

THE ISDN BASIC RATE INTERFACE, ZEPHYR, AND YOU

– With Order Forms to Fax to the Phone Company –

USA & Canada

16 February 2004, Cleveland Ohio, USA

ISDN (Integrated Services Digital Network) is your digital link to the “public switched telephone network”, offering both voice and data connectivity to just about anywhere in the world. Because ISDN comes in many different flavors, there is a occasionally confusion about what it is, and how to get it. If you know who to call and provide them with complete information, the ISDN ordering process can be simple and straightforward. This guide takes you through the process step-by-step. Telos Customer Support is available by phone, fax, or email to answer any further questions you may have.

We give a brief overview of ISDN’s basic concepts here. For a more complete discussion, please see the manual for your specific Telos Zephyr product. The information there will help you better understand the information that follows. Manuals can be downloaded from the Telos website at www.telos-systems.com/support/.

On one ISDN BRI circuit, there are three simultaneous bi-directional channels: two 64kbps “bearer” or “B” channels for the transmission of user information and one 16kbps data or “D” channel for call set-up and status communication. That is why this is sometimes called 2B+D service. You can use the B channels, but only the phone companies and equipment manufacturers can usually use the D channel. ISDN comes into your facility on two wires, just like plain old telephone service (POTS).

ISDN BRIs are perfectly matched to the transmission capabilities of the Zephyr family of codecs. With one channel, FM quality mono is possible; While two channels allow for near CD quality stereo (Zephyr classic) or, in the case of the Zephyr Xstream, MPEG AAC “indistinguishable” quality.

From the perspective of telephone network routing, each channel appears to be a separate line with it’s own number and independent dial-out capabilities. Since each has to be dialed or answered separately, they appear to be “lines” to users also. To reduce confusion we refer to a B channel as a “line” on Zephyr and Zephyr Xstream menus.

The Zephyr’s Integral ISDN Interface

Zephyr family makes use of an internal ISDN interface (sometimes called by it’s generic name “Terminal Adapter”) to connect to digital ISDN telephone lines. It easily adapts to the various types of service offered by the range of Central Office (CO) switches installed by telephone companies in the USA and Canada.

Because the ISDN interfaces are fully integrated into the system, a single user interface controls all aspects of the system.

Protocols

In a perfect world, all ISDN terminal equipment would work with all ISDN lines, without regard for such arcana as 5ESS, DMS100, CSV/CSD, SPIDs, etc. Unfortunately, the ISDN "standard" has been evolving for the past few years and has only recently begun to settle down.

At their central offices, the telephone companies use either AT&T/Lucent 5ESS, Northern Telecom DMS100, or Siemens EWSD switching equipment. While each will work with the Zephyr, there are some differences that need to be taken into account when lines are ordered and used. Each has a "protocol" - the language the user equipment and the telephone network use to converse (on the D channel) for setting up calls and the like.

There is a standard protocol that all switches may provide, called National ISDN 1 (NI-1). This protocol was standardized and specified by Bellcore, the technical lab jointly owned by the former "Bell" companies. However, both AT&T and Northern Telecom had versions of ISDN that predated the NI-1 standard, and few switches may not been upgraded to the new format.

There is also the newer NI-2 standard, but it designed to be compatible with NI-1 for all of the basic functions.

SPIDs

Service Profile Identification (SPID) numbers are required in all but one of the AT&T protocols. This number is given to the user by the phone company and must be entered correctly into the Zephyr in order for the connection to function. SPIDs usually consist of the phone number plus a few prefix or suffix digits. There is frequent confusion between phone numbers and SPIDs, even among Telco personnel. While the SPID frequently includes the corresponding phone number, this is not necessarily the case.

The intention of the SPID is to allow the Telco equipment to automatically adapt to various user requirements by sensing different SPIDs from each type or configuration of user terminal. None of this matters with the typical Zephyr application, but we must enter the SPIDs nevertheless. BellSouth proposed, and most of the other telephone companies agreed to implement, a standardized SPID for new installations. They announced this would be phased in during 1996. As of this writing, it has been implemented by most Telcos. The standard is area code+phone number+0101 (XXXYYYZZZZ0101).

Unless you are using the AT&T Custom PTP protocol, your Telco service representative should give you one SPID for each B channel you order. Don't let the phone company installer leave without providing you with the phone numbers of your B channels (called Directory Numbers, or DNs) and your SPIDs!

Dealing with the Phone Company

As is often the case when broadcasters interface with phone people, the lines of communication on ISDN can get a little tangled. Face it: we are not the usual customers. Start with the name itself -- some creative handles for ISDN include: IntellilinQ, SDS-IS, DigiLine, Microlink.

The first order of business is to find someone who knows what ISDN is. While your usual account agent will be the normal entry point, you may be talking to a number of phone people before you find one who understands your needs. Some of the regional Bell companies offer a single point of contact number for switched digital services. Note that in many cases the phone company will need to do a "loop qualification" (line loss test) from your site before they can verify that ISDN will be available. Some telephone companies use "resellers". If this is the case, you should inquire what experience this reseller has with installing ISDN for audio codecs.

Here are some contact numbers we use - if you have particularly positive or negative experiences with these offices, please let us know.

COMPANY	TELEPHONE NUMBER	WORLDWIDE WEB
Ameritech	800-TEAMDATA (800-832-6328)	www.ameritech.com/
Bell Atlantic	800-204-7332 (see below for former NYNEX regions)	http://www.ba.com/
Bell Atlantic North	Call your account representative. If you do not know who s/he is, call: 800-GET-ISDN (800-438-4736)*	www.nynex.com/
BellSouth	615-401-4347 (Lorilynn Smith)	www.bell.bellsouth.com
Cincinnati Bell	513-566-DATA (513-566-3282)	www.cincinnati-bell.com/
GTE	See Verizon	
Natco	800-775-6682 ext 288	www.natconet.com/
Nevada Bell	Small Business 702-333-4811 Large business 702-688-7100	www.sbc.com/
Pacific Bell	800-4PB-ISDN (800-472-4736) Automated availability center 800-995-0346	www.pacbell.com/
Rochester Tel.	800-851-5626	www.rtc1.com/
SBC	See Ameritech, Pacific Bell, Nevada Bell, SNET, or Southwestern Bell	
SNET	800-430-ISDN (800-430-4736)	www.sbc.com/
Stentor (Canada)	800-578-4736 (Fax Server, document 200 has list of local ordering numbers) For questions or assistance, 403-944-8130	
Southwestern Bell	800-SWB-ISDN (800-792-4736)	www.sbc.com/
US West	800-728-4949 (Fax server) small business 800-246-5226 For questions or assistance 206-447-4029	www.uswest.com/
Verizon	Bell Atlantic or Bell Atlantic North	www.verizon.com/

*You may need to call this number more than once to find someone who can arrange for fast installation for remotes. Be sure to explain that you are a broadcaster.

For countries outside of the USA see: www.gbmarks.com/html/international.html

Details, Details

In order to communicate accurately what it is you need, we think you should be familiar with the vocabulary used to describe ISDN. As with anything, for best results, it helps to know what you are talking about. For an in-depth glossary of terminology please check Telos' web site at www.telos-systems.com/techtalk.

- **IOC Capability Packages (provisioning package)**

More and more Telcos are using ISDN Ordering Code (IOC) capability packages for ISDN ordering. If your telephone company uses these you need only tell them you need IOC package "S" and an RJ-11 style (SJA48) jack. If you do not need the Zephyr's ability to call a regular

(POTS) telephone you may order IOC package "R". We still recommend that you fax them these forms as well.

- **CSD and CSV**

Recall that each ISDN BRI has two possible B channels. It is possible to order a line with one or both of the B channels enabled - and each may be enabled for voice and/or data use. Phone terminology for the class of service is CSV for Circuit Switched Voice and CSD for Circuit Switched Data (In contrast to PSD, Packet Switched Data, which is possible, but irrelevant to our needs.).

CSD is required for digital codec connections. Even though you may be sending voice, the ISDN codec's bit-stream output looks like computer data to the phone network.

CSV is for interworking with standard voice phone service, and allows ISDN to call to regular Plain Old Telephone Service (POTS) analog phone lines and phones. All members of the Zephyr family allow outgoing voice calls on either of the channels if you have CSV. This voice capability exists on each channel; thus you can make calls to any normal telephone number on one channel while a program is being transmitted on the other. Also, since the Zephyr Xstream uses this method to talk to the Zephyr Xport POTS terminal, Xstream users will definitely use this capability. This is a feature you will want to use.

You will be ordering an ISDN BRI 2B+D line with CSD (required) and CSV (optional) available on any B channel.

- **56/64kbps**

All ISDN BRI circuits have a 64kbps per channel capacity, and almost all local calls operate at this rate. Some long distance connections, however, operate at only 56kbps. The 56kbps limitation results from an old system used within the Telcos called "robbed bit signaling" which uses one bit of eight for internal communication and which is being phased out.

Zephyrs provide standard rate adaptation (officially known as CCITT V.110) from 56 to 64kbps when required. Bit rate adaptation happens automatically within the Zephyr depending upon the rate of an incoming call.

In our experience, the only sure way to know the capacity of a given connection is to try it, first at 64kbps and then at 56kbps if the higher rate fails.

- **NT1s**

The ISDN standard specifies two reference points, the "U" and the "S" interfaces. The U is the single-pair bare copper from the Telco central office. A device called a "Network Termination, Type 1" converts this to the two-pair S interface.

In Europe and Asia the NT1 is always provided by the phone company, and only the S interface may be on user equipment. Zephyr classics shipped outside of the USA and Canada have the S interface only, as do units sold prior to 1996. In the USA and Canada, the NT1 must be provided by the user, and is therefore built-in to the ISDN terminal adaptor. Therefore, Zephyr Classics and Zephyr Xports sold in the USA & Canada have both the S and U interfaces.

The Zephyr Xstream (ISDN models) always have both interfaces present.

- **Terminals & Terminal Types**

Any equipment connected to an ISDN line is a "terminal", whether phone, computer, or audio codec. Point-to-point lines support one terminal, while multipoint lines can have up to eight in some applications.

“Terminal Type” is a parameter sometimes requested by the phone people. The appropriate value varies depending upon protocol and is included on the order forms.

- **Long Distance Carriers**

Not all long distance carriers can make reliable long distance connections for ISDN. We have found that the following are most likely to work; MCI (not WorldCom), AT&T, and Sprint. If you have difficulties with long distance calls, see your Owners manual or contact Telos customer support for troubleshooting tips.

For unknown reasons, some long distance companies may try to charge extra if you are placing data calls. As of this printing, AT&T and Sprint appear to charge extra for data while MCI does not.

While you can select a carrier on a “per call” basis by using a 10xxxxx) access code, your rates will be much lower if you set up an account with the carrier you intend to use. You can contact the “Switched Data Services” department of these carriers as follows:

AT&T

(Registration required or data calls may not work, or service may be abruptly terminated)
800-222-7956 (Business)
800-820-6464 (Residential)

MCI

800-888-0800

Sprint

800-326-1015 or
800-606-6452

FAXABLE ISDN ORDER FORMS

On the next few pages are forms that can be used to place orders for ISDN lines. These should give the phone company all of the information they need. The majority of installations, if ordered in writing, with this information, go smoothly. If you do experience problems, Telos customer support is here to help. You may also wish to look at our troubleshooting information in the manual for your Zephyr, and on our web site at www.telos-systems.com .

Complete the top portion of the form and send all three pages to the phone company. Keep the form handy and show it to the installer when he or she puts in your line and ask the installer to verify with the switch programmer (at the central office) that your line is configured as ordered.

**ISDN LINE ORDERING INFORMATION - TELOS ZEPHYR FAMILY
(USA & Canada)**

To: Telephone Company

Attention: _____

From:	Location for line:
Company: _____	Company: _____
Address: _____	Address: _____
City/State/ZIP: _____	City/State/ZIP: _____
Phone: _____	Phone: _____
Contact: _____	Contact: _____

Long distance carrier: _____

Date needed: _____ Termination date: _____

We request an ISDN Basic Rate Interface (BRI) line for use with the Telos Zephyr family of hi-fidelity audio codecs. This device is used to transmit audio using digital telephone services. It *requires* Circuit Switched Data (CSD). The Zephyr transmits coded audio in real time and therefore needs reliable constant bit rate (CBR) service. It can also make standard POTS voice calls to telephones or modems using Circuit Switched Voice (CSV) service. We therefore request alternate CSD/CSV on each B channel. Please advise us if there is a cost penalty for having both CSD and CSV.

*If you use IOC Capability Packages, please use **Capability Package "S"**. If you do not use IOCs, use the information on the pages that follow.*

Zephyr has an integral BRI terminal adapter that supports these protocols (see details on following pages):

- AT&T 5ESS: Custom Point-to-Point (5E4.2 or later), National ISDN-1, National ISDN-2
- Northern Telecom: Functional (PVC1), National ISDN-1 (PVC2), National ISDN-2
- Siemens EWSD: National ISDN-1, National ISDN-2

We can use any of the protocols given above. Please let us know which protocol you will provide and the switch. We will provide the NT1 and need a U interface with 2B1Q line coding on a *standard, six-pin/4-conductor RJ11-style modular jack (SJA48)*, of which only the center two conductors will be used. IEC 10XXXXX option must be set to "YES".

You may call the manufacturer of the Zephyr, Telos Systems, at +1(216) 241-7225 for any additional required information. Ask for "ISDN Customer Support".

PROTOCOL: National ISDN-1

From AT&T 5ESS, Northern Telecom DMS100, and Siemens EWSD.

If you use IOC Capability Packages, please use Capability Package "S".

CO Values

Line Type: National ISDN-1 or National ISDN-2

Bearer Service: CSD/CSV on both channels

TEI: One dynamic per number

Terminal Type: A

10XXXXXX Long Distance Prefix: Allowed

Turn off features such as; packet mode data, multiline hunt, multiple call appearances, Electronic Key Telephone Sets (EKTS), shared directory numbers, accept special type of number, intercom groups, network resource selector (modem pools), message waiting, hunting, interLata competition, etc.

NOTES: For EWSD switch running NI-2: Switch must be programmed CLID=DN

For 5ESS switch on loop extended lines: REX test must be disabled for this line using one of the following: ASDFI266 (Prohibit REX on BRI lines per office) or ASDFI267 (Prohibit REX on BRI lines per line).

Give us:

- 1) Two SPID numbers, depending upon number of active B channels
- 2) Two Directory Numbers

PROTOCOL: Northern Telecom DMS100 'Functional' (Custom, PVC1)

Northern Telecom DMS100 switches BCS 31 and above.

CO Values

Line Type: Basic Rate, Custom Functional

EKTS: No

Call Appearance Handling: No

Non-Initializing Terminal: No

Circuit Switched Service: Yes

Packet Switched Service: No

TEI: Dynamic

Bearer Service: CSD/CSV on both channels

10XXXXXX Long Distance Prefix: Allowed

Give us:

- 1) Two SPID numbers, depending upon number of active B channels
- 2) Two Directory Numbers

PROTOCOL: AT&T Point-to-Point (Custom)

Software version 5E4.2 and above.

CO Values:

Line Type (DSL class): Point-to-Point (PTP)

B1 Service: On Demand (DMD)

B2 Service: On Demand (DMD)

Maximum B Channels (MaxChan): 2

CSV Channels: Any

Number of CSV calls: 1

CSD Channels: Any

Number of CSD calls: 2

Terminal Type: A

Number Display: No

Call Appearance Pref: Idle

10XXXXX Long Distance Prefix: Allowed

Turn off features such as; packet mode data, multiline hunt, multiple call appearances, Electronic Key Telephone Sets (EKTS), shared directory numbers, accept special type of number, intercom groups, network resource selector (modem pools), message waiting, hunting, interLata competition, etc.

Note for 5ESS on loop extended lines: REX test must be disabled for this line using one of the following: ASDFI266 (Prohibit REX on BRI lines per office) or ASDFI267 (Prohibit REX on BRI lines per line)

Give us:

- 1) One Directory Number

PROTOCOL: AT&T Point-to-Multipoint (Custom)

Not supported by the Zephyr family.

Please provide National ISDN or AT&T Point-to-Point (Custom)