9 Planning for & Installing ISDN

ISDN is beginning to change the way people work and learn, how they come together, and how — as individuals and as groups — they gather and exchange information. And every day it becomes easier and more convenient to bring this power to to your desktop.

Today, almost all NYNEX central offices have at least one digital, ISDN-capable switch installed. Plans indicate that by the end of the decade, virtually all switches throughout the NYNEX area will be either AT&T 5ESS or Northern Telecom DMS-100 systems – both digital switches designed to support the ever-growing range of advanced telecommunications services, including ISDN.

NYNEX is also implementing a *Virtual ISDN* program that allows users in areas not yet served by an ISDN switch to obtain ISDN lines "imported" from a nearby central office. While these remote *Virtual ISDN* connections may require a change in telephone numbers when a customer's local switch does become ISDN-ready, they can and do offer access to ISDN today..

In addition, NYNEX is working to overcome the technical restriction that limits ISDN connectivity to a distance of about 18,000 feet (slightly less than three and a half miles) from the user's local telephone switch. Using line boosters, that distance can be effectively doubled.

The goal of both these programs is to enable any individual or company in the NYNEX "footprint" to obtain ISDN by the end of 1995. Both programs do incur small additional installation and monthly charges.

ISDN is also being broadly implemented in many other areas of the United States. Through the long-distance ISDN services of the major interexchange carriers (IECs) such as AT&T, MCI or Sprint, dialed digital connections can now reach out to locations throughout the nation and the world. For international applications, many European and Pacific Rim countries also offer ISDN connections to most overseas commercial centers.

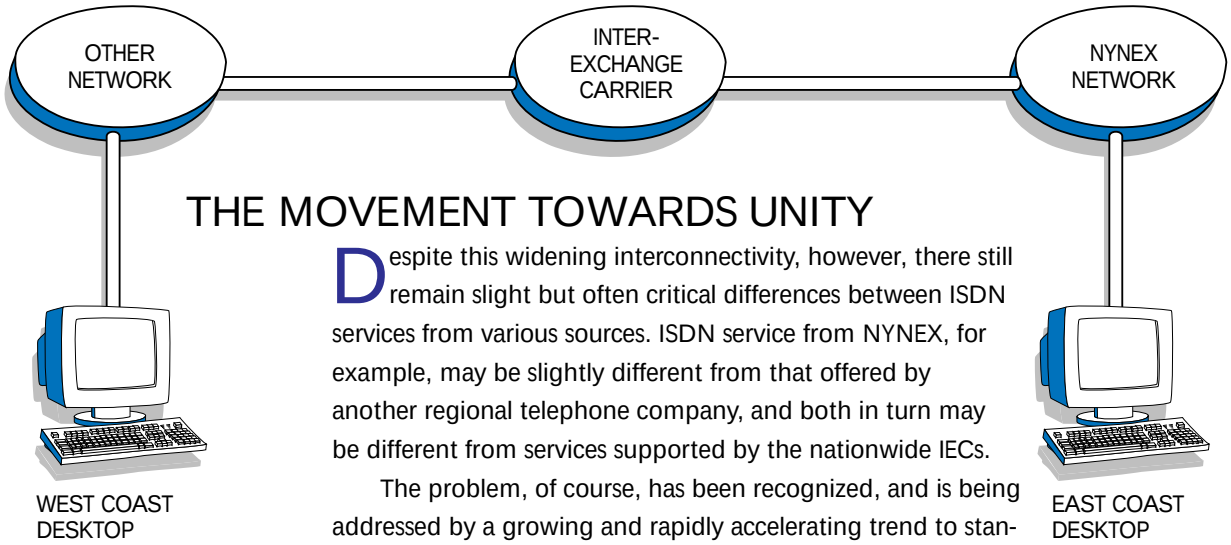
Which means that it is now increasingly practical to begin implementing even the most ambitious worldwide telecommunications strategies using the high-speed digital connections of ISDN to "close the loop" to user desktops around the globe.

Extending an Application with Switched 56

For applications that extend into areas still not served by ISDN, it is also possible to use universally available Switched 56 services offered by all regional and interexchange carriers. These are single-channel, dialed, data-only connections, capable of uncompressed data speeds up to 56Kbps.

Nationwide interconnection. *Almost any ISDN desktop can be connected to any other, anywhere in the world.*

All Switched 56 services are connected to the nationwide networks of the interexchange carriers, and thus to each other. The result: ISDN applications can be successfully extended through Switched 56 if they do not require voice, do not use two channels simultaneously, and do not depend on D-channel signaling.



THE MOVEMENT TOWARDS UNITY

Despite this widening interconnectivity, however, there still remain slight but often critical differences between ISDN services from various sources. ISDN service from NYNEX, for example, may be slightly different from that offered by another regional telephone company, and both in turn may be different from services supported by the nationwide IECs.

The problem, of course, has been recognized, and is being addressed by a growing and rapidly accelerating trend to standardize ISDN services throughout the nation, and the world.

National ISDN

In 1992, NYNEX and the other major regional telephone operating companies, as well as major telephone switch manufacturers, made a commitment to move towards a uniform, nationwide ISDN service.

This thrust, as detailed by Bell Communications Research (Bellcore), is called *National ISDN*. It specifies that every central office ISDN switch throughout the nation should operate in a standard way, and offer a standard interface to the telephones, terminals and other Customer Premises Equipment – CPE in telephone jargon – from many different manufacturers.

National ISDN is being deployed in phases, each building on the one before. National ISDN-1 (or NI-1), for example, calls for a uniform Basic Rate Interface, the implementation of basic switch features, and the availability of a Primary Rate Interface. NI-2 adds a uniform Primary Rate Interface, consistent end-user services, and the availability of the even higher-speed dialed

capabilities of Switched Fractional DS-1. NI-3 holds the promise of full compatibility and equipment interoperability between all ISDN switches, and adds additional end-user features.

Ordering Codes

A corresponding thrust is also bringing order to the world of customer equipment. All major telephone carriers, as well as telephone switch and customer equipment manufacturers, are now implementing "central office switch translations" – called *ISDN Ordering Codes*. These describe the capabilities and needs of customer premise equipment, and tell a telephone company how an ISDN line should be configured, or "provisioned," for that equipment. Today, hundreds of ISDN products have successfully completed this translation and coding procedure, with hundreds more – from virtually every major equipment manufacturer – in the process.

"National ISDN and Ordering Codes mean that ultimately customers will be able to buy equipment, plug it in anywhere in the nation, and have it work right out of the box." says Ralph Nultemeier of *Digital Equipment Corporation,* which offers full ISDN equipment, installation and support services in New York City. "Like any new technology, ISDN still has its problems and growing pains," he said, "but things are getting better fast."

NYNEX ISDN SERVICES

NYNEX today offers BRI and PRI connections through digital switches located throughout the Northeast.

ISDN Basic Service

ISDN Basic Service is NYNEX's implementation of the standard BRI. It offers integrated voice, data and video transmission over a single dialed telephone line, as well as the quality and increased data speeds of digital transmission.

It accommodates multiple phone numbers and can carry two simultaneous voice conversations through the same twisted-pair line. It offers such easy-to-use features as hold, three-way conference calls, and call transfer from one phone to another.

ISDN Basic Service can also be used, of course, for dialing to and receiving calls from ordinary voice telephones everywhere, since the digital and analog systems are fully interconnected.

For data, the service offers two 64Kbps clear-channel, circuit-switched digital B channels – capable of bonded speeds of up to 128Kbps before data compression. It also offers a 16Kbps D channel for call signaling and setup, as well as for direct interconnection to the worldwide X.25 packet-switched network.

ISDN Basic Service uses standard 1MB, 1MR or Intellipath lines, and is fully compatible with other NYNEX digital services. It can be readily interconnected to AT&T, MCI, Sprint and other IECs to make long distance ISDN channels for global applications.

Lines can be linked directly from the NYNEX local office to the user's desktop, or can be linked to a company's PBX so that dialed ISDN connections can be used within the company.

ISDN Intellipath

ISDN Intellipath is NYNEX's Digital Centrex service for business. In effect, NYNEX allocates a segment of its central office ISDN switch to act as a dedicated PBX for the customer's ISDN system. The customer thus has a PBX of almost unlimited power, without the cost and effort of installing one.

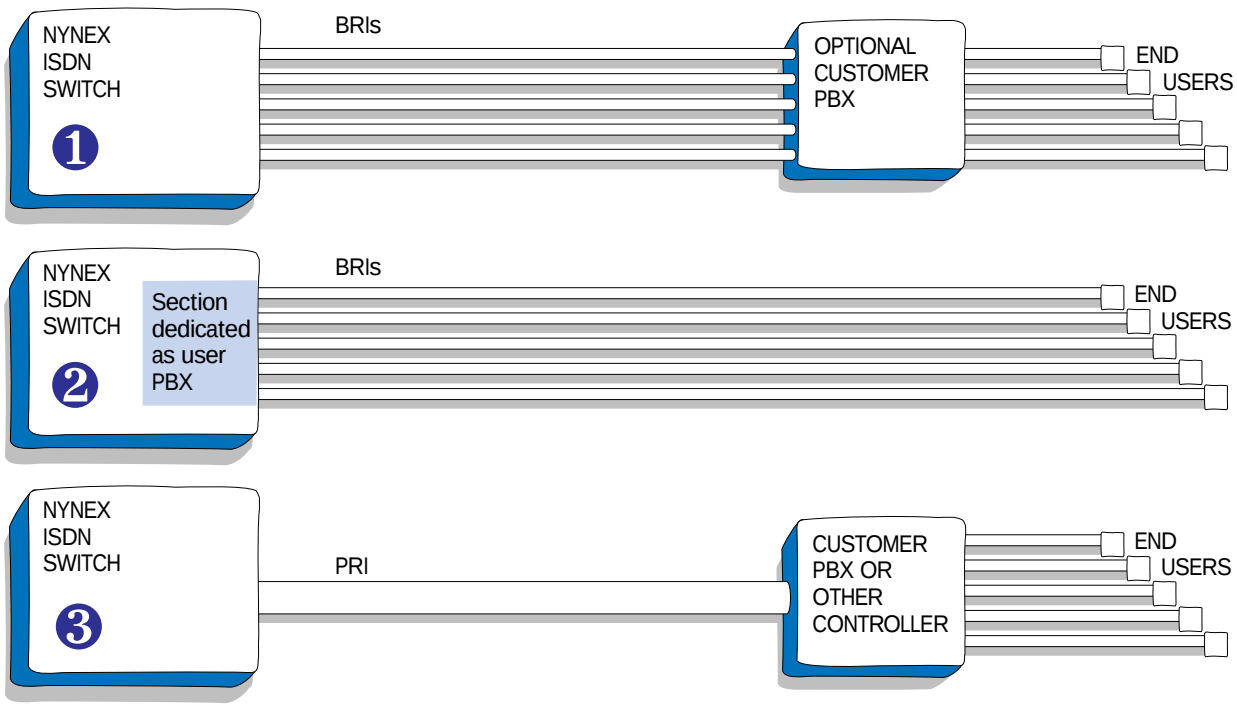
The advantages of ISDN Intellipath include advanced call management and call handling features. The switches are state-of-the-art digital systems, staffed around the clock by trained engineers and technicians. They are also fully "disaster-prepared" and equipped with uninterrupted power backup.

Three types of service.

ISDN can be delivered from a digital switch in three ways:
❶ through BRI connections from the central office to the user's desktop or to a PBX;
❷ through ISDN Intellipath, which lets the NYNEX switch serve as the user's PBX; and
❸ through a Primary Rate Interface, which brings multiple B channels to a corporate PBX or bandwidth controller.

ISDN Primary Service

NYNEX's implementation of the standard PRI is called ISDN Primary Service, and is most often provided through a standard T1 (1.544Mbps) dedicated point-to-point line. The service enhances the capabilities of the



Making Sense of SPIDs

"Some day soon," says Ralph Nultemeier of Digital Equipment Corporation, "installing ISDN will be as simple as putting in a regular POTS (*Plain Old Telephone Service*) line." Until then, he advises, there are a few things the customer needs to watch. Nultemeier should know, because as product manager of Digital's ISDN service business, he installs and supports ISDN lines for customers throughout New York City.

"Probably the most important items to look for, and certainly the least understood, are *SPIDs – Service Profile Identifiers*" he says.

"Basically, a SPID is simple. It's your ten-digit telephone number, with a suffix of one to four numbers that describe a specific ISDN device to the telephone network."

Why a SPID? Because since it's technically possible to attach up to eight different devices with some 64 separate telephone numbers to a single ISDN telephone line, there must be some way to identify each device to both the local switch and the worldwide telephone network. The SPID does that.

"For example," notes Nultemeier, "I have a telephone, a PC and a fax machine on my desk, all served by a single ISDN line. I also have two different numbers on the telephone, each with different call-forwarding options, and I can bond the two B channels for higher-speed transmissions from my PC to my corporate LAN. SPIDs help sort and describe these capabilities to the network."

Unfortunately, he adds, things can get even more complicated, depending on the type of digital switch that serves your area. AT&T 5ESS switches, for example, require only one SPID for a bonded data transmission using both B channels, while Northern Telecom DMS-100 systems require two SPIDs, one for each B channel. There are other small differences, as well.

"For the time being," says Nultemeier, "do yourself a favor and get involved with SPIDs when you order an ISDN line. Ask the order clerk *if* you will need a SPID, and if so *how many*. Then, when the line goes in, make sure that you get and understand *all* of your SPIDs before the installer leaves.

"You will have to enter correct SPIDs into each of your ISDN devices, because they will not function without them."

basic T1 digital trunk by giving the user hour-by-hour or even minute-by-minute control over each individual 64Kbps channel.

For example, instead of having separate trunks for voice access, for incoming 800-number lines, for outgoing WATS services and the like, it is now possible to allocate almost any channel to any function, wherever and whenever it's needed. This variable allocation of trunks can either be programmed into a NYNEX central office switch, or can be offered through a growing range of bandwidth-on-demand controllers, multiplexers, codecs and other equipment at the customer's location.

The result, of course, is that more voice and data traffic can be handled through existing facilities, with a much more productive use of each trunk.

While one 64Kbps channel must be reserved for D-channel signaling, those installations with multiple PRIs may choose to have one D channel serve two, three or even four PRI trunks. Large customers can also consolidate their traffic to one or more interexchange carriers through a PRI connection to the central office, thereby eliminating separate connections to each IEC.

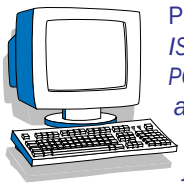
NYNEX's ISDN Primary Service is available today from many central offices throughout NYNEX. Its flexibility, power and call-by-call service capabilities can also be added to existing T1 trunks served by an appropriate digital switch.

ISDN EQUIPMENT

A growing range of LAN servers, bridges, routers, bandwidth controllers and other equipment is rapidly becoming available. Many manufacturers and suppliers of this equipment are listed in the appendix of this guide, and most provide expert advice and assistance in planning for ISDN.

Some Basic User Needs

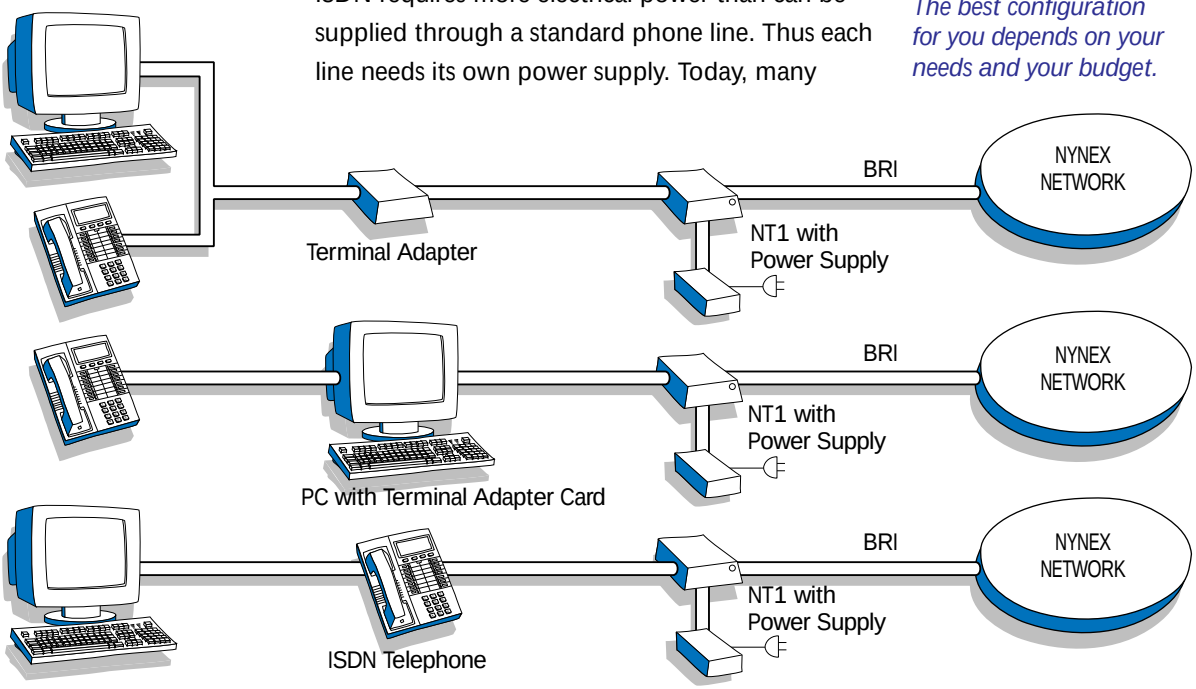
The equipment needs of the individual user are relatively simple. The typical user will require some of the following:



PC circuit boards. *ISDN circuit boards for PCs and workstations are, in effect, terminal adapters. Many include jacks for analog telephones and other devices. Many also include a built-in power supply.*

- *A Network Termination Device.* An NT1, as it's called, links a BRI connection to the telephone network. It offers both line-conversion and line-testing capabilities. Some manufacturers incorporate this device into other components. For example, many terminal adapters and desktop computer circuit boards come with a built-in NT1.
- *A Terminal Adapter.* The TA is a protocol converter that adapts PCs, workstations and other equipment to ISDN. Some terminal adapters, especially those that come as a circuit board, include telephone jacks for connecting analog telephones or faxes, while many ISDN telephones come with a built-in terminal adapter and appropriate jacks for connecting a PC.
- *A Power Supply.* Unlike analog telephone service, ISDN requires more electrical power than can be supplied through a standard phone line. Thus each line needs its own power supply. Today, many

Some typical desktop configurations. *Using ISDN telephones or terminal adapters, it's possible to link analog devices (PCs, analog telephones, faxes and more) to an ISDN line. The best configuration for you depends on your needs and your budget.*



NT1s, TAs and PC circuit boards come with their own built-in power supply.

- *An ISDN Telephone.* Powerful digital telephones that most often include a terminal adapter, an LCD screen for D-channel messaging and "softkeys" for call-management and call-control features.

ISDN telephones. *Most often come with built-in LCD screens for "softkey" call control. Most are also terminal adapters, and come with jacks for linking PCs and analog faxes to the B channel. Many also include a PAD (packet assembler-disassembler) for linking PCs and point-of-sale devices to the D channel.*

- *An Aggregation Device.* While some aggregation devices are still sold as stand-alone units, a growing number of terminal adapters now include the electronics to aggregate, or bond, two B channels into a single higher-speed connection. Some, especially PC boards, also include an Ethernet bridge.

Also required, of course, is the equipment – PCs, workstations, video or sound systems, credit-card readers and the like – and software to be used in a specific application.

"Prices for ISDN equipment are declining rapidly," said DEC's Nultemeier. "As the market grows, prices will continue to come down while capabilities keep going up."

Wiring for ISDN

In more than 80 percent of existing locations, the copper twisted-pair lines that currently serve analog telephones can be successfully used for ISDN. Nonetheless, depending on the usage of the ISDN line, and the number of existing handsets or other devices currently installed, those who plan to order ISDN may want to consider the costs and advantages of several alternatives.

- *ISDN as the only line.* This requires that all equipment (telephones, terminal adapters and the like) be ISDN-compatible. Several variations of equipment can be used to configure the line, depending on needs and projected customer applications.
- *ISDN as a second line.* This alternative can also be configured in several ways, and lets existing analog lines serve analog phones and faxes. A drawback: it may not be possible to "roll over" calls between equipment on the various lines. An advantage: analog lines can function through a power outage, while ISDN lines can not without adequate battery or other power backup.

GETTING STARTED NOW

Perhaps the hardest thing about getting started with ISDN is changing our perception of what, in fact, a telephone line can do – venturing beyond the slow modems and analog connections of yesterday into the digital connections and multi-megabit speeds of tomorrow.

The purpose of this guide, of course, is to enlarge that perception – to shed light on the hundreds of viable, powerful applications for ISDN that are being used today by thousands of companies and organizations throughout the world.

Determining a Need

In most organizations, the initial thrust towards ISDN will be driven by a single application: opening a backbone network to smaller locations, or linking multiple stores or offices together. It might be the opportunity to try video conferencing or telecommuting, or to find an economical way to back up a critical worldwide network.

The NYNEX ISDN Hotline number is 1-800-GET-ISDN

Whatever the need, however, a wealth of information, help and advice is literally as close as the nearest telephone. Perhaps the best and most obvious place to start is with a call to your own local NYNEX account team or, if you don't have a regular account team, to your local business office.

Both large and small customers can also call a special NYNEX hotline designed specifically to help in the ordering and installation of ISDN and other NYNEX digital services. The toll-free number is 1-800-GET-ISDN.

Most ISDN switch and equipment manufacturers also provide ISDN hotlines or customer service numbers in the NYNEX area – many of them toll-free. They offer helpful information, as well as service and availability information. Many are also set up to actually take orders, or arrange meetings with a knowledgeable account team. In addition, a growing number of consultants, system integrators and value-added resellers are offering their expertise in many specialized applications. A list of these NYNEX authorized Sales Agents and Business Alliance Partners appears in the appendix to this guide.

The Future Starts With a Phone Call

Today, ISDN is a reality – ready to bring the speed, power and control of the worldwide digital network to your desktop, and the desktops of users throughout the Northeast and the world. Finding out just how much ISDN can mean to you and your work begins with a simple phone call.

ISDN is ready. We hope that you are, too.

Appendix: ISDN Resources

A wide range of expertise and assistance is available to help you select, acquire, install and maintain your ISDN applications and equipment. The listings that follow — which include equipment manufacturers and suppliers, NYNEX authorized sales agents, other telephone companies throughout the United States and more — should help you get started.

Equipment & Software Suppliers and Service Providers

The manufacturers, suppliers and service providers listed here offer ISDN equipment and services with specifications that respond to a broad range of ISDN applications. It is not a complete list, however. New products are continually introduced, and equipment from companies not listed here may work equally well. This information has been compiled from a range of sources, including Solutions '94, the North American ISDN User's Forum catalog of ISDN applications and solutions, and other documents.

This list does not imply any endorsement of these products by NYNEX, although as part of our Business Alliance program (noted below with a ✦), the products and services of many companies can be leased or purchased through NYNEX.

The telephone numbers listed are correct to the best of our knowledge. For more information, contact your NYNEX account team, or the NYNEX ISDN Hotline, 800-GET-ISDN, or any of the numbers shown in this appendix.

Other non-ISDN equipment and software is also needed, of course, to implement the applications illustrated in the text of this document, including PCs, workstations, computers and file servers, LANs and LAN-access hardware, video and/or sound equipment and the like. Manufacturers of many of these products are not listed here.

Company	Telephone
3Com ✦	800-NET-3COM
Adak Communications	517-887-5800
Adtran ✦	800-397-3146
Ameritech	800-TEAMDATA
Ascend Communications, Inc.	800-621-9578
AT&T WorldWorx Solutions	800-828-WORX
AT&T Business Communications Services	800-222-0400
AT&T Global Business Communications	800-325-7466
AT&T Network Systems ✦	800-257-8699
AT&T Power Systems	214-284-2948
Bell Atlantic	800-570-ISDN
Bellcore	800-992-ISDN

BellSouth	800-428-ISDN
BT Visual Images	800-778-6288
Cincinnati Bell Telephone	513-566-5050
CISCO Systems, Inc.	415-326-1981
Compression Laboratories Inc.	408-428-6759
Connective Strategies, Inc.	703-378-ISDN
Controlware Communications Systems	908-919-0400
Digiboard ✦	800-344-4273
diehl isdn GmbH	011-49-7152-9329
Eicon Technology	800-80-EICON
Electronic Cafe International	310-828-8732
Engage Communications, Inc.	408-688-1021
EuRoNis	407-363-9008
Extension Technology	800-856-2672
FastComm Communications Corporation ✦	800-282-9642
Fujitsu ISDN Division	800-228-ISDN
Fujitsu Network Switching of America ✦	800-228-4736
Gandalf Technologies	800-GANDALF
GTE	800-448-3795
Hayes Microcomputer Products, Inc.	404-441-1617
Hewlett-Packard	800-637-7740
Hitachi America	404-242-1410
Integral Communications, Inc.	800-ICI-8234
Integrated Network Corporation	800-662-5515
Intel Corporation ✦	800-538-3373
International Transware, Inc.	800-999-6387
IBM Corporation	800-IBM-CALL
ISCOM	301-779-1368
ISDN Systems Corporation	703-883-0933
ISDN*Tek	415-712-3000
Link Technology	215-357-3354
MCI Telecommunications Corp.	800-727-5555
Memotec DataComm, Inc. ✦	800-766-7782
Mitel Corporation	613-592-2122
Motorola Transmission Products	800-451-2369
NEC (Dr. Bond)	800-222-4NEC
netCS Informationstechnik GmbH	011-49-30-8569990
Newbridge Networks Inc.	201-818-2766
Northern Telecom ✦	800-NORTHERN
NYNEX	800-GET-ISDN
Obertronics Software, Inc. ✦	508-664-2205
Pacific Bell	8004PB-ISDN
PictureTel ✦	800-874-2835
Pierce-Phelps, Inc. Integrated Comm. Systems ✦	800-262-6800
Primary Rate Inc.	800-950-ISDN
Racal-Datacom, Inc.	305-846-6762
Siemens Stromberg-Carlson	407-955-6054
Silicon Graphics Inc.	415-390-2522
Southern New England Telephone	800-430-ISDN
Southwestern Bell Telephone Company	800-992-ISDN
Sprint	800-546-1828
Sun Microsystems Computer Company	800-821-4643
TELES GmbH	512-990-0780
TeleSystems Marketing Applications ✦	800-334-9334
Teloquent Communications ✦	800-872-2272
Telrad Telecommunications, Inc.	516-921-8300
Tone Commander Systems	800-524-0024
TxPort ✦	800-926-0085
Vitel	800-856-8835
VIVO Software, Inc.	800-848-6411
U. S. West	800-288-4044

NYNEX Authorized Sales Agents

A full range of equipment and services, as well as installation and applications assistance is offered by many NYNEX Authorized Sales Agents. NYNEX Sales Agents are independent companies, and are not direct employees of NYNEX. Most represent a wide range of equipment manufacturers and providers, and offer an extensive line of installation and post-sales service and support. This list was compiled in September, 1995.

Company	Location	Telephone	Area Codes Served
Advanced Digital Networks, Inc.	New York, NY	212-944-5400	212 516
Advanced Information Sys, Inc.	Quincy, MA	617-773-3110	617 508
All-Mode Communications, Inc.	Freeville, NY	607-347-4164	718 914 607
Annese & Associates, Inc.	Herkimer, NY	315-866-2213	518 914
Associated Telephone Dsgn, Inc.	New York, NY	212-532-6800	212 914 516
Birns Telecommunications	New York, NY	212-807-6000	212
Com/Peripherals, Inc.	Great Neck, NY	516-487-0690	212 718 516 914
Comlink Incorporated	Marlboro, MA	508-460-7800	617 508 413 401 802 603 207
Communications Plnnng & Svs.	Farmingdale, NY	516-753-2150	516 212 718 914
Computer Telephone Corp.	Waltham, MA	617-466-8080	617 508 413 401 802 603 207
	New York, NY	212-608-2200	212 516 914
Cortel Business Systems, Inc.	New York, NY	212-627-4200	212 718
Delta Data Net, Inc.	Teterboro, NJ	201-288-9444	212
DSS-Net, Inc.	New York, NY	212-695-5559	212
Eagle InterCommunications	New York, NY	516-777-1200	212 516 718 914
Eastern Datacomm, Inc.	Emerson, NJ	201-262-9022	212
Eastern Telecom, Inc.	Cranston, RI	401-946-9500	401 413 617 508
	Albany, NY	518-464-0244	518 914
Executone Information Systems	Westwood, MA	800-852-3122	401 617 508 413
Gaffney Communications	Utica, NY	800-962-2000	315
IBM Corporation	New York, NY	212-745-4334	212 516
ICS/Executone Telecom Inc.	Rochester, NY	716-427-7000	716 315 607
	Buffalo, NY	716-633-8200	716 315 607
Kern Telemanagement	New Rochelle, NY	914-636-2342	212 516 914
Network Research & Control	Stratham, NH	800-445-4541	603 508
Network Services, Inc.	Burlington, VT	802-864-0300	802 603
PRF Systems, Inc.	New York, NY	212-354-4290	212
Ronco Comm. & Electronics	Tonawanda, NY	716-879-8133	716
Taylor Telephone Services, Inc.	Brewer, ME	207-989-7926	207 603
Telecom Consultants, Inc.	Greenvale, NY	516-484-7494	212 516 718 914
Telecom Ventures, Inc.	Brooklyn, NY	718-238-3340	212
Telenetwork Services, Inc.	E. Providence, RI	800-525-0032	401 508 413
TIE Communications, NY	New York, NY	212-768-2000	212
USTeleCenters	Boston, MA	800-441-3211	617 508 413 401 603
	New York, NY	212-221-9911	212 718 914
Whitcom, Inc.	Islandia, NY	800-338-3940	212 516

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