FCC ID: MQ4IV128

EUT: PCMCIA CARD ISDN MODEM

ABOCOM SYSTEMS INC.

USER'S MANUAL

EXHIB

Contents

FEDERAL COMMUNICATIONS COMMISSION

NOTE

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

-Reorient o relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Chapter 1 Introduction

1.1 Overview

The ISDN TA + 56K Fax/Modem + ISDN Phone Multifunction PC Card is the only one multifunction PC Card in the world, which offers seamless connection between digital ISDN line and analog telephone line (PSTN) within one single PC Card. Its unique "switchable" feature allows you enjoy both speed and convenience of traveling needs no matter where you are in the world.

It's peerless switchable technology integrates both ISDN TA and today's fastest 56K fax/modem technologies together. The users can switch to digital ISDN connections or analog PSTN connections just simply plug-in the provided network connection cables without any pain. Moreover, you don't need to be hustle of buying two PC Cards, but still enjoy two functions. It definitely protects your investment and meets your future needs.

In addition to its unique switchable ability, it also features "ISDN Phone" voice application. Normally, most of the ISDN TA PC Card in the market today functions 1 or 2 B-channel for data transferring only; however, with the multifunction PC Card, you can still take pleasure from the high speed digital data transferring, but also enjoy the fun and excitement of voice communications as well.

Indeed, this ISDN TA + 56K Fax/Modem + ISDN Phone Multifunction PC Card is the one PC Card investment you cannot miss!

1.2 KEY FEATURES

- ISDN line or analog telephone line (PSTN) connection switchable.
- Provide 56K modem or G3 fax connections over analog telephone line or ISDN line.
- Feature built-in microphone/speakerphone interface for "ISDN Phone" voice applications.
- Provide options for ISDN S/T- or U-interface.
- Assure universal ISDN protocol compatibility.
  D-channel: DSS1 (Euro-ISDN), NI-1, Net 64
  B-channel: X.75, V.120, V.110, PPP/MP, Async-to-Sync PPP Conversion, etc.
- Comply with most of the ISDN software standards, such as
  ISDN AT command, NDIS WAN, WinISDN, CAPI 2.0, and NAF ISDN PCI
- Microsoft Plug and Play compatible.
- Menu-driven configuration utility included.

1.3 SPECIFICATIONS

Fax

- G3, send and receive
- EIA Class 1 fax command set

Modem

- K56flex (56Kbps), V.34+ (33.6Kbps), V.34 (28.8Kbps), V.32bis (14.4Kbps)
- V.42/V.42bis, MNP Class 2 to 5 error correction and data compression

ISDN

Standards

- Basic Rate Access (2B+D)

- U-interface: complies with ANSI T1.601
- S/T-interface: complies with ITU-T I.430
- Protocol: ITU-T Q.921, Q.931, and ETSI NET3

Line Rate
- 64/56 Kbps on 1 B-channel (ISDN data mode)
- 128/112 Kbps on 2 B-channel (PPP/MP)
- 56Kbps on 1 B-channel (modem mode)
- 16Kbps on D-channel for signaling

DTE Rate
- Asynchronous, up to 460.8Kbps (COM Port emulation mode)

ISDN Network & Switch Compatibility
- National ISDN-1 (NI-1)
- AT&T 5ESS Custom
- Northen Telecom DMS-100 Custom
- DSS1 (Euro-ISDN)
- INS-Net 64

B-channel Protocols
- X.75
- V.120
- V.110
- PPP and Multilink Protocol
- Async-to-Sync PPP Conversion
- 56K modem over B-channel
- G3 fax over B-channel
- Voice over B-channel

Application Program Interfaces
- ISDN AT Command Set
- WinISDN
- CAPI 2.0
- NDIS WAN
- NAF ISDN PCI

Operating System Support
- Windows 95 and OSR2
- Windows NT 4.0

1.3 The Package
- One PCMCIA Type II ISDN TA + 56K Fax/Modem + ISDN Phone Multifunction PC Card.
- One ISDN U- or S/T-interface ISDN network connection cable.
- One analog fax/modem DAA connection cable.
- One ISDN Phone kit.
- One ISDN phone cord with RJ45 plugs.

- One analog telephone cord with RJ11 plugs.
- One User's Manual
- Three 3.5" program diskettes.

Chapter 2 Installation

2.1 Preparation

To run the ISDN TA + 56K Fax/Modem + ISDN Phone Multifunction PC Card, following system configurations are recommended:

* CPU: Intel Pentium or above
* HDD: at least 30MB free space
* At least one Type II or Type III PCMCIA slot
* PCMCIA Card Services and Socket Services v2.1 or newer
* Windows 95, OSR2, or Windows NT 4.0 installed (Windows NT driver will be supported by software upgrade)

2.2 Overview of Multifunction PC Card Installation

The ISDN TA + 56K Fax/Modem + ISDN Phone Multifunction PC Card features:

- ISDN data connections over ISDN B-channel, through either VCOMM, WinISDN or NDIS API, using ISDN U- or S/T-interface network connection cable.
- 56K modem and G3 fax connections over ISDN B-channel, through VCOMM API, using ISDN U- or S/T-interface network connection cable.
- ISDN Phone voice applications over ISDN B-channel, through VCOMM API, using ISDN U- or S/T-interface network connection cable.
- 56K modem and G3 fax over analog telephone line (PSTN), using analog fax/modem DAA connection cable (working exactly same as conventional analog 56K fax/modem)

Choose the appropriate hardware and software combinations for your applications.

Applications	Network Connection Cable	ISDN API
ISDN Data	ISDN U- or S/T-interface network connection cable	VCOMM, WinISDN, NDIS
Fax/Modem over ISDN	ISDN U- or S/T-interface network connection cable	VCOMM
ISDN Phone over ISDN	ISDN U- or S/T-interface network connection cable + ISDN Phone kit	VCOMM
Analog Fax/Modem over PSTN	Analog Fax/Modem DAA network connection cable	N/A

Note: Fax/Modem over ISDN can not concurrently use with ISDN Phone over ISDN applications. Only one of the applications is possible at one time.

Note: To switch between Analog Fax/Modem DAA and ISDN Network Connection Cables, the system needs to be re-booted.

1. Insert the ISDN TA + 56K Fax/Modem + ISDN Phone Multifunction PC Card to the free PCMCIA slot.
2. Install the multifunction PC Card driver suites and Run! ISDN Configuration Utility. Refer to the next sections to complete the software installations.

   There are three Application Program Interfaces supported by the multifunction PC Card (VCOMM, WinISDN, and NDIS. Refer to section 3.1 for ISDN API introductions.), Select one of the APIs for your applications.
   - ISDN data: either VCOMM, WinISDN, or NDIS
   - Fax/modem over ISDN: VCOMM
   - ISDN Phone voice over ISDN: VCOMM

3. Connect the ISDN network connection cable (U- or S/T-interface) or analog fax/modem DAA to the multifunction PC Card's 15-pin connector.
4. Connect the ISDN phone line (RJ-45 phone cord) to the ISDN network connection cable and ISDN outlet on the wall for ISDN connections. Or connect the analog telephone line (RJ-11 phone cord) to the analog fax/modem DAA and telephone outlet on the wall for analog 56K fax/modem connections.

   Note: If S/T-interface ISDN network connection cable is used, the ISDN phone cord should be connected between the ISDN network connection cable and external NT1 device.

5. Your multifunction PC Card installation is completed.

2.3 How to Install ISDN VCOMM and WinISDN Drivers

0. Make sure **COM5** is free before installing VCOMM API (check **Settings → Control Panel → System → Device Manager → Ports [COM & LPT]**), the multifunction PC Card will force using COM5 for VCOMM installation. If COM5 is in use by any other device, remove it and reserve COM5 for the multifunction PC Card. After completing the VCOMM installation, you can change the COM port as you desire, but please be aware that the selected COM port should not conflict with other devices.
1. Plug the multifunction PC Card into any one of the free PCMCIA slots, Windows 95 will auto-detect the PC Card.
2. Choose **Driver from disk provided by hardware manufacturer**, then insert the **VCOMM/ WinISDN** driver disk, and enter the correct driver path, e.g. **A:**, and click **OK**. Both VCOMM and WinISDN drivers will be installed automatically. The default current active API will be set to **VCOMM**.
3. The users can use the Run! ISDN Configuration Utility to set ISDN phone numbers, SPIDs, change the API mode from VCOMM to WinISDN, or ISDN protocol settings. Refer to section 3.2 and 3.3 for Run! ISDN Configuration Utility applications.

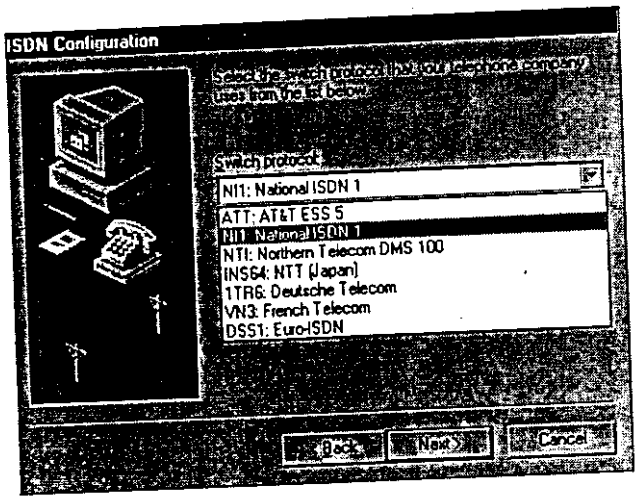
2.4 How to Install ISDN NDIS Driver (WinISDN, NDIS)

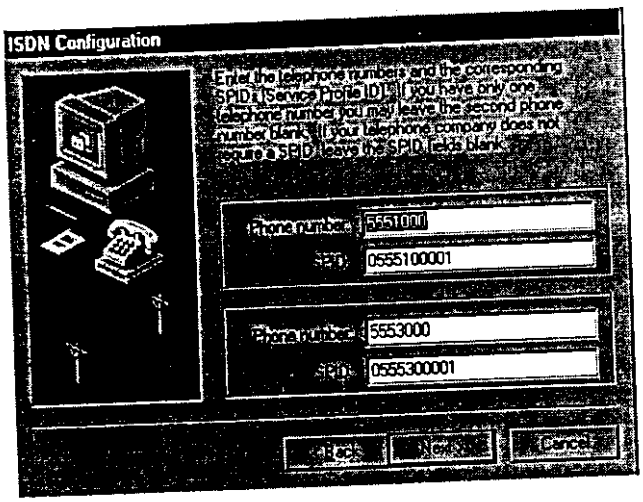
Typically just one of the APIs is needed. You can skip this section if VCOMM and WinISDN had been installed, unless you want to change the API to NDIS on purpose.

Install Microsoft ISDN (MSISDN) Accelerator Pack version 1.1 or Microsoft Dial-Up

Networking (MSDUN) version 1.2 before the NDIS driver suite installation. Otherwise the driver installation will fail.

0. If any other APIs have been installed (VCOMM or WinISDN), remove them, then install NDIS API. Click **Uninstall** menu in Utility Manager to remove the existed APIs (refer to section 2.10 and Chapter 3.2, 3.3 for the details of Run! ISDN Configuration Utility installation and applications), and unplug the multifunction PC Card. Skip this step if no API was installed before (NDIS is your first API).
1. Install Microsoft ISDN Accelerator pack – run **MSISDNxx.EXE** (you can get more information about Microsoft Accelerator Pack from Microsoft's Web site at address http: //www.microsoft.com/windows/getisdn/). Refer to Microsoft ISDN Accelerator Pack **README.TXT** for the details of installation.
2. Plug the multifunction PC Card into any one of the free PCMCIA slots, Windows 95 will auto-detect the PC Card.
3. Choose **Driver from disk provided by hardware manufacturer**, then insert the **NDIS** driver disk, and enter the correct drive path, e.g. **A:**, and click **OK**. The NDIS drivers will be installed automatically. Specify ISDN switch protocol, and enter ISDN phone numbers as well as SPIDs accordingly to complete the NDIS API installation.





4. Refer to **Appendix C: NDIS Applications** for the details of making ISDN data calls through NDIS API.

Note: The users can also use Run! ISDN configuration utility to change the ISDN phone numbers and SPIDs later.

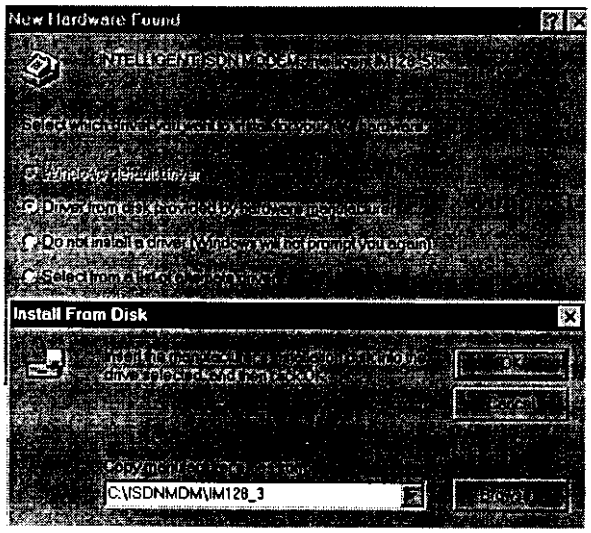
Note: If you want to change API under this mode (NDIS only), uninstall it (enter Utility Manager in Run! ISDN, click Uninstall men, and select Execute), then install the API you desire. Refer to section 2.10 for the details.

2.5 How to Install VCOMM, WinISDN and NDIS Drivers at One Time

Some users may need to change the APIs very frequently , e.g. change from VCOMM or WinISDN to NDIS. If so, they can install all the three APIs, VCOMM/WinISDN/NDIS, at the very beginning and change the API through Run! ISDN Configuration Utility.

Install Microsoft ISDN (MSISDN) Accelerator Pack version 1.1 or Microsoft Dial-Up Networking (MSDUN) version 1.2 before the NDIS driver suite installation. Otherwise the driver installation will fail.

1. Install Microsoft ISDN Accelerator pack – run **MSISDNxx.EXE** (you can get more information about Microsoft Accelerator Pack from Microsoft's Web site at address http: //www.microsoft.com/windows/getisdn/). Refer to Microsoft ISDN Accelerator Pack **README.TXT** for the details of installation.
2. Run **SETUP.EXE** in Run! ISDN configuration utility floppy disk to copy the API drivers into your local hard disk drive (C:). The Run! ISDN Configuration Utility will also be installed.
3. Plug the multifunction PC Card into any one of the free PCMCIA slots, Windows 95 will auto-detect the PC Card.
4. Choose **Driver from disk provided by hardware manufacturer** and enter the driver path, for example, **C:\ISDNMDM\IM128_3**. And click **OK**. All VCOMM, WinISDN, and NDIS drivers will be installed automatically.



5. Enter your ISDN phone numbers and SPIDs correctly if requested. The users can also use the Run! ISDN configuration utility for ISDN phone number and SPID changes later.
6. After completing the drivers installation, execute Run! ISDN configuration utility and select the API you demand. The default current active API will be set to **NDIS**.

2.6 Installation of Run! ISDN Configuration Utility

Skip the following steps if your first installation is VCOMM, WinISDN, NDIS 3-in-1 version (refer to section 2.5) at one time.

1. Insert the **Run! ISDN** Configuration Utility program disk into floppy drive.
2. Run **SETUP.EXE** in Run! ISDN configuration disk.
3. The Run! ISDN configuration utility will install all the components for you.

The Run! ISDN configuration utility provides the following functions:

- Set the ISDN Switch type.
- Set the ISDN B-channel protocols (V.120, V.110, and PPP).
- Set the ISDN data call phone numbers, and the secondary phone number for PPP Multi-Link connections.
- Set the ISDN SPID numbers.
- Set the COM port, from COM1 to COM8, for the ISDN TA PC Card.
- Set the API mode.
- Uninstall the Intelligent ISDN TA PC Card drivers.
- Terminal emulation tool (for issuing AT commands only, can not be used for file transfer).
- Set subscriber line (ISDN or PSTN) for fax/modem applications.
- Set the ISDN B-channel speed (56K or 64K) and PPP link mode.
- Set ISDN Phone voice CODEC parameter.
- ISDN Phone dialer.

2.7 Hardware Installation Tips

There are two LED indicators (ACT and LNK) on the ISDN network connection cable, they are used for simple hardware diagnostics. The meaning of the LED indicators are as follows.

When U-interface network connection cable is used:

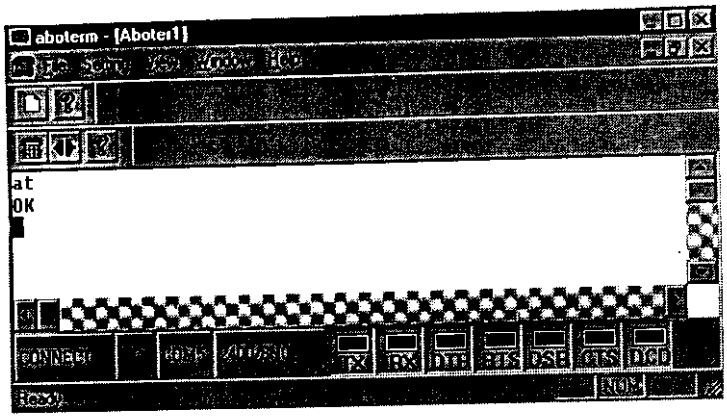
ACT LED indicator ON: ISDN layer 1 active.
ACT LED indicator OFF: ISDN layer 1 activation failure. Check your ISDN line link.
LNK LED indicator ON: SPID setting okay.
LNK LED indicator OFF: SPID setting failure. Check your SPID settings

When S/T-interface network connection cable is used:

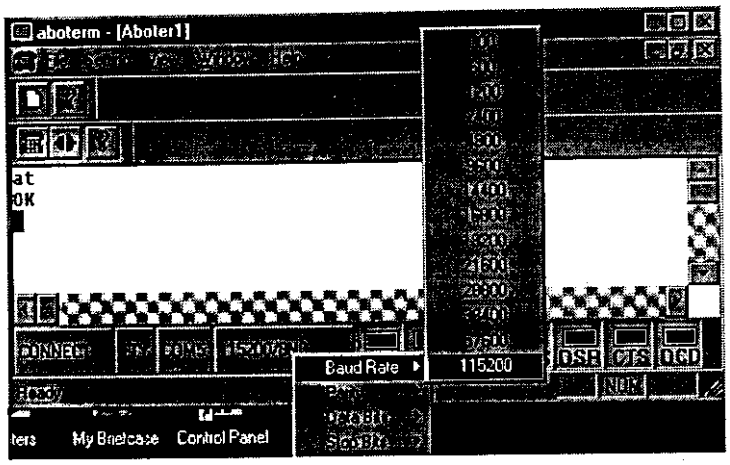
ACT LED indicator ON: PC Card powered on
ACT LED indicator OFF: PC Card powered on failure
LNK LED indicator ON: SPID setting okay (for US version), or ISDN layer 1 active (for non-US version)
LNK LED indicator OFF: SPID setting failure (US version), or ISDN layer 1 activation failure (non-US version)

2.8 How to Verify whether the Multifunction PC Card Works under VCOMM

1. Under VCOMM mode, execute Run! ISDN Configuration Utility.
2. Get into **aboterm** utility in **Terminal** menu.



3. Click the **New** pop-up menu to open a new terminal screen, then click **CONNECT** command box and issue AT commands to verify the function of the ISND TA PC Card. If the PC Card is well installed, it should respond **OK** when you type **AT** and press **Enter** key. Otherwise check the COM port setting.
4. You can also specify the DTE speed, asynchronous data format, and terminal emulation mode through the command box at the bottom of **aboterm** screen.



2.9 How to Verify whether the Multifunction PC Card well Installed under NDIS

1. Make sure the current API setting is NDIS mode.
2. Keep the PC Card seated in PCMCIA slot.
3. Get into **Control Panel → System → Device Manager,** and check the following device settings:

   ISDN adapters: Intelligent ISDN MODEM (ISDN)
   Multi-function adapters: Intelligent PCMCIA ISDN TA Multi-Function card
   Network adapters: Intelligent PCMCIA ISDN TA (Net)

   If there is any setting problem, remove the API drivers (refer to section 2.10) and install them once again.

Note: Install Microsoft ISDN (MSISDN) Accelerator Pack version 1.1 or Microsoft Dial-Up Networking (MSDUN) version 1.2 again before re-installing NDIS API.

2.10 How to Uninstall the APIs

If you face any problems when you install the API drivers for the multifunction PC Card. Execute following steps.

1. Keep the multifunction PC Card seated in the PCMCIA slot.
2. Run "Run! ISDN " configuration utility.
3. Execute "Uninstall". The utility will remove the already existed API components for you automatically (enter **Utility Manager** in Run! ISDN, click **Uninstall** men, and select **Execute).**
4. Remove the multifunction PC Card.

Then, you can plug the PC Card once again to start the installation.

Chapter 3 Communication Basics

This chapter covers how to place and answer calls (ISDN data calls, Modem over ISDN data calls, ISDN Phone over ISDN voice calls, Analog Fax/Modem over PSTN). Select the best way to communicate with the remote parties.

The ISDN TA + 56K Fax/Modem + ISDN Phone Multifunction PC Card comes with a Windows-based configuration utility, the users can use the bundled utility to setup the multifunction PC Card. The utility makes it easier to drive the Intelligent multifunction PC Card, the users no longer need to suffer from the pain of complicated ISDN device configuration.

3.1 ISDN Application Program Interfaces (APIs)

There are many communication software packages in the market, they have different ways to talk to the ISDN TA devices. The ISDN multifunction PC Card supports three APIs to connect to the most popular ISDN communication software packages, they are ISDN AT commands -- also known as COM Port Emulation or VCOMM, WinISDN, and NDIS. API is the interface between Application Programs (APs) and hardware (PC Card) platform, which lets APs talk to and drive the ISDN multifunction PC Card physical hardware.. Select the appropriate API for your software packages and applications.

VCOMM COM port emulation:

COM port is commonly used for connecting to the external ISDN devices. With the VCOMM COM Port emulation , the ISDN multifunction PC Card works exactly like an ISDN TA (Terminal Adapter) external box, which can run with traditional terminal program packages, such as Windows 95 Hyper Terminal, Procom Plus for Windows, Telix, pcAnywhere, etc., to hook up to the on-line services and bulletin boards. In this mode, ISDN AT commands are usually used to drive the ISDN multifunction PC Card.

The "Fax/Modem over ISDN" and "ISDN Phone over ISDN" functions are available under VCOMM API.

WinISDN:

An interface to transfer data in parallel mode, can be executed in Windows. The most popular software package which supports WinISDN API is Chameleon from NetManage.

NDIS :

NDIS is dedicatedly designed for running with Microsoft ISDN Accelerator Pack for Internet connections.

3.2 Specify the ISDN Application Program Interfaces (APIs)

The ISDN API was pre-specified when you installed the ISDN multifunction PC Card hardware. If you want to change it, execute following steps.

1. Click the **Mode** menu in Utility Manager, then select **Mode Change**.
2. Select one of the APIs you want to change and click **OK**. Then Run! ISDN configuration utility will change the API for you automatically.

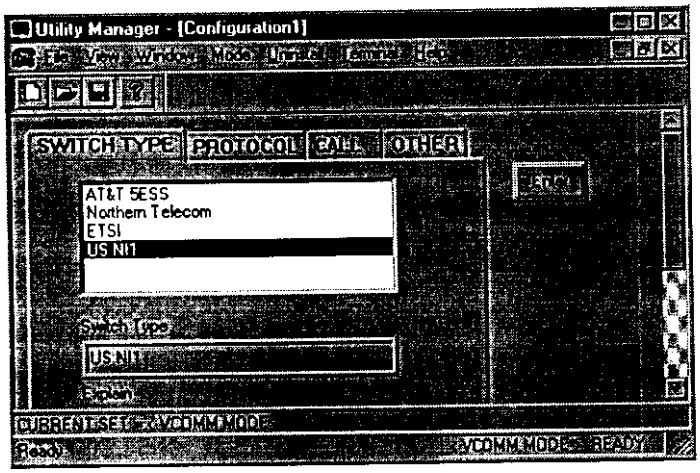
Note: For using NDIS API, the Microsoft ISDN Accelerator Pack MUST be installed in advance, otherwise it will cause problems. Refer to section 2.4 How to Install NDIS Drivers for NDIS API installation.

Note: If you didn't install VCOMM. WinISDN, and NDIS 3-in-1 at the first time, uninstall the previous APIs (refer to section 2.10 "How to Uninstall APIs"), then install the new one you desire.

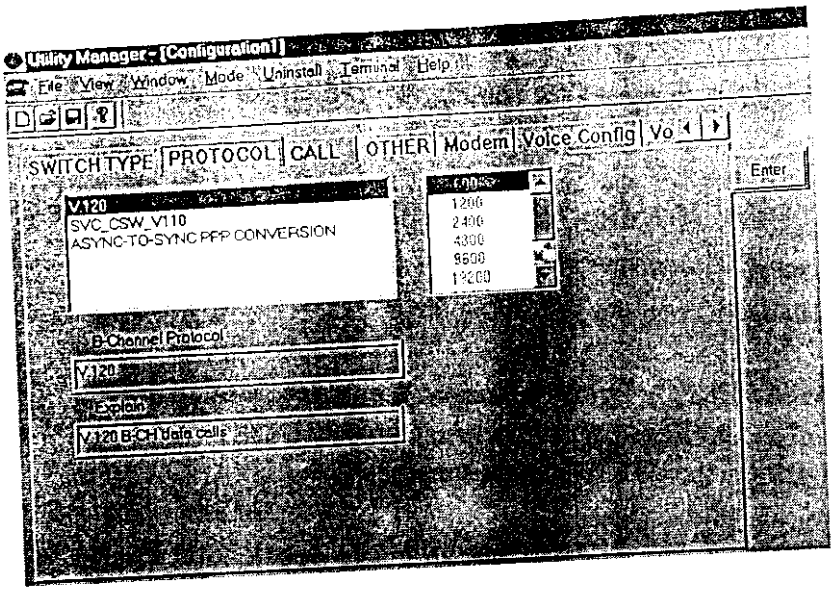
3.3 Configure ISDN Line and Network for ISDN Data Calls

1. Double click **Configuration Utility** icon to get into **Utility Manager.** The current active mode is shown at the bottom of the screen. For example, **<VCOMM MODE> READY**.
2. Set ISDN D-channel signaling protocol and ISDN switch type in **SWITCH TYPE** settings folder.

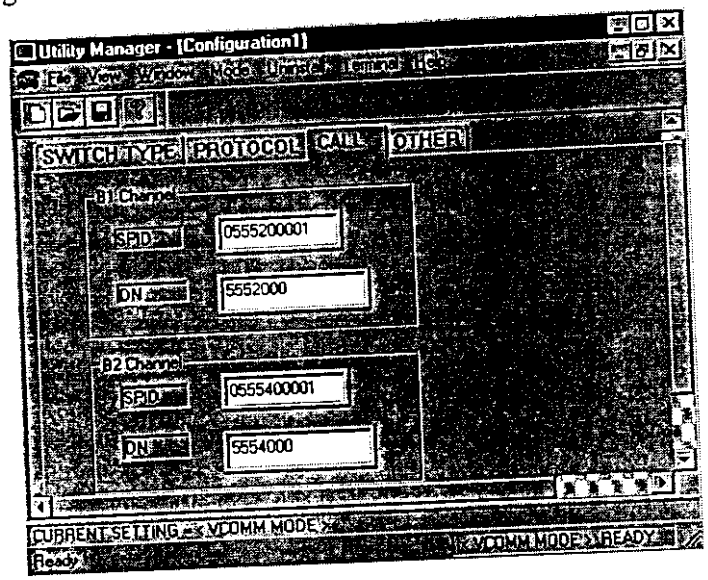
   NI-1, AT&T 5ESS, Northen Telecom DMS-100: mainly used in the States and Canada
   ETSI: mainly used in European countries and outside US countries
   INS-64: used in Japan



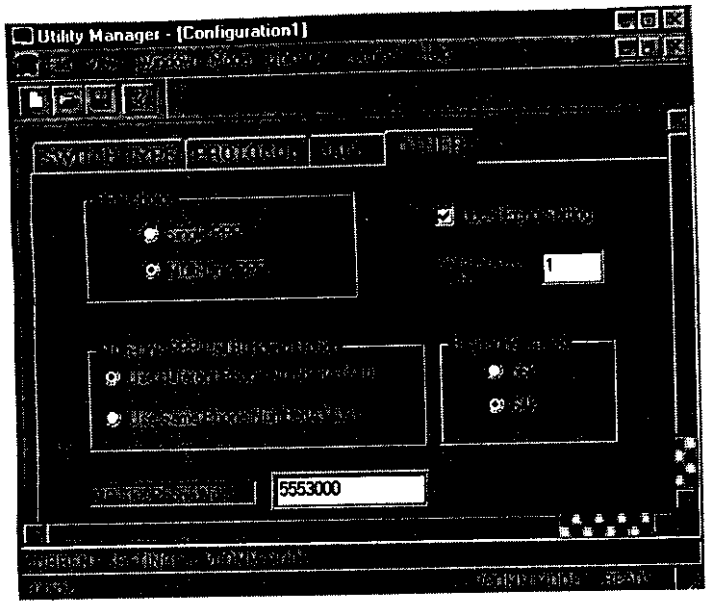
3. Choose ISDN B-channel protocol and connection speed in **PROTOCOL** settings folder (for VCOMM mode only, refer to chapter 4 for B-channel protocols introduction) accordingly.



4. Enter the correct ISDN phone numbers (DN) and SPIDs in **CALL** settings folder. Skip the SPID settings at the areas outside U.S.



5. Specify the ISDN B-channel speed correctly in **OTHER** settings folder (refer to chapter 4 for the details of ISDN B-channel data rate). And set the PPP link mode if **Async-to-Sync PPP Conversion** protocol is selected in **PROTOCOL** settings folder (available for VCOMM mode only). Enter the second ISDN phone number for Multi-Link PPP connections when **Use Different Phone Number (AT&J0)** is clicked.



6. Click **Enter** button to complete the configuration procedures.

3.4 How to Make ISDN Data Calls

The dialing method is usually subject to the application programs (AP) you use, such as Telix uses AT command for making calls, Microsoft Exchange and Internet Explorer use DUN for dialing. For example, the users can use ISDN AT command ATD<ISDN_phone_number>, like ATD5551000 or ATDT5551000, or Windows 95 Dial-Up Networking (DUN) to make ISDN calls in VCOMM mode. See also section 4.5 to 4.8 for making Multi-Link PPP connections through VCOMM API.

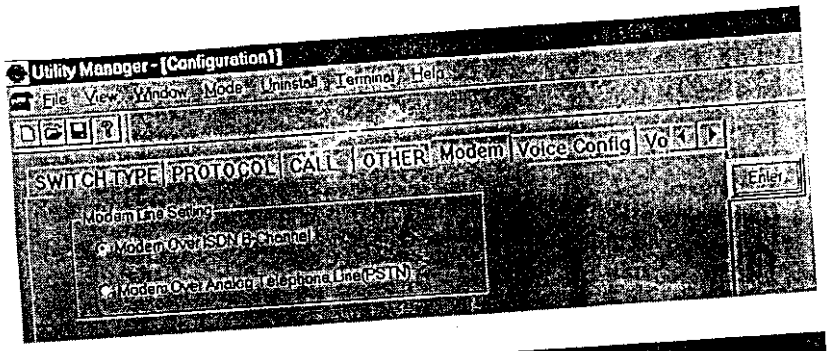
Some APs have their own proprietary dialing tool, such as Chameleon Internet (WinISDN) and Microsoft ISDN Accelerator Pack (NDIS). Select the appropriate dialing method for your AP. Refer to Appendix C for NDIS applications details.

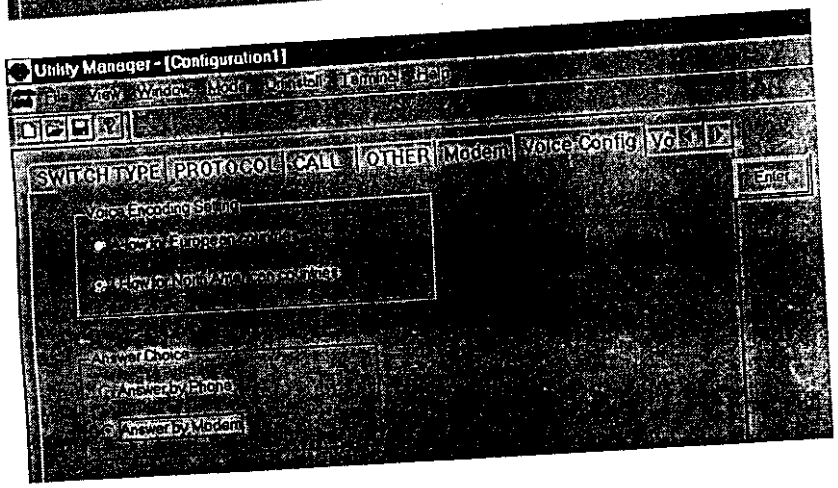
3.5 How to Make "Modem over ISDN" Data Calls

The "**Fax/Modem over ISDN**" function lets you seamlessly talk to the analog fax/modem devices at the remote parties through ISDN line. This function is only available under **VCOMM** API. Make sure the current API setting is correct, otherwise change it (refer to section 3.2 for the API change details). Then use ISDN AT commands to make modem over ISDN B-channel data calls.

1. Select "**Modem over ISDN B-channel**" in **Modem** setting folder in Run! ISDN Configuration Utility, then click **Enter** button.
2. Issue
   ATDM<phone_number>, for example
   ATDM5553000
   under terminal mode (like Hypertrm in Windows 95) to make modem over ISDN data calls.

To answer the incoming modem calls through ISDN line, select "**Answer by Modem**" in Run! ISDN configuration utility "**Voice Config**" setting folder. Then click **Enter** button.





3.6 How to Make "ISDN Phone over ISDN" Voice Calls

The **"ISDN Phone over ISDN"** function makes the voice communications over ISDN line possible with the included ISDN Phone kit. The multifunction PC Card let you talk to the remote parties easily through its unique "ISDN Phone over ISDN" feature, which is exactly same as using normal telephone set for voice communications. The "ISDN Phone over ISDN" function is also only available under **VCOMM API**. Make sure the current API setting is correct, otherwise change it (refer to section 3.2 for the API change details).

Note: Fax/Modem over ISDN can not concurrently use with ISDN Phone over ISDN applications. Only one of the applications is possible at one time.

1. Attach the ISDN network connection cable (S/T- or U-interface) to the multifunction PC Card's 15-pin connector. And connect the ISDN phone cord to the ISDN wall outlet directly (U-interface network connection cable) or NT1 device (S/T-interface network connection cable).
2. Attach the ISDN Phone kit to the voice interface on the ISDN network connection cable.
3. Enter Run! ISDN configuration utility **"Voice Config"** setting folder to select the appropriate **"Voice Encoding Setting"** parameter for your ISDN Phone voice applications. If you do not know which parameter is better for your area, try either one.

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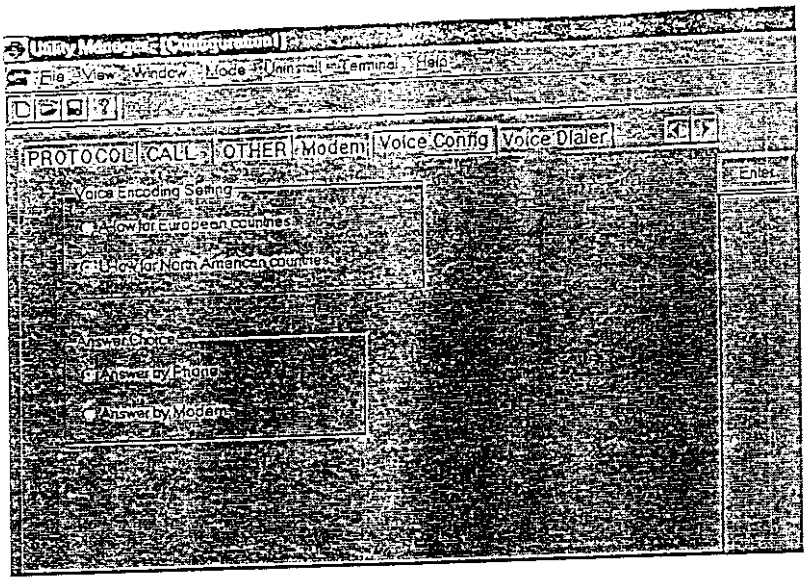
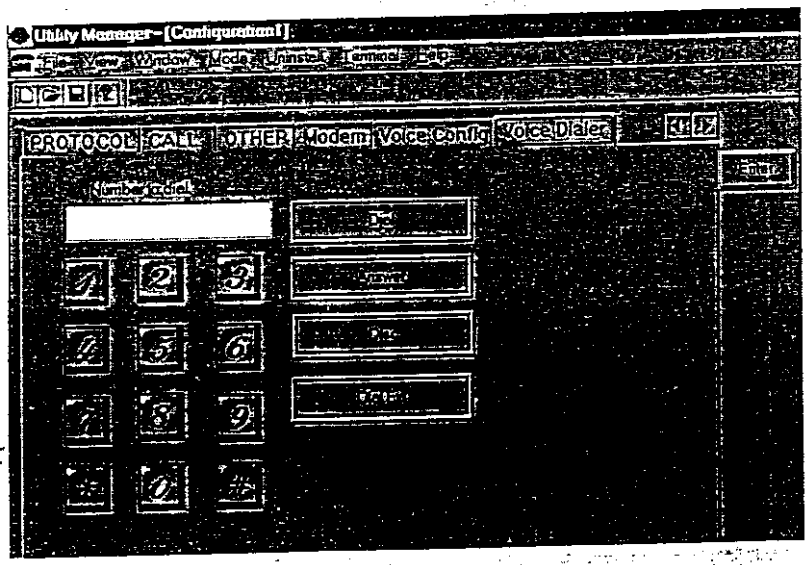


4. Use the "**Voice Dialer**" in Run! ISDN configuration utility to make voice calls. Enter the remote party phone number by pressing the number key pads, or key-in the phone number directly in the blank space of "**Number to Dial**", then press "**Dial**" button to dial out the phone number.

   Give the extension number and press "**Dial Ext**" button if the remote party is an auto-attending switch board. Press "**Disc**" to terminate the voice session.

To answer the incoming voice calls over ISDN line, select "**Answer by Phone**" in Run! ISDN configuration utility **Voice Config** setting folder. Then click **Enter** Button. Otherwise (when "**Answer by Modem**" is selected), the incoming calls will be treated as modem data calls, and they will be automatically answered by modem. When ringing signals are heard, press "**Answer**" in **Voice Dialer** setting folder to answer the incoming voice calls. Press "**Disc**" to terminate the voice session.



It could be also possible to use one ISDN B-channel for ISDN data calls and the other B-channel for ISDN Phone voice calls simultaneously (under VCOMM API only). Use Run! ISDN Configuration Utility to place or answer voice calls, and use appropriate APs, such

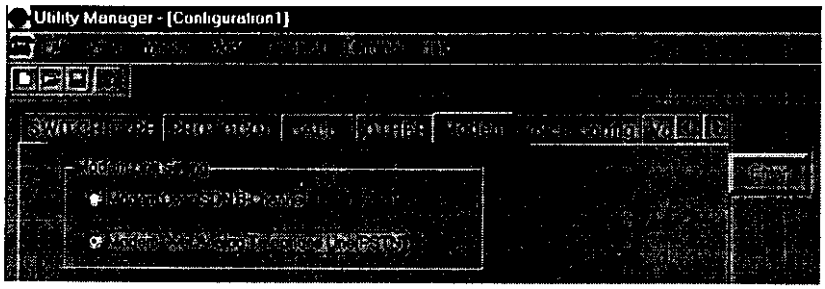
as Hypertrm, Telix, and Microsoft Dial-Up Netwroking with VCOMM API for ISDN data transfers.

3.7 How to Make "Analog Fax/Modem over PSTN" Data Calls

The analog Fax/Modem connections over PSTN is also possible in the multifunction PC Card. The function makes you connect to the remote party through normal analog telephone line (PSTN) if you could not find ISDN line at your places (home, office, hotel, or on the road).

1. Switch the ISDN S/T- or U-interface network connection cable to analog fax/modem DAA network connection cable.
2. Make sure the current API is set to **VCOMM**. Select **"Modem over Analog Telephone Line (PSTN)"** in **Modem** settings folder, then click **Enter** button.
3. Reboot the system.

The multifunction PC Card now works exactly same as a fax/modem device. Use fax/modem AT commands to place and answer analog fax/modem data calls (over PSTN).



Chapter 4 B-channel Protocols

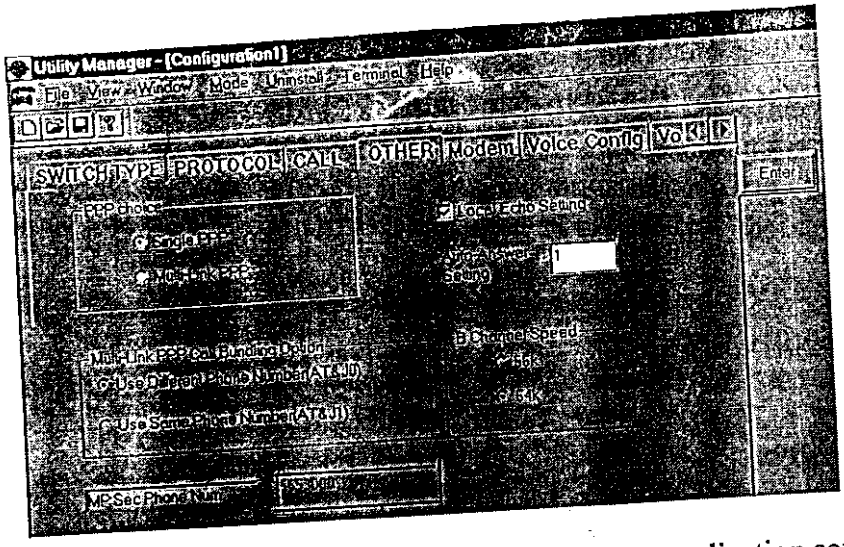
This chapter introduces the ISDN B-channel protocols supported by the ISDN modem multifunction PC Card.

4.1 B-channel Data Rate

Mostly the ISDN switches transmit the network signaling data through the D-channel, allowing both B-channels to be used exclusively for communications purpose. It is so called out-of-band signaling. This allows for throughput of 64K bps per channel. However, not all ISDN switches support out-of-band signaling. For switches that do not support out-of-band signaling, network signaling data is transmitted through the B-channels. This downgrades the B-channel bandwidth to 56K bps for communications use. Clarify the ISDN switches you are connecting to support 56K or 64K B-channel speed, and specify the correct line speed before making ISDN calls.

In VCOMM mode (V.120, or async-to-sync PPP and Multi-Link mode), use **AT!Q** command or Run! ISDN configuration utility (enter **OTHER** settings folder) to specify the ISDN B-channel data rate.

AT!Q=0	Select 64K bps for B-channel communications
AT!Q=4	Select 56K bps for B-channel communications



In WinISDN mode, specify the B-channel data rate through the application software (like Chameleon Internet).

In NDIS mode, specify the B-channel data rate through Dial-Up Networking utility (refer to Appendix C for details)

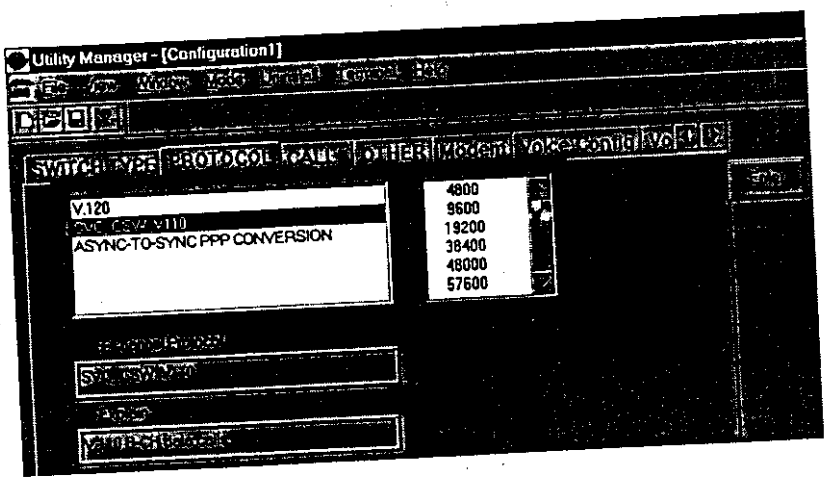
4.2 V.120 Protocol (for VCOMM only)

When you are making V.120 calls, make sure the ISDN switch you are connecting to supports out-of-band signaling. Otherwise set 56K bps B-channel speed for communications. For example,

AT!Z=5 Set to V.120 mode

Then, use ATD or ATDT command to make dialing, that is
ATD5551000, or
ATDT5551000

Or specify the V.120 protocol in **PROTOCOL** settings folder in Run! ISDN configuration utility.



4.3 V.110 Protocol (for VCOMM only)

V.110 is widely used in Japan and some European countries. Once you set the proper V.110 communication mode, there is no need to configure the V.110 data rate for the incoming calls. The ISDN Modem multifunction PC Card will auto-detect the V.110 incoming call data rates and establish the links.

Use Run! ISDN Configuration Utility or ISDN AT command to enable V.110 protocol and specify V.110 user rates (line rate). Unlike external ISDN TA box, you don't need to care about the speed match between DTE speed and V.110 user rate. The ISDN Modem PC Card will convert the speed for you automatically.

AT!Z=6	Select V.110 protocol
ATB?	Display current V.110 user rate for outgoing calls.
ATB0	Set V.110 user rate = 600 bps.
ATB1	Set V.110 user rate = 1200 bps.
ATB2	Set V.110 user rate = 2400 bps.
ATB3	Set V.110 user rate = 4800 bps.
ATB4	Set V.110 user rate = 9600 bps.
ATB5	Set V.110 user rate = 19200 bps.
ATB6	Set V.110 user rate = 38400 bps.
ATB7	Set V.110 user rate = 48000 bps
ATB8	Set V.110 user rate = 57600 bps (for Japanese ISDN only).

4.4 Async to Sync PPP Conversion (for VCOMM only)

More and more Internet Service Providers (ISPs) are offering their services through dial-up ISDN lines for higher data bandwidth demands. The equipment used at the service provider's location is usually ISDN router or Remote Access Server which, unlike Terminal Adapters (TAs), doesn't have asynchronous capability. For that reason, ISDN TAs that support only V.120 or other async protocols will not work with the router-based servers at the ISP site.

The support of async to sync PPP conversion lets the Intelligent ISDN TA PC Card connecting to your router-based ISPs at any time anywhere with the incorporation of TCP/IP software packages. Furthermore, the Multi-Link PPP protocol makes an 128K bps ISDN highway when the applications are bandwidth critical.

Set the Single-Link PPP mode:

AT!Z=9	Set async to sync PPP conversion mode
AT&N0=0	Set Single-Link mode

Set the Multi-Link PPP (MLPPP) mode:

AT!Z=9	Set async-to-sync PPP conversion mode
AT&N0=1	Set Multi-Link mode

You can also enable Async-to-Sync PPP Conversion protocol with Run! ISDN Configuration Utility.

1. Make sure the current active API is **VCOMM** mode.
2. Double click **Utility Manager**, and open **PROTOCOL** settings folder, then select **Async-to-Sync PPP Conversion**.

4.5 Multi-Link PPP

The technique of combining multiple lines together into a single dial up connection is known by Multi-Link connection. Multi-Link is available when you have more than one dial up device in your system, such as two B channels of an ISDN connection. If you have only one device configured, then you will not be able to use Multi-Link connections. The Intelligent ISDN TA PC Card supports the combining of two 64 kbps data channels into the equivalent of a single 128 kbps line.

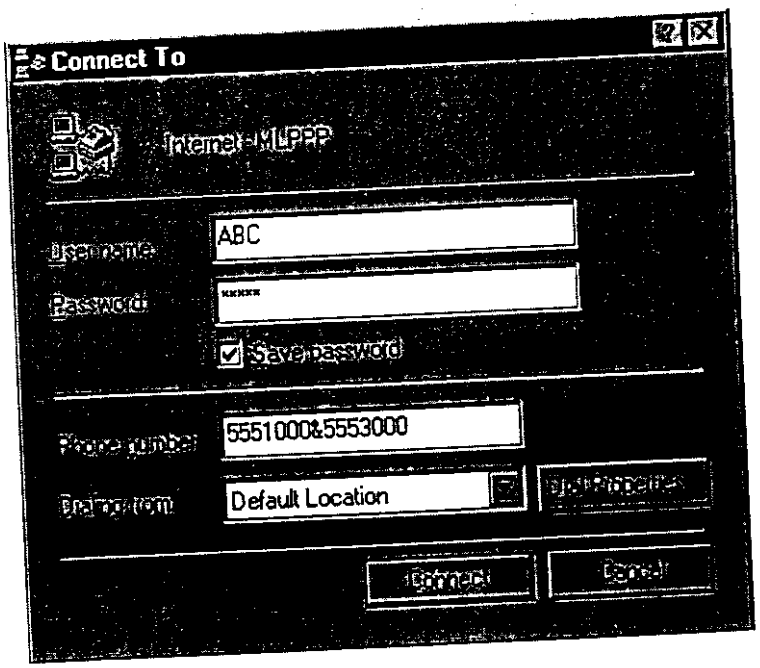
Multi-Link depends upon the capabilities of the service or corporate network that you are dialing. To use Multi-Link, the answering Internet service provider, online service or corporate LAN must provide Multi-Link capabilities.

4.6 Making Multi-Link Async-to-Sync PPP Conversion Connections through Microsoft Dial-Up Networking (for VCOMM)

(Set AT!Z=9 and AT&N0=1, or enable Multi-Link PPP in OTHER settings folder in Run! ISDN configuration utility in advance) To configure Multi-Link PPP support in Windows 95, double click on the **My Computer** icon on your Windows 95 desktop, then double click on the **Dial Up Networking (DUN)** folder. The DUN folder displays an icon labeled **Make New Connection**, plus icons for each of the connections that you have already created. If you have not yet created a connection, double click on **Make New Connection** to define a connection to the dial up service you wish to use. When you have created your connection, or if the connection you wish to use for Multi-Link access already exists in the folder, double click the connection icon, and enter the ISDN phone gnumbers in the format,

<first_ISDN_phone_number>+<secondary_ISDN_phone_number>, or
<first_ISDN_phone_number>&<secondary_ISDN_phone_number>, or
<first_ISDN_phone_number>!<secondary_ISDN_phone_number>,

Windows 95 DUN will make Multi-Link calls for you automatically.



4.7 Using ISDN AT Command to Establish Multi-Link PPP Connections (for VCOMM only)

There are three ways to make Multi-Link PPP calls through ISDN AT commands. All the following methods must be executed under async-to-sync PPP conversion mode (AT!Z=9).

Method 1:

AT!Z=9	Set async-to-sync PPP conversion mode
AT&N0=1	Set Multi-Link mode
AT&Z0=<ISDN_phone_number>	Set the secondary dialed ISDN phone number

For example,
AT!Z=9&N0=1&Z0=5553000
ATD5551000

When you make an ISDN call (5551000), the Intelligent ISDN TA PC Card will make the second call for you automatically through the pre-stored secondary ISDN phone number in AT&Z0 (5553000) and bundle the two calls for data transfer.

Method 2:

AT!Z=9	Set async-to-sync PPP conversion mode
AT&N0=1	Set Multi-Link mode
AT&J1	Use single ISDN phone number for Multi-Link PPP connections

For example,
AT!Z=9&N0=1&J1
ATD5551000

In this case, if AT&J1 is set and the users dial one number with the dial string (5551000), the Intelligent ISDN TA PC Card will automatically dial that number twice and bundle the two calls for data transfer. If there is any pre-stored ISDN phone number in AT&Z0, it will be automatically overwritten by the ISDN phone number (5551000).

When AT&J0 is set (the second phone number also must be specified in AT&Z0=<second_ISDN_phone_number>) , the Intelligent ISDN TA will dial two different ISDN phone numbers to make Multi-Link PPP calls (see also **Method 1**). If the second ISDN phone number is not specify in AT&Z0, some unknown problems may occur.

Method 3:

AT!Z=9	Set async-to-sync PPP conversion mode
AT&N0=1	Set Multi-Link mode

ATD<first_ISDN_phone_number>+<secondary_ISDN_phone_number>, or
ATD<first_ISDN_phone_number>&<secondary_ISDN_phone_number>, or
ATD<first_ISDN_phone_number>!<secondary_ISDN_phone_number>

For example,
AT!Z=9&N0=1
ATD5551000+5553000, or
ATD5551000&5553000, or
ATD5551000!5553000

The Intelligent ISDN TA PC Card will make two ISDN calls automatically through the two separate ISDN phone numbers (5551000 and 5553000) and bundle the two calls for data transfer. The "+", "&", and "!" modifiers are accepted in the dial string to indicate the start of secondary phone number to dial call for MLPPP connections.

If there is any pre-stored ISDN phone number in AT&Z0, it will be overwritten by the second specified ISDN phone number (5553000).

When AT&J1 is also enabled, and if the users dial two separate numbers using "+", "&", and "!" dial modifiers, the explicitly specified second phone number supersedes the AT&J1 setting. The second number given in the dial command (5553000) will be used, rather than dial the first number (5551000) twice. The only time that the AT&J1 has an effect is when the users dial one number.

4.8 How to enable Multi-Link PPP Options with Run! ISDN Configuration Utility (for VCOMM only)

0. Make sure the current active API is **VCOMM** mode.
1. Double click **Utility Manager**, and open **PROTOCOL** settings folder, then select **Async-to-Sync PPP Conversion**.
2. Open **OTHER** settings folder, select **Multi-Link** mode.
3. Specify the Call Bundling options. If **Use Same Phone Number (AT&J1)** is selected, the Intelligent ISDN TA will dial the ISDN phone number in dialing string or dialing utility (like Dial-Up Networking) twice to make Multi-Link PPP connections. Once **Use Different Phone Number (AT&J0)** is clicked, enter the second ISDN phone number for Multi-Link PPP connections.
4. Click **Enter** button to finish the settings.

Chapter 5 ISDN AT Commands

There are ways to configure and control the Intelligent ISDN TA PC Card. One is using Run! ISDN configuration utility, the other is using ISDN AT command.

AT commands are usually issued to the ISDN TA PC Card to control the TA's operation and configuration. AT commands can only be entered while the TA is in command mode. The format for entering AT commands is:

TYPE: **ATXn**

where **X** is the AT command, and **n** is the specific value for that command.

PRESS: **Enter**

Any command issued is acknowledged with a response in either text or numeric values. All commands and command-values accepted by the modem, the **OK** message will be shown; any entries other than those show OK response cause the **ERROR** result code.

This chapter describes how to use the AT commands for the users who need special parameters in order to meet their applications. Refer to the appendix for the detailed ISDN AT command definition.

5.1 How to Use ISDN AT Commands

Usually, your fax and data communications software controls the ISDN TA for you. However, you may also want to use the AT commands. These commands give you complete control over your ISDN TA. Using the AT commands carefully every time, because they can cause your software to loose its ability to control the modem. When you do find any AT command causes ISDN TA maul-function, turn the computer off and then on. That will reset most of the AT command settings to the factory defaults.

In order to use an AT command, you need to have done the following:

1. Run your communication software.
2. Configure the software for the appropriate COM port and IRQ setting if necessary.
3. Enter terminal mode (aka command mode, local mode, or direct mode.). This is usually the mode that communications software starts up. Then, type the AT command you need, then press **Enter** key. For example,

AT!C0=0<Enter>	Set the ISDN TA to connect to AT&T 5ESS switch
AT!Z=9<Enter>	Select async to sync PPP Conversion
AT&N0=0<Enter>	Select Single-Link PPP mode

Mostly the AT commands can also be entered in the same command line. For example,

AT!C0=0!Z=9&N0=0<Enter>

As shown above, it is not necessary to put spaces between the commands (there is no space between **AT**, **!C0=0**, **!Z=9**, and **&N0=0**).

The ISDN TA usually returns an response at the next line if it understands the command. The response is usually **OK** or **ERROR** unless the AT command has other extended messages. Add **&Wn** at the end of the AT command string to save the changes to ISDN TA's memory (refer to AT&Wn commands for details), otherwise the changes will get lost when you restart or shut down the computer. Type **AT&F&Wn<Enter>** if you get lost in the AT command and want to go back to the factory default settings.

5.2 Setting ISDN Phone Numbers and SPIDs by Using ISDN AT Commands

(1) Unplug the ISDN line.
(2) Open Hypertrm in Windows 95, or run any terminal program like Procom Plus for Windows.
(3) Issue **AT!Cn** and **AT!Nn** commands to change the settings.
(4) Save the changed settings to one of the user profiles (e.g. Profile 0).

Example:
The ISDN phone numbers: 5552000 and 5554000
The DN 0: 5552000
The DN 1: 5554000
The SPID 0: 0555200001
The SPID 1: 0555400001

(5) Issue following AT command string at terminal mode of your terminal program:

AT!N0=5552000!N1=5554000!C2=0555200001!C6=0555400001&W0

(6) Press **Enter** key (Carriage Return).
(7) Plug the ISDN line.

Note: When you re-start your computer, the settings will be changed back to the original power-up profile (Profile E). If you want to set the stored changes (Profile 0 in this example) to be the power-up profile (Profile E), add &Pn (&P0) to the above command string, therefore the changes will be loaded automatically when you re-start your computer next time.

5.3 Exception

Do not precede following commands with an **AT** prefix or conclude it by pressing **Enter**.

+++ **Escape sequence**

The escape sequence allows the modem to exit data mode and enter on-line command mode. While in on-line command mode, you may communicate directly to your modem using AT commands. Once you are finished, you may return to data mode using the ATO command.