

Omni.Net Lite

ISDN Terminal Adapter

User's Guide

Version 1.2
5/2005

ZyXEL

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- This device must accept any interference received, including interference that may cause undesired operations.

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 against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

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Notice 1

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- 3 Select the certification you wish to view from this page.

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- To reduce the risk of fire, use only No. 26 AWG (American Wire Gauge) or larger telecommunication line cord.
- Do NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel can service the device. Please contact your vendor for further information.
- Use ONLY the dedicated power supply for your device. Connect the power cord or power adaptor to the right supply voltage (110V AC in North America or 230V AC in Europe).
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- Do NOT store things on the device.
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- Warranty Information.
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METHOD	SUPPORT E-MAIL	TELEPHONE ^A	WEB SITE	REGULAR MAIL
	SALES E-MAIL	FAX	FTP SITE	
CORPORATE HEADQUARTERS (WORLDWIDE)	support@zyxel.com.tw	+886-3-578-3942	www.zyxel.com www.europe.zyxel.com	ZyXEL Communications Corp. 6 Innovation Road II Science Park Hsinchu 300 Taiwan
	sales@zyxel.com.tw	+886-3-578-2439	ftp.zyxel.com ftp.europe.zyxel.com	
CZECH REPUBLIC	info@cz.zyxel.com	+420 241 091 350	www.zyxel.cz	ZyXEL Communications Czech s.r.o. Modranská 621 143 01 Praha 4 - Modrany Ceská Republika
	info@cz.zyxel.com	+420 241 091 359		
DENMARK	support@zyxel.dk	+45 39 55 07 00	www.zyxel.dk	ZyXEL Communications A/S Columbusvej 5 2860 Soeborg Denmark
	sales@zyxel.dk	+45 39 55 07 07		
FINLAND	support@zyxel.fi	+358-9-4780-8411	www.zyxel.fi	ZyXEL Communications Oy Malminkaari 10 00700 Helsinki Finland
	sales@zyxel.fi	+358-9-4780 8448		
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	sales@zyxel.de	+49-2405-6909-99		
NORTH AMERICA	support@zyxel.com	+1-800-255-4101 +1-714-632-0882	www.us.zyxel.com	ZyXEL Communications Inc. 1130 N. Miller St. Anaheim CA 92806-2001 U.S.A.
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	sales@zyxel.no	+47 22 80 61 81		
SPAIN	support@zyxel.es	+34 902 195 420	www.zyxel.es	ZyXEL Communications Alejandro Villegas 33 1º, 28043 Madrid Spain
	sales@zyxel.es	+34 913 005 345		
SWEDEN	support@zyxel.se	+46 31 744 7700	www.zyxel.se	ZyXEL Communications A/S Sjöporten 4, 41764 Göteborg Sweden
	sales@zyxel.se	+46 31 744 7701		

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	SALES E-MAIL	FAX	FTP SITE	
UNITED KINGDOM	support@zyxel.co.uk	+44 (0) 8702 909090	www.zyxel.co.uk	ZyXEL Communications UK Ltd., 11, The Courtyard, Eastern Road, Bracknell, Berkshire, RG12 2XB, United Kingdom (UK)
	sales@zyxel.co.uk	+44 (0) 8702 909091 0906 7370001(UK only)	ftp.zyxel.co.uk	

a. "+" is the (prefix) number you enter to make an international telephone call.

Table of Contents

Copyright	2
Federal Communications Commission (FCC) Interference Statement	3
Safety Warnings	4
ZyXEL Limited Warranty	5
Customer Support	6
Table of Contents	8
List of Figures	12
List of Tables	14
Preface	16
Chapter 1	
Introduction	18
1.1 About your TA	18
1.1.1 TA Features	18
1.1.1.1 ISDN Basic Rate Interface (BRI) Support	18
1.1.1.2 Extensive Analog Phone Support	18
1.1.1.3 Outgoing Data Call Bumping Support	18
1.1.1.4 PPP Multilink	18
1.1.1.5 Bandwidth-On-Demand	19
1.1.1.6 PAP and CHAP Security	19
1.1.1.7 Upgrade Firmware	19
1.1.1.8 Supplementary Voice Features	19
1.1.1.9 Switch Type	19
1.1.2 TA and ISDN Interfaces	19
1.2 TA Hardware and Driver Installation	20
1.3 Top Panel LEDs	20
1.4 Configuration Methods	21
Chapter 2	
Using the Utility	24
2.1 Accessing the TA with the Utility	24
2.2 Navigating the Utility	26
2.3 System	27

2.4 RS-232 Port: Local DN (Directory Number) and Call Type	28
2.4.1 Introduction to PPP	28
2.4.2 Multilink PPP (MP or MLP)	29
2.4.3 BACP and BAP	29
2.4.4 ISDN Protocols	30
2.4.5 Configuring Local DN and Call Type	30
2.5 RS-232 Port: PPP/MP Parameters	32
2.5.1 Link Authentication	32
2.5.1.1 Windows Authentication	32
2.5.2 Call Bumping (Bandwidth Release) for Voice Calls	34
2.5.3 Bandwidth On Demand (BOD)	34
2.5.4 Configuring PPP/MP Parameters	35
2.6 RS-232 Port: V.24 Signal	36
2.6.1 RS-232 Flow Control	36
2.6.2 Configuring V.24 Signal	37
2.7 Incoming Call Screening	38
2.8 Outgoing Call Screening	39
2.9 Pre-stored Numbers	40
2.10 RS-232 Port: Advance Setting	41
2.11 Analog Port: Local DN and Options	43
2.11.1 MSN (Multiple Subscriber Number) and Subaddress	43
2.11.1.1 Phone Number Assignment Example	43
2.11.2 Caller ID	44
2.11.2.1 Type 1: On-hook Caller ID Transmission	44
2.11.2.2 Type 2: Off-hook Caller ID Transmission	44
2.11.3 Dialing Method	45
2.11.4 Configuring Local DN and Options	45
2.12 Voice Calls	46
2.12.1 Placing a Voice Call	46
2.12.2 Answering a Voice Call	47
2.12.3 Intercom	47
2.12.4 Supplementary Services	47
2.12.4.1 The Flash Key	48
2.12.4.2 Call Hold	48
2.12.4.3 Call Waiting	49
2.12.4.4 Call Transfer	50
2.12.4.5 Three-Way Conference	51

Chapter 3	
Using AT Commands	52
3.1 AT Commands Overview	52
3.2 Accessing the TA Example	52
3.3 AT Commands	55

3.3.1 Data Command Sets	55
3.3.2 Command Sets for Analog Ports	59
3.3.3 Debug Command Sets	61
3.4 Configuring Examples with AT Commands	61
3.4.1 Phone Number Assignment	62
3.4.2 Storing Phone Number	62
3.4.3 Setting Ports Priority	63
3.4.4 Disabling Call Waiting	63
3.4.5 Link Authentication	63
3.4.6 Call Bumping (Bandwidth Release) for Voice Calls	64
3.4.7 Bandwidth On Demand (BOD)	64
3.4.8 Incoming Call Screening	64
3.4.8.1 Data Call	64
3.4.8.2 Voice Call	65
3.4.9 Outgoing Call Screening	65
3.4.9.1 Data Call	65
3.4.9.2 Voice Call	65
3.4.10 Caller ID	65
3.5 Result Codes	66

Chapter 4 Using Tone Commands 68

4.1 How to Use Tone Commands with a Telephone Keypad	68
4.1.1 Tone and Ring Patterns	68
4.2 Tone Commands	69
4.3 Configuring Example with Tone Commands	70
4.3.1 Phone Number Assignment	70
4.3.2 Storing Phone Number	71
4.3.3 Setting Ports Priority	71
4.3.4 Disabling Call Waiting	71
4.3.5 Incoming Call Screening	71
4.3.5.1 Voice Call	71
4.3.6 Outgoing Call Screening	71
4.3.6.1 Voice Call	71
4.3.7 Caller ID	71

Chapter 5 Firmware Upgrade..... 72

5.1 Upgrading Using the Utility	72
5.2 Upgrading Using HyperTerminal Example	73

Chapter 6	
Troubleshooting	78
Index	80

List of Figures

Figure 1 TA and ISDN Interfaces	20
Figure 2 Top Panel	20
Figure 3 ZyXEL Utility Main Screen	26
Figure 4 System	28
Figure 5 Point-to-Point Link Pathway	29
Figure 6 RS-232 Port: Local DN and Call Type	31
Figure 7 Windows XP: Dial-up Connection: Property	33
Figure 8 Windows XP: Dial-up Connection Property: Security	33
Figure 9 Windows 98: Dial-up Connection Property: Server Types	34
Figure 10 RS-232 Port: PPP/MP Parameters	35
Figure 11 CTS/RTS Handshake	36
Figure 12 RS-232 Port: V.24 Signal	37
Figure 13 RS-232 Port: Incoming Call Screen	39
Figure 14 Analog Port: Outgoing Call Screen	40
Figure 15 Analog Port: Pre-stored Numbers	41
Figure 16 RS-232 Port: Advance Setting	42
Figure 17 Analog Port: Local DN and Options	45
Figure 18 Analog Port: Supplementary Service	50
Figure 19 AT Command Example 1	62
Figure 20 AT Command Example 2	63
Figure 21 AT Command Example 3	65
Figure 22 Utility: Navigation Panel	72
Figure 23 Utility Firmware Upgrade: Open a File	72
Figure 24 Utility Firmware Upgrade: Confirm	73
Figure 25 Utility Firmware Upgrade: In Progress	73
Figure 26 Utility Firmware Upgrade: Restart	73

List of Tables

Table 1 Top Panel LED Description	20
Table 2 Navigation Panel	25
Table 3 Screens Summary	26
Table 4 ISDN B-channel Protocols	30
Table 5 RS-232 Port: Local DN and Call Type	31
Table 6 RS-232 Port: PPP/MP Parameters	35
Table 7 RS-232 Port: V.24 Signal	38
Table 8 RS-232 Port: Advance Setting	42
Table 9 Caller ID signaling type	44
Table 10 Analog Port: Local DN and Options	46
Table 11 Incoming Voice Call Scenarios	47
Table 12 Flash Key commands	48
Table 13 Examples of AT Command	52
Table 14 AT Data Command Sets Requiring an "AT" Prefix	55
Table 15 AT Command Sets for the Analog Port	59
Table 16 Debug Command Sets	61
Table 17 PPP AT commands	63
Table 18 Call Bumping AT commands	64
Table 19 BOD AT commands	64
Table 20 Result Codes	66
Table 21 Tone and Ring Patterns	68
Table 22 Tone Commands	69
Table 23 Troubleshooting	78

Preface

Congratulations on your purchase of the Omni.Net Lite ISDN Terminal Adapter.

Note: Register your product online to receive e-mail notices of firmware upgrades and information at www.zyxel.com for global products, or at www.us.zyxel.com for North American products.

Your TA is easy to install and configure.

About This User's Guide

This manual is designed to guide you through the configuration of your TA for its various applications.

Related Documentation

- Supporting Disk

Refer to the included CD for support documents.

- Quick Start Guide

The Quick Start Guide is designed to help you get up and running right away. They contain hardware installation/connection information.

- ZyXEL Glossary and Web Site

Please refer to www.zyxel.com for an online glossary of networking terms and additional support documentation.

User Guide Feedback

Help us help you. E-mail all User Guide-related comments, questions or suggestions for improvement to techwriters@zyxel.com.tw or send regular mail to The Technical Writing Team, ZyXEL Communications Corp., 6 Innovation Road II, Science-Based Industrial Park, Hsinchu, 300, Taiwan. Thank you.

Syntax Conventions

- “Enter” means for you to type one or more characters. “Select” or “Choose” means for you to use one predefined choices.
- The SMT menu titles and labels are in **Bold Times New Roman** font. Predefined field choices are in **Bold Arial** font. Command and arrow keys are enclosed in square brackets. [ENTER] means the Enter, or carriage return key; [ESC] means the Escape key and [SPACE BAR] means the Space Bar.
- Mouse action sequences are denoted using a comma. For example, "click **Start, Settings** and then **Control Panel**" means first click **Start**, then point your mouse pointer to **Settings** and then click **Control Panel**.
- Use “e.g.,” as a shorthand for “for instance”, and “i.e.,” for “that is” or “in other words”.

- The Omni.Net Lite ISDN Terminal Adapter may be referred to as the TA in this user's guide.

CHAPTER 1

Introduction

This chapter introduces the key features of the TA.

1.1 About your TA

The Omni.Net Lite is an ISDN Terminal Adapter (TA) with S/T interface, equipped with two phone ports for connecting to analog phones and/or fax devices. It also supports supplementary services such as call hold, call transfer, call waiting and 3-way conference calling. It can transmit data at the rate of up to 230 Kbps through the RS-232 cable to your computer or terminal.

1.1.1 TA Features

The following sections describe features of the TA.

1.1.1.1 ISDN Basic Rate Interface (BRI) Support

The TA supports a single BRI. A BRI offers two 64 Kbps channels, which can be used independently for two destinations or be bundled to speed up data transfer.

1.1.1.2 Extensive Analog Phone Support

The TA is equipped with two standard phone jacks for you to connect analog devices such as telephones and FAX machines. It also supports supplementary services such as call waiting and 3-way calling.

1.1.1.3 Outgoing Data Call Bumping Support

Call bumping is a feature that allows the TA to manage an MP bundle dynamically, dropping or reconnecting a B-channel in a bundle when necessary.

1.1.1.4 PPP Multilink

The TA can bundle multiple links in a single connection using PPP Multilink Protocol (MP/MLP/MLPPP). The number of links can be either statically configured or dynamically managed based on traffic demand.

1.1.1.5 Bandwidth-On-Demand

The TA dynamically allocates bandwidth by dialing and dropping connections according to traffic demand.

1.1.1.6 PAP and CHAP Security

The TA supports PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol). CHAP is more secure than PAP; however, PAP is readily available on more platforms.

1.1.1.7 Upgrade Firmware

Upgrade firmware using Terminal Emulation software such as Hyperterminal.

1.1.1.8 Supplementary Voice Features

To take full advantage of the supplementary voice services available through the TA's phone ports, you will need to subscribe to your phone company for them. The TA supports the following supplementary voice features on both of its analog, or POTS (Plain Old Telephone Service), phone ports:

- Call Waiting
- Three Way Calling
- Call Transfer
- Call Forwarding

1.1.1.9 Switch Type

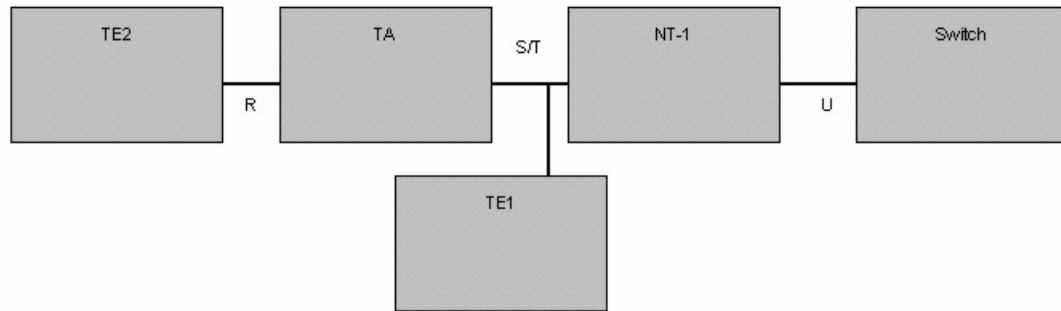
The TA supports the DSS-1 switch type.

1.1.2 TA and ISDN Interfaces

The TA comes with an S/T interface that connects to an NT-1 (Network Termination 1) device (supplied by the phone company in Europe).

In the following figure:

- All devices that are designed for ISDN are designated Terminal Equipment 1 (TE1).
- All other communication devices that are not ISDN capable, but have a POTS telephone interface (also called the R interface), including ordinary analog telephones, FAX machines, and modems, are designated Terminal Equipment 2 (TE2).
- The Terminal Adapter (TA) connects a TE2 device to an ISDN S/T bus.

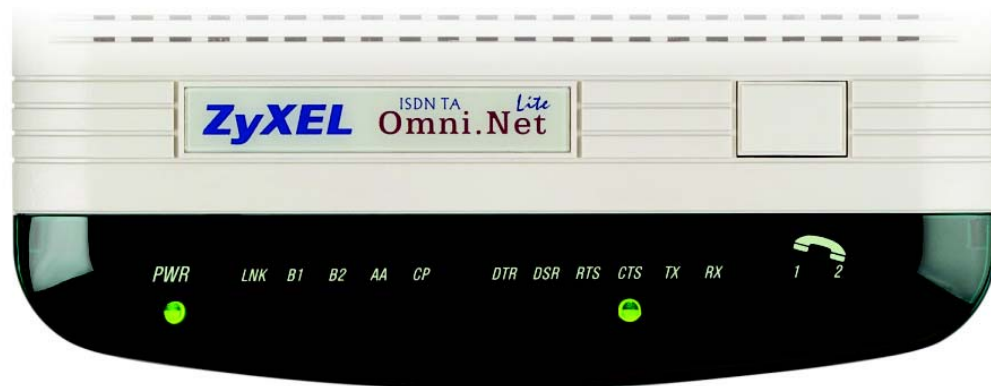
Figure 1 TA and ISDN Interfaces

Note: Do not connect this TA to a U interface.

1.2 TA Hardware and Driver Installation

Follow the instructions in the Quick Start Guide to install the driver and make hardware connections.

1.3 Top Panel LEDs

Figure 2 Top Panel

The following table describes the LEDs on the top panel.

Table 1 Top Panel LED Description

LED	STATUS	DESCRIPTION
POWER	On	The TA is receiving power.
	Off	The TA is not receiving power.

Table 1 Top Panel LED Description

LED	STATUS	DESCRIPTION
LNK	On	The TA has a successful connection to a local ISDN switch.
	Blinking	The TA is attempting to make a local connection.
	Off	The TA is not connected to the local ISDN switch or the local connection failed.
B1	On	The ISDN B1 channel is in use.
	Off	The ISDN B1 channel is idle or not established.
B2	On	The ISDN B2 channel is in use.
	Off	The ISDN B2 channel is idle or not established.
AA	On	The TA is in automatic answer mode.
	Blinking	The TA is ringing.
	Off	The TA is not in automatic answer mode.
CP	On	Data compression is not supported at the time of writing. Data compression is being used over the B-channel(s). Compression types are Hi/fn LZS (formerly Stac) for PPP connections, and V.42bis for V.120 or X.75 connections.
	Off	Data compression is not activated.
DTR (Data Terminal Ready)	On	The DTE (Data Terminal Equipment) is your computer or terminal that is connected to the TA TO DTE port. DTR indicates a DTE is ready for communication by RS-232 signal.
	Off	The DTE is not ready for communication with the TA via a RS-232 link.
DSR (Data Set Ready)	On	The TA is ready for communication with the DTE.
	Off	The TA is not ready for communication with the DTE.
RTS (Request To Send)	On	The DTE is ready to receive data. The RTS signal is used in hardware handshaking.
	Off	The DTE is not ready to receive data.
CTS (Clear To Send)	On	The TA is ready to receive data.
	Off	The TA is not ready to receive data.
TX	On	The DTE is sending data to the TA.
	Off	The DTE is not sending data to the TA.
RX	On	The DTE is receiving data from the TA.
	Off	The DTE is not receiving data from the TA.
PHONE 1 PHONE 2	On	The telephone connected to this port is in use.
	Off	The telephone connected to this port is idle.

1.4 Configuration Methods

To configure your TA, choose one of the following methods:

- Utility

- AT commands with a terminal emulation program such as Hyperterminal in Windows
- Tone commands using the telephone keypad (for analog ports)

CHAPTER 2

Using the Utility

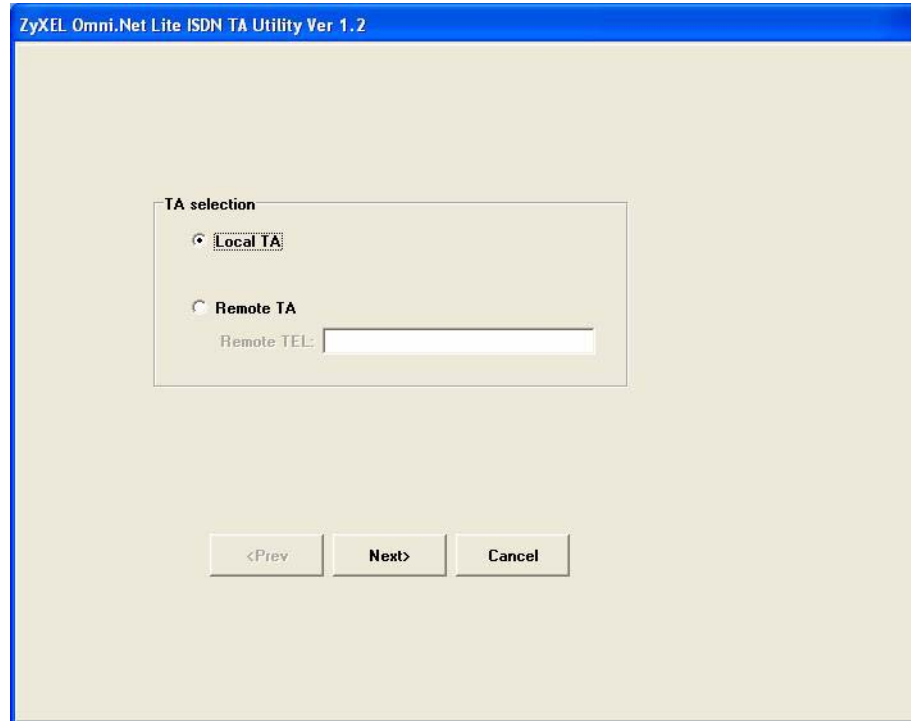
This chapter shows you how to access and configure the TA using the utility.

2.1 Accessing the TA with the Utility

- 1 Make sure your TA hardware is properly connected (refer to the Quick Start Guide).
- 2 Insert the included CD into your CD-ROM driver.
- 3 Double-click the **ConfigOmniNetLite.exe** icon, as shown below, in the **Utility** folder of your CD.

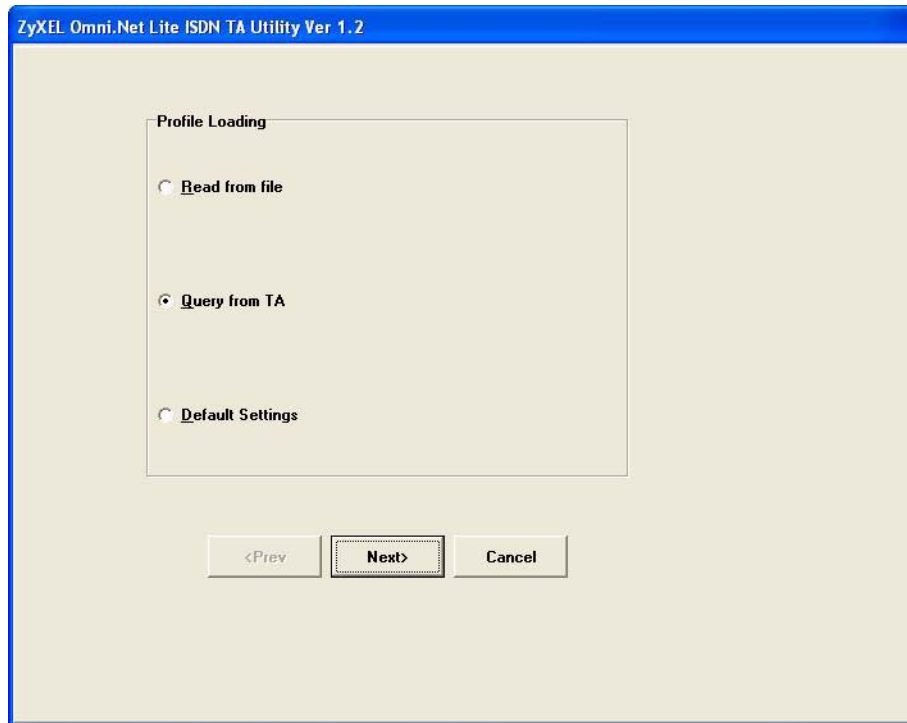


- 4 You will see the screen as shown below. Select **Local TA** and click **Next** to access the TA through the data port. Otherwise, select **Remote TA**, enter the phone number and click **Next** to access the remote TA via an ISDN network.

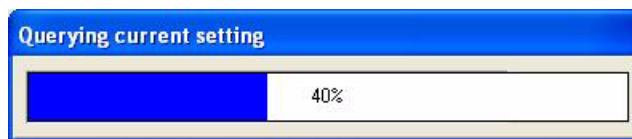


- 5 Select **Query from TA** and click **Next** to display the current settings on the TA. Select **Read from file** and click **Next** to open a previously saved configuration file (.CFG) on

your computer. Otherwise, select **Default Settings** and click **Next** to view the default settings of the TA.



6 After you select **Query from TA** and click **Next**, the following screen appears while the query is processing.



7 The utility main screen displays, you can see five icons on the navigation panel as shown.



Table 2 Navigation Panel

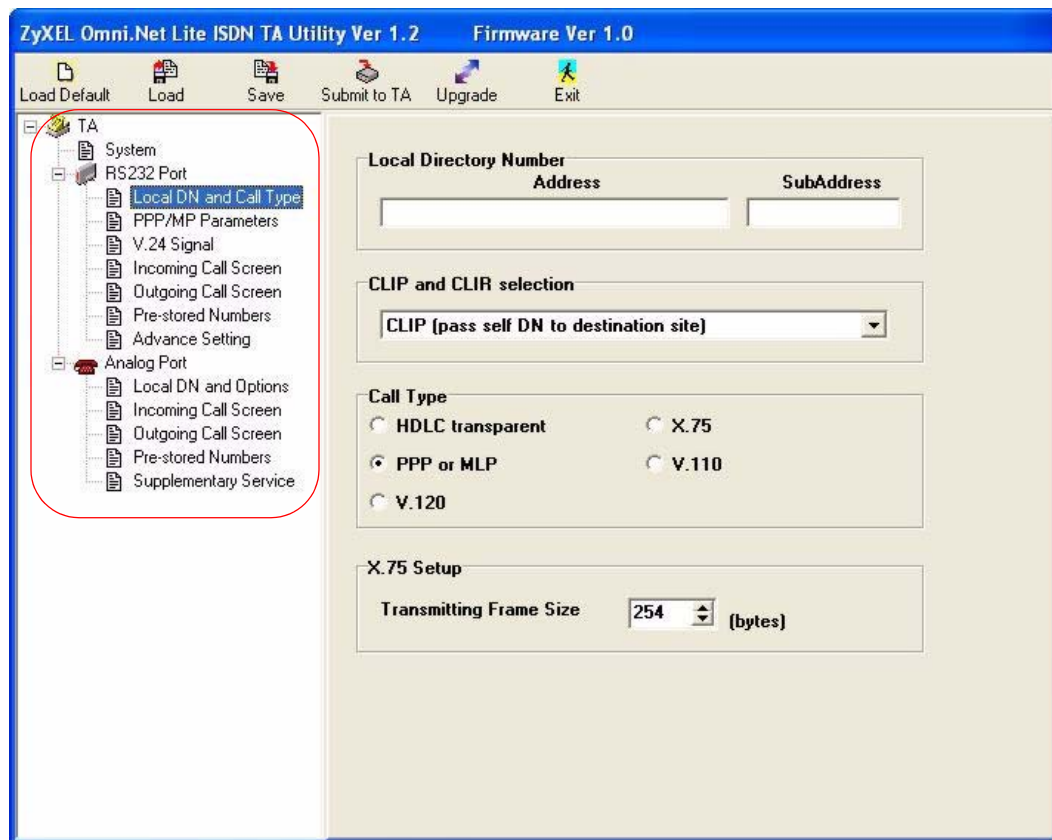
LABEL	DESCRIPTION
Load Default	Click this icon to clears all user-entered configuration information and returns the TA to its factory defaults.
Load	Click this icon to upload a new or previously saved configuration (.CFG) file from your computer to your TA.
Save	Click this icon to to back up (save) the TA's current configuration to a file on your computer.
Submit to TA	Click this icon to save your changes back to the TA.

Table 2 Navigation Panel

LABEL	DESCRIPTION
Upgrade	Click this icon to upload firmware to your TA.
Exit	Click this icon at any time to leave the utility without saving.

2.2 Navigating the Utility

This section summarizes how to navigate the utility.

Figure 3 ZyXEL Utility Main Screen

The following table describes the menus listed on the left.

Table 3 Screens Summary

MENU	SUB-MENU	FUNCTION
System		Use this screen to choose your country code.
RS232 Port		Use these screens under this menu to configure the data port.
	Local DN and Call Type	Use this screen to assign a phone number to data calls and select call type.

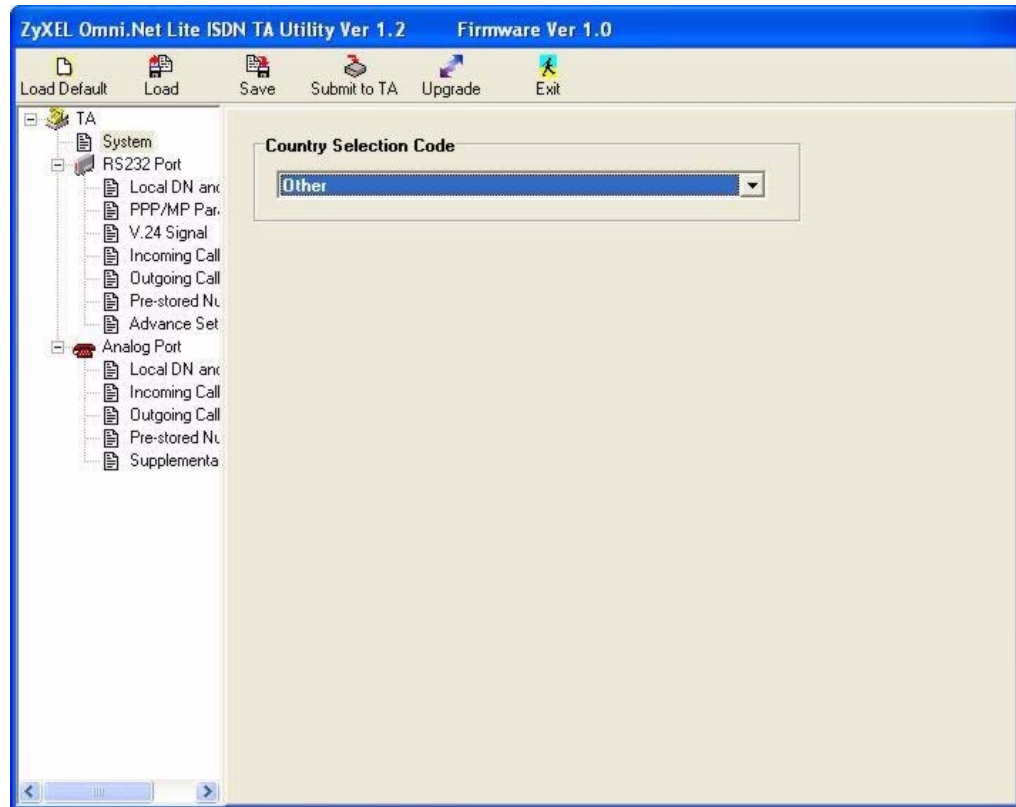
Table 3 Screens Summary

MENU	SUB-MENU	FUNCTION
	PPP/MP Parameters	Use this screen to configure PPP/MP settings.
	V.24 Signal	Use this screen to define how to treat data control signal.
	Incoming Call Screen	Use this screen to set restrictions on incoming data calls.
	Outgoing Call Screen	Use this screen to set restrictions on outgoing data calls
	Pre-stored Numbers	Use this screen to store up to five phone numbers for data calls on the TA.
	Advance Setting	Use this screen to configure the advanced settings, including charge information.
Analog Port		Use these screens under this menu to configure the analog ports.
	Local DN and Options	Use this screen to assign phone number(s) to voice calls, set port priority, caller ID service types and dialing method.
	Incoming Call Screen	Use this screen to set restrictions on incoming voice calls.
	Outgoing Call Screen	Use this screen to set restrictions on outgoing voice calls.
	Pre-stored Numbers	Use this screen to store up to five phone numbers for voice calls on the TA.
	Supplementary Service	Use this screen to enable or disable the call waiting feature.

2.3 System

Click **System** to display the screen as shown next. Select your country from the **Country Selection Code** drop-down list. The default is **Other**.

Figure 4 System



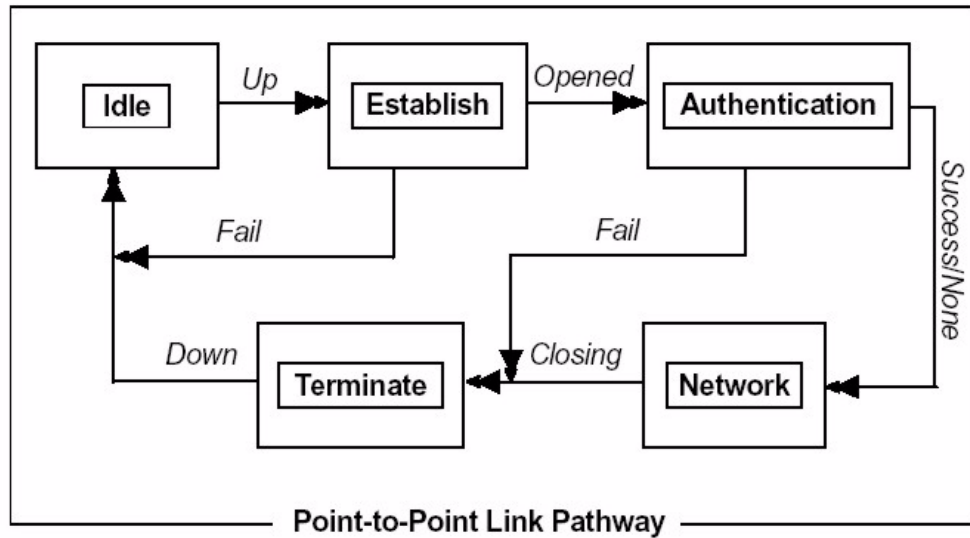
2.4 RS-232 Port: Local DN (Directory Number) and Call Type

This section shows you how to configure the data call number and type.

2.4.1 Introduction to PPP

Point-To-Point Protocol (PPP) is designed for simple one-to-one links. These links provide full-duplex, simultaneous, bi-directional operation, and are assumed to deliver packets in order. PPP is intended to provide a common solution for easy connection for a wide variety of hosts, bridges and routers.

In the process of configuring, maintaining and terminating the point-to-point link, PPP goes through several distinct phases, as specified in the following simplified state diagram:

Figure 5 Point-to-Point Link Pathway

2.4.2 Multilink PPP (MP or MLP)

There are two B channels in basic rate ISDN. This offers the possibility of opening multiple simultaneous channels between systems giving users additional bandwidth on demand. Multilink PPP is a method for bundling both B-channels into one PPP link for higher throughput.

Multilink PPP must be negotiated in the establish-link phase by both peers. If the negotiation is successful, the second link will be dialed after the first link reaches network phase. In some countries the directory number is not the same for both channels. For dialing the second B-channel with a different directory number, both numbers must be obtained before dialing out unless the peer supports BACP and BAP, which will be described later in this chapter. Multilink PPP is described in RFC-1990.

2.4.3 BACP and BAP

Bandwidth Allocation Control Protocol (BACP) and Bandwidth Allocation Protocol (BAP) is used for call request and link drop under Multilink PPP.

BACP is negotiated during the network phase. Without BACP/BAP, the directory numbers of both B-channels must be specified before dialing out. In some cases, it is not possible for the ISP to support more than one chassis that is capable of bundling both channels at the same time. With BACP/BAP, the second B-channel directory number can be obtained while requesting a call. The second directory number is not necessary any more.

2.4.4 ISDN Protocols

HDLC (High-Level Data Link Control) is one of the most common data link (layer 2) protocols. It supports both half duplex and full duplex communication lines, point to point (peer to peer) and multi-point networks, and switched or non-switched channels. It permits synchronous, code-transparent data transmission.

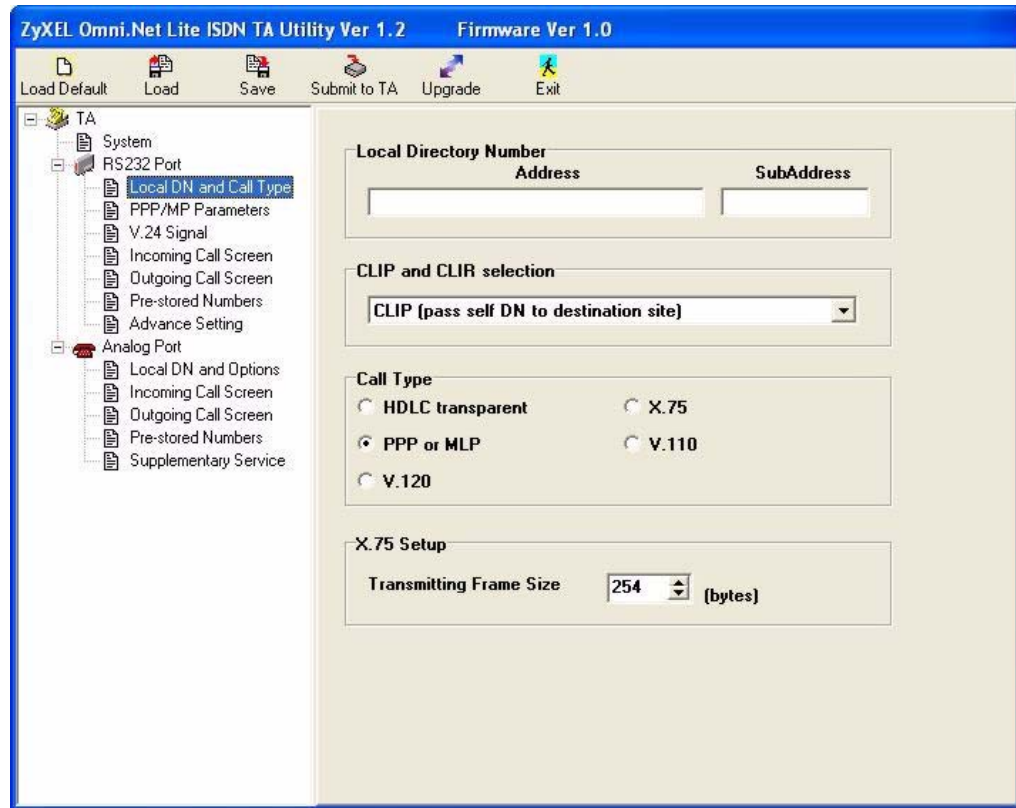
The TA supports the following protocols.

Table 4 ISDN B-channel Protocols

ISDN PROTOCOLS	DESCRIPTION
V.110	V.110 is most popular in Japan or Europe.
V.120	V.120 is most commonly used in North America.
X.75	X.75 was originally designed for packet-switched signaling systems in public networks to provide data transmission services. However, it is now also used as the link layer for telematic services (as defined in T.90) in ISDN. These services include both ISDN circuit-switched mode (DTE-DTE communication) and ISDN packet-switched mode (DTE-DCE communication). DCE (Data Communication Equipment) is a device, such as a modem, that converts data between different interfaces (digital and analog for example) and exchanges data with the DTE.
PPP and MLP	PPP allows B-channels bundling and bandwidth release and is the most widely used protocol for Internet access.

2.4.5 Configuring Local DN and Call Type

Click **Local DN and Call Type** under **RS-232 Port** to open the screen as shown next.

Figure 6 RS-232 Port: Local DN and Call Type

The following table describes the labels in this screen.

Table 5 RS-232 Port: Local DN and Call Type

LABEL	DESCRIPTION
Local Directory Number	
Address	Enter the phone number of the data port.
SubAddress	Enter the sub-address of the data port.
CLIP and CLIR Selection	<p>CLIP (Calling Line Identity Presentation) displays the phone number of the caller on the callee's telephone. CLIR (Calling Line Identity Restriction) allows you to hide your phone number when you make a call.</p> <p>Select CLIP (pass self DN to destination site) to allow the ISDN switch to pass your phone number to the destination site.</p> <p>Select CLIR (don't pass self DN to destination site) to disable the CLIP service.</p>

Table 5 RS-232 Port: Local DN and Call Type

LABEL	DESCRIPTION
Call Type	<p>Sets the calling protocol for the your TA. The protocol selected should match the protocol in use by the device or network your ISDN TA is calling.</p> <p>Select HDLC transparent to apply HDLC on B-channels and allow peer to peer communication similar to what a modem does.</p> <p>Select X.75 or V.120 to do CRC (Cyclic Redundancy Check) error detecting on B-channel. X.75 performs error correction using LAPB (Link Access Procedure Balanced) and V.120 uses LAPD (Link Access Procedure on the D Channel).</p> <p>Select PPP or MLP for modem-like dial-up connection to the Internet and/or combining two B-channels into one.</p> <p>Select V.110 to allow rate adaption between sync 64 kbps B-channel and async 9.6 - 115.2 kbps DTE.</p>
X.75 Setup	
Transmitting Frame Size (bytes)	<p>Select a value between 128 and 2048 to change the sending frame size. The default sending frame size is 254 bytes.</p>

2.5 RS-232 Port: PPP/MP Parameters

This section shows you how to configure PPP or MP parameters.

2.5.1 Link Authentication

After a link is established, it is necessary to authenticate the peer for security reasons. There are two popular authentication methods. One is Password Authentication Protocol (PAP) and the other is Challenge Handshake Authentication Protocol (CHAP). PAP is less secure because it transmits the username/password in plain text form. Unlike PAP, CHAP transmits the username/password in encrypted form. Some ISPs may support CHAP as the only method for authentication.

2.5.1.1 Windows Authentication

For those applications that do not support CHAP, the TA converts CHAP into PAP. It is recommended that you select **Allow unsecured password** in the **Dial-up Connection Property Security** screen on Windows 2000/XP or do not select the **Required encrypted password** checkbox in the **Dial-up Connection Property Server Types** screen on Windows 95/98 by right-clicking on the dial-up connection icon (see the figures below), since Microsoft uses MS-CHAP for username and password encryption but MS-CHAP is not supported by most ISPs.

Figure 7 Windows XP: Dial-up Connection: Property

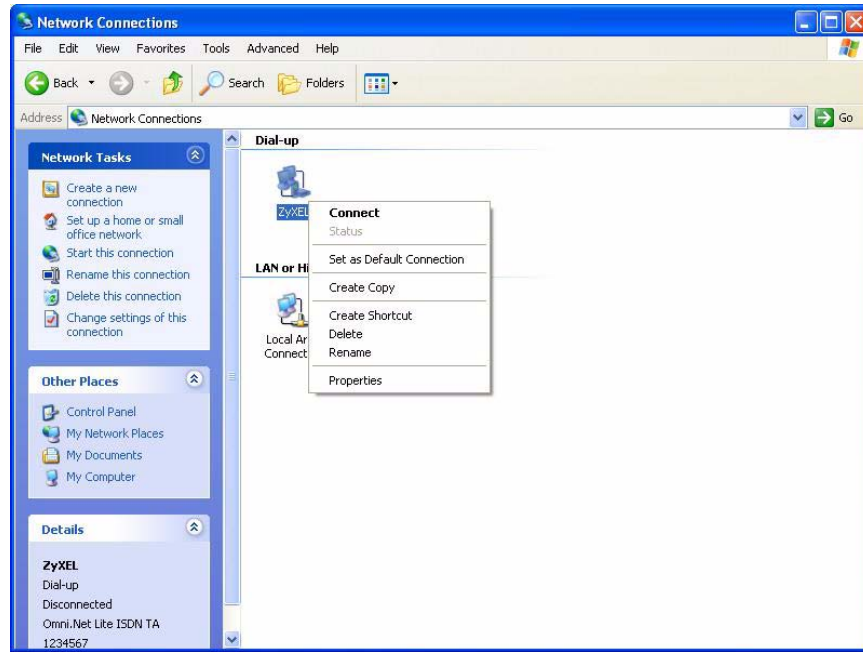


Figure 8 Windows XP: Dial-up Connection Property: Security

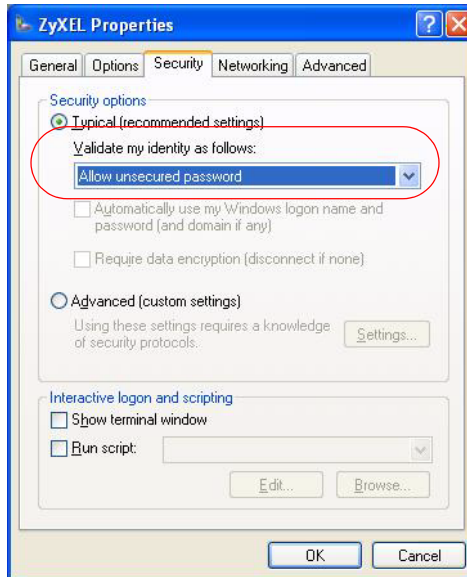
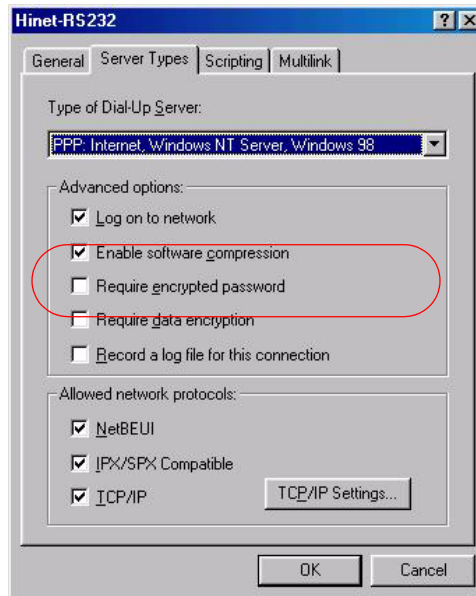


Figure 9 Windows 98: Dial-up Connection Property: Server Types

If you choose MLP 128K (dynamic or fixed) in the utility (see [Figure 10 on page 35](#)) or using the `ATC0=8CI=1` command, the TA needs the username and password in plain text form to establish the connection. Do not select **Enable CHAP** in the **PPP/MP Parameters** screen.

CHAP is described in RFC-1994 and PAP is described in RFC-1334.

2.5.2 Call Bumping (Bandwidth Release) for Voice Calls

While dynamic Multilink PPP is active and you place or answer a voice call from a device that is attached to one of the **PHONE** ports, the TA automatically drops one of the channels and assigns it to voice calls. If you subscribe to the call waiting service from your local telephone company, the TA will also drop one of the channels and answer the incoming call. Once a voice call ends, the TA automatically re-establishes the channel depending on the BOD rule.

2.5.3 Bandwidth On Demand (BOD)

In multilink PPP mode, use BOD to bring up or drop a B-channel depending on current data traffic. If there is light traffic on the link, one of the channels will be dropped automatically. On the other hand, if only one B-channel is used and data traffic is high enough, BOD will bring up the second B-channel to increase the bandwidth of the data link.

The BOD function is only effective on your TA.

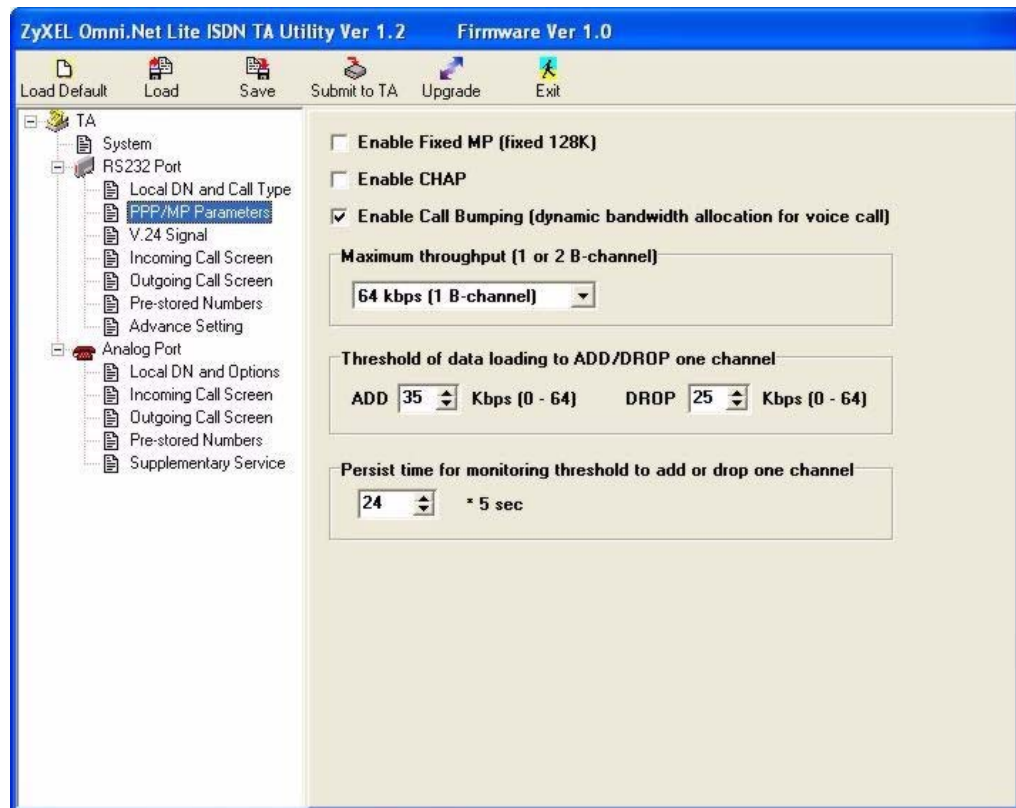
For BOD, there are three parameters to set high/low threshold and persist time. Traffic utilization is measured in the ISDN link. Highly compressible data may not generate enough traffic to start the second B-channel. Both add-persist time and subtract-persist time must be set to activate BOD.

Note: The high threshold must be greater than the low threshold, otherwise, both of them will be reset to the default.

2.5.4 Configuring PPP/MP Parameters

Click **PPP/MP Parameters** under **RS-232 Port** to display the screen as shown next.

Figure 10 RS-232 Port: PPP/MP Parameters



The following table describes the labels in this screen.

Table 6 RS-232 Port: PPP/MP Parameters

LABEL	DESCRIPTION
Enable Fixed MP (fixed 128K)	Select this option to combine both B-channels into one PPP link for data calls and always has the higher transmission rate.
Enable CHAP	Select this option to have your TA use CHAP for link authentication with the username and/or password.
Enable Call Bumping	Select this option to allow bandwidth release for voice calls.
Maximum throughput (1 or 2 B-channel)	This field is not available if you select Enable Fixed MP . Select 64 kbps (1 B-channel) to activate only one B-channel and transmit data at 64 kbps. Select 128 kbps (2 B-channel) if you want to bundle two B-channels to increase the data transfer rate. This is called multilink.

Table 6 RS-232 Port: PPP/MP Parameters

LABEL	DESCRIPTION
Threshold of data loading to ADD/DROP one channel	This field is not available if you select Enable Fixed MP . Set the maximum threshold in the ADD field and the minimum threshold in the DROP field. The TA adds the second B-channel when traffic is above the threshold and drops the second B-channel when traffic is below the threshold.
Persist time for monitoring threshold to add or drop one channel	This field is not available if you select Enable Fixed MP . Set the time interval between calculating traffic load. The unit of a value is 5 seconds.

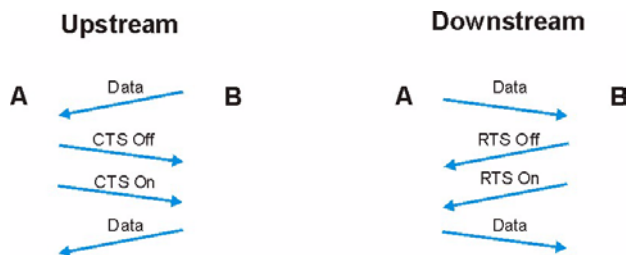
2.6 RS-232 Port: V.24 Signal

The V.24 signal screen describes ways to treat data control signal for data transmitted via the RS-232 serial interface of the TA. You can also use this screen to configure how to control data flow between the computer and the TA.

2.6.1 RS-232 Flow Control

RS-232 Flow control is used to control data flow between devices, such as two modems or a computer and a modem, using a serial connection. Standard flow control protocols include hardware (RTS/CTS) flow control and software (XON/XOFF) flow control.

The RTS (Request To Send) and CTS (Clear to Send) lines of a RS-232 serial cable signal flow control handshaking. In the following example, **A** is a TA and **B** is a computer. For upstream traffic from **B** to **A**, when device **A**'s receive buffer is nearly full, it lowers the CTS line (the **CTS** LED is off) to signal device **B** to stop sending data. When **A** is ready for new incoming data, it raises the CTS signal (the **CTS** LED is on) to resume transmission. For downstream traffic from **A** to **B**, **B** sets the RTS line to have **A** stop or restart sending data.

Figure 11 CTS/RTS Handshake

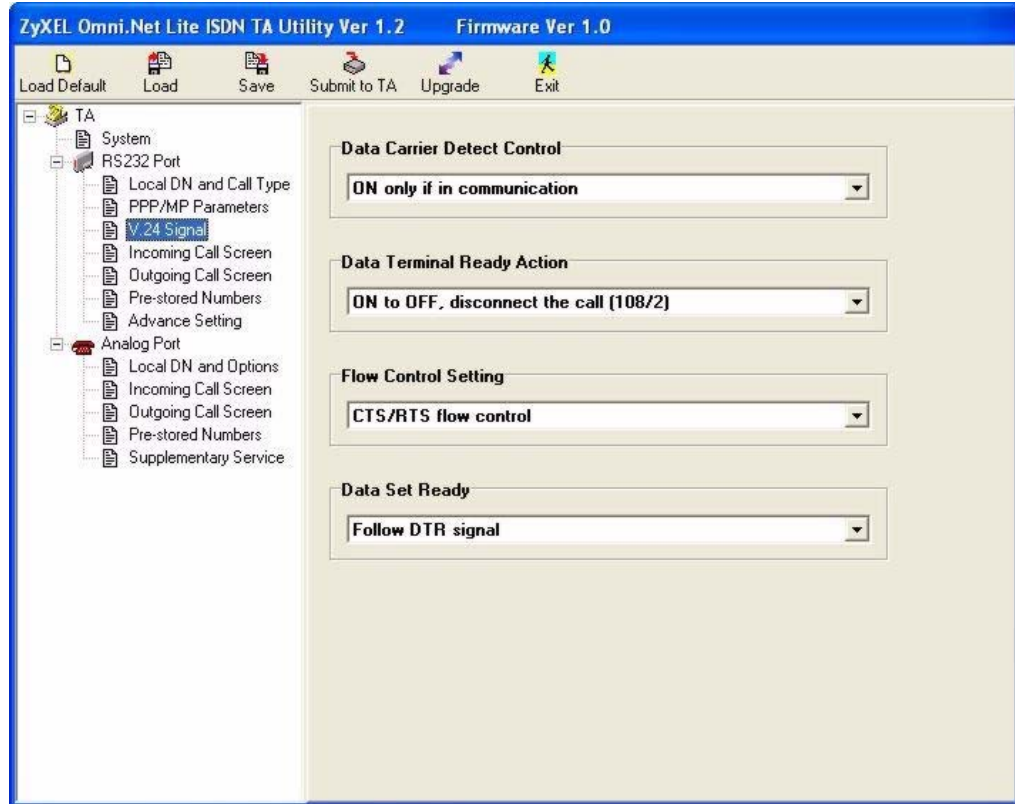
Flow control can also be done using the XON character (by pressing Ctrl-Q on the keyboard) and XOFF characters (by pressing Ctrl-S) in a data stream. When a device receives an XOFF signal from another device, it suspends or stops data transmitting to that device until receiving an XON (Ctrl-Q) signal from the same device. An XOFF character is sent when the receive buffer is nearly full. An XON signal is sent when the buffer is no longer full. Binary files may contain these signal characters and cannot be sent with XON/XOFF flow control protocol.

Note: The TA and the computer should use the same flow control protocol.

2.6.2 Configuring V.24 Signal

Click **V.24 Signal** under **RS-232 Port** to display the screen as shown next.

Figure 12 RS-232 Port: V.24 Signal



The following table describes the labels in this screen.

Table 7 RS-232 Port: V.24 Signal

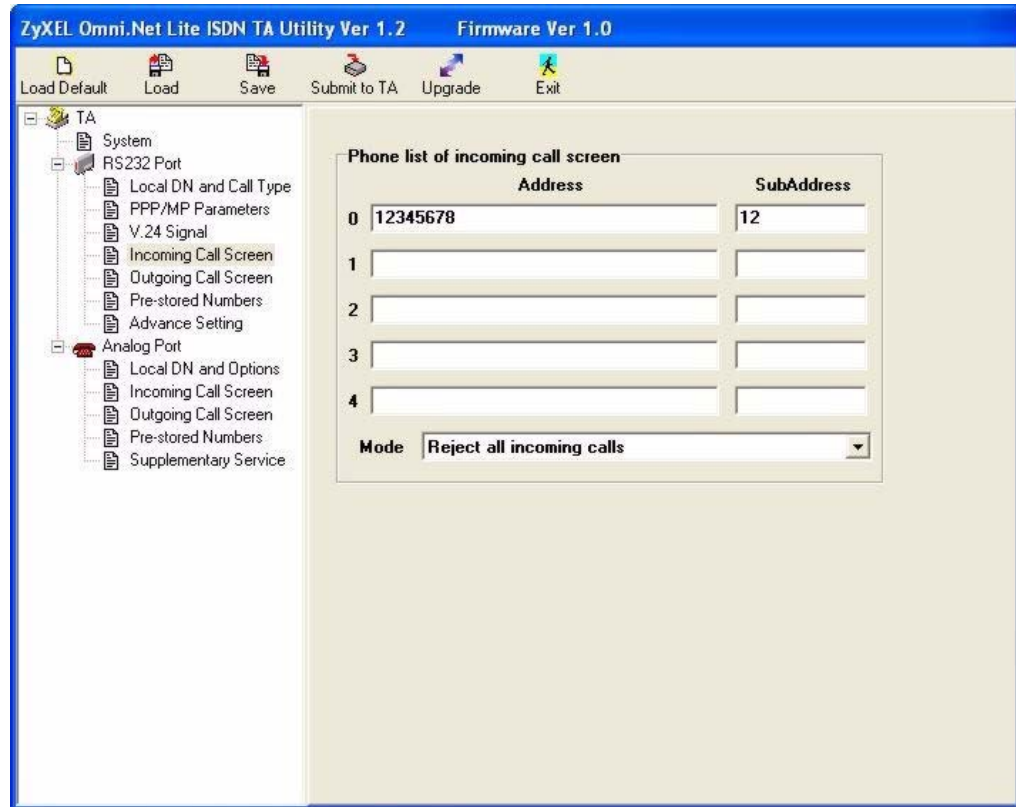
LABEL	DESCRIPTION
Data Carrier Detect Control	<p>Data Carrier Detect (DCD) is a serial communication signal. It indicates whether or not the TA is connected to a remote modem.</p> <p>Select Follow DTR signal to raise the DCD signal and have the LED turn on when the DTR signal is raised and the DTR LED is on and vice versa.</p> <p>Select On only if in communication to raise the DCD signal and have the LED turn on only when a data call is established.</p>
Data Terminal Ready Action	<p>DTR indicates whether or not the computer or terminal is ready for data transmission.</p> <p>Select ON to OFF, disconnect the call (108/2) to have the computer or terminal disconnect the current data call if the DTR signal is lowered and the LED is off.</p> <p>Select Ignore DTR status so that the TA will not follow the behavior of the DTR signal to drop a call; you then need to use the ATH command to disconnect it.</p> <p>Select OFF to ON, make a call, On to OFF, clear the call (108/1) to have the TA dial out a call using the pre-stored phone number when the DTR LED turns on and disconnect the call when it is off.</p>
Flow Control Setting	<p>Select the flow control method from the drop-down list. Options are Disable flow control, CTS/RTS flow control and XON/XOFF flow control.</p>
Data Set Ready	<p>DSR indicates whether or not the TA is ready for data transmission.</p> <p>Select Follow DTR signal to have the DSR LED turn on when the DTR LED is on and vice versa.</p> <p>Select Follow DCD signal to have the DSR LED turn on when the DCD LED is on and vice versa.</p>

2.7 Incoming Call Screening

Use this function to set restrictions on incoming data or voice calls.

In **Incoming Call Screen** under **RS-232 Port** or **Analog Port**, create a list of incoming call phone numbers (with sub-addresses) and configure the **Mode** field to reject or accept the calls with the phone number in the list.

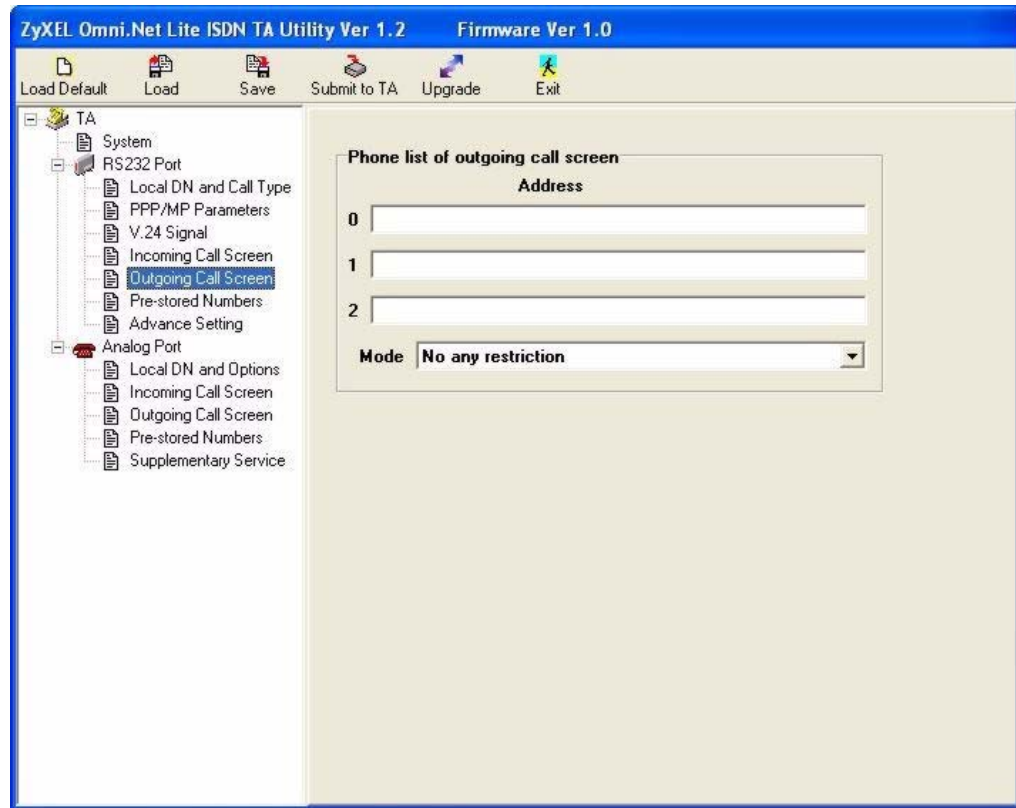
Figure 13 RS-232 Port: Incoming Call Screen



2.8 Outgoing Call Screening

Use this function to set restrictions on outgoing data or voice calls, such as allowing or prohibiting a long-distance or international call.

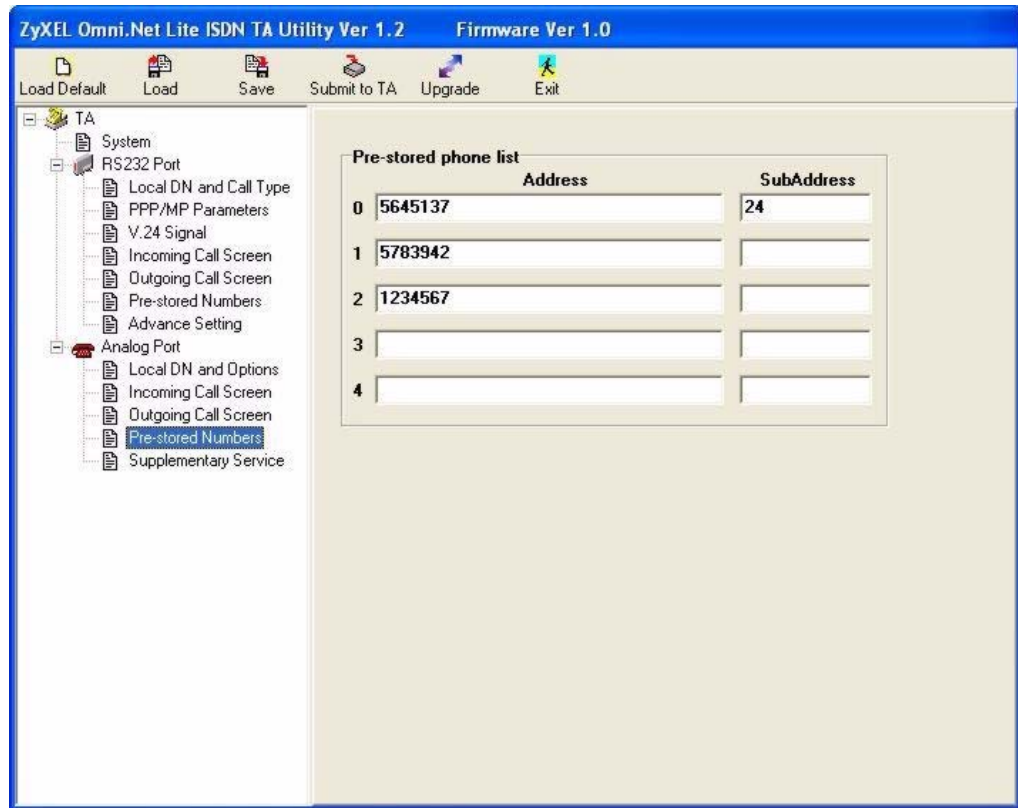
In **Outgoing Call Screen** under **RS-232 Port** or **Analog Port**, create a list of prefix digits for outgoing call and configure the **Mode** field to prohibit or allow the calls with the prefix digits in the list.

Figure 14 Analog Port: Outgoing Call Screen

2.9 Pre-stored Numbers

To store a phone number for data calls or voice calls in the TA, click **Pre-stored Numbers** under **RS-232 Port** or **Analog Port** and enter the phone numbers (and sub-addresses) in the screen shown as below.

Figure 15 Analog Port: Pre-stored Numbers

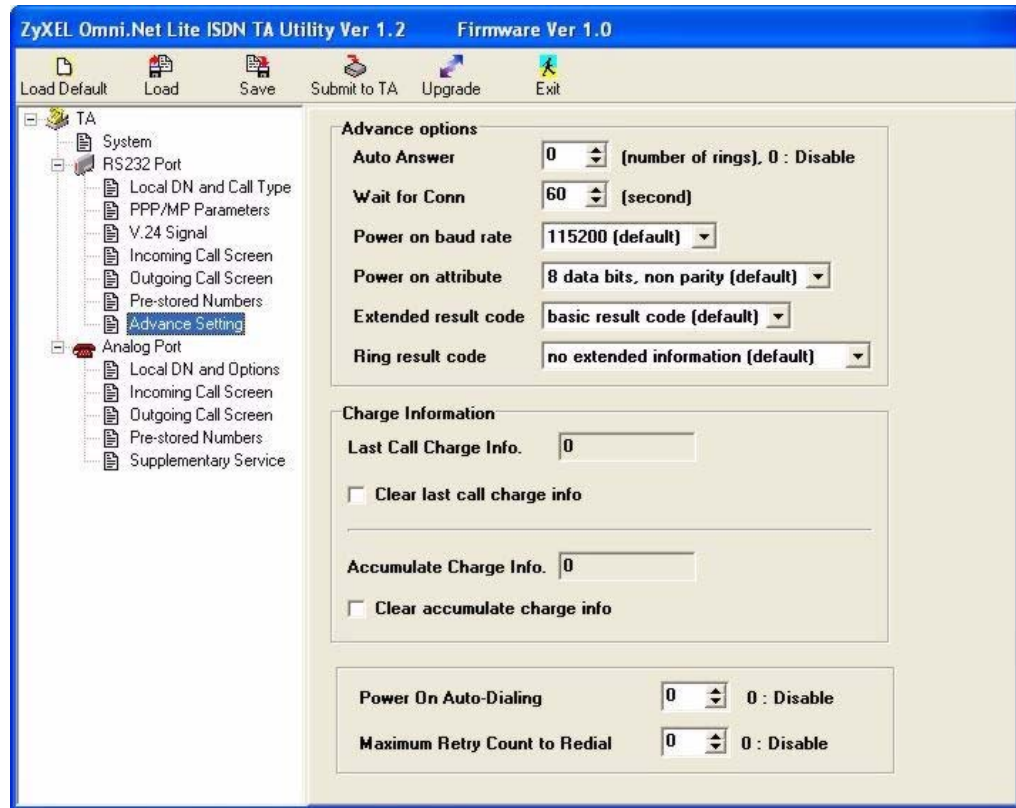


2.10 RS-232 Port: Advance Setting

Use this screen to configure data port settings and charge information.

Click **Advance Setting** under **RS-232 Port** to display the screen as shown next.

Figure 16 RS-232 Port: Advance Setting



The following table describes the labels in this screen.

Table 8 RS-232 Port: Advance Setting

LABEL	DESCRIPTION
Advance Options	
Auto Answer	Set how many ringing messages the TA receives before it answers a data call automatically. Enter 0 to stop the TA answering a data call automatically. When there is an incoming data call, you can press the push button on the top panel (see the Quick Start Guide) or use the <code>ATA</code> command to answer it manually.
Wait for Conn	Enter the number of seconds for the TA to wait for an answer to the data call before dropping it.
Power on baud rate	Configure the initial baud rate after power-on.
Power on attribute	Configure the initial attribute of the data port after power-on.
Extended result code	Select extended result code to show the extended command response or the connect message to the DTE (see Table 20 on page 66). Otherwise, select basic result code (default) .
Ring result code	Select the information you want to display for the incoming calls. Options are no extended information (default) , display calling phone number , display user data , display calling phone number and user data and RVS-COM format .
Charge Information	

Table 8 RS-232 Port: Advance Setting

LABEL	DESCRIPTION
Last call charge info.	This field displays the cost for the last call. This feature is not supported by all ISDN switches.
Clear last call charge info.	Select this checkbox to clear the information in the field above.
Accumulate Charge Info.	This field displays total cost for all calls. This feature is not supported by all ISDN switches.
Clear accumulate charge info.	Select this checkbox to clear the information in the field above.
Power On Auto-Dialing	Select 1 to have the TA automatically dial up a connection after power-on. Select 0 to disable this feature.
Maximum Retry Count to Redial	Enter how many times (from 1 to 10) for the TA to try to dial out a data call if a call can not be established successfully. Enter 0 to disable this feature.

2.11 Analog Port: Local DN and Options

This section shows you how to assign the phone number(s) to voice calls and set port priority.

2.11.1 MSN (Multiple Subscriber Number) and Subaddress

Multiple Subscriber Number (MSN) is where the telephone company gives you more than one number for your ISDN line. You can assign each number to a different port, e.g., the first number to data calls, the second to A/B adapter 1 and so on. Or (DSS1) the telephone company may give you only one number, but allow you to assign your own subaddresses to different ports, e.g., subaddress 1 to data calls and 2 to A/B adapter 1.

2.11.1.1 Phone Number Assignment Example

Different telephone companies deploy different types of switches for ISDN service. Depending on the switch for your particular installation, you will have a different number of telephone numbers.

When your telephone company provides you with more than one phone number (say 5009001 and 5009002), you can connect two analog phones and/or G3 fax devices to the **PHONE 1** and **PHONE 2** ports and assign each number to a port. If you attach one analog phone and one fax machine to the analog ports but don't assign any phone number to either port, both telephone and fax ring when there is an incoming call. That will be difficult to tell whether it is a fax call or voice call.

Follow the steps for the configuration method of your choice to assign the phone numbers. After configuration, the TA will route a call to the port that matches the dialed number.

- 1 Refer to [Section 2.1 on page 24](#) to open the utility.

- 2 Enter the first number in the **Address field** beside **Port 1** and the second number in the **Address field** beside **Port 2**.
- 3 Click **Submit to TA** to save the changes back to the TA.

2.11.2 Caller ID

The caller ID (Caller Identification) information will display on the analog ports. Two caller ID service types are supported by your TA.

2.11.2.1 Type 1: On-hook Caller ID Transmission

If the caller ID protocol uses DTMF (Dual Tone Multi-Frequency) signal, the caller ID information includes the phone number and is sent prior to ringing.

If the caller ID protocol uses FSK (Frequency Shift Keying) signal, the phone number will be sent during ringing.

The caller ID signaling type varies depending on the country.

Table 9 Caller ID signaling type

COUNTRY	COUNTRY CODE	CALLER ID SIGNALING TYPE	RINGING PATTERN
Denmark	252	DTMF	1 Sec On, 2 Sec OFF
France	219	FSK	1 Sec On, 2 Sec OFF
German	237	FSK	1 Sec On, 2 Sec OFF
India	214	DTMF	1 Sec On, 2 Sec OFF
Ireland	235	FSK	0.4 Sec On, 0.2 Sec OFF, 0.4 Sec On, 2 Sec OFF
Italy	236	DTMF	1 Sec On, 2 Sec OFF
Netherland	253	DTMF	1 Sec On, 2 Sec OFF
Norway	245	FSK	1 Sec On, 2 Sec OFF
Portugal	220	DTMF	1 Sec On, 2 Sec OFF
Spain	213	DTMF	1 Sec On, 2 Sec OFF
Sweden	250	DTMF	1 Sec On, 2 Sec OFF
Switzerland	251	DTMF	1 Sec On, 2 Sec OFF
UK	249	FSK	0.4 Sec On, 0.2 Sec OFF, 0.4 Sec On, 2 Sec OFF
Other (default)	216	DTMF	1 Sec On, 2 Sec OFF

2.11.2.2 Type 2: Off-hook Caller ID Transmission

The Type 2 service uses only FSK and shows call waiting caller ID. If the service is supported and activated on your TA, the call waiting phone number is displayed when you are on the phone.

2.11.3 Dialing Method

There are two ways to send a message containing the phone number: **EN-BLOC sending** and **OVERLAP sending**.

In En-Bloc mode, the complete phone number is sent in the first signaling message. Users enter all digits of the phone number before a timeout period expires (the call times out if there is inactivity for more than four seconds) or press “#” to indicate the complete phone number has been entered.

OVERLAP sending is similar to what the traditional PSTN (Public-Switched Telephone Network) telephone system uses. **OVERLAP sending** means sending some phone digits in the first signaling message and the rest in subsequent signaling message. Users enter the phone number after a dial tone. The ISDN network is aware of the completion of the phone number automatically. You can not enter the sub-address when using overlap sending.

OVERLAP sending is usually used as the default for voice calls. For data calls, only **EN-BLOC sending** is used.

2.11.4 Configuring Local DN and Options

Click **Local DN and Options** under **Analog Port** to display the screen as shown next.

Figure 17 Analog Port: Local DN and Options

The screenshot displays the ZyXEL Omni.Net Lite ISDN TA Utility Ver 1.2 Firmware Ver 1.0 interface. The left sidebar shows a tree view with 'TA' expanded, containing 'System' and 'Analog Port'. Under 'Analog Port', 'Local DN and Options' is selected. The main window shows the configuration for 'Local Directory Number' with two ports. Port 1 has an address of 5009001 and Port 2 has an address of 5009002. The 'CLIP and CLIR selection' section shows both ports set to 'CLIP (pass self DN to destination site)'. The 'Device type on analog port' section shows Port 1 set to 'Telephone, G3 Fax or Modem' and Port 2 set to 'Telephone with Call Waiting caller ID device'. The 'Port priority' section is set to 'Both ports are same priority'. The 'Dialing method' section is set to 'OVERLAP sending'.

Local Directory Number	
Address	SubAddress
Port 1: 5009001	
Port 2: 5009002	

CLIP and CLIR selection

Port 1: CLIP (pass self DN to destination site)
Port 2: CLIP (pass self DN to destination site)

Device type on analog port

Port 1: Telephone, G3 Fax or Modem
Port 2: Telephone with Call Waiting caller ID device

Port priority

Both ports are same priority

Dialing method

OVERLAP sending

The following table describes the labels in this screen.

Table 10 Analog Port: Local DN and Options

LABEL	DESCRIPTION
Local Directory Number	
Port 1 Port 2	Enter the ISDN phone number for voice calls in the Address field and the sub-address in the SubAddress field.
CLIP and CLIR Selection	CLIP (Calling Line Identity Presentation) displays the phone number of the caller on the callee's telephone. CLIR (Calling Line Identity Restriction) allows the phone number to be hid. Select CLIP (pass self DN to destination site) to allow the ISDN switch to pass your phone number to the destination site. Select CLIR (don't pass self DN to destination site) and the CLIP service will not be available.
Device type on analog port	To enable the Type 2 service on either analog port, select Telephone with Call Waiting caller ID device . Otherwise, select Telephone, G3 Fax or Modem .
Port Priority	To set the same priority for both two ports, select Port priority to Both ports are same priority . To set the PHONE 1 port to have the first priority, select Port priority to Analog Port 1 is high priority . To set the PHONE 2 port to have the first priority, select Port priority to Analog Port 2 is high priority .
Dialing method	Configure how to send the signaling message with the phone number. Options are OVERLAP sending and EN-BLOC sending .

2.12 Voice Calls

This section covers how to initiate and receive calls over an ISDN through the analog ports on your ISDN TA and introduces supplementary services including call hold, call waiting, call transfer and three-way conference.

Note: You can only use the utility, AT command or Tone command to activate or deactivate call waiting. Use the flash key and the digit keys on the telephone to invoke supplementary services (see [Section 2.12.4 on page 47](#)).

2.12.1 Placing a Voice Call

You can use your analog phone connected to the **PHONE 1** and **PHONE 2** ports to dial out a call directly. With the **Quick Dial** feature, you can place an ISDN voice call by dialing “nn#” (where nn=00-04, pre-stored phone number index). You must store up to five phone numbers first by using the utility, AT commands or tone commands. Refer to [Section 2.9 on page 40](#) on how to store a phone number with the utility.

2.12.2 Answering a Voice Call

To answer an incoming call, just pick the receiver when that telephone is ringing.

Voice calls are routed to one or both of the analog ports (**PHONE 1** or/and **PHONE 2**) based on the phone number assignment when they are received. When the same number is assigned to both ports, you can choose the port you want to receive calls by setting the priority of the ports. If two ports have same priority, both ports receive ring signals. See [Section 2.11.4 on page 45](#) on how to configure port priority.

When answering an incoming call, the TA will first be identified if the calling number matches the MSN settings. The Multiple Subscriber Number (MSN) supplementary service enables multiple ISDN numbers to be assigned to a single ISDN BRI line. It allows the caller to select, via the public network, one or more distinct terminals from a variety of terminal choices. Since the TA supports many different communication protocols and two analog adapters, each of these ports can individually be assigned to a different ISDN number (see [Section 2.11.1 on page 43](#) for more information).

The following table shows incoming voice call scenarios.

Table 11 Incoming Voice Call Scenarios

PHONE 1 MSN	PHONE 2 MSN	PORT PRIORITY	PHONE 1	PHONE 2
Unassigned or Matched	Unassigned or Matched	0	Ring	Ring
Unassigned or Matched	Unassigned or Matched	1	Ring	-
Unassigned or Matched	Unassigned or Matched	2	-	Ring
Matched	Not matched	None	Ring	-
Not matched	Matched	None	-	Ring
Not matched	Not matched	None	-	-

2.12.3 Intercom

Your TA can work as an “Intercom” by connecting two phones to **PHONE 1** and **PHONE 2** at the rear panel of your TA.

Please follow the instructions below to operate the Intercom:

- 1 Pick up the telephone handset.
- 2 Dial “1#” and the other local phone will start to ring.

2.12.4 Supplementary Services

Supplementary services such as call hold, call waiting, call transfer, ... are generally available from your telecommunications provider. The TA supports all of the following services:

- Call Hold
- Call Waiting
- Call transfer
- Three-Way Conference

Note: To take full advantage of the supplementary voice services available through the TA's phone ports, you will need to subscribe to the services from your local telephone company.

2.12.4.1 The Flash Key

Flashing means to press the hook for a short period of time (a few hundred milliseconds) before releasing it. On newer telephones, there should be a "flash" key (button) that generates the signal electronically. If the flash key is not available, you can tap (press and immediately release) the hook by hand to achieve the same effect. However, using the flash key is preferred since the timing is much more precise. With manually tapping, if the duration is too long, it may be interpreted as hanging up by the TA.

You can invoke all the supplementary services by using the flash key. Commands for supplementary services are listed in the table below

After pressing the flash key, if you do not issue the sub-command before the default sub-command timeout (2 seconds) expires or issue an invalid sub-command, the current operation will be aborted.

Table 12 Flash Key commands

COMMAND	SUB-COMMAND	DESCRIPTION
Flash		Put a current call on hold to place a second call.
Flash	0	Drop the call presently on hold or reject an incoming call which is waiting for answer.
Flash	1	Disconnect the current phone connection and answer the incoming call or resume with caller presently on hold.
Flash	2	1. Switch back and forth between the two calls. 2. Put a current call on hold to answer an incoming call. 3. Separate the current three-way conference call into two individual calls (one is on-line, the other is on hold).
Flash	3	Create three-way conference connection.
Flash	4	Transfer the call to another phone.

2.12.4.2 Call Hold

Call hold allows you to put a call (**A**) on hold by pressing the flash key.

If you have another call, press the flash key and then "2" to switch back and forth between caller **A** and **B** by putting either one on hold.

Press the flash key and then “0” to disconnect the call presently on hold and keep the current call on line.

Press the flash key and then “1” to disconnect the current call and resume the hold call.

If you hang up the phone but a caller is still on hold, there will be a remind ring (see [Section 4.1.1 on page 68](#) for more information).

2.12.4.3 Call Waiting

This allows you to place a call on hold while you answer another incoming call on the same telephone (directory) number. By default call waiting is enabled on both telephone ports, but can be disabled on either port.

If there is a second call to a telephone number, you will hear a call waiting tone. Take one of the following actions.

- Reject the second call.

Press the flash key, wait for the sub command tone, press “0”.

- Disconnect the first call and answer the second call.

Either press the flash key, wait for the sub command tone and press “1”, or just hang up the phone and then answer the phone after it rings.

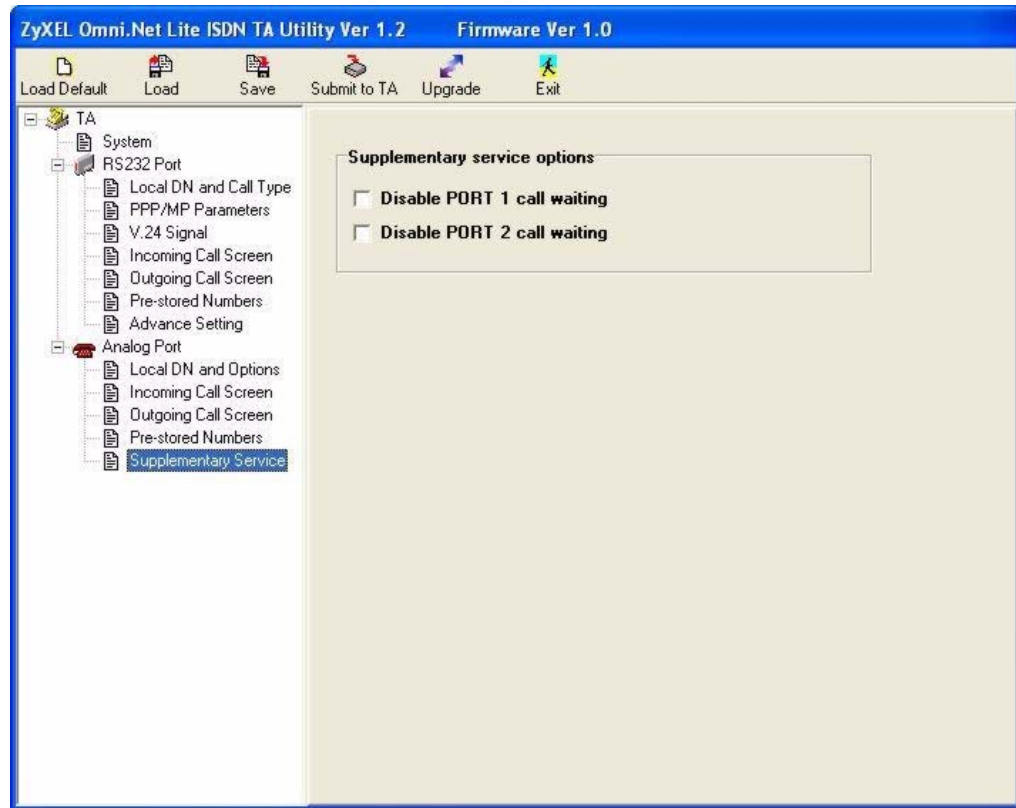
- Put the first call on hold and answer the second call.

Press the flash key, wait for the sub command tone, press “2”.

2.12.4.3.1 Disabling Call Waiting

The call waiting tone will interfere with the data communication. It is highly recommended that you disable the call waiting feature on the port to which a fax or modem is connected.

To disable call waiting on either port, select the **Disable PORT 1/2 call waiting** check box in the **Analog Port Supplementary Services** screen of the utility.

Figure 18 Analog Port: Supplementary Service

2.12.4.4 Call Transfer

You can transfer a call to a local phone (connected to the TA) or a remote phone (not connected to the TA) through an ISDN line.

2.12.4.4.1 Call Transfer between Two Analog Ports

To transfer incoming calls (after you answer this call) to a local phone, follow these steps:

- 1 Press the flash key to put the caller on hold.
- 2 When you hear the dial tone, dial “1#” to operate the Intercom.
- 3 After you hear the ring signal or the second party answer it, press the flash key, then “4”.
- 4 Hang up the phone.

2.12.4.4.2 Call Transfer to a Remote Phone

To transfer incoming calls (after you answer this call) to a remote phone, follow these steps:

- 1 Press the flash key to put the caller on hold.
- 2 When you hear the dial tone, simply dial the number you want, to transfer the first call.
- 3 After you hear the ring signal or the second party answer it, press the flash key, then “4”.

- 4 Hang up the phone.

2.12.4.5 Three-Way Conference

- 1 When you are on the phone talking to someone, place the flash key to put the caller on hold and get a dial tone.
- 2 Dial a phone number directly to make another call.
- 3 When the second call is answered, press the flash key, wait for the sub-command tone and press “3” to create a three-way conversation.
- 4 Hang up the phone to drop the connection.
- 5 If you want to separate the activated three-way conference into two individual connections (one is on-line, the other is on hold), press the flash key, wait for the sub-command tone and press “2”.

CHAPTER 3

Using AT Commands

3.1 AT Commands Overview

An AT Command is a command in asynchronous data format issued by the computer to the ISDN TA through the asynchronous computer-modem interface. AT commands are used to configure and control the TA by typing commands at a computer or terminal keyboard. To send an AT Command from a computer to the TA, you must run a communication software program and the TA must be in command state.

Commands must be written in a specific form in order for the TA to recognize them. A command begins with the letters “AT” or “at”, followed by one or more printable characters and then ended by pressing [ENTER], as shown in the following example.

Table 13 Examples of AT Command

COMMAND	OPERATION	RESPONSE
AT<Enter>	To verify that the TA is online with your terminal or computer.	OK
AT I3	To display the version of the current firmware.	

Note: AT commands can only be issued when the computer or terminal is connected to the TA with an RS-232 cable.

3.2 Accessing the TA Example

To configure the TA by terminal emulation program, you need a terminal emulation program first, such as Hyperterminal in Windows.

- 1 Make sure your TA hardware is properly connected (refer to the Quick Start Guide).
- 2 Open the HyperTerminal program in Windows. For example, in Windows XP click **Start, Programs, Accessories, Communications, HyperTerminal**.

- 3 Enter a descriptive name and select an icon in the **Connection Description** screen. Click **OK** to display the **Connect To** screen.

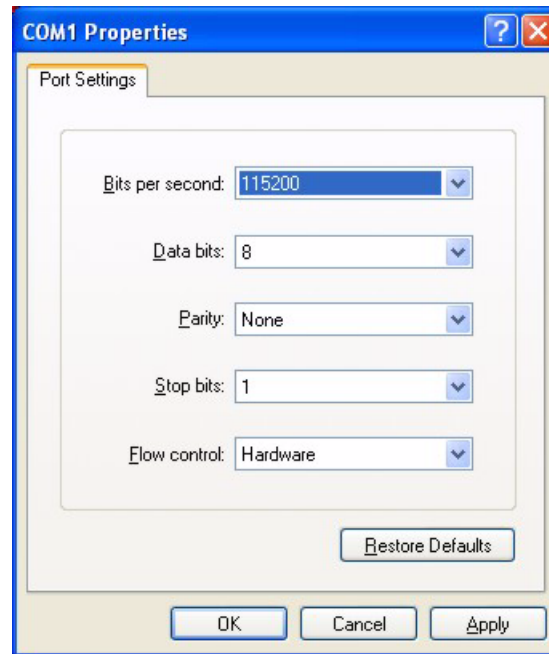


- 4 Select the COM port to which the TA is connected. Click **OK** to continue.

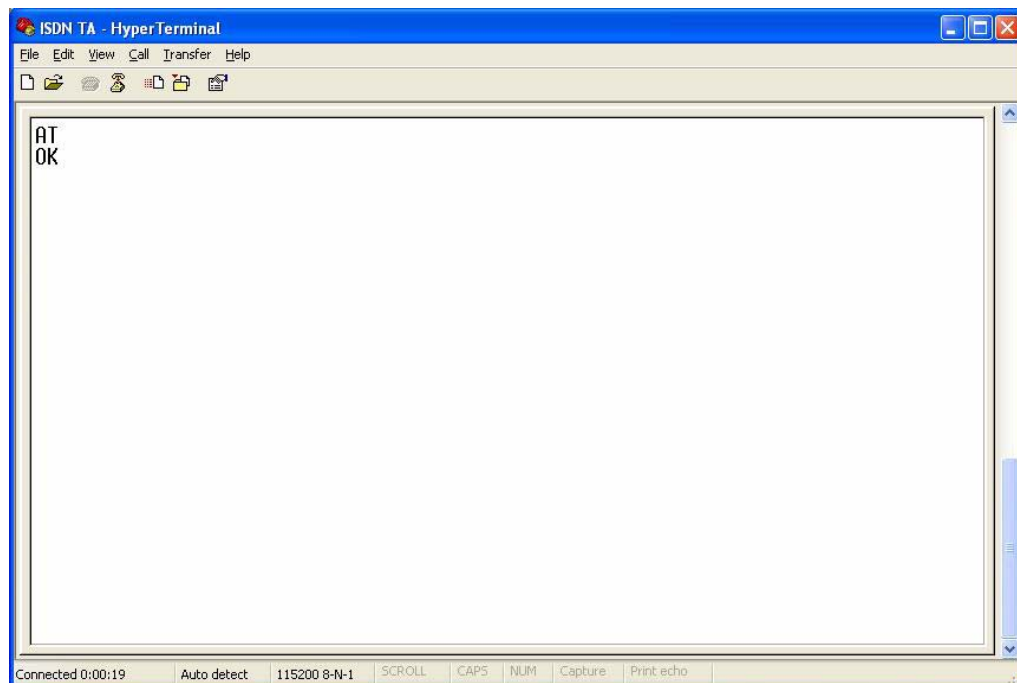


- 5 In the **COM Properties** screen, click **OK** after configuring the following parameters:
 - VT100 terminal emulation
 - Baud rate between 9600 and 230400 bps, the default is 115200 bps.

- No parity, 8 data bits, 1 stop bit, flow control set to hardware



- 6 The **DTR** LED is on. If it is off, check the HyperTerminal settings and your cable connections.
- 7 Type in `AT` and press [ENTER]. The terminal will response OK as shown below. You can now use the commands with an "AT" or "at" prefix to configure the TA. Refer to [Chapter 5 on page 72](#) for detailed information on AT command sets.



3.3 AT Commands

The following tables summarize the AT command sets.

3.3.1 Data Command Sets

The AT data command sets are shown in the following table.

Table 14 AT Data Command Sets Requiring an "AT" Prefix

COMMAND	OPTION	DESCRIPTION
A		Answer an incoming call.
C0=n		Select the call type. n=1:HDLC transparent n=3: V.110 n=4: V.120 n=5: X.75 n=8: PPP or MLP (default).
C1=n		This feature is only available when you select PPP or MLP call type (C0=8). Configure maximum throughput by using one B channel or two B channels. n=0: 64 Kbps (one B channel) n=1: 128 Kbps (two B channels)
D <phone number> [<sub-address>] [:<user data>]		Dial an outgoing call. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and ('.'). [','] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9", "a-z" and "A-Z". <user data>: Enter up to 128 printable characters. Note: ATDT, ATDP and ATDW are all same as ATD.
DS=n[:<user data>]		Dial an outgoing call using a pre-stored phone number. n: pre-stored phone number index <user data>: Enter up to 128 printable characters.
DL		Dial the last-dialed number, including the user data.
E		Enable or disable the command echo function.
	E0	Disable the command echo function.
	E1	Enable the command echo function (default).
H		Hang up a call.
I		Display product information.
	I2	Display the model name.
	I3	Display the firmware version.
	I4	Display the hardware version.
	I11	Display the bootcode version.

Table 14 AT Data Command Sets Requiring an "AT" Prefix

COMMAND	OPTION	DESCRIPTION
O		Change from escape mode to data mode. +++ is the escape sequence code that is entered in data state to return the ISDN TA to command state. The TA will accept AT commands only while it is in command state.
Q		Enable or disable result code.
	Q0	Enable result code (default).
	Q1	Disable result code.
S0=n		n=0: Disable the auto answer feature. n=1-255: Enable the auto answer feature to answer a call after it rings for n times.
S1		Display read-only last ringing counting for the current incoming call.
S2=n		Set the monitored 3 continuous characters (ESC-Sequence) to enter command mode. n=0~127, the default is 43, that is "+++".
S3=n		Set the character value as CR. n=0~127, the default is 13.
S4=n		Set the character value as LF. n=0~127, the default is 10.
S5=n		Set the character value as BS (Backspace). n=0~127, the default is 8.
S7=n		The time (in seconds) you wait before connection. n=1-255, the default is 60.
S12=n		Set the "Guard time" for "ESC-Sequence" (in company with "+++"). The unit is 0.1 second. n=0: ignore "Guard time". n=1-255, the default is 10.
S25=n		The DTR transition time. The unit is 0.05 second. n=1-255, the default is 1.
S50=n		Forwarding character in data mode. n=0: no forwarding character (default) n=2: select CR as forwarding character
S51=n		Set how much time the TA is left idle in data mode. The unit is 0.01 second. n=1-255, the default is 2.
S80		Display the read-only cause value of disconnection in the last call.
V		Select result code format.
	V0	Display result code in numeric form.
	V1	Display result code in verbose form (default).
W		Display extended information of "RING" result code.
	W0	No extended information.
	W1	Display phone number of calling site.

Table 14 AT Data Command Sets Requiring an "AT" Prefix

COMMAND	OPTION	DESCRIPTION
	W2	Display user data.
	W3	Display phone number of calling site and user data.
X		Enable/Disable extended result code.
	X0	Basic result code (default).
	X1	Extended result code.
Z		Reload user-defined profile.
&C		DCD signal control.
	&C0	Follow DTR signal.
	&C1	ON only if in communication (default).
&D		DTR (Data Terminal Ready) signal control.
	&D0	Ignore DTR signal, assume DTR is always ON.
	&D1	DTR OFF-ON transition causes dial of an outgoing call using the first pre-stored phone number.
	&D2	DTR OFF causes the modem to hang up (default).
&F		Restore the factory default.
&K		Set flow control mode.
	&K0	Disable flow control.
	&K3	Enable CTS/RTS flow control (default).
	&K4	Enable XON/XOFF flow control.
&S		DSR (Data Set Ready) signal control.
	&S0	Follow DTR signal (default).
	&S1	Follow DCD signal.
&V		Display all data parameters settings.
&W		Save current parameters setting, include &-leading and non-leading parameters, as user defined profile.
%D0=n		Select DTE baud rate when system is powered on. n=8: 9600 bps n=11: 19200 bps n=13: 38400 bps n=16: 57600 bps n=17: 115200 bps (default) n=21: 230400 bps
%D1=n		Select DTE attribute when system is powered on. n=0: 8 data bits, non parity (default) n=1: 7 data bits, even parity n=2: 7 data bits, odd parity
%D2=n		Dial an outgoing data call automatically if there is pre-stored dialing number after system is powered on. n=0: do nothing (default) n=1: auto-dial after power on

Table 14 AT Data Command Sets Requiring an "AT" Prefix

COMMAND	OPTION	DESCRIPTION
%D3=n		The number of retrying to re-dial the outgoing data call once TA failed to establish the data call. n=0: don't re-dial. n=1~10: re-dial for n times until the call is established.
%Id=<phone number> [/<sub-address>]		Create a list of the incoming call phone number via the data port. d=0-4. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and (;). [;] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9", "a-z" and "A-Z".
%M1=n		Enable/Disable PAP to CHAP conversion. n=0: Disable CHAP (default). n=1: Enable CHAP.
%M2=n		Enable/Disable "Dynamic Bandwidth Allocation for Voice Call". n=0: Disable. n=1: Enable (default).
%M3=n		Set threshold of data loading to add one channel, the unit is kbps. n=0-64, the default is 35.
%M4=n		Set a threshold of data loading to drop one channel, the unit is kbps. n=0-64, the default is 25.
%M5=n		Persist time for monitoring threshold to add or drop one channel, the unit is 5 seconds. n=1-255, the default is 24.
%Od=<prefix digits>		Create a list of the outgoing call prefix digits for the data port. d=0-2.
%P0=n		Set incoming call screen mode for the data port. n=0: Accept all incoming calls (default). n=1: Reject all incoming calls. n=2: Only accept the calls from the phone number in the list (see %Id=<phone number> [/<sub-address>]). n=3: Only reject the calls from the phone number in the list (see %Id=<phone number> [/<sub-address>]).
%P1=n		Set outgoing call screen mode for the data port. n=0: No restriction (default). n=1: Prohibit all outgoing calls. n=2: Only accept the calls with the prefix in the pre-defined list (see %Od=<prefix digits>). n=3: Only reject the calls with the prefix in the pre-defined list (see %Od=<prefix digits>).

Table 14 AT Data Command Sets Requiring an "AT" Prefix

COMMAND	OPTION	DESCRIPTION
%P2=n		Select CLIP (Calling Line Identification Presentation) or CLIR (Calling Line Identification Restriction). n=0 indicates you select CLIR and the ISDN switch will not pass your phone number to the destination site. n=1 indicates you select CLIP and the ISDN switch will pass your phone number to the destination site.
%S0=<phone number> [/<sub-address>]		Assign a phone number to the data port. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and (;). [;] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9", "a-z" and "A-Z".
-P0=n		Select transmitting frame size for X.75 n=128-2048 bytes, the default is 254.
-Zd=<phone number> [/<sub-address>]		Set a pre-stored phone number for the data port. d: 0-4 <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and (;). [;] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9", "a-z" and "A-Z".

3.3.2 Command Sets for Analog Ports

The AT command sets for the analog port are shown in the following table.

Table 15 AT Command Sets for the Analog Port

COMMAND	DESCRIPTION
\P0=n	Select CODEC type. Do not change the type until you use the TA in another country. n=0: A-law n=1: μ -law
\P1=n	Select the dialing method for the analog port. n=0 indicates overlap sending, and same system as the traditional telephone (default). n=1 indicates en-block sending, and you must press "#" after the phone number.
\P2=n	Configure the analog port priority. n=0: Both of the analog ports have same priority. n=1: The PHONE 1 port has higher priority. n=2: The PHONE 2 port has higher priority.
\V	Display the settings for all parameters.

Table 15 AT Command Sets for the Analog Port

COMMAND	DESCRIPTION
\Zd=<phone number> [/<sub-address>]	Set a pre-stored phone number for the analog port. d: 0-4 <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and (';'). [';'] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9", "a-z" and "A-Z".
!pA0=n	Set the device type of the analog equipment connected to the analog port. p: enter 1 or 2 to specify the analog port. n=0: indicates a telephone, telephone with caller ID (type 1), G3 fax or modem (default). n=2: indicates a telephone with call waiting caller ID (type 2).
!pA1=n	p: enter 1 or 2 to specify the analog port. n=0: Disable call waiting. n=1: Enable call waiting (default).
!pId=<phone number> [/<sub-address>]	Create a list of the phone numbers for incoming call screening on the analog port. p: enter 1 or 2 to specify the analog port. d=0-4. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and (';'). [';'] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9", "a-z" and "A-Z".
!pOd=<prefix digits>	Create a list of the prefix digits for outgoing call screening on the analog port. p: enter 1 or 2 to specify the analog port. d=0-2
!pP0=n	Set incoming call screen mode for the analog port. p: enter 1 or 2 to specify the analog port. n=0: Accept all incoming calls (default). n=1: Reject all incoming calls. n=2: Only accept the calls from the phone number in the list (see !pId=<phone number> [/<sub-address>]). n=3: Only reject the calls from the phone number in the list (see !pId=<phone number> [/<sub-address>]).
!pP1=n	Set outgoing call screen mode for the analog port. p: enter 1 or 2 to specify the analog port. n=0: No restriction (default). n=1: Prohibit all outgoing calls. n=2: Only accept the calls with the prefix in the pre-defined list (see !pOd=<prefix digits>). n=3: Only reject the calls with the prefix in the pre-defined list (see !pOd=<prefix digits>).
!pP2=n	Select CLIP (Calling Line Identification Presentation) or CLIR (Calling Line Identification Restriction) for the analog port. p: enter 1 or 2 to specify the analog port. n=0 indicates you select CLIR and the ISDN switch will not pass your phone number to the destination site. n=1 indicates you select CLIP and the ISDN switch will pass your phone number to the destination site.

Table 15 AT Command Sets for the Analog Port

COMMAND	DESCRIPTION
!pS=<phone number> [/<sub-address>]	Assign you phone number to the analog port. p: enter 1 or 2 to specify the analog port. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and (';'). [';'] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9", "a-z" and "A-Z".
\$D99	Upgrade firmware.
\$C0?	Display the charge information of the last call. Use \$C0=0 to clear the information.
\$C1?	Display the accumulative charge information of the calls. Use \$C0=1 to clear the information.
\$F99	Reset all parameters to the factory defaults.
\$P5=<country selection code>	Set three-digit country code for caller ID signaling (FSK or DTMF). The default is 216.

3.3.3 Debug Command Sets

The AT command sets for debugging are shown in the following table.

Table 16 Debug Command Sets

COMMAND	DESCRIPTION
#C0	Clear frame logs.
#Dn	Display frame logs or internal task status. n=80: display frame logs. n=82: display C/I code (layer 1 signal) logs.
L6=n	Set the level of frame logs to Q.921. n=0: disable frame logging. n=1: enable signal frame logging. n=2: enable full frame logging.
L8=n	Set the level of frame logs to V.120, X.75. n=0: disable frame logging. n=1: enable signal frame logging. n=2: enable full frame logging.
L13=n	Set the level of frame logs to PPP. n=0: disable frame logging. n=1: enable signal frame logging. n=2: enable full frame logging.

3.4 Configuring Examples with AT Commands

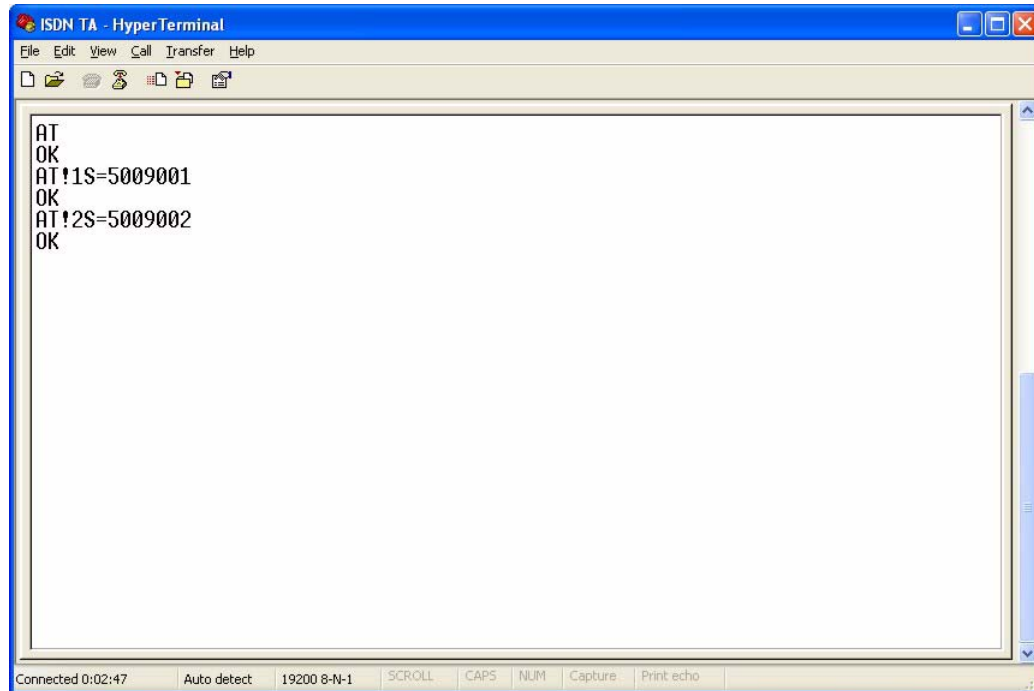
This section shows you some examples of configuring the TA using AT commands.

3.4.1 Phone Number Assignment

Enter `AT!pS=<phone number>` and press [ENTER] to assign the first phone number to the **PHONE 1** port.

Enter `AT!pS=<phone number>` and press [ENTER] to assign the second phone number to the **PHONE 2** port.

Figure 19 AT Command Example 1



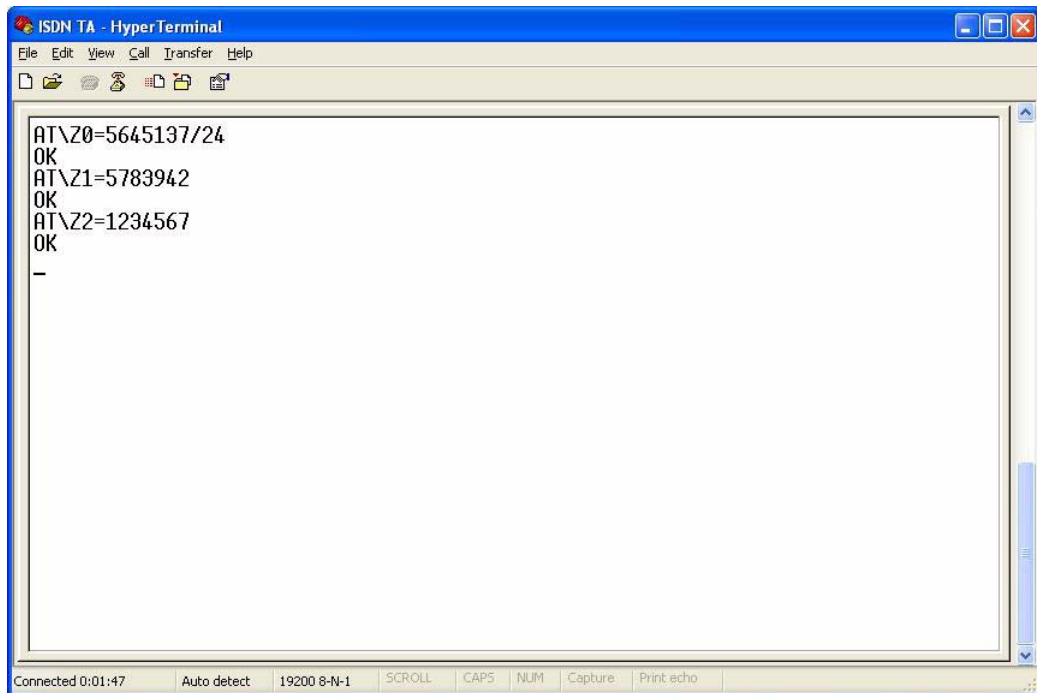
The screenshot shows a HyperTerminal window titled "ISDN TA - HyperTerminal". The window contains the following text:

```
AT
OK
AT!1S=5009001
OK
AT!2S=5009002
OK
```

The status bar at the bottom of the window displays: "Connected 0:02:47", "Auto detect", "19200 8-N-1", "SCROLL", "CAPS", "NUM", "Capture", and "Print echo".

3.4.2 Storing Phone Number

To store a phone number (1234567 for example) on the TA, use the `AT-Zd=<phone number> [/<sub-address>]` command for data calls and the `AT\Zd=<phone number> [/<sub-address>]` command for voice calls.

Figure 20 AT Command Example 2

3.4.3 Setting Ports Priority

To set the same priority for both ports, enter `AT\P2=0` and press [ENTER].

To set the **PHONE 1** port to have the first priority, enter `AT\P2=1` and press [ENTER].

To set the **PHONE 2** port to have the first priority, enter `AT\P2=2` and press [ENTER].

3.4.4 Disabling Call Waiting

A call waiting tone will interfere with data communication. It is highly recommended that you disable the call waiting feature on the port to which a fax or modem is connected.

To disable call waiting on either port, enter `AT!1A1=0` or `AT!2A1=0` and press [ENTER].

3.4.5 Link Authentication

Refer to [Section 2.5.1 on page 32](#) for more information.

Table 17 PPP AT commands

AT COMMANDS	DESCRIPTION
<code>AT%M1=0</code>	Disable PAP to CHAP conversion (default).
<code>AT%M1=1</code>	Enable PAP to CHAP conversion.

3.4.6 Call Bumping (Bandwidth Release) for Voice Calls

Refer to [Section 2.5.2 on page 34](#) for more information.

Table 18 Call Bumping AT commands

AT COMMANDS	DESCRIPTION
AT%M2=0	Disable bandwidth release for voice calls.
AT%M2=1	Enable bandwidth release for voice calls (default).

3.4.7 Bandwidth On Demand (BOD)

Refer to [Section 2.5.3 on page 34](#) for more information.

Table 19 BOD AT commands

AT COMMANDS	DESCRIPTION
AT%M3=n	n= 0-64 (Kbps), the default is 35. Set the maximum threshold. The TA adds the second B-channel when traffic is above the threshold.
AT%M4=n	n= 0-64 (Kbps), the default is 25. Set the minimum threshold. The TA drops the second B-channel when traffic is below the threshold.
AT%M5=n	n= 1-255. The unit is 5-second. The default is 24, that is, 2 minutes. Set the time interval between calculating traffic load.

Note: The high threshold must be greater than the low threshold, otherwise, both of them will be reset to the defaults as shown in the table.

If you set %M2=1, %M3=0, %M4=0 and %M5=1, the BOD function will be disabled and the TA establishes fixed multilink PPP data call with both two B-channels and release bandwidth for voice calls.

3.4.8 Incoming Call Screening

Use this function to set restrictions on incoming calls. Refer to [Section 3.4.8 on page 64](#) for more information.

3.4.8.1 Data Call

Use AT%Id=<phone number> [/<sub-address>] to configure a list of incoming call phone numbers (with sub-addresses), then use AT%P0=n to reject or accept the calls with the phone number in the list.

3.4.8.2 Voice Call

Use `AT!pId=<phone number> [/<sub-address>]` to configure a list of incoming call phone numbers (with sub-addresses), then use `AT!pP0=n` to reject or accept the calls with the phone number in the list.

3.4.9 Outgoing Call Screening

Use this function to set restrictions on outgoing calls, such as allowing or prohibiting a long-distance or international call. Refer to [Section 3.4.9 on page 65](#) for more information.

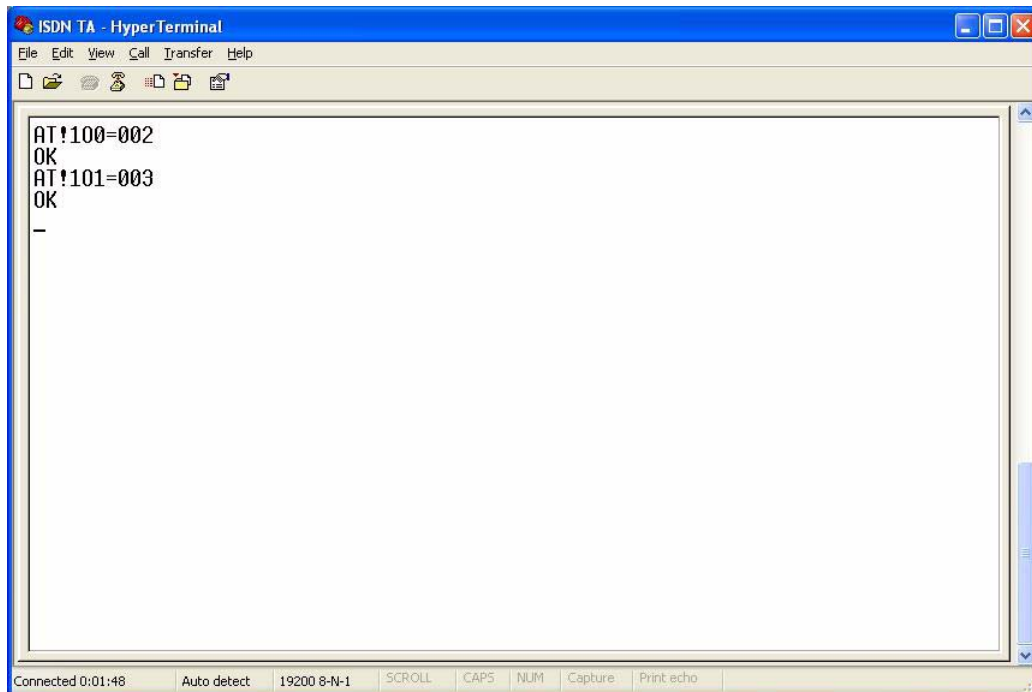
3.4.9.1 Data Call

Use `AT%Od=<prefix digits>` to configure a list of prefix digits for outgoing calls, then use `AT%P1=n` to prohibit or allow the calls with the prefix digits in the list.

3.4.9.2 Voice Call

Use `AT!pOd=<prefix digits>` to configure a list of prefix digits for outgoing calls, then use `AT!pP0=n` to prohibit or allow the calls with the prefix digits in the list.

Figure 21 AT Command Example 3



The screenshot shows a HyperTerminal window titled "ISDN TA - HyperTerminal". The window contains the following text:

```
AT!100=002
OK
AT!101=003
OK
-
```

The status bar at the bottom of the window displays: "Connected 0:01:48", "Auto detect", "19200 8-N-1", "SCROLL", "CAPS", "NUM", "Capture", and "Print echo".

3.4.10 Caller ID

Use `AT!pA0=n` to select the device type to enable call waiting caller ID when you have a call (see [Section 3.4.10 on page 65](#) for more information).

3.5 Result Codes

A result code is the command response or the connect message to the computer connected to the TA. The format of the result code is dependent on X_n and V_n commands. The result codes are shown in the following table.

Table 20 Result Codes

NUMERIC FORM	VERBOSE FORM	BASIC (X0)	EXTENDED (X1)
0	OK	V	V
1	CONNECT	V	
2	RING	V	V
3	NO CARRIER	V	V
4	ERROR	V	V
18	CONNECT 9.6K		V
21	CONNECT 19.2K		V
23	CONNECT 38.4K		V
26	CONNECT 57.6K		V
27	CONNECT 115.2K		V
31	CONNECT 230.4K		V
33	CONNECT 64K		V
34	CONNECT 128K		V

CHAPTER 4

Using Tone Commands

You can also use a telephone keypad to configure the TA using tone commands.

4.1 How to Use Tone Commands with a Telephone Keypad

- 1 Make sure your TA hardware is properly connected (refer to the Quick Start Guide).
- 2 Pick up the receiver of the telephone which is connected to the **PHONE 1/2** port.
- 3 Issue the *** tone command by dialing the asterisk (*) key three times. You will then hear a configuration tone (refer to [Table 21 on page 68](#) for more information).
- 4 You can now use the tone command(s) to configure the TA. If the command is valid, you will hear a configuration confirmation tone. If the command is not valid, the TA rejects it and generates a busy tone. Hang up the phone and repeat steps 2 and 3 to issue the command(s) again.

4.1.1 Tone and Ring Patterns

The following table describes the tones and ring patterns.

Table 21 Tone and Ring Patterns

TONE	RING PATTERN
Dial Tone	Depend on your ISDN provider.
Local Dial Tone	Listing on.
Busy Tone	0.5 Sec On, 0.5 Sec Off, Repeat.
Call Waiting Tone	0.125 Sec On, 0.125 Sec Off, 0.125 Sec On, 0.625 Sec Off, Repeat.
Configuration Tone	0.125 Sec On, 0.125 Sec Off, Repeat
Configuration Confirm Tone	1.5 Sec On, 0.5 Sec Off, Repeat
Sub Command Tone	0.125 Sec On, 0.125 Sec Off, Repeat
Normal Ring Patter	1 Sec On, 2 Sec Off, Repeat This ring pattern varies depending on the country code you select (see Table 9 on page 44).
Remind Ring	0.5 Sec On, 0.5 Sec Off, Repeat

4.2 Tone Commands

The tone command sets are shown in the following table. Refer to the corresponding AT commands in [Chapter 5 on page 72](#) for more information.

Table 22 Tone Commands

STONE COMMAND	AT COMMAND	DESCRIPTION
991*99#	\$F99	Reset all parameters to the factory defaults.
015*<country code>#	\$P5	Set three-digit country code for caller ID signaling (FSK or DTMF). The default is 216.
120*n#	\P0	Select CODEC type. Do not change the type until you use the TA in another country. n=0: A-law n=1: μ -law
121*n#	\P1	Select the dialing method for the analog port. n=0 indicates overlap sending, and same system as the traditional telephone (default). n=1 indicates en-block sending, and you must press “#” after the phone number.
122*n#	\P2	Configure the analog port priority. n=0: Both of the analog ports have same priority. n=1: The PHONE 1 port has higher priority. n=2: The PHONE 2 port has higher priority.
13d*<phone number> [<i>*<sub-address></i>]#	\Zd	Set a pre-stored phone number for the analog port. d=0-4: phone number index. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and ('.'). [','] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from “0-9,” a-z” and “A-Z”.
210*n#	!pA0	n=0: Disable the Type 2 caller ID service on the current analog port. n=2: Enable the Type 2 caller ID service on the current analog port.
211*n#	!pA1	n=0: Disable call waiting. n=1: Enable call waiting (default).
220*n#	!pP0	Set incoming call screen mode for the analog port. n=0: Accept all incoming calls (default). n=1: Reject all incoming calls. n=2: Only accept the calls from the phone number in the list (see 32d*<phone number> [<i>*<sub-address></i>]#). n=3: Only reject the calls from the phone number in the list (see 32d*<phone number> [<i>*<sub-address></i>]#).

Table 22 Tone Commands

TONE COMMAND	AT COMMAND	DESCRIPTION
221*n#	!pP1	Set outgoing call screen mode for the analog port. n=0: No restriction (default). n=1: Prohibit all outgoing calls. n=2: Only accept the calls with the prefix in the pre-defined list (see 35d*<prefix digits>#). n=3: Only reject the calls with the prefix in the pre-defined list (see 35d*<prefix digits>#).
222*n#	!pP2	Select CLIP (Calling Line Identification Presentation) or CLIR (Calling Line Identification Restriction) for the analog port. n=0 indicates you select CLIR and the ISDN switch will not pass your phone number to the destination site. n=1 indicates you select CLIP and the ISDN switch will pass your phone number to the destination site.
310*<phone number> [*<sub-address>]#	!pS	Assign your phone number to the analog port. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and ('.'). [','] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9," a-z" and "A-Z".
32d*<phone number> [*<sub-address>]#	!pId	Create a list of the incoming call phone number via the analog port. d=0-4: phone number index. <phone number>: Enter up to 32 characters, including digits from 0 to 9, *, #, hyphen (-), comma (,) and ('.'). [','] will be ignored. <sub-address>: Enter up to 20 ASCII characters ranging from "0-9," a-z" and "A-Z".
35d*<prefix digits> #	!pOd	Create a list of the outgoing call prefix digits via the analog port. d=0-2

4.3 Configuring Example with Tone Commands

This section shows you some examples of configuring the TA using Tone commands. Refer to [Chapter 2 on page 24](#) for more information about these TA features.

4.3.1 Phone Number Assignment

Use the `***310*<phone number>[*<sub-address>]#` tone command to assign a phone number to the **PHONE** port to which the telephone is attached. For example, dial `***130*5009001#` to assign 5009001 to the analog port.

4.3.2 Storing Phone Number

To store a phone number on the TA, use the `13d*<phone number> [*<sub-address>]#` command for voice calls. For example, dial `***130*1234567#` to store 1234567 on the TA. The phone number index is 0. See [Section 2.12.1 on page 46](#) on how to place a voice call.

4.3.3 Setting Ports Priority

To set the same priority for both two ports, use the `***122*0#` command.

To set the **PHONE 1** port to have the first priority, use the `***122*1#` command.

To set the **PHONE 2** port to have the first priority, use the `***122*2#` command.

4.3.4 Disabling Call Waiting

To disable call waiting on either port, use the `***211*0#` command.

4.3.5 Incoming Call Screening

Use this function to set restrictions on incoming calls.

4.3.5.1 Voice Call

Use `32d*<phone number> [*<sub-address>]#` to configure a list of incoming call phone numbers (with sub-addresses), `***320*1234567#` for example, then use `220*n#` to reject or accept the calls with the phone number in the list.

4.3.6 Outgoing Call Screening

Use this function to set restrictions on outgoing calls, such as allowing or prohibiting a long-distance or international call.

4.3.6.1 Voice Call

Use `35d*<prefix digits>#` to configure a list of prefix digits for outgoing call, `***350*080#` for example, then use `221*n#` to prohibit or allow the calls with the prefix digits in the list.

4.3.7 Caller ID

Use `210*n#` to select the device type to enable call waiting caller ID when you have a call (see [Section 3.4.10 on page 65](#) for more information).

CHAPTER 5

Firmware Upgrade

You can upgrade TA firmware using the utility or by terminal emulation program such as HyperTerminal in Windows. To obtain the latest firmware version, please go to ZyXEL's website at <http://www.zyxel.com>. Only use firmware for your TA's specific model.

5.1 Upgrading Using the Utility

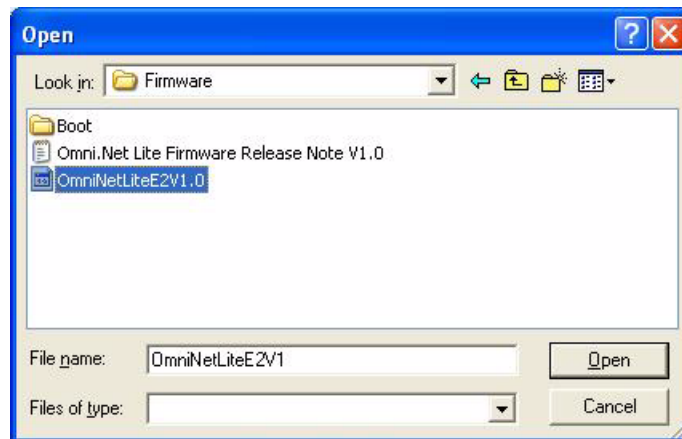
- 1 Follow the steps in [Section 2.1 on page 24](#) to open the utility.
- 2 Click the **Upgrade** icon on the navigation panel.

Figure 22 Utility: Navigation Panel



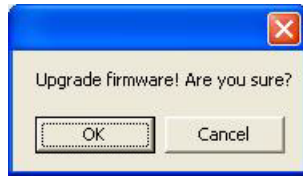
- 3 When the **Open** screen displays, browse to find the file you want to upload and click **Open**.

Figure 23 Utility Firmware Upgrade: Open a File



- 4 A window display asking you to confirm that you want to upload firmware. Click **OK**.

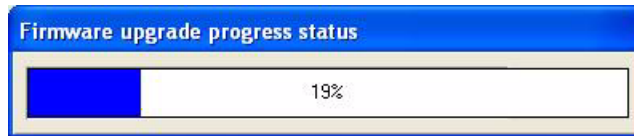
Figure 24 Utility Firmware Upgrade: Confirm



5 The following screen displays while firmware upload is in progress.

Note: Do not interrupt the file transfer process as this may PERMANENTLY DAMAGE your TA.

Figure 25 Utility Firmware Upgrade: In Progress



6 After a successful upload, the system will reboot.

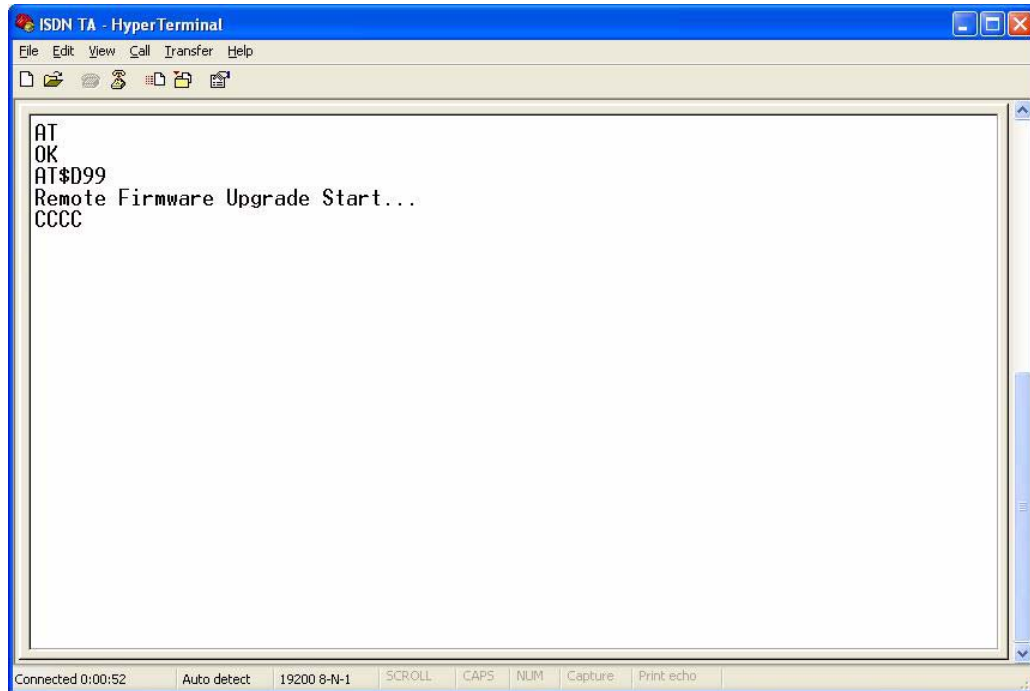
Figure 26 Utility Firmware Upgrade: Restart



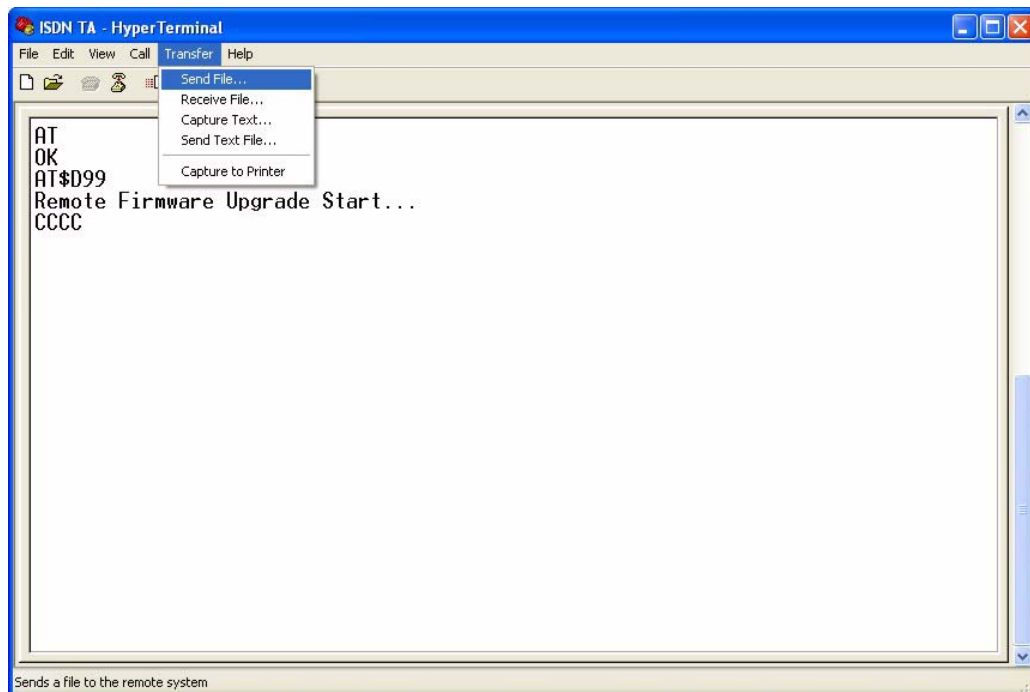
5.2 Upgrading Using HyperTerminal Example

1 Follow the steps in [Section 3.1 on page 52](#) to start HyperTerminal in Windows.

- 2 Type `AT$D99` and press `[ENTER]`. A message “Remote Firmware Upgrade Start...” shows in the next screen.



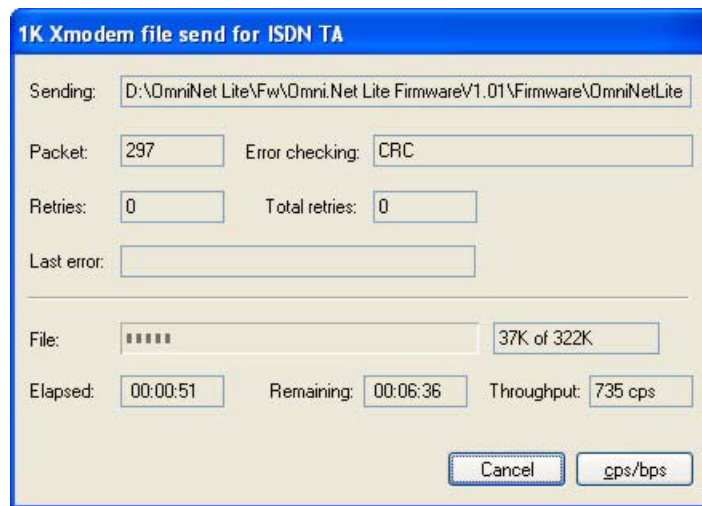
- 3 Be sure you have the new firmware file on hand. You must decompress compressed (.zip) files before you can upload them.
- 4 Click **Transfer**, then **Send File** to display the **Send File** screen.



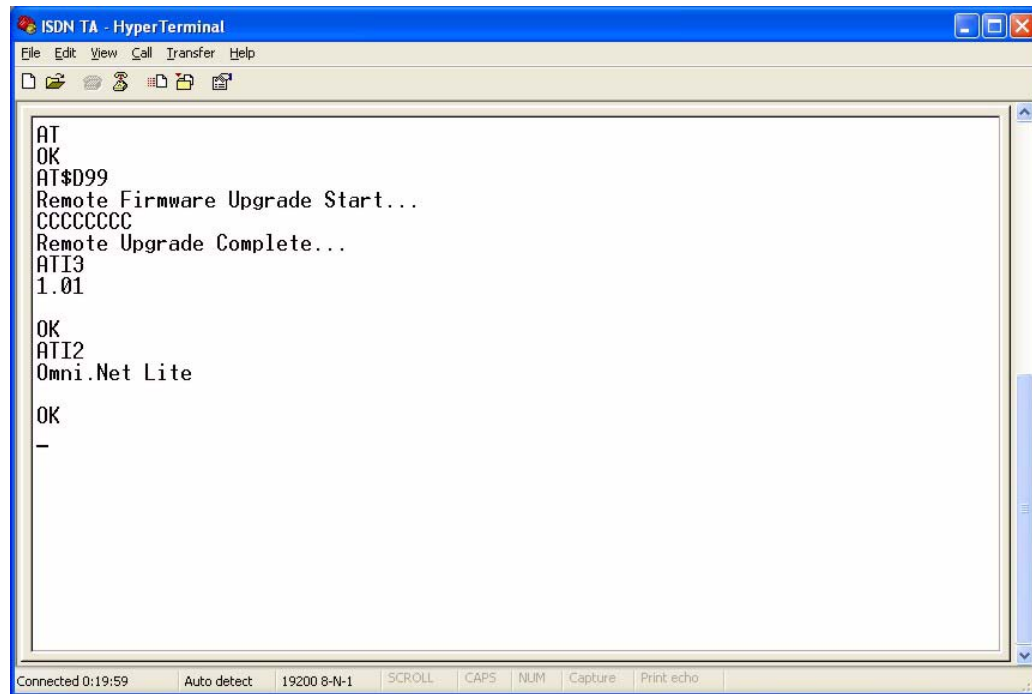
- 5 Choose the **1K Xmodem** protocol. Type the firmware file's location, or click **Browse** to search for it. Then click **Send**.



- 6 Firmware upload is in progress; do not turn off the TA or disconnect the RS-232 cable.



- 7 After the firmware upload process has completed, the TA automatically restarts. You can check your new firmware version by using the AT+I3 command.



The screenshot shows a HyperTerminal window titled "ISDN TA - HyperTerminal". The window contains the following text:

```
AT
OK
AT+D99
Remote Firmware Upgrade Start...
CCCCCCCC
Remote Upgrade Complete...
+I3
1.01

OK
+I2
Omni.Net Lite

OK
-
```

The status bar at the bottom of the window displays: "Connected 0:19:59", "Auto detect", "19200 8-N-1", "SCROLL", "CAPS", "NUM", "Capture", and "Print echo".

CHAPTER 6

Troubleshooting

This chapter covers potential problems and possible remedies. After each problem description, some instructions are provided to help you to diagnose and to solve the problem. Please see our included disk for further information.

Table 23 Troubleshooting

PROBLEM	CORRECTIVE ACTION
None of the LEDs are on.	<p>Make sure the TA's power adaptor is connected to the TA and an appropriate power source. Check that the TA and the power source are both turned on.</p> <p>Make sure your computer or terminal is turned on.</p> <p>Check all cable connections.</p> <p>Turn the TA off and on. If the error persists, you may have a hardware problem. In this case, you should contact your local vendor</p>
I cannot connect to the Internet.	<p>Click Start, Control Panel, double-click Phone and Modem Options (or Modems). If Omni.Net Lite TA is not present, install the driver.</p> <p>Make sure you entered the correct phone number, user name and password.</p> <p>Make sure the ISDN port is properly connected to the ISDN wall jack with a RJ-45 cable.</p> <p>Connect a phone into the PHONE 1 or PHONE 2 port and see if you get a dial tone.</p> <p>Carefully follow the instructions to uninstall and reinstall the software driver.</p> <p>Restart your computer</p>
Windows does not auto-detect the RS-232 connection to the TA.	<p>Make sure the TA is turned on and connected to a serial port on the computer.</p> <p>Perform a hardware scan by clicking Start, Settings, Control Panel and double-clicking Add/Remove Hardware. (Steps may vary depending on the version of Windows). Follow the on-screen instructions to search for the modem and install the driver.</p> <p>Check for possible hardware conflicts. In Windows, click Start, Settings, Control Panel, System, Hardware and then click Device Manager. Verify the status of the modem under Network Adapters. (Steps may vary depending on your version of Windows).</p> <p>Connect the TA to another computer. If the error persists, you may have a hardware problem. In this case, you should contact your local vendor.</p>
I need two B-channels for Internet access, but only one B-channel is active.	<p>By default, the TA uses dynamic 128K MLP.</p> <p>Use the utility to enable fixed MP to have the TA always transmit data at 128 Kbps or configure the minimum and maximum thresholds for adding or adding the second B-channel according to traffic load (see Section 2.5 on page 32).</p>
The TA does not release bandwidth for incoming voice calls.	<p>Make sure you have subscribed to the call waiting service first.</p> <p>Check if the call bumping feature is activated.</p>

Index

Numerics

110V AC [4](#)
230V AC [4](#)

A

AC [4](#)
Accessories [4](#)
Airflow [4](#)
American Wire Gauge [4](#)
AT Commands [55](#)
AT Commands Overview [52](#)
AWG [4](#)

B

BACP [29](#)
BACP and BAP [29](#)
Bandwidth On Demand [19](#), [34](#)
Bandwidth On Demand (BOD) [64](#)
Bandwidth Release [34](#), [64](#)
BAP [29](#)
Basement [4](#)
Basic Rate Interface [18](#)
BOD [34](#), [64](#)
BRI [18](#)
busy tone [68](#)

C

Cables, Connecting [4](#)
Call Bumping [18](#), [34](#), [64](#)
Call Forwarding [19](#)
Call Hold [48](#)
Call Transfer [19](#), [50](#)
Call Waiting [19](#), [46](#), [49](#)
Caller ID [44](#)

Caller Identification [44](#)
Calling Line Identity Presentation [46](#)
Calling Line Identity Restriction [46](#)
Challenge Handshake Authentication Protocol [32](#)
CHAP [32](#)
Charge Information [42](#)
Clear to Send [21](#)
CLIP [46](#)
CLIR [46](#)
configuration confirmation tone [68](#)
Configuration Methods [21](#)
configuration tone [68](#)
Connecting Cables [4](#)
Copyright [2](#)
Corrosive Liquids [4](#)
Country Code [27](#)
Covers [4](#)
CTS [21](#)
CTS/RTS Handshake [36](#)
Customer Support [6](#)

D

Damage [4](#)
Dampness [4](#)
Danger [4](#)
Data Carrier Detect [38](#)
Data Set Ready [21](#)
Data Terminal Equipment [21](#)
Data Terminal Ready [21](#)
DCD [38](#)
Denmark, Contact Information [6](#)
Device Type [46](#)
Dialing Method [45](#)
Directory Number [28](#)
Disabling Call Waiting [49](#)
DN [28](#)
DSR [21](#), [38](#)
DTE [21](#)
DTMF [44](#)
DTR [21](#), [38](#), [57](#)
Dust [4](#)

E

Electric Shock [4](#)
Electrical Pipes [4](#)
Electrocution [4](#)
En-Bloc Sending [45](#)
Europe [4](#)
Exposure [4](#)

F

FCC [3](#)
Finland, Contact Information [6](#)
Firmware Upgrade [19](#), [72](#)
Flow Control [36](#)
France, Contact Information [6](#)
FSK [44](#)

G

Gas Pipes [4](#)
Germany, Contact Information [6](#)
getting started [18](#)

H

hardware connections [20](#)
Hardware Flow Control [36](#)
HDLC [30](#)
High Voltage Points [4](#)
High-Level Data Link Control [30](#)
How to Use Tone Commands with a Telephone Keypad
[68](#)
HyperTerminal [72](#)
Hyperterminal [52](#)

I

Incoming Call Screening [38](#), [64](#)
Incoming Voice Call Scenarios [47](#)
Intercom [47](#)
Introduction to PPP [28](#)

ISDN Interfaces [19](#)
ISDN Protocols [30](#)

L

Lightning [4](#)
Link Authentication [32](#)
Liquids, Corrosive [4](#)

M

MLP [18](#), [29](#)
MLPPP [18](#)
MP [18](#), [29](#)
MSN [43](#), [47](#)
Multilink PPP [29](#)
Multiple Subscriber Number [43](#)

N

North America [4](#)
North America Contact Information [6](#)
Norway, Contact Information [6](#)
NT-1 [19](#)

O

Off-hook Caller ID Transmission [44](#)
On-hook Caller ID Transmission [44](#)
Opening [4](#)
Outgoing Call Screening [39](#), [65](#)
Overlap Sending [45](#)

P

PAP [32](#)
PAP and CHAP Security [19](#)
Password Authentication Protocol [32](#)
Phone Number Assignment [62](#)
Phone Number Assignment Example [43](#)

Pipes [4](#)
Point-To-Point Protocol [28](#)
Pool [4](#)
Ports Priority [46](#), [47](#), [63](#)
Power Adaptor [4](#)
Power Cord [4](#)
Power Outlet [4](#)
Power Supply [4](#)
Power Supply, repair [4](#)
PPP [28](#)
PPP Multilink [18](#)
PPP/MLP [30](#)
Pre-stored Numbers [40](#)

Q

Qualified Service Personnel [4](#)
Quick Start Guide [16](#), [20](#), [24](#), [52](#), [68](#)

R

Regular Mail [6](#)
Related Documentation [16](#)
Removing [4](#)
Repair [4](#)
Request to Send [21](#)
Result Codes [57](#), [66](#)
Risk [4](#)
Risks [4](#)
RTS [21](#)
RTS Threshold [36](#)
RTS/CTS [36](#)

S

S/T interface [19](#)
Service [4](#), [5](#)
Service Personnel [4](#)
Shock, Electric [4](#)
Software Flow Control [36](#)
Spain, Contact Information [6](#)
Storing Phone Number [62](#)
Subaddress [43](#)
Supplementary Services [19](#), [46](#), [47](#)

Supplementary Voice Features [19](#)
Supply Voltage [4](#)
support CD [16](#)
Support E-mail [6](#)
Sweden, Contact Information [6](#)
Swimming Pool [4](#)
Switch Type [19](#)
syntax conventions [16](#)
System [27](#)

T

Telecommunication Line Cord. [4](#)
Telephone [6](#)
The Flash Key [48](#)
Three-Way Conference [51](#)
Thunderstorm [4](#)
Tone and Ring Patterns [68](#)
Tone Commands [69](#)

U

U interface [20](#)
Using the Utility [24](#)

V

V.110 [30](#)
V.24 Signal [36](#)
Vendor [4](#)
Ventilation Slots [4](#)
Voltage Supply [4](#)
Voltage, High [4](#)

W

Wall Mount [4](#)
Warnings [4](#)
Water [4](#)
Water Pipes [4](#)
Web Site [6](#)
Wet Basement [4](#)

Worldwide Contact Information [6](#)

X

X.75 [30](#)

XON/XOFF [36](#)

Z

ZyXEL Limited Warranty
Note [5](#)