3.2 National ISDN-2 BRI Solutions

The guides in Section 3.2 use the capabilities of the National ISDN-2 Basic Rate Interface (BRI). This interface is very similar to the NI-1 BRI interface, but it has the following differentiating characteristics:

- An NI-2 BRI can support up to eight B channel devices, while an NI-1 BRI supports only two.
- A single Directory Number (DN) may be used for multiple call types (voice, circuit-data, and packet-data) by an ISDN subscriber with an integrated terminal.
- B channels may be used to originate packet-data calls as needed. This capability is known as "On-Demand B channel packet-data," as opposed to the "Semi-Permanent" connections required for B channel packet-data under NI-1.
- Additional value of NI-2 BRI implementations results from work done to provide uniform feature operation from the user's perspective on the various switching systems.

All of the solutions shown in Section 3.1 may also be implemented using NI-2 Basic Rate Interfaces. The following solutions are intended only to highlight new features of NI-2 BRIs.

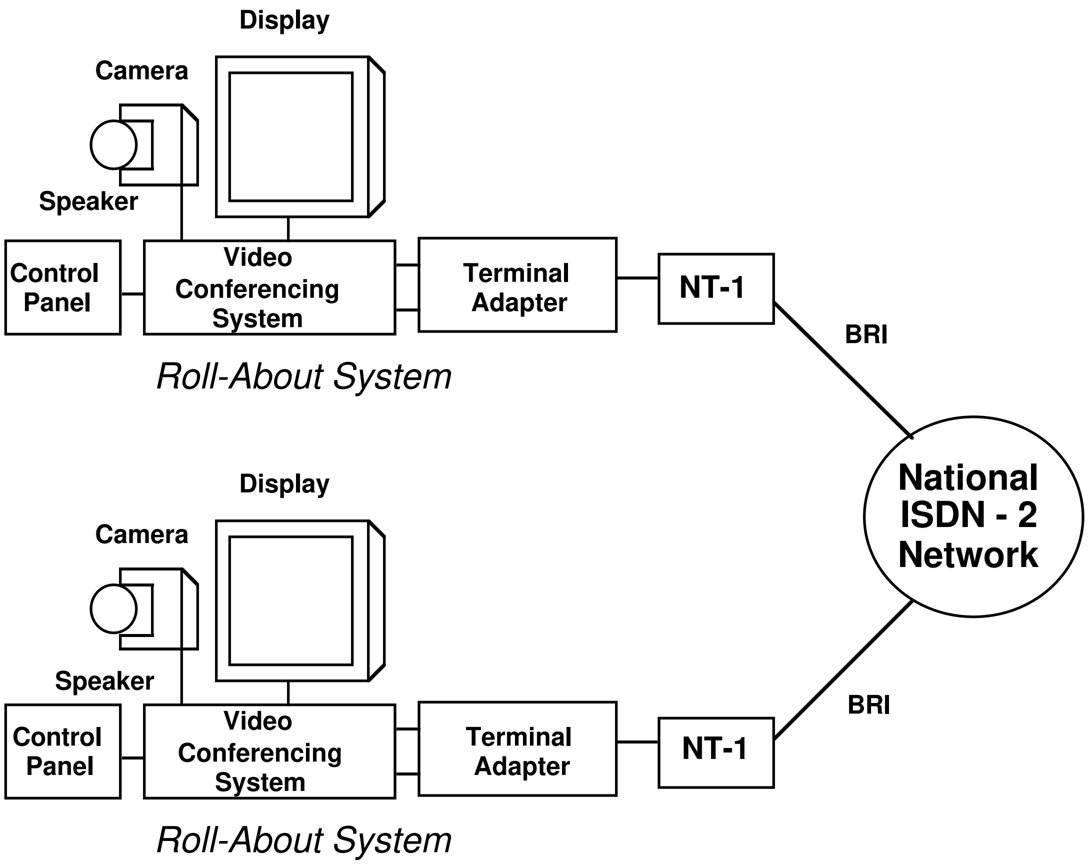
The solutions in Section 3.2 fit into the following groups:

- 3.2.1 Roll about videoconferencing — Video
- 3.2.2 X.25 back up — Other
- 3.2.3 Packet mode screen sharing for many users — Screen sharing
- 3.2.4 Home office — Work at home

3.2.1 Roll about videoconferencing

Any conference room or office can become a videoconferencing site with "roll about" video systems and basic rate ISDN. A company can equip many rooms at different geographic locations with ISDN basic rate lines. The company buys a few small video conferencing systems, stored on carts that can be rolled from room to room when needed. Then, simply by plugging in the unit to the phone jack, and electrical outlet, the room is equipped for videoconferencing.

Configuration:



How It Works:

Users wanting to set up a video conference simply call from the control panel, or dial from the TA. The systems may have ISDN capabilities built in, or may use external TAs. The conferencing systems in this example use two simultaneous circuit-data calls for a 128 (112) video call. Inverse multiplexing is built in. Generally for 128 systems, video and audio are carried over the same channel, multiplexed by the conferencing system. In some products, voice is carried on one channel (as a voice call) and video-only on a second channel as a circuit data call.

Obtain Equipment with These Capabilities

Video Conferencing System

- Camera, display, and video codec compatible with far end. Coding standards are H series.
- Speaker and microphone (or handset)
- Audio/Video interface to TA - dual 56/64 ports (V.35 or RS-449).
- Optional control panel interface to TA for dialing (e.g., RS-366)

Terminal Adapter

- B channel capabilities:
  - Simultaneous circuit-data calling on two B channels.
  - With NI-2, support for one Directory Number (DN) and Service Profile ID (SPID) will be needed.
- Physical interfaces:
  - Dual ports to Video Conferencing Terminal (e.g., RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to Terminal Adapter

Network Services Required:

- One BRI. (2B)
- Two B channels for circuit-data calls, with a single circuit-data DN and SPID.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- One BRI. (2B)
- Two B channels for circuit-data calls, with a circuit-data DN and SPID.
- Circuit-Data Features:
  - None required.
- Subscription or Ordering Information:
  - This interface is configured for two simultaneous circuit-data calls (NIIG 14). Other NIIGs which have this functionality include 15, 17, 24, 25, and 27.
  - Parameter Groups for Circuit-Data Features:

    None required.

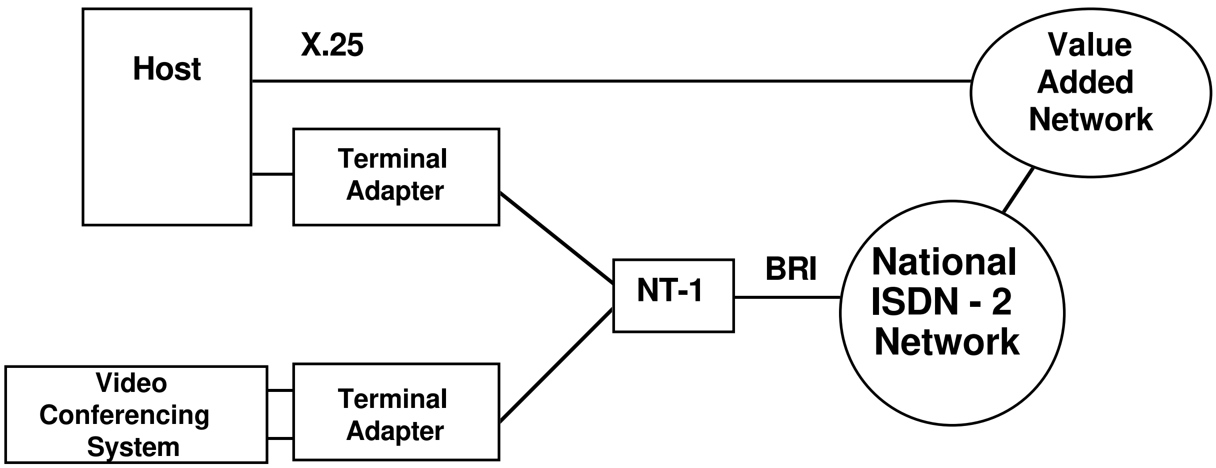
Technical Notes

- The H Series standards describe all aspects of videoconferencing. Principal standards are H.261 for Video coding, which supports a separate 16 Kbps channel for Audio that is coded in accordance with G.728 H.221 for multiplexing; and H.321 for system aspects.
- See Section 5.1.5 for Lower Layer Compatibility (LLC-IE) and Higher Layer Compatibility (HLC - IE) Information Element values for H series videoconferencing.
- Optionally, voice calling can be added, so that calls can be made to and from regular voice telephones. In this case, alternate voice or circuit data on both B channels, with a single "voice or circuit-data" DN and SPID will work. The TA will now have , as an additional feature, a phone jack and support for voice calls on one B channel.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPGs), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.5 (Circuit-Data Call Setup) and 5.2.1.6 (Voice & Circuit-Data Call Clearing).

3.2.2 X.25 back up

A company uses X.25 for transferring processing information between hosts. Coincidentally, the company is adding ISDN for videoconferencing. The single BRI line can double as a redundant path for the current X.25 facility, while predominantly supporting videoconferencing.

Configuration:



How It Works:

One Terminal Adapter has ports to the host for X.25 traffic. The second attaches to the conferencing system. The BRI is shared by the two terminal adapters, and configured with on-demand B channel packet-data on one B channel and circuit-data calling on both. When a videoconference takes place, both B channels are used to carry the signal at 128 (112) kbps. When the host needs to place an X.25 call, the videoconferencing system can only operate at 64/56 kbps, but this is expected to happen only in emergencies, since the X.25 facility is a back up.

Obtain Equipment with These Capabilities

Host

- Applications, compatible with communications software using X.25, and far end.
- One or more X.25 ports.
- Features for distributing traffic over the available lines, based on line failures, and time of day.

Terminal Adapter for Host

- B channel capabilities:
  - Packet-data calling on one B channel (on demand).
  - If using NI-2, one Directory Number (DN) and SPID will be needed.
  - Support for the packet-data features listed under "Network Interface to Terminal Adapters".
- Physical interfaces:
  - Serial connection to Host (e.g., RS-232, RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

Video Conferencing System

- Camera, display, and video codec compatible with far end. Coding standards are H series.
- Speaker and microphone (or handset)
- Audio/Video interface to TA - dual 56/64 ports (V.35 or RS-449).
- Optional control panel interface to TA for dialing (e.g., RS-366)

Terminal Adapter for Video Conferencing System

- B channel capabilities:
  - Simultaneous circuit-data calling on two B channels.
  - If using NI-2, one Directory Number (DN) and Service Profile ID (SPID) will be needed.
- Physical interfaces:
  - Analog phone jack.
  - Serial connection to Videoconferencing System (e.g., dual V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to ISDN Terminal Adapter

Network Services Required:

- One BRI. (2B)
- Two terminals, two DNs and SPIDs.
- For Videoconferencing (First DN), circuit-data calling on two B channels.
- For Host, on-demand B-channel packet-data on one B channel.
- Circuit-Data Features:
  - None required.
- Packet-Data Features:
  - Switched Virtual Call Service
  - Logical Channels: At Least 1 Two-Way LC.
  - Throughput Class : 19.2 Kbps.
  - Maximum User Data Field: 256 Octets.
  - Packet Window Size: 2.
  - Fast Select (Unrestricted) & Fast Select Acceptance.
  - Optional Network User Identification (NUI) Codes.
  - RPOA Selection.
  - Throughput Class Negotiation.
  - Flow Control Parameter Negotiation.

Subscription or Ordering Information:

- This interface is configured for alternate on - demand B channel packet-data and circuit-data. NIIGs which have this functionality are undefined.
- Parameter Groups for Circuit-Data Features:
  - None required.
- Parameter Groups for Packet-Data Features:
  - NIPG 9 - Basic B Channel Packet-Data.

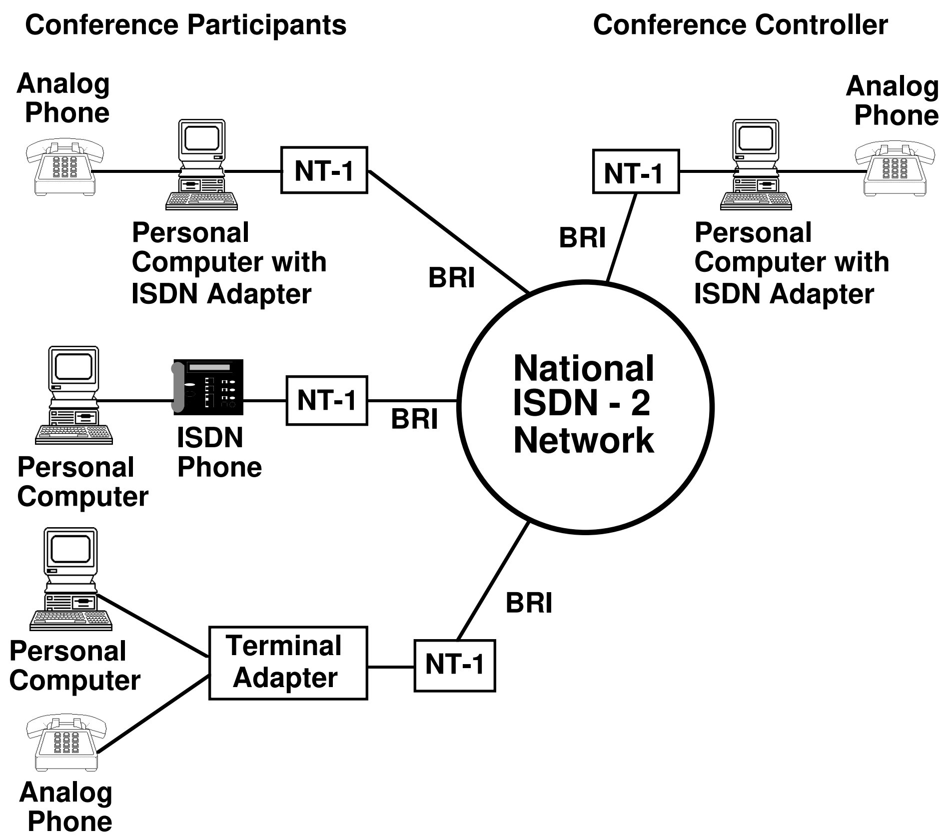
Technical Notes

- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.5 (Circuit-Data Call Setup), and 5.2.1.6 (Voice & Circuit-Data Call Clearing), 5.2.2.1 and 5.2.2.2 (On Demand Packet-Data Call Setup & Clearing)

3.2.3 Packet-mode screen sharing for many users

ISDN can be used by a group of people to view and edit the same data files at speeds up to 9.6 kbps while conversing. Each person requires only one B channel ISDN line. Network-based voice conferencing is used to support the voice conference. The data conference is provided by software running in one of the personal computers, which is designated the conference controller. The conference controller software receives the changes to the file made at the other personal computers and ensures that the data files on the others are updated appropriately. This application uses packet-data on the D channel for the conference participants at lower performance than circuit-data approaches.

Configuration: (<u>**1**</u>, <u>**2**</u>, <u>**3**</u>, 4, 5)



How It Works:

The conference controller first gains control of a six port voice conference bridge located within the network. The controller then places voice calls using Hold and Retrieve to all participants to establish the voice conference. Each participant then places a 9.6 kbps D channel packet-data call to the controller's packet-data DN. The controller has the ability to establish a B channel connection to the Public Packet Switched Network and answers the incoming packet-data calls on the B channel. The controller's software performs all bridging functions, so the other participants' software only has to support point-to-point conferencing.

Obtain Equipment with These Capabilities

Personal Computer with ISDN Adapter - Participant

- Application software compatible with communication software and far end.
- If using NI-2, a DN may be shared between the voice and packet-data calling.
- B channel capabilities:
  - Voice calling on a single B channel.
- D channel capabilities:
  - Packet-data on the D channel.
  - Packet Assembler & Disassembler (PAD) function, supporting X.3, X.28, and X.29. (As required by Communications Software).
  - Support for the packet-data features listed under "Network Interface to Participants".
- Physical interfaces:
  - Analog phone jack.
  - RJ-45 connector to NT-1, or integrated NT-1.

Personal Computer connected to ISDN Phone or Terminal Adapter

- Application software compatible with communications software and far end.
- Serial connection to ISDN Phone or Terminal Adapter (e.g., RS-232, RS-449, V.35).

ISDN Phone or Terminal Adapter

- If using NI-2, a DN may be shared between the voice and packet-data calling.
- B channel capabilities:
  - Voice calling on a single B channel.
- D channel capabilities:
  - Packet-data on the D channel.
  - Packet Assembler & Disassembler (PAD) function, supporting X.3, X.28, and X.29.
  - Support for the packet-data features listed under "Network Interface to Participants".
- Physical interfaces:
  - Analog phone jack. (Terminal Adapter only)
  - Serial connection to Personal Computer (e.g., RS-232, RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

Personal Computer with ISDN Adapter - Controller only

- Application software for data conferencing, compatible with communication software for remote personal computers. The software should support at least three other conference participants. The software should clear all participants when the controller hangs up.
- If using NI-2, a DN may be shared between the voice and packet-data calling.
- B channel capabilities:
  - Simultaneous voice and packet-data calling.
  - Packet Assembler & Disassembler (PAD) function, supporting X.3, X.28, and X.29. (As required by Communications Software).
  - Support for the voice features listed under "Network Interface to Controller".
  - Support for the packet-data features listed under "Network Interface to Controller".
- Physical interfaces:
  - Analog phone jack.
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to Controller

Network Services Required:

- One BRI. (2B)
- One B channel for voice calls, with voice DN and SPID.
- One B channel for packet-data calls, which may share the voice DN and SPID.
- Voice Features:
  - Flexible Calling (including 6-Way Conference calling, Hold, Transfer, and Drop).

- Packet-Data Features:
  - Logical Channels: At Least 3 Two-Way LCs.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 256 Octets.
  - Packet Window Size: 2.
  - Throughput Class Negotiation. See Technical Note.
  - Flow Control Parameter Negotiation. See Technical Note.

Subscription or Ordering Information:

- This interface is configured for voice calls (NIIG 2). Other NIIGs do not support this on-demand packet functionality. Note that the interface should also support incoming packet-data calls on the B channel. This capability is not currently specified in the NIIGs.
- Parameter Groups for Voice Features:
  - NIPG 3 - Flexible Calling for Voice.
  - A la Carte: Six Party Conference Calling
- Parameter Groups for Packet-Data Features:
  - NIPG 9 - Basic B channel packet features. Select number of Logical Channels.
  - A la carte: Multiline Hunt Group.

Network Interfaces to Participants

Network Services Required:

- One BRI. (1B+D)
- One B channel for voice calls, with voice DN and SPID.
- Packet-data on the D channel, which may share the voice DN and SPID.
- Voice Features:
  - None required.
- Packet-Data Features:
  - Logical Channels: At Least 1 Two-Way LC.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 128 Octets.
  - Packet Window Size: 2.
  - Throughput Class Negotiation. See Technical Note.
  - Flow Control Parameter Negotiation. See Technical Note.

Subscription or Ordering Information:

- This interface is configured for simultaneous voice calls and packet-data on the D channel (NIIG 6). Other NIIGs which have this functionality include 8, 20-23, 25, 27, and 28.
- Parameter Groups for Voice Features:
  - None required.
- Parameter Groups for Packet-Data Features:
  - NIPG 7 - Basic D Channel Packet-Data. In addition request Flow Control Parameter Negotiation (window size and packet size), and Throughput Class Negotiation.

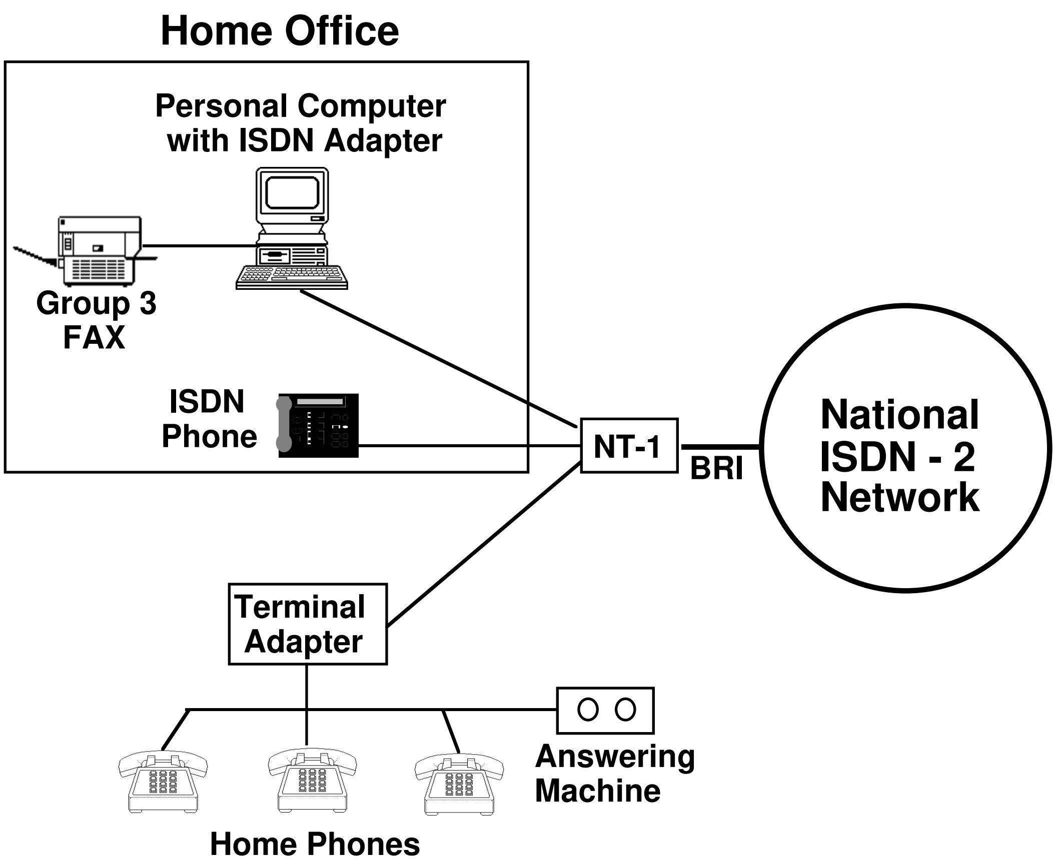
Technical Notes

- Note that the number of participants which can be supported at a Default Throughput Class of 9.6 kbps each by a controller with B channel packet-data capability varies with the application. Unlike circuit-data, no guaranteed bandwidth is tied up for each user. For some applications, e.g. with bursty traffic, as many as ten participants may be supported over a single B channel using packet-data.
- In many cases the packet-data configuration of the participants will not be the same. As a result, the likelihood of packet-data call completion will be higher if the communications server and its packet-data DN also support Throughput Class Negotiation & Flow Control Parameter Negotiation.
- Although this solution shows the controller using an On-Demand B channel packet connection, the same functionality could be provided with a Semi - Permanent B channel connection. This configuration could use NIIG 13, 18, 23, or 28.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIG) and NIUF Parameter Groups (NIPG) , see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.4 (Voice Call Setup), 5.2.1.5 (Circuit-data Call Setup), and 5.2.1.6 (Voice & Circuit-data Call Clearing), and 5.2.2.1 and 5.2.2.2 (On-Demand Packet-Data Call Setup & Clearing) .

3.2.4 Home Office

People who run small businesses from home offices have a wide variety of telecommunications needs. The flexibility of ISDN allows these people to subscribe to many advanced services at relatively low cost. The configuration shown below assumes the home office includes a personal computer with an ISDN adapter, an ISDN phone, and a Group III fax machine. Note that the ISDN phone is subscribed to Electronic Key Telecommunications Service (EKTS) so that calls to the home phone number may be answered in the office with the ISDN phone.

Configuration: (1, 2, 3, <u>**4**</u>, 5)



How It Works:

This configuration takes advantage of the "passive bus" architecture allowed by NI-2. The personal computer can place and receive circuit-data calls, and it can setup and clear voice calls for the Group 3 fax machine. The ISDN phone can be used to control many different network services which may be needed for the business. As previously mentioned, one such service is EKTS, used in this case to answer the home phone from the office. All the home phones are wired through a terminal adapter to allow them to function on an ISDN interface.

Obtain Equipment with These Capabilities

Personal Computer with ISDN Adapter

- Application software compatible with communication software and far end, for communications with clients, etc.
- ISDN adapter must be compatible with Group 3 facsimile signaling for cut through to fax machine.
- On board modem for use over ISDN voice calls, for communications with clients, etc.
- B channel capabilities:
  - Simultaneous voice and circuit-data calling.
  - Simultaneous circuit-data calling on two B channels.
  - Optionally combine two 64 kbps signals to/from the BRI into 128 kbps signal in a way that is compatible with far end (BONDING, H.221).
  - Support rate adaptation for rates lower than 64 kbps. For example, asynchronous communications may be rate adapted using V.120.
- Physical interfaces:
  - Analog phone jack for fax machine.
  - RJ-45 connector to NT-1, or integrated NT-1 with passive bus support for 3 terminals

ISDN Phone

- B channel capabilities:
  - Voice calling on a single B channel.
  - Support for the voice features listed under "Network Interface to ISDN Phone".
- Physical interfaces:
  - RJ-45 connector to NT-1, or integrated NT-1 with passive bus support for 3 terminals.

ISDN Terminal Adapter

- B channel capabilities:
  - Voice calling on a single B channel.
- Physical interfaces:
  - Analog phone jack for home phones and answering machine..
  - Serial connection to Personal Computer (e.g., RS-232, RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1 with passive bus support for 3 terminals

Request These Capabilities From ISDN Service Provider

Network Interface for Home Office

Network Services Required:

- One BRI. (2B)
- Three terminals, Three DNs and SPIDs.
- Personal computer (one DN), uses two B channels, with alternate voice and circuit-data on one B channel and circuit-data on one B channel.
- ISDN Phone (second DN), uses one B channel, with voice.
- Terminal Adapter (third DN) uses voice calling on a single B channel.
- Two B channels for alternate voice and circuit-data, with alternate voice and circuit-data DNs and SPIDs.
- Voice Features:
  - Electronic Key Telecommunications Service (EKTS) for ISDN phone.
  - Call forwarding - interface busy, no answer for forwarding calls to answering machine.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- This interface is configured for two simultaneous alternate voice and circuit-data calls (NIIG 17). The only other NIIG with this functionality is 27. Note three terminals, and use of DNs for each.
- Parameter Groups for Voice Features:
  - NIPG 4 - Basic EKTS for Voice for ISDN Phone.
  - NIPG 2 - Advanced call forwarding features for voice.
- Parameter Groups for Circuit-Data Features:
  - None required.

Technical Notes

- The Lower Layer Compatibility Information Element (LLC-IE) can communicate rate - adaptation details end-to-end. For details on V.120 rate adaptation, and the use of the LLC Information Element for circuit-data calls, see Sections 5.1.4 and 5.1.5.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIG) and NIUF Parameter Groups (NIPG) , see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.4 (Voice Call Setup), 5.2.1.5 (Circuit-data Call Setup) and 5.2.1.6 (Voice & Circuit-data Call Clearing).