Tool Help, there are instructions for using the Utility and detailed information on the protocols and parameters needed to configure your RouteAbout Access ISDN. To access basic instructions for using the Utility and its Help effectively, press `h` in the opening window.

Note: In addition to the ways previously listed for accessing online Help, if you select the Basic Configuration method, Help appears immediately when you select a configurable item in a window.

Setting Up Passwords

Passwords limit access to the router and the ability to change the setup parameters.

When a Password Is Needed

You do not need a password to start the RouteAbout Access ISDN Configuration Tool and to enter configuration settings via your PC. If the

RouteAbout Access ISDN you are configuring has the Console Login enabled, you need a password to load your setup information and to set up some advanced options. The setup procedure prompts you for a password when you need one.

How to Choose a Password

Choose a password that is unique, easy to remember, and yet complicated enough so that no one can easily discover or ascertain it.

The best passwords combine numbers and letters. An easily remembered personal phrase is also a good password choice. The RouteAbout Access ISDN Configuration Tool accepts passwords up to 40 characters long (including spaces). RouteAbout Access ISDN passwords are sensitive to upper and lower case.

Running the RouteAbout Access ISDN Configuration Tool

Once you have installed the RouteAbout Access ISDN Configuration Tool, you can run the program and use it to configure your RouteAbout Access ISDN. Do the following:

1. In Program Manager, either double click the RouteAbout Access ISDN Configuration Tool icon (raicfg) or choose the **Run...** command and enter the path and filename of the executable program. For example,

```
C:\raicfg\raicfg.exe
```

In Windows 95, click the Start button, select the **Run...** command, enter the pathname in the Open field, and click OK.

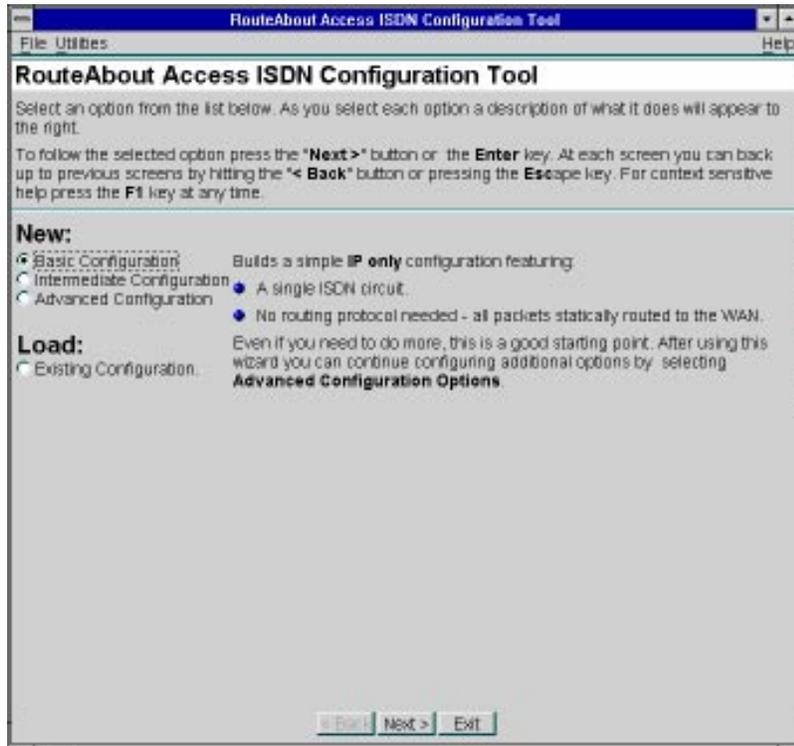
2. When the RouteAbout Access ISDN Configuration Tool is running, to use it to configure your RouteAbout Access ISDN, proceed through the windows in the Utility and configure the parameters you need for your particular RouteAbout Access ISDN. Most parameters have default values that you can use for most typical installations. These default values appear in the windows.

At the bottom of each window are three buttons:

Button	Description
<Back	Returns to the previous window.
Next>	Proceeds to the next window.
Exit	Exits the Configuration Tool. When you choose this button the Utility asks you if you are sure you want to exit (shut down) the Utility.

The About window is the first to appear. You can access this window from any window by selecting the Help menu and clicking About. This window provides the RouteAbout Access ISDN Configuration Tool version and the version of RouteAbout Access ISDN software it supports.

To proceed to the first configuration window, click OK (or press \hat{A}). The RouteAbout Access ISDN Configuration Tool window appears as the active window.



From this window, you can access all the protocols and parameters you need to configure your RouteAbout Access ISDN. This window allows you to create a new configuration for your RouteAbout Access ISDN by using one of the following methods:

This method...	Allows you to configure...
Basic Configuration	Essential parameters and options needed to configure your RouteAbout Access ISDN.
Intermediate Configuration	Parameters that you need for your RouteAbout Access ISDN in greater detail than the Basic Configuration.
Advanced Configuration	More complex protocols and features.

This window also allows you to load an existing configuration to your RouteAbout Access ISDN. Refer to the “Loading an Existing Configuration” section on page 87.

To create a new configuration, select the method that you want and choose the Next> button at the bottom of the window (or press \hat{A}) to begin the configuration process.

Using Basic Configuration

If you are inexperienced in network routing, DIGITAL recommends that you select the Basic Configuration method for configuring your RouteAbout Access ISDN. You may need the services of an Internet Service Provider (ISP), and you definitely need the services of an ISDN provider. If you do not have a network administrator who already has the configuration information that you need, you need to get that information from your ISP and/or ISDN provider. For a list of information you need, refer to the “Ordering ISDN” section in Chapter 2.

The Basic Configuration takes you through a series of windows that allow you to configure all of the parameters that your RouteAbout Access ISDN needs to operate. Some of these parameters are set to default settings. These are the most commonly used settings, and you should not need to change them. For other settings, you must enter information that your providers supply.

Note: The Basic Configuration method allows you to configure a RouteAbout Access ISDN that is running IP only. If your RouteAbout Access ISDN is running IPX or AppleTalk, you must use either the Intermediate or the Advanced Configuration method.

The Basic Configuration windows appear in the following sequence:

- Router Type
- Internet Addresses
- ISP Connection
- ISDN Provider Information
- Administration and Security
- Configure Firewall

Select Basic Configuration and choose the Next> button. The Router Type window appears.



1. Select the RouteAbout Access ISDN type you want to configure: RouteAbout Access ISDN/IP or RouteAbout Access ISDN/MP.
2. Choose the Next> button to advance to each of the windows in the Basic Configuration.

3. Configure IP addresses for both the LAN and WAN interfaces. Your LAN administrator should give you your LAN address(es), and your ISP should provide your WAN address.



4. Configure information about your ISP connection. Some default settings appear. You can change these if your ISP advises you to do so. Your ISP should provide you with all of the information you need to enter in this window.

The screenshot shows a window titled "RouteAbout Access ISDN Configuration Tool" with a menu bar containing "File", "Utilities", and "Help". The main content area is titled "Basic Configuration" and contains the "ISP Connection" section. This section includes several input fields and options: "ISP's Phone #" (with a text box), "Login Name" (with a text box), "Password or Secret" (with a text box), "Dial On Demand" (checked), "Idle Time" (text box with "60"), "Multilink PPP" (radio buttons for "Never", "Dynamic", and "Always"), and "Second Phone #" (with a text box). To the right of these fields is explanatory text: "Enter the complete number to dial to reach your Internet Service Provider (ISP). Your ISP should provide this information." and "Note: If you do not use Multilink PPP this is the only number you need for the ISP connection. If you need to enter a sub-address, enter the phone number, a colon (:), and the sub-address. Example: 8005551212:1234". At the bottom of the window are three buttons: "< Back", "Next >", and "Exit".

5. Configure your RouteAbout Access ISDN for communication over an ISDN connection based on your switch type. Your ISDN provider or your network administrator should provide this information.

The screenshot shows a window titled "RouteAbout Access ISDN Configuration Tool" with a menu bar containing "File Utilities" and "Help". The main content area is titled "Basic Configuration" and contains the following sections:

- ISDN Provider Information**
 - Switch Type: A group of radio buttons with two columns:
 - Column 1: USM1, USM2, DMS100, SESS
 - Column 2: NET3, VN3, NS64, T3013
 - Your Phone #:
 - Your Second #:
 - SPID # 1:
 - SPID # 2:
- Switch Type**

Sometimes known as "Switch Variant", this identifies the type of device you are connecting to over the ISDN phone system. The correct choice should be given to you by your telephone company or other ISDN provider.

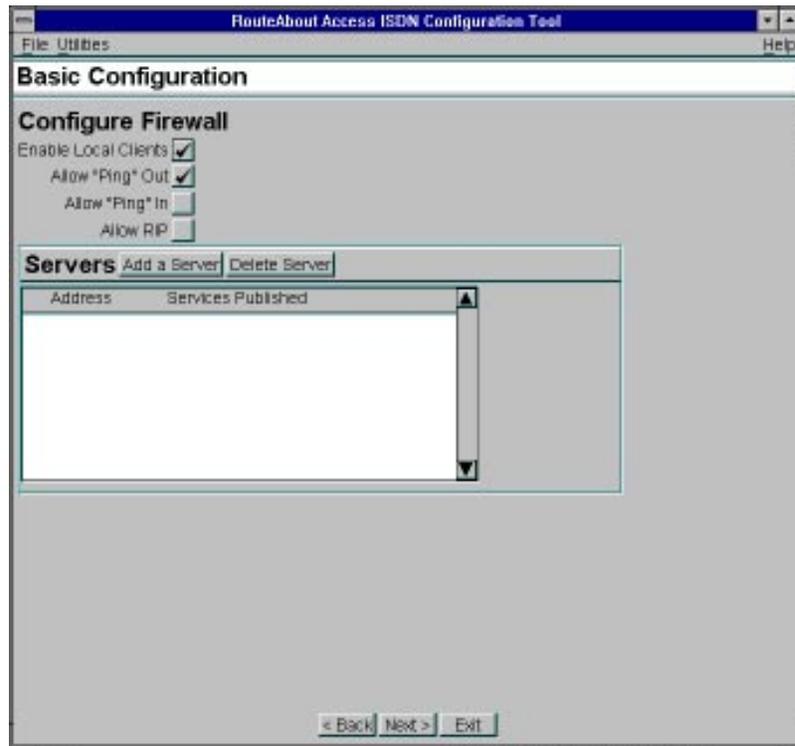
At the bottom of the window, there are three buttons: "< Back", "Next >", and "Exit".

6. Provide information regarding the administration and security of your RouteAbout Access ISDN. Part of your security configuration includes configuring a firewall. (A firewall protects your RouteAbout Access ISDN and your network from unauthorized access.) You can access the Configure Firewall window by choosing the Configure Firewall button in the Administration and Security window.



Note: If you do not select Enable SNMP, you cannot monitor your RouteAbout Access ISDN over the network. If you do not select Enable SNMP Management, you cannot configure your RouteAbout Access ISDN over the network.

7. Configure a firewall to protect your network by adding filters that secure it against unauthorized access.



8. At this point in the configuration process, you have two choices:
 - Stop configuring your RouteAbout Access ISDN and save the configuration.
 - Continue configuring your RouteAbout Access ISDN by going to the Advanced Configuration Options window.



If...	Then...
You choose to stop your configuration	Select Save this configuration and choose the Next> button. When you do this, the Save Configuration window appears. For instructions on saving your configuration, refer to the “Saving Your Configuration” section.
You choose to continue your configuration	Select Continue configuring Advanced Options and choose the Next> button. For instructions on configuring advanced options, refer to the “Using Advanced Configuration” section.

Note: If you stop configuring your RouteAbout Access ISDN at this point, you have configured everything your RouteAbout Access ISDN needs to function properly. There is no need to configure anything more. If there is a reason to configure additional parameters, then you can proceed to the Advanced Options.

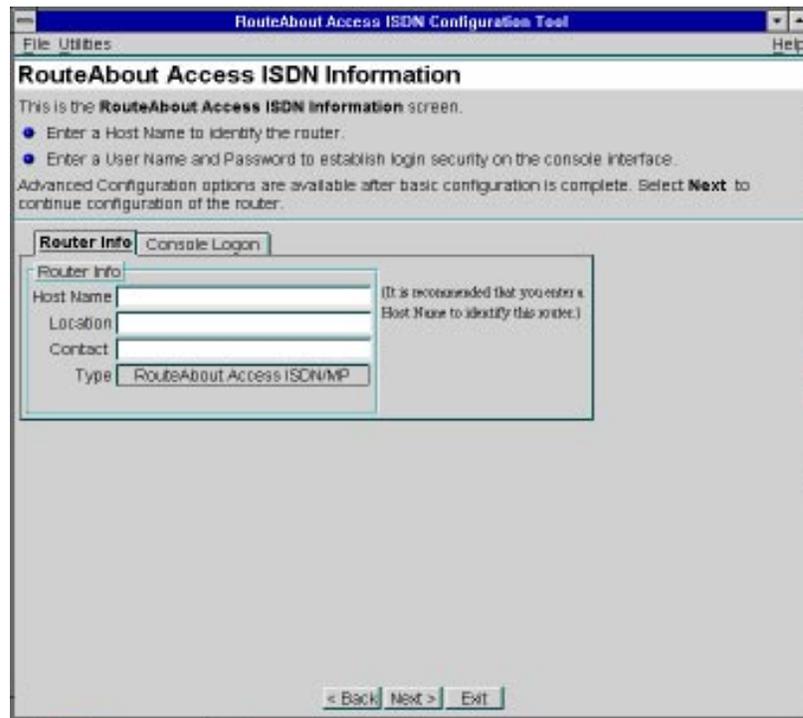
Using Intermediate Configuration

If you are experienced in network routing and want to customize your RouteAbout Access ISDN configuration, DIGITAL recommends that you select the Intermediate Configuration method to configure your router. Do the following:

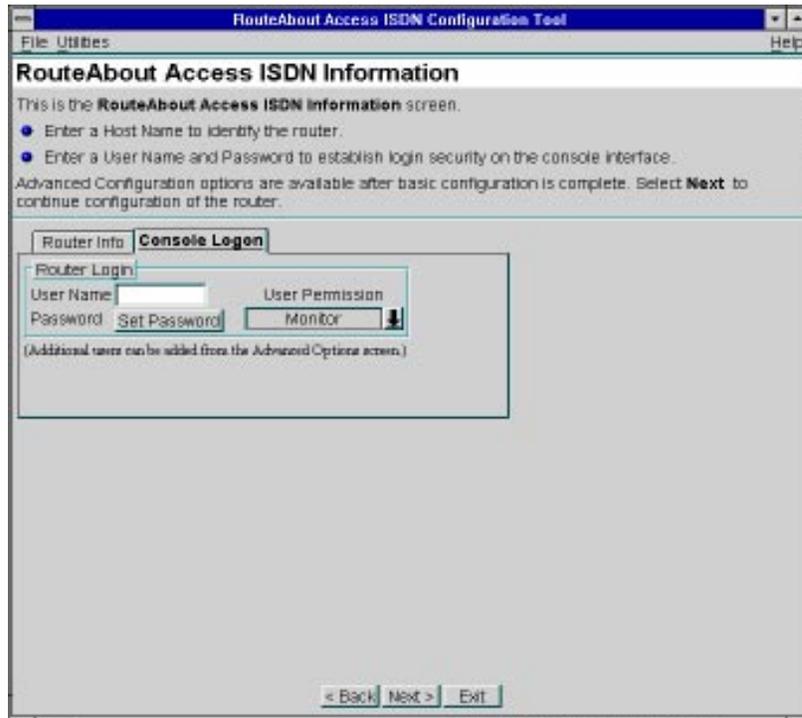
1. Select the Intermediate Configuration method on the RouteAbout Access ISDN Configuration Tool window.
2. Choose the Next> button. The Router Type window appears.



3. Select the type of router you are configuring (RouteAbout Access ISDN/IP or RouteAbout Access ISDN/MP) from the drop-down list and choose the Next> button. The RouteAbout Access ISDN Information window appears. It allows access to two additional windows: Router Info and Console Logon.



4. Enter the Host Name, Location, and Contact information. The Host Name can be up to 78 characters.
5. Select the Console Logon window.



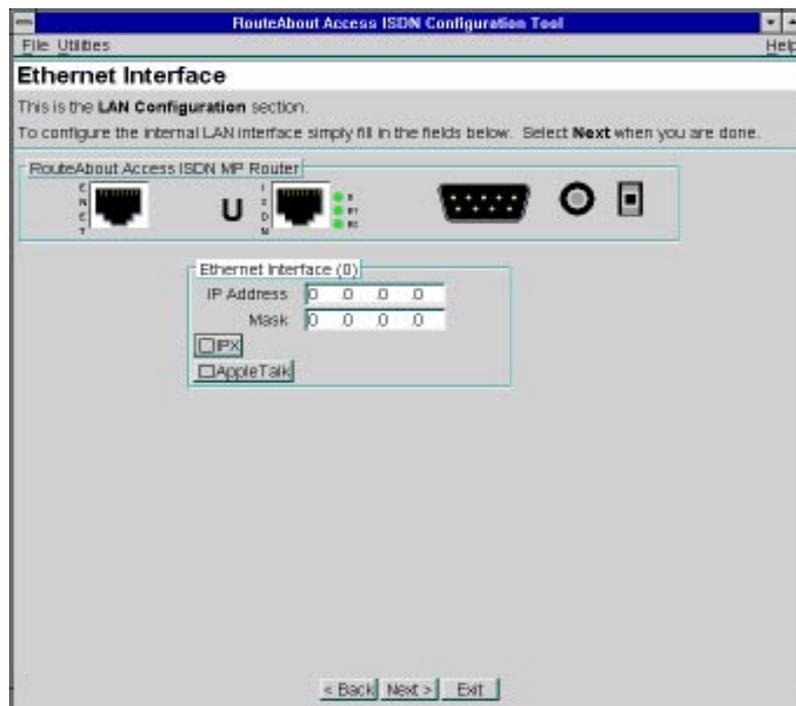
6. Enter a User Name and set the User Permission. The User Name can be up to 8 characters. If you wish, configure your password by choosing the Set Password button and entering the appropriate information in the window that appears.

The RouteAbout Access ISDN Configuration Tool accepts passwords up to 40 characters long (including spaces). RouteAbout Access ISDN passwords are sensitive to upper and lower case.

7. Choose the Next> button. The Ethernet Interface window appears.

Configuring Your Local Area Network (LAN) Connections

In the Ethernet interface window, set your LAN address(es).



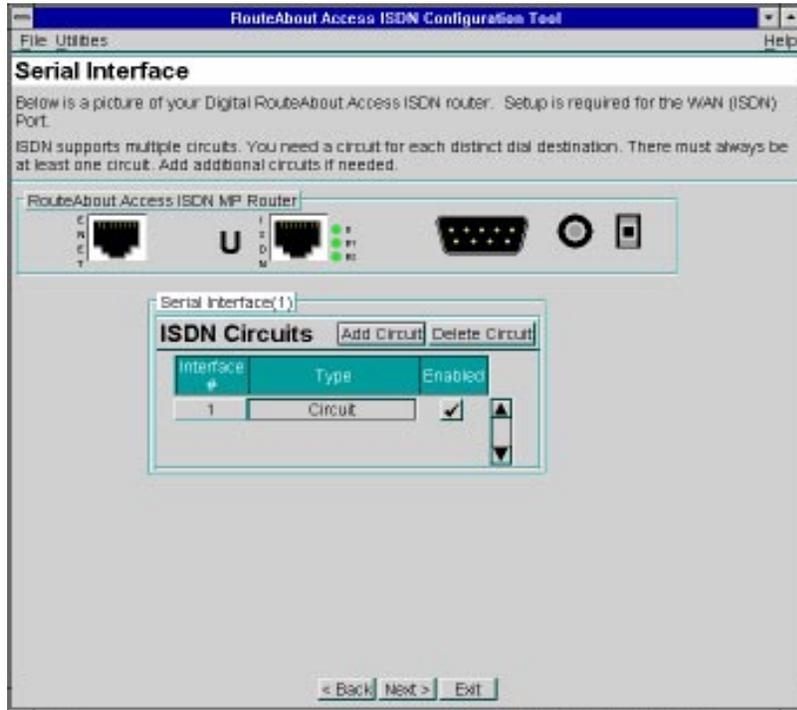
1. Enter the IP address and network mask. If you already have a valid network address for Ethernet, use that address. If not, consult your ISP or network administrator.

Note: If you are configuring a RouteAbout Access ISDN/MP, you can also configure addresses for IPX and AppleTalk 2.

2. Choose the Next> button. The Serial Interface window appears.

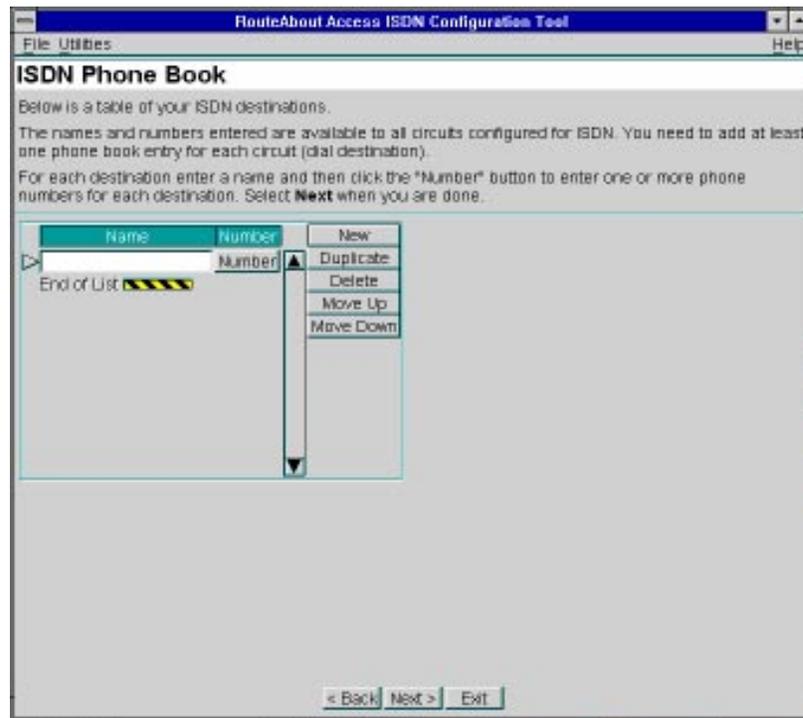
Configuring Your Wide Area Network (WAN) Connections

The Serial Interface window allows you to configure your ISDN circuit(s) .

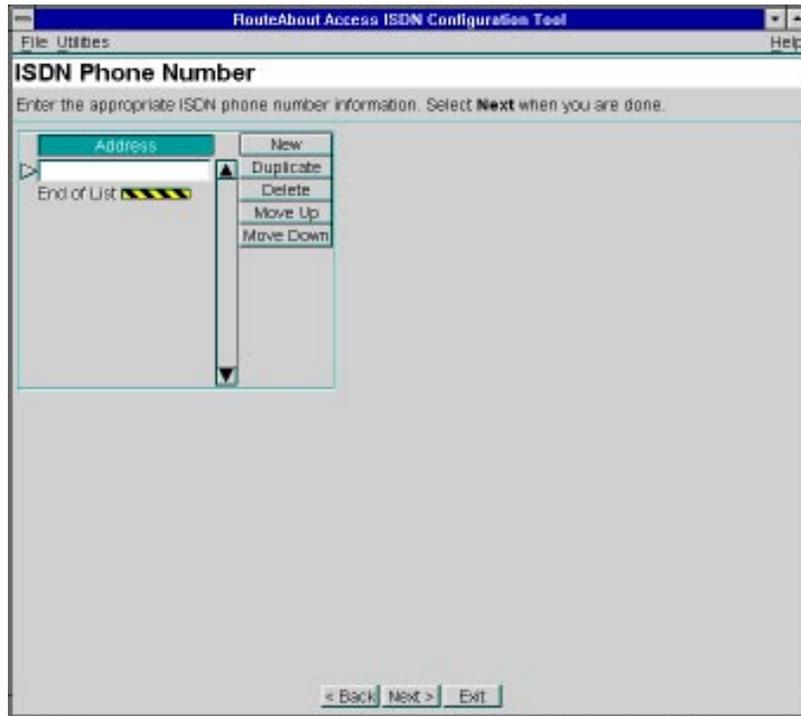


Note: You need at least one ISDN circuit for WAN communication. This circuit is added automatically when you enable WAN communication. The circuit allows you to establish a connection to one destination.

1. Add one circuit for each additional destination that you want to call.
2. Choose the Next> button. The ISDN Phone Book window appears.



3. Choose the New button and add a name for each destination.
4. Choose the Number button next to each name. The ISDN Phone Number window appears.



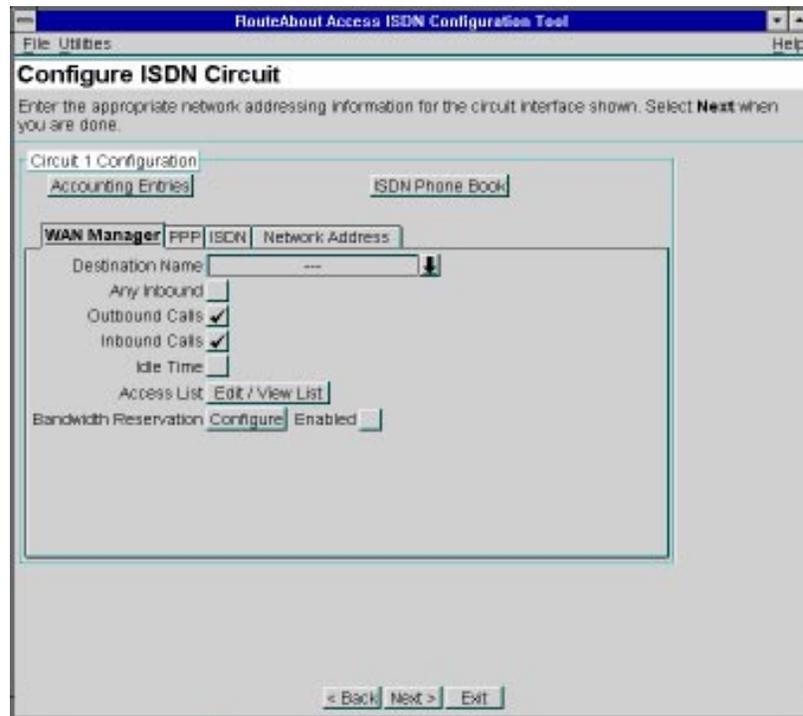
5. Choose the New button and enter an address (telephone number) and subaddress (typically, a telephone extension), if needed, for each name you entered into the ISDN Phone Book.

You can configure multiple telephone numbers for each name. If your telephone company assigns you more than one telephone number, you must enter each number into the ISDN Phone Book. The RouteAbout Access ISDN tries every telephone number it knows about until it successfully connects.

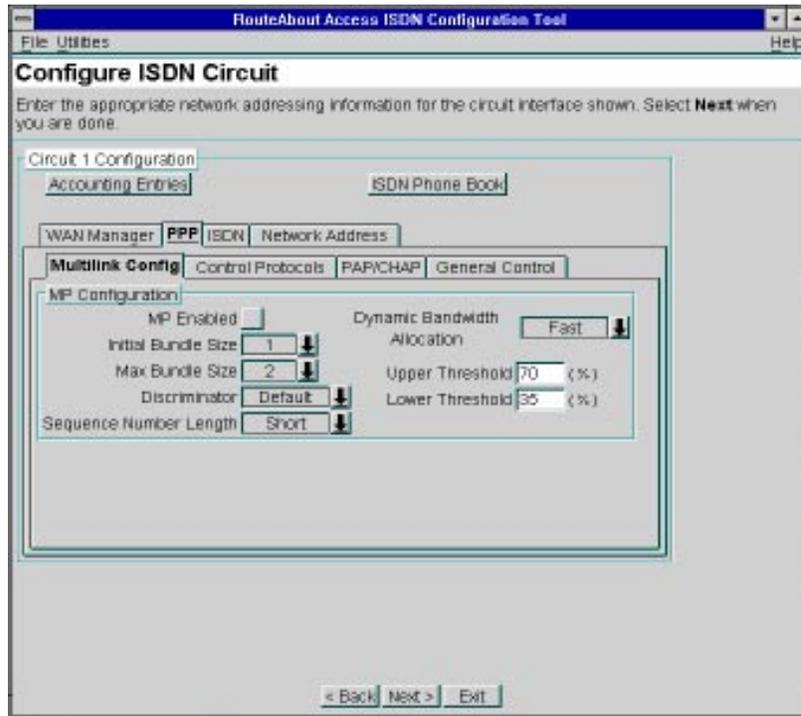
Note: If you enter a name and no telephone number, the router ignores the entry.

6. Choose the Next> button and repeat steps 4 and 5 for each name.

7. When you have configured all the numbers for all your ISDN circuits, choose the Next> button. The Configure ISDN Circuit window appears with WAN Manager parameters displayed.



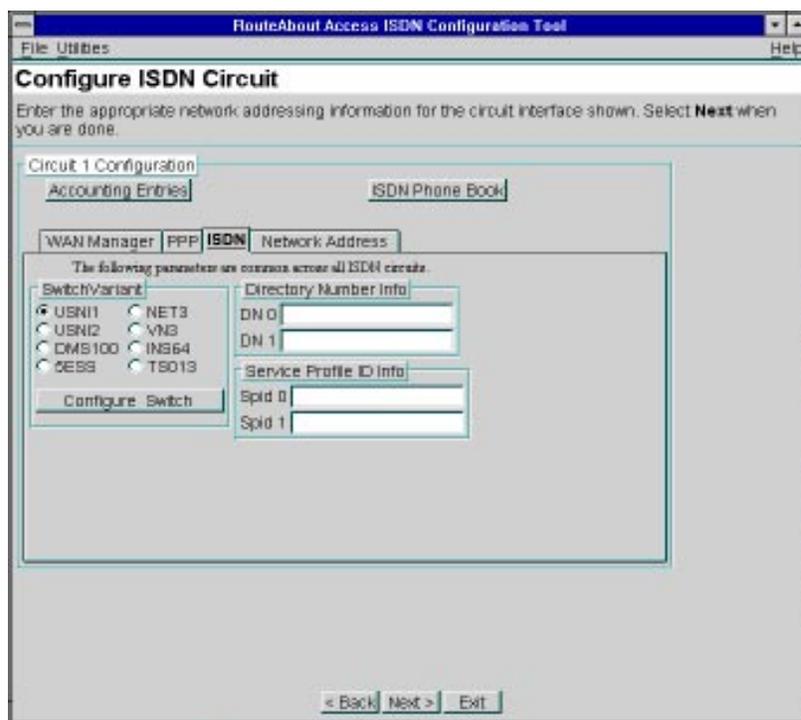
8. Configure the parameters, especially the destination name.
9. Select PPP. The PPP parameters appear.



10. Configure the PPP parameters in each of the PPP windows.

11. Select ISDN.

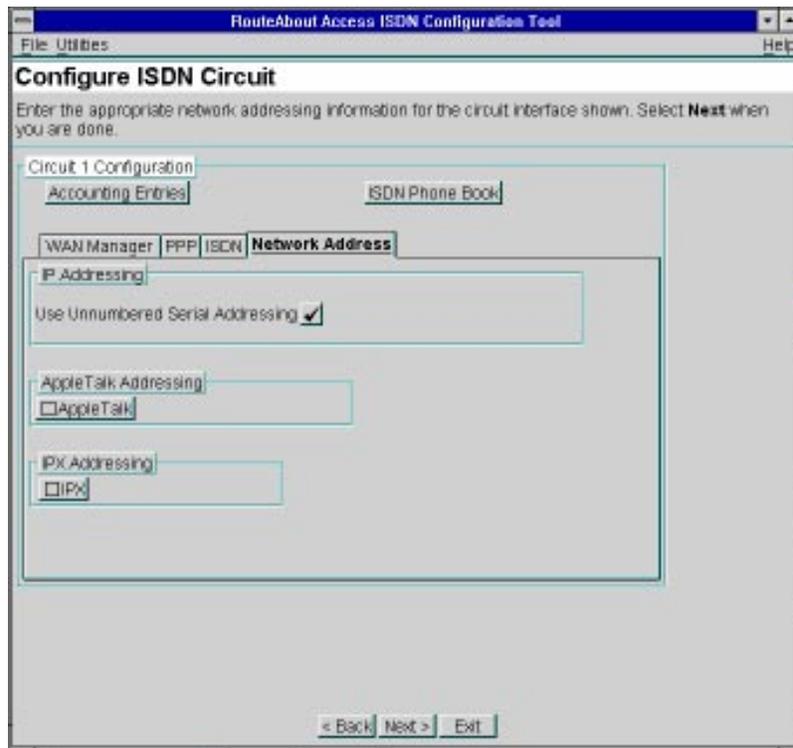
The ISDN window allows you to select a switch variant, configure its parameters, and also configure directory numbers and Service Profile IDs, as needed.



12. Select a switch variant from the Switch Variant Info drop-down list and choose the Configure Switch button to configure its parameters. For information on ISDN switch variants, refer to the “Switch Variants” section in Chapter 2.

Depending on the switch variant that you select, configure directory numbers and SPIDs. Enter the ISDN information provided by your telephone company.

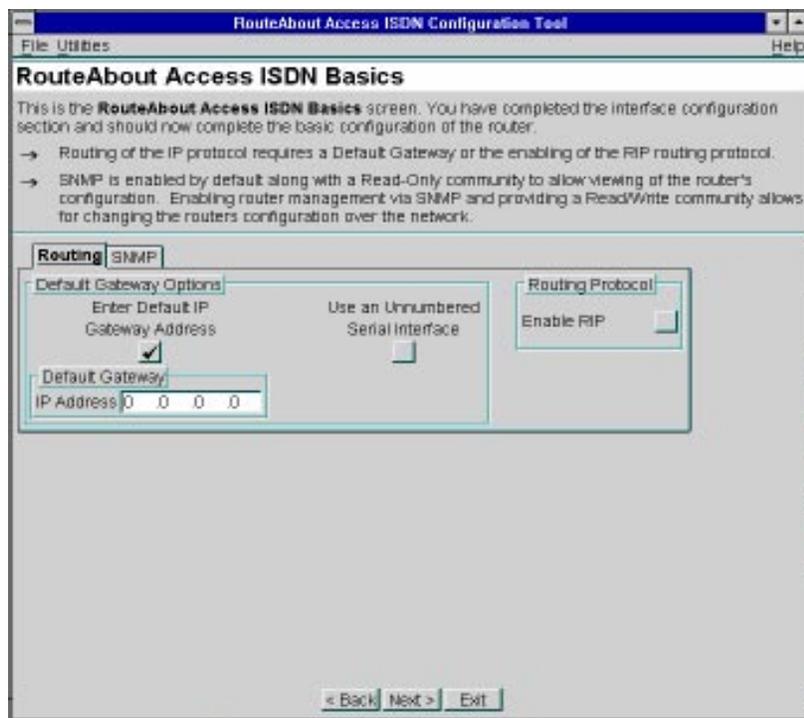
13. Select Network Address. The network addressing parameters appear.



14. Enter the network addresses that you need.
15. When you have configured all the circuits, choose the Next> button.
The RouteAbout Access ISDN Basics window appears. From this window you can access the Routing and SNMP windows.

Configuring RouteAbout Access ISDN Basics

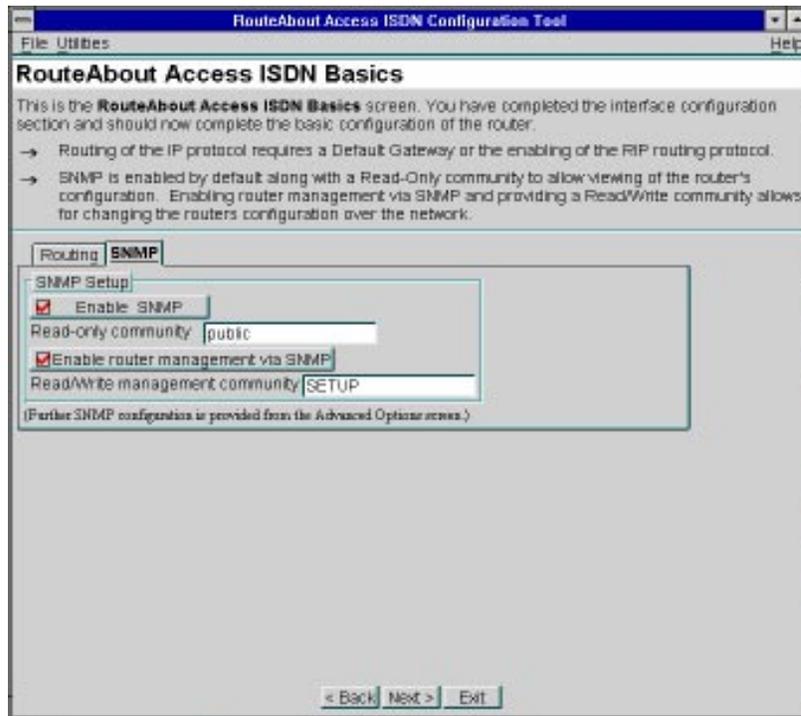
The RouteAbout Access ISDN Basics window accesses the Routing and SNMP windows.



1. In the Routing window, you have two options:
 - Enter the Default Gateway IP address that provides access between or among routers.
 - or
 - Select Use an Unnumbered Serial Interface and enter the interface number.

If you select *neither* of these choices, then you should enable the Routing Information Protocol (RIP) *or* add static routes under the Advanced Configuration options.

2. Select the Enable RIP check box if you want RIP to build the routing tables. If you want the WAN to dial-on-demand, do not select the Enable RIP check box and add static routes under the Advanced Configuration Options.
3. Select the SNMP window. The SNMP parameters appear.



If this is your initial configuration, you *must* configure SNMP at this time. Only then can you configure your RouteAbout Access ISDN over the network.

Note: SNMP is enabled by default.

4. Enable router management via SNMP.
5. Add a Read/Write management community.

Use a community name that you can remember and that provides security for your RouteAbout Access ISDN.

6. Choose the Next> button. The Configuration Finished window appears.



In this window, you have two options:

- Stop configuring your RouteAbout Access ISDN and save the configuration.
- Continue configuring your RouteAbout Access ISDN by going to the Advanced Configuration Options window.

If...	Then...
You choose to stop your configuration	Select Save this configuration and choose the Next> button. When you do this, the Save Configuration window appears. For instructions on saving your configuration, refer to the “Saving Your Configuration” section.
You choose to continue your configuration	Select Continue configuring Advanced Options and choose the Next> button. For instructions on configuring advanced options, refer to the “Using Advanced Configuration” section.

Using Advanced Configuration

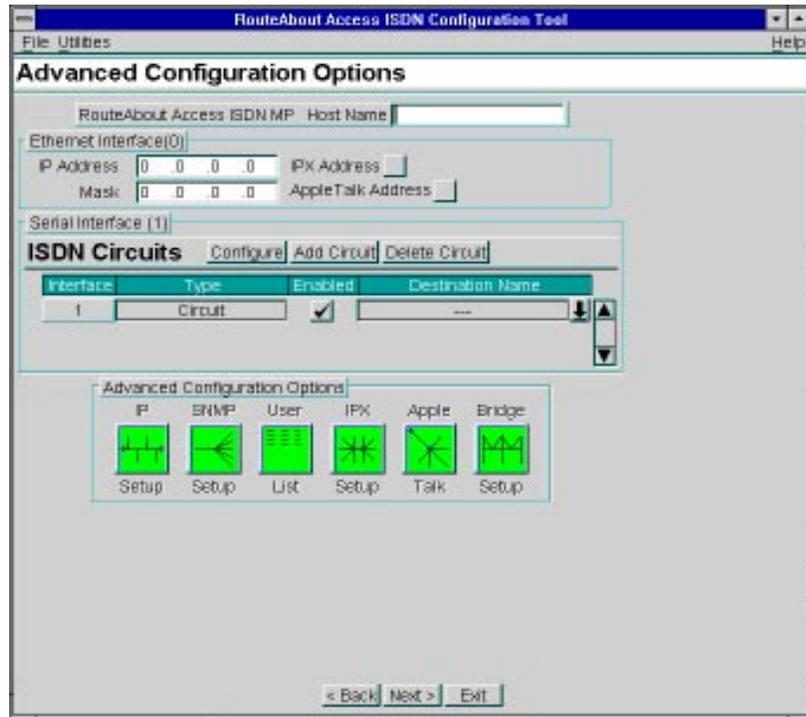
If you are very experienced in configuring network routers and are comfortable configuring complex protocols, then you can select the Advanced Configuration method (in the opening window of this Utility) to configure your RouteAbout Access ISDN.

1. Select the Advanced Configuration method on the RouteAbout Access ISDN Configuration Tool window.
2. Choose the Next> button. The Router Type window appears.
3. Select the Router Type you want to configure from the drop-down list: RouteAbout Access ISDN/IP or RouteAbout Access ISDN/MP.

Note: If you began configuring your router by selecting either the Basic Configuration or the Intermediate Configuration method (in the opening window of this Utility), then you have already selected your router type.

4. Choose the Next> button.

The Advanced Configuration Options window appears. This window allows you to reconfigure your router's basic configuration and also configure additional protocols and options for your RouteAbout Access ISDN. The options available depend on the type of your router. The following window is for a RouteAbout Access ISDN/MP.



Note: DIGITAL recommends that your ISP or network administrator carry out or recommend any advanced configurations you may need for your RouteAbout Access ISDN.

If you are configuring a RouteAbout Access ISDN/IP, you have the following options:

- IP Setup
- SNMP Setup
- User List (for router administration, operation, or monitoring)

If you are configuring a RouteAbout Access ISDN/MP, you have the following options:

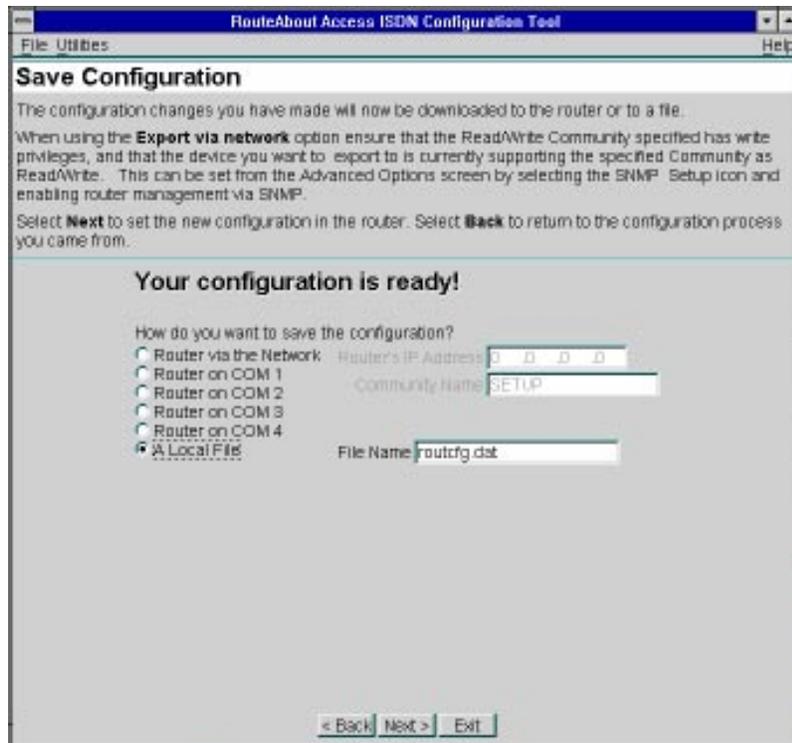
- IP Setup
- SNMP Setup
- User List (for router administration, operation, or monitoring)
- IPX Setup
- AppleTalk Setup
- Bridge Setup

When you have finished configuring the advanced options that you want, choose the Next> button. The Save Configuration window appears.

Saving Your Configuration

If you used either the Basic or Intermediate Configuration method to configure your RouteAbout Access ISDN and did not choose to configure Advanced Options, select Save this configuration in the Configuration Finished window. The Save Configuration window appears.

If you have configured Advanced Options, choose the Next> button, when you finish your configuration. The Save Configuration window appears immediately.



You can save the configuration for your RouteAbout Access ISDN in the following ways:

If...	Then...
You save the configuration to a router on the network	You must identify this router's IP address and its SNMP Community. The save takes place when you choose the Next> button.
You save the configuration to a router physically connected to your PC's COM port	The save takes place without any further action on your part when you choose the Next> button.
You save the configuration to a file	You must name the file. You can save the file to a particular directory on a particular drive by designating the full path for the file's location. When you choose the Next> button, the configuration is saved to the file.

The following window appears.



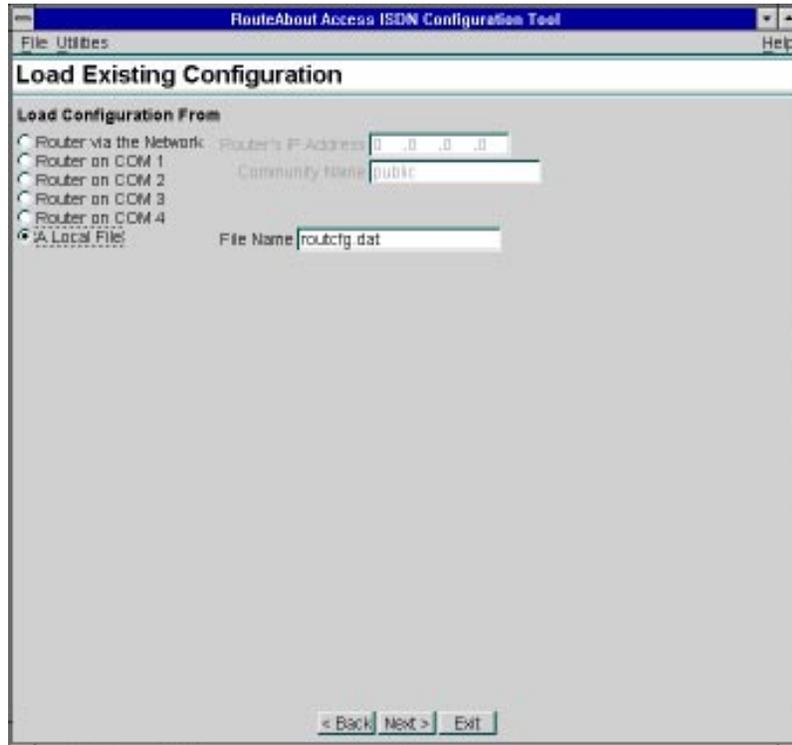
Congratulations! You have successfully downloaded the configuration that you created.

Loading an Existing Configuration

To load an existing configuration to your RouteAbout Access ISDN, select the Existing Configuration method in the following window.



Choose the Next> button. The Load Existing Configuration window appears.



In this window, just as in the Save Configuration window, you can load an existing router configuration (for the same router type) in the following ways:

- From a router on the network
- From a router connected to your PC's COM port
- From a configuration file

Once the load has been completed, you can use the Advanced Configuration method to modify the router's configuration, as needed.

Chapter 5

Monitoring Your RouteAbout Access ISDN

You can monitor the operational status of your RouteAbout Access ISDN by checking the status lights on the front and back of your router. You can also check the connection between your PC and the RouteAbout Access ISDN by running either the Ping or Telnet program.

This chapter contains the following topics:

Monitoring RouteAbout Access ISDN Status Lights	92
Running Ping and Telnet	96

Monitoring RouteAbout Access ISDN Status Lights

There are four green status lights in slots on the front of the RouteAbout Access ISDN. These lights indicate the current operating status of the RouteAbout Access ISDN. The lights can glow steadily (ON) or they can blink. Table 5-1 indicates the meaning of each light.

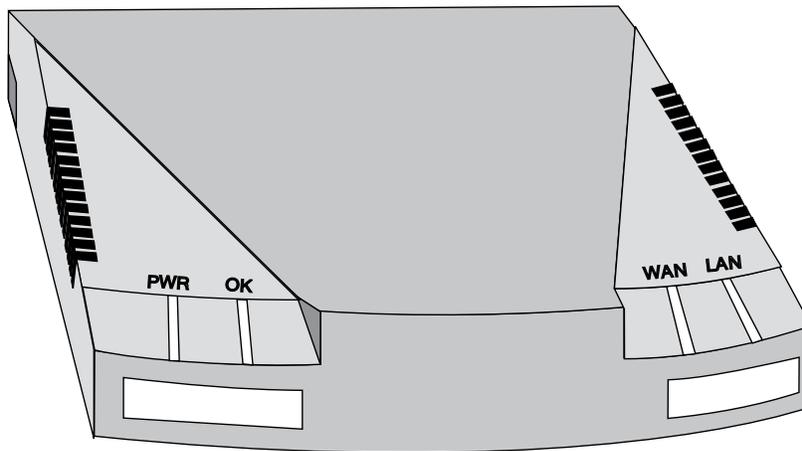


Figure 5-1 Front of the RouteAbout Access ISDN

Table 5-1 Lights on the Front of the RouteAbout Access ISDN

Light	State	Indicates RouteAbout Access ISDN...
PWR	On (not blinking)	Power supply is operating within its specifications.
	Off (no light)	Not receiving power.
OK	On (blinking once every five seconds)	Running its operational software.
	On (blinking three times per second)	Performing diagnostics. This happens only at powerup.
	Blinking (once per second)	Running its startup (BOOT) software.
	Off	Hardware problem. See Chapter 6, Troubleshooting.
WAN	On	WAN connection is up, and at least one ISDN B channel has a call.
	Blinking	Traffic on one or both ISDN B channels.
	Off	Has no B channels calls up.
LAN	On	LAN connection to your local network is up.
	Blinking	Sending and receiving user data on its LAN link.
	Off	LAN connection is down.

There are three green status lights on the back panel of the RouteAbout Access ISDN. These lights indicate the BRI ISDN status of the two B and one D channels. The lights can glow steadily (ON) or they can blink. Both D and B channel lights go off when you restart the router.

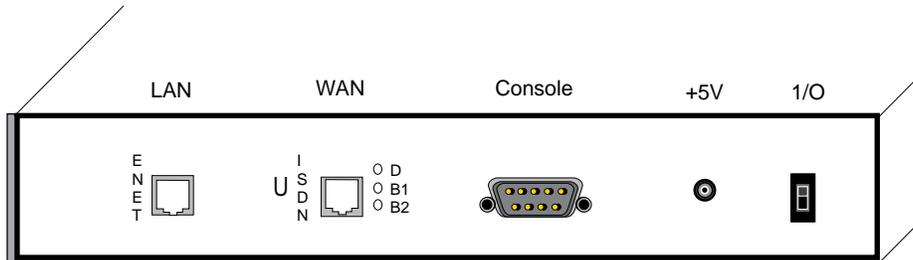


Figure 5-2 RouteAbout Access ISDN U Back Panel

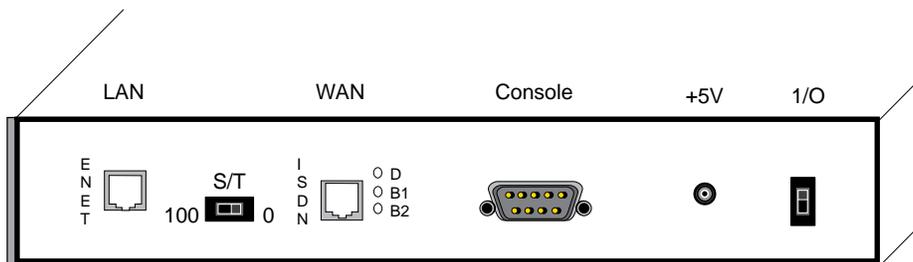


Figure 5-3 RouteAbout Access ISDN S/T Back Panel

Table 5-2 indicates the meaning of each light on the back of your RouteAbout Access ISDN.

Table 5-2 Lights on the Back of the RouteAbout Access ISDN

ISDN Light	State	Indicates...
D	On	RouteAbout Access ISDN is linked to the telephone company.
	Blinking	Traffic is on the D channel.
	Off	RouteAbout Access ISDN is not linked to the telephone company. This is an error in North America but okay in Europe.
B1	On	Call established on the B1 channel.
	Blinking	Traffic is on the B1 channel.
	Off	Channel is not in use or the channel is idle.
B2	On	Call established on the B2 channel.
	Blinking	Traffic is on the B2 channel.
	Off	Channel is not in use or the channel is idle

Running Ping and Telnet

After you run the RouteAbout Access ISDN Configuration Tool and download (export) the configuration to your RouteAbout Access ISDN, via the console port, you can quickly check to see if your PC can reach the RouteAbout Access ISDN and whether the RouteAbout Access ISDN can forward data from your PC to a system on a remote LAN. If the **ping** and **telnet** commands are present on your PC or workstation, use these commands to check your connections. The location of the Ping and Telnet utilities varies from system to system, depending on your operating system and the vendor's TCP/IP stack.

From Your PC to the RouteAbout Access ISDN

The steps below are for Windows 3.1. These steps may vary from system to system. To run Ping or Telnet from your PC to the RouteAbout Access ISDN, do the following:

1. In Program Manager, select the File menu, choose the **Run...** command, and the appropriate path of your TCP/IP utility.
2. In the same command line text box, enter **ping** or **telnet** and the IP address of the LAN connector (port) on your RouteAbout Access ISDN. For example,

```
c:\pctcp\ping 128.185.19.6
```

If Ping succeeds, you receive a message indicating that the RouteAbout Access ISDN address is reachable; or you receive lines of output showing that your PC is receiving bytes of data back from the RouteAbout Access ISDN. If Telnet succeeds, you see a RouteAbout Access ISDN welcome message.

For Windows 95, click the Start button, select the **Run...** command, enter the pathname above in the Open field, and click OK.

From Your PC to a Remote Network

To run Ping or Telnet from your PC to a remote network, do the following:

1. Ask your Internet Service Provider for the IP address or name of a remote system that your PC can reach through the RouteAbout Access ISDN.

2. In Program Manager, select the File menu and choose the **Run...** command.
3. In the command line text box, enter **ping** or **telnet** and the address of the remote system. For example,
`ping 120.193.10.16`

If Ping succeeds, you see either a message indicating that the address is reachable or a series of short messages that show when your PC receives bytes of data back from the remote system. If Telnet succeeds, a welcome message appears prompting you to log in to the remote system.

Chapter 6

Troubleshooting

This chapter provides information on the more common problems you may encounter in using your RouteAbout Access ISDN. It contains the following topics:

Hardware Problems and Solutions	100
Software Problems and Solutions	103
Using Event Logging System Messages	110

Hardware Problems and Solutions

The following table lists the more common hardware problems you may encounter with your RouteAbout Access ISDN or with routers in general. It identifies the problem, possible cause(s) of the problem, and the steps to take to solve the problem.

Table 6-1 Hardware Problems and Solutions

Problem	Possible Cause(s)	Solution
No PWR light, console, or other activity.	RouteAbout Access ISDN is not plugged into a power source.	Plug your RouteAbout Access ISDN into a grounded power outlet.
	Circuit power interrupted.	Check outlet and circuit fuses or breakers.
Note: The RouteAbout Access ISDN has no fuses.		
No OK light.	RouteAbout Access ISDN is not booting.	Contact DIGITAL customer service if you get the message Power On Self Test detected a hardware failure. Error log longword = xxxxxxxx where xxxxxxxx will be eight hex digits. Report this value to DIGITAL customer service.
No LAN light.	Ethernet is not up.	Check all Ethernet-specific connections.
No WAN light.	See problems with D and B channels in this table.	

Table 6-1 Hardware Problems and Solutions

Problem	Possible Cause(s)	Solution
No D channel light.	Line activation is not achieved due to the following:	
	Incorrect S/T switch setting.	Set switch correctly. See “Setting the S/T Switch” in Chapter 3.
	European switch type.	The European switch type (NET3, VN3) only activates the line during a call. The line is deactivated when the interface has no active calls, and no light will be on.
	Loose connection.	Secure all connections.
	Bad cable.	Try another DIGITAL-supplied RJ-45 ISDN cable and see if it works.
	Wrong cable.	Check the Part Number (P/N) on the cable and use the appropriate cable. See “Before You Begin” in Chapter 3. If all else is okay, check with your telephone company.

Table 6-1 Hardware Problems and Solutions

Problem	Possible Cause(s)	Solution
No B channel light.	The call is not successfully established.	<p>Check to be sure you are dialing the correct telephone number.</p> <p>Check that your ISDN line is in service. (D channel light must be on.)</p> <p>Check to see if the remote site is busy.</p> <p>Check the RouteAbout Access ISDN Software V2.3 <i>LAN/WAN Interface Guide</i> on the DIGITAL web site for other possible configuration problems and try again later.</p>
Cannot access a remote network or the Internet even though the RouteAbout Access ISDN looks okay.	ISP service is down.	Try again later. Contact your ISP for status.

Software Problems and Solutions

Table 6-2 lists the more common software problems you may encounter with your RouteAbout Access ISDN or with routers in general. It identifies the problem, possible cause(s) of the problem, and the steps to take to solve the problem. The table also specifies ISDN and PPP software problems.

For additional help in solving problems, visit the Digital Equipment Corporation Network Products Business Home Page on the World-Wide Web (<http://www.networks.digital.com>) for Frequently Asked Questions (FAQs) about the RouteAbout Access ISDN/IP.

Table 6-2 Software Problems and Solutions

Problem	Possible Cause(s)	Solution
Cannot read a configuration.	Configuration not loaded in the RouteAbout Access ISDN.	Download the appropriate configuration file through the RouteAbout Access ISDN Setup Utility, Quick Config, or the Command Line Interface.
User cannot log in to the RouteAbout Access ISDN.	User does not have appropriate permission.	Check user's account and assign the required permission by using Console Logon in the RouteAbout Access ISDN Setup Utility or by using the add user command at the <code>Config></code> prompt.

Table 6-2 Software Problems and Solutions (Continued)

Problem	Possible Cause(s)	Solution
Data is not being received on a particular interface.	RIP (Routing Information Protocol) is not enabled.	At the <code>IP Config></code> prompt, enter enable rip .
	Data-link protocols are not compatible.	Verify that the same protocol is configured on the source and destination routers.
	Interface has not been configured with the appropriate protocol, for example, IP.	See the <i>Protocol Guide</i> , found on the DIGITAL web site under Technical Information.
Cannot find a destination, access a remote network, or connect to the Internet.	Wrong IP address.	Get the correct IP address for the destination from your ISP or network administrator.
	Incorrect network mask address.	Correct the network mask address. If RIP is enabled, then the address mask must be one of 255.0.0.0, 255.255.0.0, or 255.255.255.0.
	Incorrect default gateway IP address.	Check the default gateway IP address.

Table 6-2 Software Problems and Solutions (Continued)

Problem	Possible Cause(s)	Solution
RouteAbout Access ISDN Configuration Tool does not display all the configurable parameters.	Wrong version of the Tool.	Check that you are using the version that supports the RouteAbout Access ISDN Software V2.3 load in your RouteAbout Access ISDN. To find this out, check the first screen of the RouteAbout Access ISDN Configuration Tool and use the config command at the + prompt on the router.
ISDN Specific Problems and Solutions		
TEIs are not assigned.	The switch is unable to assign a TEI. See also No D channel light in Table 6-1.	Contact your telephone company.
SPIDs not initializing when needed for switch variant.	Using a SPID not given to you by your telephone company.	Call your telephone company to find out if you need a SPID and, if so, get a valid SPID from them. You can configure up to two SPIDs on the RouteAbout Access ISDN, one for each B channel.

Table 6-2 Software Problems and Solutions (Continued)

Problem	Possible Cause(s)	Solution
Unable to place a successful outbound call.	Incorrect local telephone number (DN0 and DN1).	Call your telephone company to verify your local telephone numbers.
	Incorrect destination telephone number. Example: Using a seven-digit destination number instead of a four-digit extension number to dial out.	Call your telephone company to verify your remote telephone numbers.
	Incorrect switch type.	Call your telephone company to verify what switch type your ISDN lines are coming from.
	ISDN interface has been disabled.	At the <code>Config></code> prompt, enter enable interface .
	Using point-to-point instead of multipoint for multipoint selection.	At the <code>ISDN Config></code> prompt, enter set multipoint-selection mp . Call your telephone company to verify this provisioning on the switch.

Table 6-2 Software Problems and Solutions (Continued)

Problem	Possible Cause(s)	Solution
Unable to receive an inbound telephone call.	Authorization fails because caller ID is absent.	<p>Caller ID, a supplementary service is not supported for this line. You must do one of the following to work around this:</p> <ul style="list-style-type: none"> • Configure PAP and CHAP on both the calling and the called routers. • At the WAN Config> prompt, enter enable any-inbound.
	Authentication fails.	Check PAP and CHAP configuration on both the calling and the called routers.
	Router dialing in is not part of Access Control List.	At the WAN Config> prompt, add the remote router name to the Access Control List using the set access-list command.
	Disable inbound is set at the WAN Config> prompt.	At the WAN Config> prompt, enter enable inbound .
	ISDN interface has been disabled.	At the Config> prompt, enter, enable interface interface number .

Table 6-2 Software Problems and Solutions (Continued)

Problem	Possible Cause(s)	Solution
Remote site is not responding.	Remote site is not configured.	Check the configuration of the remote site.
	Remote site is busy with all its channels in use.	Wait until the remote site frees up a channel and try again.
PPP Specific Problems and Solutions		
The Maximum Receive Unit (MRU) value negotiated is less than the value configured.	The MRU size negotiated cannot exceed the ISDN Max Frame size configured. If the MRU value negotiated is less than the value configured, it is because the ISDN Max Frame size is less than the MRU size.	If you want a larger MRU size, change the ISDN Max Frame size to a value greater than or equal to the MRU size desired.
The second link of a Multilink PPP (MP) bundle between two routers cannot join the MP bundle.	The initial or maximum bundle size is not configured correctly.	Check the configured MP Maximum MP bundle size. This value <i>must</i> be set to 2 on the <i>called</i> side to create an MP bundle with two links.
		Check the configured MP Initial MP bundle size. This value <i>must</i> be set to 2 on the <i>calling</i> side to create an MP bundle with two links.

Table 6-2 Software Problems and Solutions (Continued)

Problem	Possible Cause(s)	Solution
No available PPP Instance for a standard PPP link to join.	There can only be one standard PPP link established per configured PPP interface. An attempt was made to establish a second link.	<p>If one PPP interface is desired to have two links, then Multilink PPP (MP) should be enabled.</p> <p>If two PPP interfaces are desired with one link each (split-B channel configuration), then a second PPP interface needs to be added to the router.</p> <p>If two interfaces are already created, check that both interfaces are enabled.</p>
Multilink PPP connection denied.	The second link of a Multilink PPP bundle may not come up due to a busy signal received when placing the ISDN call.	The router keeps retrying the ISDN call at random intervals, not exceeding four minutes.
The PPP link goes down with high volume traffic.	PPP echo maintenance packets are a way to keep the PPP link up. In high volume traffic situations, the echo packet may be delayed or lost. This causes the PPP link to come down.	Disable PPP echo packet transmission via the disable echo command at the PPP Config> prompt.

Using Event Logging System Messages

Events occur continuously while the router is operating. They can be caused by any of the following:

- System activity
- Status changes
- Service requests
- Data transmission and reception
- Data and internal errors

The Event Logging System (ELS) is a monitoring system that manages the messages logged as a result of the router activity. When an event occurs, ELS generates a message describing the event. This description indicates what the problem may be.

Using ELS commands, you can set up a configuration that sorts out only those messages that are important to you. You can display the messages using the Command Line Interface. You can find the ELS commands under the GWCON commands at the + prompt. See Appendix A, Using the Command Line Interface.

For detailed information on ELS messages, refer to the *Event Logging System Messages Guide*. This is part of the RouteAbout Access ISDN Software V2.3 documentation set available on the DIGITAL web site (www.networks.digital.com).

The following sections contain ISDN cause codes, as well as sample ISDN ELS messages for a router successfully placing a call and a router successfully receiving the call.

Interpreting ISDN Cause Codes

ISDN cause codes help you diagnose problems. Cause codes appear in ELS messages. Cause codes are in the format:

cause (*first number: second number*)

If the *first number* is 0x5, it indicates a *Q.931 Cause info element indication*.

If the *second number* is 0x6F, it means *Protocol error, unspecified*.

Table 6-3 refers to the first number of a cause code. The information is from page 301 of the *1988 CCITT Q.930 - Q.940 Blue Book*.

Table 6-4 lists the reasons you received the *Cause info element indication*. The numbers in Table 6-4 appear as hexadecimal and the decimal equivalents.

The following example shows this cause code in the context of an ELS message:

```
00:00:21 ISDN.003: ConnID 0x0 Status msg cause (0x5:0x6F) Q.931  
Cause Info Element on nt 1 int PPP/0
```

Table 6-3 Cause Codes for First Number

Code	Description
0x2	ISDN firmware unrecoverable error - DIGITAL ISDN specific
0x5	Q.931 Cause info element indication
0x6	Q.931 Display info element indication
0x7	Q.931 Signal info element indication
0x8	Q.931 Progress Indication info element
0x9	Q.931 Feature Indication info element
0x0E	Update Physical Channel
0x10	No channel available error
0x12	Q.931 Notification Indicator info element received

Table 6-4 Cause Codes for Second Number

Hexadecimal Equivalent	Code	Description, if First Number is 0x5
01	1	Unallocated (unassigned number)
02	2	No route to specified transit network
03	3	No route to destination
06	6	Channel unacceptable
07	7	Call awarded and being delivered in an established channel
10	16	Normal call clearing
11	17	User busy
12	18	No user responding

Table 6-4 Cause Codes for Second Number (Continued)

Hexadecimal Equivalent	Code	Description, if First Number is 0x5
13	19	No answer from user (user alerted)
15	21	Call rejected
16	22	Number changed
1A	26	Non-selected user clearing
1B	27	Destination out of order
1C	28	Invalid number format (address incomplete)
1D	29	Facility rejected
1E	30	Response to STATUS ENQUIRY
1F	31	Normal, unspecified
22	34	No circuit/channel available
26	38	Network out of order
29	41	Temporary failure
2A	42	Switching equipment congestion
2B	43	Access information discarded
2C	44	Requested circuit/channel not available
2F	47	Resource unavailable, unspecified
31	49	Quality of Service not available
32	50	Requested facility not subscribed
39	57	Bearer capability not authorized
3A	58	Bearer capability not presently available
3F	63	Service or option not available, unspecified
41	65	Bearer capability not implemented
42	66	Channel type not implemented
45	69	Requested facility not implemented
46	70	Only restricted digital information bearer capability is available
4F	79	Service or option not implemented, unspecified
51	81	Invalid call reference value
52	82	Identified channel does not exist
53	83	A suspended call exists, but this call identify does not
54	84	Call identity in use
55	85	No call suspended

Table 6-4 Cause Codes for Second Number (Continued)

Hexadecimal Equivalent	Code	Description, if First Number is 0x5
56	86	Call having the requested call identity has been cleared
58	88	Incompatible destination
5B	91	Invalid transit network selection
5F	95	Invalid message, unspecified
60	96	Mandatory information element is missing
61	97	Message type non-existent or not implemented
62	98	Message not compatible with call state or message type non-existent or not implemented
63	99	Information element non-existent or not implemented
64	100	Invalid information element contents
65	101	Message not compatible with call state
66	102	Recovery on timer expiry
6F	111	Protocol error, unspecified
7F	127	Internetworking, unspecified

Sample ELS Messages of a Router Placing a Successful Call

The following is a sample log of ELS messages that occurred during the placement of a successful call. The log shows the placement and disconnection of a telephone call. The bold type indicates the messages for the indicated action. You may wish to compare your ELS messages with these.

```

GW.002: Portable CGW [router] Rel RouteAbout Access ISDN 2.3 [Z35]
strtd
WAN.009: Ev Buf Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Buf Params from PPP to WAN1, Nt 1 int PPP/0
WAN.009: Ev Line Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Line Params from PPP to WAN1, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from WAN1 to PPP, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
GW.030: 6432 bytes reserved by ISDN
WAN.009: Ev Buf Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Buf Params from PPP to WAN1, Nt 1 int PPP/0
WAN.009: Ev Buf Params from ISDN to PPP, Nt 2 int PPP/0
WAN.009: Ev Buf Params from PPP to WAN2, Nt 2 int PPP/0
WAN.009: Ev Line Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Line Params from PPP to WAN1, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from WAN1 to PPP, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
WAN.009: Ev Line Params from ISDN to PPP, Nt 2 int PPP/0
WAN.009: Ev Line Params from PPP to WAN2, Nt 2 int PPP/0
WAN.008: Cmd Set ELS from WAN1 to PPP, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from WAN2 to PPP, Nt 2 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
GW.049: Patched ping-size to 1200
GW.049: Patched ping-rate to 8
GW.018: Strt nt slf tst nt 0 int Eth/0
GW.019: Slf tst nt 0 int Eth/0
WAN.006: Int dis nt 2 int PPP/1
GW.030: 1536 bytes reserved by IP
GW.030: 24776 bytes reserved by IP
GW.059: Alloc buff with min 15 global, 4 per net
GW.060: Buffs alloc with reduction 0
GW.005: Bffrs: 400 avail 400 idle fair 103 low 80
ISDN.045: Start BRI Slf Test
GW.020: Nt pss slf tst nt 0 int Eth/0 GW.021: Nt up nt 0 int Eth/0
ISDN.008: Download OK, PUD status (0x0) nt 1 int PPP/0
ISDN.010: Config ok nt 1 int PPP/0

```

```
ISDN.039: Hndlr N_STAT_RQ nt 1 int PPP/0
ISDN.038: Parameter download ok nt 1 int PPP/0
ISDN.026: Hndlr inidev() st Config nt 1 int PPP/0
GW.026: Mnt nt 0 int Eth/0
ISDN.027: Hndlr N_START_RQ nt 1 int PPP/0
ISDN.025: Start ok nt 1 int PPP/0
ISDN.004: ConnID 0xFF Q.931 Display Info Element "TEI 0 ID request"
(cause 0x6:0x0) on nt 1 int PPP/0
ISDN.045: Status Indication: LINE_NOT_ACTIVE
ISDN.003: ConnID 0xFF Status msg cause (0xA:0x12) CCITT line
activation lost on nt 1 int PPP/0
ISDN.045: Status Indication: LINE_NOT_READY
ISDN.003: ConnID 0xFF Status msg cause (0x1A:0x8) on nt 1 int PPP/0
GW.026: Mnt nt 0 int Eth/0
GW.026: Mnt nt 0 int Eth/0
GW.026: Mnt nt 0 int Eth/0
```

D Channel Light Goes On

```
ISDN.045: Status Indication: LINE_ACTIVE
ISDN.003: ConnID 0xFF Status msg cause (0xB:0x13) CCITT line
activation achieved on nt 1 int PPP/0
ISDN.045: ISDN MAC Layer in 'RUNNING' state
WAN.009: Ev Net Up from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Net Up from PPP to WAN1, Nt 1 int PPP/0
WAN.001: Dv up nt 1 int PPP/0
WAN.009: Ev Net Up from ISDN to PPP, Nt 2 int PPP/1
WAN.009: Ev Net Up from PPP to WAN2, Nt 2 int PPP/1
WAN.001: Dv up nt 2 int PPP/1
WAN.008: Cmd Prot Init from WAN1 to PPP, Nt 1 int PPP/0
```

Sending an Outbound Connect Request

```
WAN.008: Cmd Conn Req from WAN1 to PPP, Nt 1 int PPP/0
WAN.008: Cmd Conn Req from PPP to ISDN, Nt 1 int PPP/0
ISDN.043: CLIENT CONNREQ: index 0, physchan 0
ISDN.043: CLIENT CONNREQ: proceeding index 0, physchan 65535
ISDN.033: Chn 65536 ConnID 0xFFFF FSM st Idle ev ConnReq ->
Call_Init nt 1 int PPP/0
ISDN.046: NET CONNREQ: index 0, dialing ph# [0984:]
ISDN.032: Chn 0 ConnID 0x0 Cl1 Txcmp on nt 1 int PPP/0
ISDN.015: Chn 0 FSM st Idle ev ConnReq -> Call_Init nt 1 int PPP/0
ISDN.003: ConnID 0x0 Status msg cause (0x7:0x1) Ring back tone is on
on nt 1 int PPP/0
ISDN.043: NET CONNCNF: index 0, physchan 65535
ISDN.043: Client ConnInd: index 0, physchan 0
WAN.009: Ev Conn Ind from ISDN to PPP, Nt 1 int PPP/0
```

```
ISDN.045: NET CONNCNF: Dataxfer, Client ACCEPTED ConnInd
ISDN.033: Chn 1 ConnID 0x0 FSM st Call_Init ev ConnCnf -> DataXfer
nt 1 int PPP/0
ISDN.003: ConnID 0x0 Status msg cause (0x7:0x3F) All tones are off
on nt 1 int PPP/0
ISDN.021: Chn 1 ConnID 0x0 RxD Pkt ln 28 nt 1 int PPP/0 ISDN.021:
Chn 1 ConnID 0x0 RxD Pkt ln 24 nt 1 int PPP/0
WAN.009: Ev QoS from PPP to WAN1, Nt 1 int PPP/0
WAN.008: Cmd Conn Req from PPP to ISDN, Nt 1 int PPP/0
ISDN.043: CLIENT CONNREQ: index 0, physchan 0
ISDN.043: CLIENT CONNREQ: proceeding index 1, physchan 65535
ISDN.033: Chn 65536 ConnID 0xFFFF FSM st Idle ev ConnReq ->
Call_Init nt 1 int PPP/0
ISDN.046: NET CONNREQ: index 1, dialing ph# [0984:]
ISDN.032: Chn 1 ConnID 0x1 Cll Txcmp on nt 1 int PPP/0
ISDN.015: Chn 1 FSM st Idle ev ConnReq -> Call_Init nt 1 int PPP/0
ISDN.021: Chn 1 ConnID 0x0 RxD Pkt ln 12 nt 1 int PPP/0
ISDN.021: Chn 1 ConnID 0x0 RxD Pkt ln 12 nt 1 int PPP/0
WAN.009: Ev Conn Ind from PPP to WAN1, Nt 1 int PPP/0
WAN.008: Cmd Prot Init from WAN1 to PPP, Nt 1 int PPP/0
ISDN.003: ConnID 0x1 Status msg cause (0x7:0x1) Ring back tone is on
on nt 1 int PPP/0
```

TEI and SPID Negotiation

```
ISDN.004: ConnID 0xFF Q.931 Display Info Element "TEI 0 ID request"
(cause 0x6:0x0) on nt 1 int PPP/0
GW.026: Mnt nt 0 int Eth/0
ISDN.004: ConnID 0xFF Q.931 Display Info Element "TEI 0 ID request"
(cause 0x6:0x0) on nt 1 int PPP/0
ISDN.004: ConnID 0xFF Q.931 Display Info Element "TEI 0 ID request"
(cause 0x6:0x0) on nt 1 int PPP/0
ISDN.004: ConnID 0xFF Q.931 Display Info Element "TEI 0 ID request"
(cause 0x6:0x0) on nt 1 int PPP/0
ISDN.004: ConnID 0xFF Q.931 Display Info Element "TEI 0 assigned"
(cause 0x6:0x40) on nt 1 int PPP/0
ISDN.045: Status Indication: LINE_READY
ISDN.003: ConnID 0xFF Status msg cause (0x1B:0x8) on nt 1 int PPP/0
GW.026: Mnt nt 2 int PPP/1
GW.026: Mnt nt 0 int Eth/0
```



```
ISDN.021: Chn 1 ConnID 0x0 RxD Pkt ln 8 nt 1 int PPP/0
WAN.008: Cmd Disc Req from PPP to ISDN, Nt 1 int PPP/0
ISDN.044: CLIENT DISCREQ: Disconnect Initiated
ISDN.042: CLIENT DISCREQ: index 0 state DataXfer
WAN.009: Ev Disc Ind from ISDN to PPP, Nt 1 int PPP/0
ISDN.033: Chn 1 ConnID 0x0 FSM st DataXfer ev DiscReq -> Clearing nt
1 int PPP/0
ISDN.021: Chn 2 ConnID 0x1 RxD Pkt ln 8 nt 1 int PPP/0
WAN.008: Cmd Disc Req from PPP to ISDN, Nt 1 int PPP/0
ISDN.044: CLIENT DISCREQ: Disconnect Initiated
ISDN.042: CLIENT DISCREQ: index 1 state DataXfer
WAN.009: Ev Disc Ind from ISDN to PPP, Nt 1 int PPP/0
ISDN.033: Chn 2 ConnID 0x1 FSM st DataXfer ev DiscReq -> Clearing nt
1 int PPP/0
ISDN.020: Chn 0 ConnID 0x0 Rxd Dt Pkt ln 8 bd stt Clearing nt 1 int
PPP/0 ISDN.020: Chn 1 ConnID 0x1 Rxd Dt Pkt ln 8 bd stt Clearing nt
1 int PPP/0 ISDN.043: NET DISCCNF: index 0, physchan 0
ISDN.045: NET DISCCNF: Clearing, freeing channel
ISDN.033: Chn 1 ConnID 0x0 FSM st Clearing ev DiscCnf -> Idle nt 1
int PPP/0
ISDN.043: NET DISCCNF: index 1, physchan 1
ISDN.045: NET DISCCNF: Clearing, freeing channel
ISDN.033: Chn 2 ConnID 0x1 FSM st Clearing ev DiscCnf -> Idle nt 1
int PPP/0
GW.026: Mnt nt 2 int PPP/1
WAN.009: Ev Maint OK from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Maint OK from PPP to WAN1, Nt 1 int PPP/0
```

Sample ELS Messages of a Router Receiving a Successful Call

The following is a sample log of ELS messages that occurred during the receiving of a successful call. The log shows the answering and disconnection of a telephone call. The bold type indicates the messages for the indicated action. You may wish to compare your ELS messages with these.

```
GW.002: Portable CGW [router] Rel RouteAbout Access ISDN 2.3 [Z35]
strtd
WAN.009: Ev Buf Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Buf Params from PPP to WAN1, Nt 1 int PPP/0
WAN.009: Ev Line Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Line Params from PPP to WAN1, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from WAN1 to PPP, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
GW.030: 6432 bytes reserved by ISDN
WAN.009: Ev Buf Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Buf Params from PPP to WAN1, Nt 1 int PPP/0
WAN.009: Ev Buf Params from ISDN to PPP, Nt 2 int PPP/0
WAN.009: Ev Buf Params from PPP to WAN2, Nt 2 int PPP/0
WAN.009: Ev Line Params from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Line Params from PPP to WAN1, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from WAN1 to PPP, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
WAN.009: Ev Line Params from ISDN to PPP, Nt 2 int PPP/0
WAN.009: Ev Line Params from PPP to WAN2, Nt 2 int PPP/0
WAN.008: Cmd Set ELS from WAN1 to PPP, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
WAN.008: Cmd Set ELS from WAN2 to PPP, Nt 2 int PPP/0
WAN.008: Cmd Set ELS from PPP to ISDN, Nt 1 int PPP/0
GW.049: Patched ping-size to 1200
GW.049: Patched ping-rate to 8
GW.018: Strt nt slf tst nt 0 int Eth/0
GW.019: Slf tst nt 0 int Eth/0
WAN.006: Int dis nt 2 int PPP/1
GW.030: 1536 bytes reserved by IP
GW.030: 24776 bytes reserved by IP
GW.059: Alloc buff with min 15 global, 4 per net
GW.060: Buffs alloc with reduction 0
GW.005: Bffrs: 400 avail 400 idle fair 103 low 80
ISDN.045: Start BRI Slf Test
GW.020: Nt pss slf tst nt 0 int Eth/0 GW.021: Nt up nt 0 int Eth/0
ISDN.008: Download OK, PUD status (0x0) nt 1 int PPP/0
ISDN.010: Config ok nt 1 int PPP/0
```

```
ISDN.039: Hndlr N_STAT_RQ nt 1 int PPP/0
ISDN.038: Parameter download ok nt 1 int PPP/0
ISDN.026: Hndlr inidev() st Config nt 1 int PPP/0
GW.026: Mnt nt 0 int Eth/0
ISDN.027: Hndlr N_START_RQ nt 1 int PPP/0
ISDN.025: Start ok nt 1 int PPP/0
ISDN.004: ConnID 0xFF Q.931 Display Info Element "TEI 0 ID request"
(cause 0x6:0x0) on nt 1 int PPP/0
ISDN.045: Status Indication: LINE_NOT_ACTIVE
ISDN.003: ConnID 0xFF Status msg cause (0xA:0x12) CCITT line
activation lost on nt 1 int PPP/0
ISDN.045: Status Indication: LINE_NOT_READY
ISDN.003: ConnID 0xFF Status msg cause (0x1A:0x8) on nt 1 int PPP/0
GW.026: Mnt nt 0 int Eth/0
GW.026: Mnt nt 0 int Eth/0
GW.026: Mnt nt 0 int Eth/0
```

Receiving an Incoming Call

```
GW.026: Mnt nt 0 int Eth/0
WAN.009: Ev Maint OK from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Maint OK from PPP to WAN1, Nt 1 int PPP/0
ISDN.003: ConnID 0xFF Status msg cause (0x3:0x0) Start call
alerting on nt 1 int PPP/0
ISDN.043: NET CONNIND: index 0, physchan 0
ISDN.033: Chn 1 ConnID 0x0 FSM st Idle ev ConnInd -> Call_Rxd nt 1
int PPP/0
ISDN.003: ConnID 0x0 Status msg cause (0x7:0x40) Alerting pattern 0
is on on nt 1 int PPP/0
```

B Channel Ready to Receive Data Packets

```
ISDN.043: NET CONNACK: index 0, physchan 0
ISDN.045: Calling address NOT PROVIDED by the ISDN switch
ISDN.043: Client ConnInd: index 0, physchan 0
WAN.009: Ev Auth Request from ISDN to PPP, Nt 1 int PPP/0
WAN.009: Ev Auth Request from PPP to WAN1, Nt 1 int PPP/0
WAN.009: Ev Conn Ind from ISDN to PPP, Nt 1 int PPP/0
ISDN.045: NET CONNACK: DataXfer, circuit open
ISDN.033: Chn 2 ConnID 0x1 FSM st Call_Rxd ev ConnAck -> DataXfer nt
1 int PPP/0
ISDN.003: ConnID 0x1 Status msg cause (0x7:0x4F) Alerting is off on
nt 1 int PPP/0
ISDN.021: Chn 2 ConnID 0x1 RxD Pkt ln 24 nt 1 int PPP/0
ISDN.021: Chn 2 ConnID 0x1 RxD Pkt ln 28 nt 1 int PPP/0
WAN.009: Ev QoS from PPP to WAN1, Nt 1 int PPP/0
GW.026: Mnt nt 0 int Eth/0
```

Appendix A

Using the Command Line Interface

This appendix provides instructions for using the Command Line Interface to configure your RouteAbout Access ISDN. It includes the following topics:

<u>Accessing the Command Line Interface</u>	124
<u>Procedures for Using the Command Line Interface</u>	125
<u>Using the Command Line Interface</u>	129
<u>Understanding the Command Line Interface</u>	132
<u>Commands</u>	134

Accessing the Command Line Interface

You access the Command Line Interface through a local or remote terminal. You must use a local terminal for the initial software configuration.

See “Connecting Your GlobeTrotter to a PC,” in Chapter 3 for information on how to connect a local PC or terminal to the RouteAbout Access ISDN.

Once you have enabled IP on the RouteAbout Access ISDN, and it is active on the network, you can use Telnet to connect remote terminals to the RouteAbout Access ISDN. Telnet is a protocol in the TCP/IP protocol suite. It enables remote access and control of one host from another host on the IP network.

If you are running Windows on a PC, TCP/IP software is included with Windows 95. If you are running an earlier version of Windows (Windows 3.1, Windows for Workgroups 3.11, or Windows NT), be sure you have installed the TCP/IP protocol stack on your PC.

Remote connections provide the same functionality as local connections. You can connect two remote terminals to the RouteAbout Access ISDN at the same time.

Procedures for Using the Command Line Interface

This section includes the following procedures for using the Command Line Interface to configure and monitor your RouteAbout Access ISDN:

- Logging in
- Connecting to a process
- Identifying the process by the prompt
- Getting back to the * prompt
- Exiting the router

Logging In

Before you log in from a remote terminal, you need to connect to the router using Telnet. To do so,

1. Start Telnet on your remote terminal. Supply the router's name or Internet Protocol (IP) address. To use router names, your network must have a name server.

```
%telnet brandenburg  
or  
%telnet 128.185.132.43
```

From this point on, there is no difference whether you have logged in remotely or locally.

2. If prompted, enter your login name and password. The password controls access to the router. The software prompts you for a login only if you have set one up.

```
login: ifr  
Password:
```

Note: If you do not type a login name and valid password within a minute of the initial prompt, or if you type an incorrect password three times in succession, the router drops the Telnet connection.

3. Now, enter commands.

Connecting to a Process

When you start the router, the screen first displays a boot message, then the * prompt. The * prompt is the top-level prompt. From this prompt, you can communicate with different processes. (Prompts are symbols for processes.)

To connect to a process, do the following:

1. To find out the process ID (PID) number of a process, type **status** at the * prompt. For example,

```
*status
Pid  Name      Status TTY  Comments
1    COpCon    IOW   TTY0
2    Monitr    DET   --
5    CGWCon    DET   --
6    Config    DET   --
```

The **status** command displays information about the router processes, such as the PIDs, the process names, and the status of the process.

2. Type **talk pid**, where pid is the number of the process to which you want to connect.

For example, to configure the router, type

```
*talk 6
Config>
```

Table A-1 shows each process along with the equivalent ways to connect to it, as well as an abbreviation:

Table A-1 Equivalent Ways to Connect to a Process

Process	Talk Command With PID	Command	Abbreviation
MONITR	talk 2	monitor	m
GWCON (same as CGWCON)	talk 5	gw-console	g
CONFIG	talk 6	config	c

Identifying the Process by the Prompt

Each process uses a different prompt. You can tell which process you are connected to by looking at the prompt. If you type **talk pid**, you are no longer at the * prompt. If a prompt does not appear, press **^** again.

The following list shows the prompts for the main processes:

Process	Prompt
OPCON	*
GWCON	+
CONFIG	Config>

Note: The MONITR process does not have a prompt.

Getting Back to the * Prompt

To get back to the * prompt from any main process, such as CONFIG (Config> prompt) or GWCON (+ prompt), press **., p**, which is called the intercept character. You must always return to the * prompt before you can go to another main process. For example, if you are at the + prompt and you want to go to the Config> prompt, press **., p** to return to the * prompt first.

```
*config
Config> .,p
*gw-console
+ .,p
*
```

Exiting the Router

Return to the * prompt and close the Telnet connection.

For example:

```
Config> ,,p
* logout
%
```

You can also use local Telnet commands (such as, **exit**) on your Telnet client to close the connection.

Note: There is a limit of only two concurrent Telnet sessions to a router at any one time.

Using the Command Line Interface

The Command Line Interface provides the following capabilities:

- Command line editing
- Command completion
- Command line recall

Note: The arrow keys `↑` `↓` `←` `→` are VT100/ANSI escape sequences. If your terminal or terminal emulator cannot produce these, use the control keys listed.

Command Line Editing

You can edit lines using the following keys:

<code>↑</code> , <code>u</code> or <code>↑</code>	Go up one line.
<code>↓</code> , <code>n</code> or <code>↓</code>	Go down one line.
<code>←</code> , <code>b</code> or <code>←</code>	Go back one character (left of the cursor).
<code>→</code> , <code>f</code> or <code>→</code>	Go forward one character (right of the cursor).
<code>a</code>	Go to the beginning of line.
<code>e</code>	Go to the end of the line.
<code>d</code>	Delete forward one character.
<code>k</code>	Delete from cursor to end of line.
<code>t</code>	Transpose character at cursor with previous character.
<code>,</code> or <code>%</code>	Delete characters to the left of the cursor.

You can press `^` with the cursor at any point in the line.

You can find a list of available command line editing commands by entering **help** at any prompt.

Command Completion

Enter `?` or press `↑` from any prompt to display a list of available commands or command options. Entering `?` or pressing `↑` always lists the possible completions for the present input. The lists of completions will vary depending on the software running on your router.

```
Config>PROTOCOL
```

The choices/prefixes are (a complete list)

```
IP
ARP
IPX
SNMP
AP2
BRIDGE
HST
```

Pressing `↑` on a blank input line displays a list of all commands the software allows at that prompt.

Pressing `↑` at the end of an input line terminates input and searches all commands that start with the present input. One of the following happens:

If the software finds . . .	Then . . .
A complete match of a command	The space becomes a real space.
A common unique (sub)string of commands greater than the existing input	The software displays all of the commands allowed at that prompt and redisplay the input line. Config>add The choices/prefixes are (a complete list): INTERFACE USER Config>add
No unique common (sub)string of commands	The software displays all commands and redisplay present input.

A `~` acts similarly to a space in most cases. The exception is when you enter a command and there is a default supplied for that command. In this case, `~` completes the default. The `~` is helpful when you enter values rather than commands because you can press `~` repeatedly to enter default values.

Command Line Recall

You can display up to the last 10 correctly entered command lines using the following keys:

- „ u or é Go up the saved command list.
- „ n or ë Go down the saved command list.

Understanding the Command Line Interface

The processes you use most often are OPCON, GWCON, CONFIG, and MONITR. Figure A-1 shows the processes and how they fit within the structure of the router software.

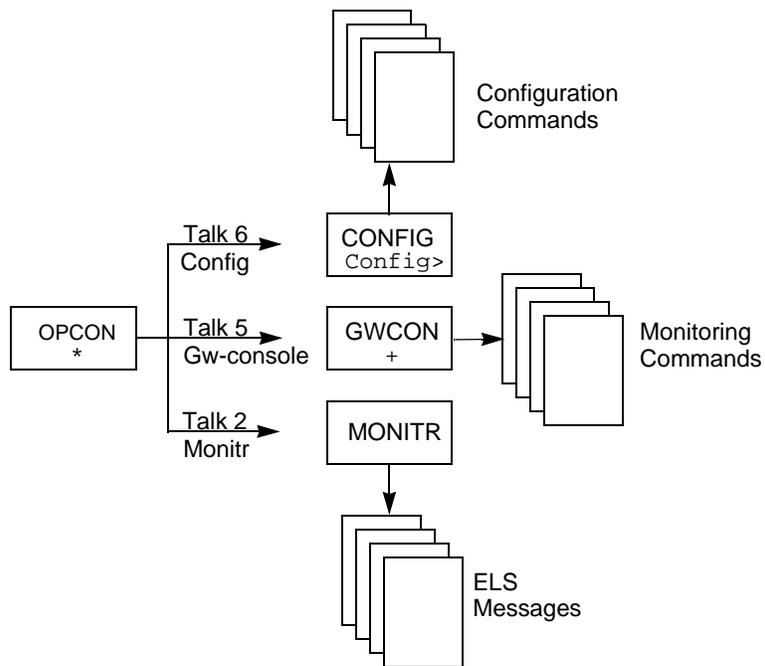


Figure A-1 Router Software Processes

Table A-2 is a list of processes on the router, with definitions and prompts.

Table A-2 Process Definitions

Process	Definition	Prompt
OPCON (First Level)	Operator console.	*
ROPCON	Remote operator console that supports two Telnet clients as remote operators. Functionally, OPCON and ROPCON are the same.	*
GWCON (Second Level)	Gateway configuration. Allows you to monitor the status and statistics of the router's hardware and software. Provides access to the third-level processes, which allow you to monitor configured protocols and features. Functionally, GWCON and CGWCON are the same.)	+
CGWCON	Current gateway configuration. See GWCON.	
CONFIG (Second Level)	Allows you to configure router parameters for interfaces, protocols, users, and booting. Provides access to third-level processes, which allow you to configure various protocols and features.	Config>
MONITR (Second Level)	Receives Event Logging System (ELS) messages and messages from the operating system and displays them on the console, according to user-selected criteria.	None

Commands

The OPCON process provides access to second-level processes, which allow you to configure (`Config>`) and monitor (+) your router. The OPCON prompt (*) is the main user interface to these processes.

Some changes to the router's operating parameters made while in OPCON take effect immediately without requiring re-initializing the router. If the changes do not take effect, use the **restart** command at the * prompt.

Note: The following figure and tables are only samples. What you actually see on your router may vary based on the specific features available on your product.

Figure A-2 shows the OPCON command tree.

Table A-3 is a list of the OPCON commands. To use these commands, access the OPCON process and enter the command at the * prompt.

Table A-4 is a list of the CONFIG commands for configuring your router. To use these commands, access the OPCON process and enter the **config** command at the * prompt. At the `Config>` prompt, enter whatever CONFIG commands you need.

Table A-5 is a list of the GWCON commands for monitoring your router. To use these commands, access the OPCON process and enter the **gw-console** command at the * prompt. At the + prompt, enter whatever GWCON commands you need.

Note: For detailed information on using these commands to configure the router, refer to the *System Software Guide*, which is part of the RouteAbout Access ISDN Software V2.3 documentation set available on the DIGITAL web site (www.networks.digital.com).

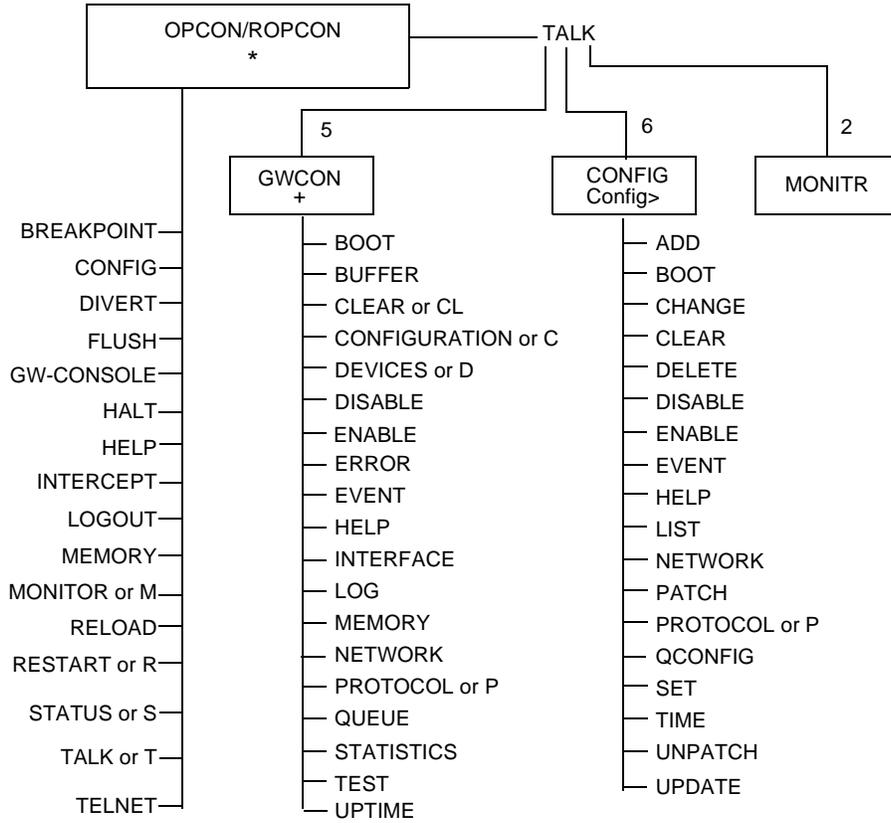


Figure A-2 OPCON Command Tree

Table A-3 OPCON Command Summary

Command	Function
Breakpoint	Halts the router and enters the router's debugger. Note: Do not use the breakpoint command unless directed to do so by customer service.
Config	Enters the configuration process.
Divert	Sends output to a console or other terminal.
Flush	Discards output.
Gw-console	Enters the gateway console process.
Halt	Stops output.
Help	Provides help about the command line interface.
Intercept	Sets the intercept character (normally, ,, p).
Logout	Logs out from a router.
Memory	Reports the router's memory usage.
Monitor	Enters event log monitor process.
Reload	Reloads the router with a new load and restarts.
Restart	Restarts the router with the same load.
Status	Shows information about all router processes.
Talk	Contacts another router process and enables the use of its commands.
Telnet	Connects to another router.

Table A-4 CONFIG Command Summary

Command	Function
Add	Adds an interface to the router configuration or a user to the router.
Boot	Enters the Boot CONFIG command process.
Change	Changes the current interface's configuration or a user's password.
Clear	Clears configuration information.
Delete	Deletes a user or an interface from the router configuration.
Disable	Disables an interface or other system options.
Enable	Enables an interface or other system options.
Event	Enters the Event Logging System configuration process.
Help	Provides help about the command line interface.
List	Lists the devices and displays the system parameters or the hardware configuration. Lists the interfaces and displays the settings for the software configuration.
Network	Enters the configuration menus of the specified network. This command accesses the Dial Circuit protocol stack.
Patch	Modifies the router's global configuration.
Protocol	Enters the command environment of the specified protocol.
Qconfig	Initiates the Quick Config process.
Set	Sets system-wide parameters for buffers, hostname, inactivity timer, logging disposition and level, packet size, restart count, location, and contact-person.
Time	Sets up system time and displays it.
Unpatch	Restores variables of the patches to default values.
Update	Updates the configuration.

Table A-5 GWCON Command Summary

Command	Function
Boot	Displays information on how the router was booted last.
Buffer	Displays information about packet buffers assigned to each device.
Clear	Clears interface statistics.
Configuration	Lists the status of current protocols and interfaces.
Devices	Lists the devices configured on the router.
Disable	Disables device, interface, or system options, such as command completion.
Enable	Enables system options, such as command completion.
Error	Displays error counts.
Event	Enters the Event Logging System environment.
Help	Provides help about the command line interface.
Interface	Displays network hardware statistics or statistics for the specified interface.
Log	Sets or views the logging level for events not included in the Event Logging System.
Memory	Displays memory, buffer, and packet data.
Network	Enters the console environment of the specified interface.
Protocol	Enters the command environment of the specified protocol.
Queue	Displays buffer statistics for a specified device.
Statistics	Displays statistics for the specified interface.
Test	Enables a disabled device or interface or tests the specified device or interface.
Uptime	Displays time statistics for the router.

Appendix B

Using Quick Configuration

This appendix describes how to configure the RouteAbout Access ISDN using the Quick Config process and includes the following sections:

Before You Begin	140
Procedures for Using Quick Configuration	141
Configuring the RouteAbout Access ISDN	141

Before You Begin

Quick Configuration (Quick Config) is part of the Command Line Interface, and is a question and answer script that allows you to configure basic device, bridging, routing, and booting information without having to enter and exit the different configuration processes. (Other parameters are set to normal default values.)

Quick Config is appropriate for installations where the RouteAbout Access ISDN always calls the same remote router. You can also use Quick Config to configure the primary remote site that the RouteAbout Access ISDN calls, and then use the RouteAbout Access ISDN Setup Utility or Command Line Interface to add other sites.

Whatever parameters you cannot configure with Quick Config you can configure using the Command Line Interface's configuration processes after exiting Quick Config.

You cannot delete Quick Config information from within Quick Config; but you can correct it by exiting and returning to Quick Config or by typing **r** for **restart** as a response to a Quick Config question.

Notes:

- Quick Config prompts you only for information that pertains to the hardware version and the software loaded on your RouteAbout Access ISDN.
- Information within brackets [] is the default. Press **^** to use this value, or enter a value and press **^**.
- Information within parentheses () is either a list of or a description of acceptable input.
- Enter **r** at any time to restart the current configuration section. For example, if you are in the device configuration section, enter **r** to redisplay the device configuration prompts.
- Press **,** or **%o** to delete the last character typed. Press **,, u** to delete an entire entry so that you can re-enter it.

Procedures for Using Quick Configuration

Entering Quick Config

If you are configuring the RouteAbout Access ISDN for the first time and you are using the Command Line Interface, the RouteAbout Access ISDN enters Quick Config automatically the first time you boot it.

To run Quick Config after you have initially configured the RouteAbout Access ISDN, follow these steps:

1. At the * prompt, enter **config** to display the `Config>` prompt. For example:

```
* config
Config>
```

2. Enter **qc** at the `Config>` prompt to begin Quick Config.

Exiting Quick Config

To exit Quick Config, type **r** for restart at any prompt and follow the queries until you type **no** and then **q** for **quit**. The router returns to the `Config (only)>` prompt or the `Config>` prompt.

Configuring the RouteAbout Access ISDN

This section describes the questions that Quick Config displays. The actual questions displayed vary depending on earlier answers you entered, such as ISDN related questions that are customized based on the type of ISDN switch specified, the software loaded on your RouteAbout Access ISDN, and your hardware configuration. The questions are covered in the following sections:

- Configuring Interfaces
- Configuring Bridging
- Configuring Protocols
- Restarting the Router

Examples of user input appear in bold typeface.

Configuring Interfaces

Quick Config interface configuration lets you configure ISDN and PAP and CHAP user authentication. It also lets you enable Multilink PPP and data compression. Ask your ISP or network manager for the network addressing information you need for your RouteAbout Access ISDN configuration.

Table B-1 has all the interface configuration questions that can appear in Quick Config. You will find that the software does not ask all of the questions listed below because some questions only pertain to particular switch types or are based on other answers and appear only when needed.

Table B-1 Interface Configuration Questions

Question	Description
Local Router's Name: [ramp-22] ramplocal	<p>Unless you override this local router's name later in this Quick Config, this local router's name is used to identify it to the remote router.</p> <ul style="list-style-type: none"> • If you are using your RouteAbout Access ISDN for personal use, you may wish to use the user name that your Internet Service Provider (ISP) assigned to you as the local router's name. Then, when you log into the ISP, you use this name when you dial. • If you are using your RouteAbout Access ISDN for corporate use, your network administrator may structure the local router's name to indicate specific information, such as remote site types.
Switch-Variant-Model (5ESS, DMS100, NET3, INS64, USNI1, USNI2, VN3, AUS): [USNI1] 5ess	The type of switch to which you connected this ISDN interface.
Point/Multi-Point Selection (PP, MP): [MP] pp	The software only asks this question if it cannot determine the correct answer based on the switch type. If the switch requires multipoint, then Quick Config makes the correct choice and does not ask the question. Check with your ISDN service provider.

Table B-1 Interface Configuration Questions (Continued)

Question	Description
Enter your first ISDN phone number (number or number:extension): [] 12228888 or 12228888:44	The ISDN telephone number that your service provider assigns to your local router. For multipoint, switch variants in North America use a different telephone number for each device. Switch variants in Europe, Japan, and Australia use sub-addresses.
Enter your second ISDN phone number (number or number:extension): [] 12225555 or 12225555:77	A second ISDN telephone number that your service provider assigns to your local router. For multipoint, switch variants in North America use a different telephone number for each device. Switch variants in Europe, Japan, and Australia use sub-addresses.
Enter your ISDN phone number (number or number:extension): [] 19992222 or 19992222:82	The software asks this question when it knows, based on your switch type, that there can only be one ISDN telephone number. This is the ISDN telephone number that your service provider assigns to your local router. For multipoint, switch variants in North America use a different telephone number for each device. Switch variants in Europe, Japan, and Australia use sub-addresses.
Enter Service Profile ID 0 (19 digits max): [] 5085551234	In North America, service providers may require Service Profile IDs (SPIDs). A SPID is a number that uniquely identifies a specific profile of service characteristics available on a particular access interface (such as a B channel). Your ISDN service provider assigns SPIDs.
Enter Service Profile ID 1 (19 digits max): []	If your service provider assigned a second SPID, enter it here. Generally, if your service provider assigns two directory numbers, they also assign two SPIDs.
Specify remote router name (1-23 chars): [] Raipremote	Enter a name for the remote router to which the RouteAbout Access ISDN connects.
Enter 'Raipremote' ISDN phone number (number or number:extension): [] 15551212 or 15551212:33	The ISDN telephone number of the remote router. For multipoint, switch variants in North America use a different ISDN telephone number for each device. Switch variants in Europe, Japan, and Australia use sub-addresses.

Table B-1 Interface Configuration Questions (Continued)

Question	Description
Enter a second ISDN phone number? (Yes, No): [No]	You can enter a second telephone number for the remote router. The dial circuit attempts to call each of the numbers until it successfully connects to the remote router.
Enter 'Raipremote' ISDN phone number (number or number:extension): [] 15551212 or 15551212:33	The ISDN telephone number of the second remote router. For multipoint, switch variants in North America use a different ISDN telephone number for each device. Switch variants in Europe, Japan, and Australia use sub-addresses.
Place Outbound Calls (Yes, No): [Yes]	Set whether or not the RouteAbout Access ISDN can place outbound calls.
Accept Inbound Calls (Yes, No): [Yes]	Set whether or not the RouteAbout Access ISDN can accept inbound calls.
Multilink PPP (Disable, Enable): [Disable]	Enables or disables Multilink PPP.
PPP STAC Data Compression (Disable, Enable): [Disable]	Enables or disables Stac [®] data compression.
PPP Call-Back (Disabled, Request, Accept, Always): [Disabled]	The initial default value is disabled. This implies Call-back is not performed. The other options, Request, Accept, and Always, enable their respective Call-back modes (Request, Accept, and Always).
Setup CHAP authentication? (Yes, No): [Yes] yes	Allows you to set up CHAP authentication on your RouteAbout Access ISDN.
Local Name used for CHAP Identification: [<i>ramplocal</i>]	Enter the name that the local router uses to identify itself in CHAP packets transmitted on this interface. The default is the local router's name specified earlier. See Table B-1. If you have multiple interfaces calling multiple ISPs, use the user name your ISP or network administrator assigned to you if that name is different than the local router's name entered earlier.
Require CHAP from remote? (Yes, No): [No]	If you enter yes , you enable CHAP when the RouteAbout Access ISDN is <i>answering</i> a call from a remote router.

Table B-1 Interface Configuration Questions (Continued)

Question	Description
Router `Raipremote` CHAP Secret: [] remote secret	Enter the CHAP secret assigned to you by the remote router administrator. This may be your ISP or the corporate network administrator.
Setup PAP authentication? (Yes, No): [No] yes	Allows you to set up PAP authentication on your RouteAbout Access ISDN.
Local Name used for PAP Identification: [ramplocal]	Enter the name that the local router uses to identify itself in PAP packets transmitted on this interface. The default is the local router's name specified earlier. If you have multiple interfaces calling multiple ISPs, use the user name your ISP or network administrator assigned to you if that name is different than the local router's name entered earlier.
Router `ramplocal's` PAP password: [] localpw	Enter the PAP password assigned to you by the remote router administrator. This may be your ISP or the corporate network administrator
Require PAP from remote? (Yes, No): [No]	If you enter yes , you enable PAP when the RouteAbout Access ISDN is <i>answering</i> a call from a remote router.
Router `Raipremote` PAP password: [] remotepw	Add a password for the remote router. This is the password you expect to receive <i>from</i> the remote router when the remote router calls your router.

Configuring Bridging

Table B-2 Bridging Configuration Questions

Prompt	Description
Enable STB on this interface?	Enter y to enable Spanning Tree Bridge/Transparent Bridging on the interface.

Configuring Protocols

Table B-3 IP Configuration Questions

Prompt	Description
Enable IP on this interface? (Yes, No): [Yes]	Enter yes to enable IP on the interface you are configuring.
IP Address: [] 128.185.142.20	Enter the IP address of the interface in decimal notation.
Address Mask: [255.0.0.0] 255.255.255.0	Address mask is a decimal value that reflects the IP address class type. Class A is 255.0.0.0, Class B is 255.255.0.0, and Class C is 255.255.255.0. For more information about IP addressing or address masks, consult your network administrator.
Use Unnumbered IP Addressing? (Yes, No): [Yes]	For WAN interfaces, IP allows you to use the interface for IP traffic without assigning an IP address.
Use Dynamic IP Address Assignment? (Yes, No): [No]	Your ISP or corporate network administrator may not permanently assign you an IP address. If your IP address is assigned when you connect to the network, then answer Yes.
Address Mask: [255.255.255.0]	The RouteAbout Access ISDN requires an IP address mask for dynamically assigned addresses. You can accept the default (255.255.255.0) unless your ISP or network administrator tells you otherwise.
Enable Dynamic Routing via RIP? (Yes, No): [Yes]	Enter yes if you want RIP to build the routing tables. Enter no to manually add IP address destinations to the routing tables (static routes).
Specify a Default Route? (Yes, No): [No]	Enter yes if you want to specify a default route.
Default Route Gateway IP Address?: [0.0.0.0] 128.185.252.2	Enter the IP address of the default gateway. This is the router that provides access to other remote networks.

Table B-3 IP Configuration Questions (Continued)

Prompt	Description
Specify default route via an unnumbered interface of address assigned interface? (Yes, No): [Yes]	If you are configuring a default route for a WAN interface, you can specify that the default route is via the unnumbered interface of the address assigned interface.
Which interface is the default route? (0-1):[1] 1	If you specify that the default route is via the unnumbered interface, enter the interface number of the unnumbered interface.

Restarting the Router

When Quick Config is finished, it prompts you to restart the router. You must restart the router for the configuration to take effect.

You may defer restarting the router to configure additional protocols and features. When you complete the configuration, restart the router for all settings to take effect.

Appendix C

Hardware Specifications

	RouteAbout Access ISDN/IP	RouteAbout Access ISDN/MP
Processor	MC 68360	MC 68360
Memory DRAM	2 MB	4 MB
Flash	1 MB	2 MB
*Input/Output Interfaces	1 Ethernet (10BaseT) 1 ISDN BRI	1 Ethernet (10BaseT) 1 ISDN BRI
Dimensions	7.25" x 6.38" x 1.25" (18.4 x 16.2 x 3.2 cm)	7.25" x 6.38" x 1.25" (18.4 x 16.2 x 3.2 cm)
Weight	1 lb (0.45 kg)	1 lb (0.45 kg)
Power	90 to 264 VAC 47-63 Hz 18 VA	90 to 264 VAC 47-63 Hz 18 VA
Operating Temperature	5 to 41 degrees C (50 to 105 degrees F)	5 to 41 degrees C (50 to 105 degrees F)
Relative Humidity	8% to 80%	8% to 80%
Agency Approvals	FCC Class B UL, CSA, TUV CISPR-22, Class B CE Mark, JATE	FCC Class B UL, CSA, TUV CISPR-22, Class B CE Mark, JATE

* For RouteAbout Access ISDN/IP and /MP, Model U, BRI U interface
 For RouteAbout Access ISDN/IP and /MP, Model S/T, BRI S/T interface

Appendix D

Cable Specifications

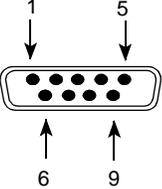
This appendix describes the signals associated with the pins on the console port, the 10BaseT Ethernet port, and the ISDN BRI S/T port. It also shows the voltages of the power connector. This information will assist you in obtaining custom cables from your supplier.

Console Port	152
ISDN BRI Connectors	153
Ethernet 10BaseT Connector	154
Ethernet 10BaseT Crossover Cable Connector	155
Power Connector	155

Console Port

Table D-1 lists pin assignments for the RouteAbout Access ISDN console port.

Table D-1 Console Port Cable – RS-232 DTE Male



The diagram shows a 9-pin DTE male connector. The pins are arranged in a single row. Arrows point to the following pins: 1 (top left), 5 (top right), 6 (bottom left), and 9 (bottom right).

Connector Pin #	Signal
1	Data Carrier Detect
2	Received Data
3	Transmitted Data
4	Data Terminal Ready
5	Signal Ground
6	DCE Ready
7	Request To Send
8	Clear To Send
9	Call Indicate

ISDN BRI Connectors

Table D-2 lists the cable specifications for the ISDN BRI S/T and Table D-3 lists the cable specifications for the ISDN BRI U physical interfaces.

Table D-2 ISDN Cable Pin Assignments for S/T Interface

Brown/White	1	Unused
Green/White	2	Unused
Orange/White	3	Transmit +
Blue/White	4	Receive +
White/Blue	5	Receive -
White/Orange	6	Transmit -
White/Green	7	Unused
White/Brown	8	Unused

Connector Pin #	Description
3	Transmit Data +
4	Receive Data +
5	Receive Data -
6	Transmit Data -

Table D-3 ISDN Cable Pin Assignments for U Interface

Brown/White	1	Unused
Green/White	2	Unused
Orange/White	3	Unused
Blue/White	4	TIP
White/Blue	5	RING
White/Orange	6	Unused
White/Green	7	Unused
White/Brown	8	Unused

Connector Pin #	Description
4	TIP
5	RING

Ethernet 10BaseT Connector

Table D-4 lists the pin assignments for the Ethernet 10BaseT RJ-45 connector.

Table D-4 Ethernet Cable 10BaseT Connector Pin Assignments

Brown/White	1	Transmit +
Green/White	2	Transmit -
Orange/White	3	Receive +
Blue/White	4	Unused
White/Blue	5	Unused
White/Orange	6	Receive -
White/Green	7	Unused
White/Brown	8	Unused

Connector Pin #	Description
1	Transmit Data +
2	Transmit Data -
3	Receive Data +
6	Receive Data -

Ethernet 10BaseT Crossover Cable Connector

Table D-5 lists the pin assignments for the Ethernet 10BaseT crossover cable.

Table D-5 Ethernet Crossover Cable Connector Pin Assignments

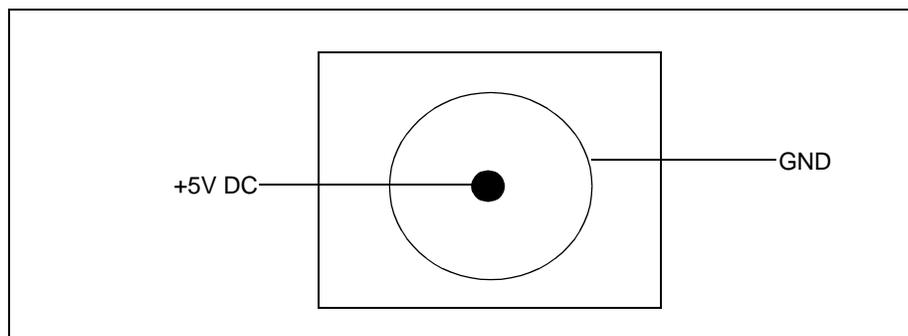
Brown/White	1	Receive +
Green/White	2	Receive -
Orange/White	3	Transmit +
Blue/White	4	Unused
White/Blue	5	Unused
White/Orange	6	Transmit -
White/Green	7	Unused
White/Brown	8	Unused

Connector Pin #	Description
1	Receive Data +
2	Receive Data -
3	Transmit Data +
6	Transmit Data -

Power Connector

Table D-6 shows the voltages of the power connector pins.

Table D-6 Power Connector



Console Adapter

The following table lists the pin assignments for the 9-pin to 25-pin console adapter used with the console cable.

Table D-7 Console Adapter
Pin Assignments

Connectors

J1 = DB9M

J2 = DB25F

Wiring

<u>J1</u>	<u>J2</u>	<u>SIGNAL</u>
1	8	DCD
2	3	RXD
3	2	TXD
4	20	DTR
5	7	SGN G
6	6	DSR
7	4	RTS
8	5	CTS
9	22	RI
SHELL	SHELL	SHIELD

Glossary

A

access interfaces

The connection between you and the telephone company's central office. The access interface is what allows you to access and obtain services such as ISDN. ISDN provides two types of access interfaces: Basic Rate Interface (BRI) and Primary Rate Interface (PRI).

analog technology

A method of voice transmission that converts voice to electrical signals and amplifies them so they can be heard over long distances.

B

bandwidth

Defines the amount of data that can flow through a channel. The greater the bandwidth, the more data that can travel at one time.

Basic Rate Interface (BRI)

An access interface that most small businesses and individuals use for ISDN. For this service, the telephone company divides the connection between you and the central office into three separate channels, two 64 Kbps B (bearer) data channels and one 16 Kbps D control channel. This is called 2B+D.

B channel

Also called a Bearer channel. It is a circuit-switched digital channel used to carry data, voice, video, or fax across ISDN.

BRI

See Basic Rate Interface.

C

caller ID

A service provided by the telephone company, where the number of the caller is relayed to the number called. The number of the caller can appear on an ISDN telephone, an LCD screen, a computer screen, or on another device.

Centrex

A call management service the local telephone company provides at their site where you get local switching features similar to those an on-site PBX provides.

Challenge Handshake Authentication Protocol (CHAP)

One of two authentication protocols (PAP and CHAP) used by the RouteAbout Access ISDN. CHAP is the Challenge Handshake Authentication Protocol, which requires the RouteAbout Access ISDN to send a challenge to the connecting router. The RouteAbout Access ISDN anticipates a specific response. If the connecting router answers with the anticipated response, communication between the two routers continues, if not, the communication channel is shut down.

CHAP

See Challenge Handshake Authentication Protocol.

Circuit Switched Data (CSD)

Phone calls with data only instead of voice.

Circuit Switched Voice (CSV)

Traditional telephone service. The voice goes through several switches before it reaches the final destination.

compression

A process for reducing the number of bits required to transmit information. For ISDN, the result of compression is increased data transmission speed.

CSD

See Circuit Switched Data.

CSV

See Circuit Switched Voice.

D

D channel

Used to control the flow of data through the network: out-of-band call setup and teardown and maintenance of overhead functions, such as signaling between telephone company switches and network monitoring.

device

Physical hardware entity within the router. Each physical LAN or WAN connection on the router corresponds to one device. Some devices (like ISDN equipment) can support multiple interfaces.

digital technology

Digital technology is the basis upon which ISDN exists. Digital technology breaks information down into strings of ones and zeros enabling fast transmission of data.

DRAM

See Dynamic Random Access Memory.

Dynamic Random Access Memory (DRAM)

A type of storage that the computer accesses at frequent intervals. It runs the system software and maintains routing tables.

F

firewall

A combination of hardware and software that prevents unauthorized access to internal networks.

flash

Programmable memory that is for system storage load and is used in the Integrated Boot Device (IBD).

functional devices

Perform tasks on an ISDN, such as a TE2, a TE1, a TA, or an NT1. A collection of protocols that define the ISDN connection.

G

gateway

A host system that provides access between or among systems.

RouteAbout Access ISDN Configuration Tool

A Microsoft Windows-based graphical configurator shipped with your RouteAbout Access ISDN.

I

IBD

See Integrated Boot Device.

in-band signaling

The signals used to operate the communications channel share the same physical channel as the information or user data in the channel.

Integrated Boot Device (IBD)

Banks of memory in routers for storing configuration files.

Integrated Services Digital Network (ISDN)

A switched digital technology that upgrades an ordinary telephone network using analog technology to an all-digital, end-to-end network. In ISDN, equipment is able to switch and transport all types of information, such as voice, data, and video.

interfaces

Logical abstractions that represent sources and destinations for packets. The router routes packets between interfaces not devices. Some devices can support multiple interfaces. Every interface must use at least one device to physically transport packets.

Internet Protocol (IP)

The internetworking protocol that forms the basis of the Internet.

Internet Service Provider (ISP)

An organization providing access to the Internet. Examples of ISPs include NetCom, PSInet, Pipex, EUnet, and UUNET.

IP

See Internet Protocol.

ISDN

See Integrated Services Digital Network.

ISP

See Internet Service Provider.

L

LAN

See Local Area Network.

Light-Emitting Diode (LED)

A miniature low-voltage light source used for status lights because they emit light with no significant amount of heat.

LED

See Light-Emitting Diode.

Local Area Network (LAN)

Any physical network technology that operates at high speed over short distances. For example, Ethernet.

M

mask

Determines which bits are used for the network part of an IP address, as well as which bits are used for the node part of an IP address.

Maximum Receive Units (MRU)

Sets the maximum size of the information field within a packet.

MP

See Multilink Point-to-Point Protocol.

MRU

See Maximum Receive Units.

Multilink Point-to-Point Protocol (MP)

Combines two 64 Kbps B channels to provide bandwidth up to 128 Kbps.

multipoint connection

Two or more ISDN devices share an ISDN line.

N

Network Termination 1 (NT1)

This is the termination point of the ISDN system. It is the physical and electrical termination function of ISDN on the end-user's side of the ISDN connection. Without an NT1, ISDN cannot work. It is an interface between the S/T and U reference points and defines communication between functional devices.

NT1

See Network Termination 1.

0

out-of-band signaling

The signals used to operate the communications channel are separate from the user's data channel. ISDN uses out-of-band signaling via the D channel.

P

PAP

See Password Authentication Protocol.

Password Authentication Protocol (PAP)

One of two authentication protocols (PAP and CHAP) used by the RouteAbout Access ISDN. PAP requires a password from a connecting router before the RouteAbout Access ISDN can receive data from that router. If the password is accepted, communication between the RouteAbout Access ISDN and the connecting router continues, if the password is not accepted, the communication line is closed.

PBX

See Private Branch Exchange.

Ping

A utility for testing whether or not a connection is up and running. It sends a packet out. If there is a response, the connection is okay.

Plain Old Telephone Service (POTS)

Transmits analog information through one channel. It is not ISDN.

point-to-point connections

One ISDN device is on an ISDN line.

POST

See Power On Self Test.

POTS

See Plain Old Telephone Service.

Power On Self Test

Occurs when powering up the router. Takes from 10-30 seconds, depending on the size of the RouteAbout Access ISDN memory.

PRI

See Primary Rate Interface.

Primary Rate Interface (PRI)

An access interface that businesses with larger data needs or with the need to set up their own local phone system use. It is a faster connection to the phone company. In North America and Japan, the most common PRI has 23 64 Kbps B channels and one 64 Kbps D channel (23B+D). In Europe, the most common PRI is 30 64 Kbps B channels, and one 64 Kbps D channel (30B+D).

Private Branch Exchange (PBX)

A telecommunications switch at the customer's site that typically handles the internal telecommunications needs of a large organization.

protocol

Rules governing communication between devices in a network.

provisioning

The special requirements for each piece of consumer-provided equipment about which you need to tell the telephone company when ordering ISDN services.

R

reference points

Device-to-device interfaces, such as R, S/T, and U.

R reference point

Located on an ISDN between non-ISDN Terminal Equipment (TE2) and a Terminal Adapter (TA).

S

Service Profile Identifier (SPID)

An alphanumeric identifier that identifies the service capabilities of an ISDN device. The telephone company assigns this number.

Simple Network Management Protocol

A protocol used to monitor routers and attached networks. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

SNMP

See Simple Network Management Protocol.

SPID

See Service Profile Identifier.

static routes

Routes that you manually configure and never change unless you change them by adding or deleting.

S/T reference point

Located on an ISDN between ISDN user equipment and Network Termination (NT1) equipment.

switch

Equipment, provided by the telephone company, that connects users on a telecommunications network. Every user has a dedicated connection to the nearest switch and every switch has access to trunk lines, which enable calling beyond the local area. The switch determines how many ISDN devices you can handle, as well as how many different configuration options.

switching

The process of interconnecting two devices on a network so that they can communicate with each other. The switch determines how many ISDN devices you can handle and different configuration options.

T

TA

See Terminal Adapter.

TE

See Terminal Equipment.

TEI

See Terminal End-point Identifier.

TE1

See Terminal Equipment 1.

TE2

See Terminal Equipment 2.

Telnet

Attaches you remotely to another router or a remote host.

Terminal Adapter (TA)

Converts some other form of communication to ISDN to allow non-ISDN devices to work with ISDN.

Terminal End-point Identifier (TEI)

An identifier provided by the telephone company that identifies terminal equipment on an ISDN interface.

Terminal Equipment

Any device you have that is connected to an ISDN.

Terminal Equipment 1 (TE1)

Any ISDN-ready device that connects directly to ISDN. For example: digital phone, RouteAbout Access ISDN/IP and /MP.

Terminal Equipment 2 (TE2)

Device, such as a PC or FAX machine, that is not capable of connecting to ISDN without using a Terminal Adapter (TA). The combination of a TE2 and a TA has the same functionality as a TE1.

U

U reference point

Located on an ISDN between NT1 equipment and an ISDN central office.

user list

Used for router administration. Users have various access privileges to the router, such as displaying router configuration and/or modifying the router configuration.

W

WAN

See Wide Area Network.

Wide Area Network (WAN)

Any physical network technology that spans large geographic distances. For example, the Internet.

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