

ELSA TanGo 1000

User Manual



Data Communications
Computer Graphics

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Preface

Thank you for your confidence in our product!

With *ELSA TanGo 1000*, you have purchased an ISDN terminal adapter which will permit you to take advantage of modern ISDN technology. The highest quality standards in manufacturing and stringent quality control are the basis for high product standards and consistent product quality.

About this manual

This manual will inform you about all aspects of your ELSA ISDN terminal adapter. It will guide you through the installation of the included software. In addition, it will provide a brief overview of the AT command set.

Amendments to this manual

ELSA products are characterized by ongoing further development. It is therefore possible that the information printed in this manual is not current in all points. Please refer to the README files (HTML format) on the *ELSA TanGo 1000* CD for current information regarding modifications.



HELP

If you have questions to the topics covered in this manual or require additional help, our online media (Internet server, newsgroups, ELSA LocalWeb dial-up web site and the CompuServe forum GO ELSA) are at your disposal around the clock. The complete scope of support and services provided by ELSA can be found in the chapter "Advice and assistance".

The online manual

The manual, and the complete AT command set can be found on the included CD. A browser (e.g. Netscape Navigator or Microsoft® Internet Explorer) is required for reading and printing HTML files. The ACROBAT Reader program is required to read and print PDF files. It can also be found on the *ELSA TanGo 1000*-CD and may be installed using the CD-Setup program.

The ELSA Homepage on the Internet

The ELSA Homepage is a service for our customers and persons interested in ELSA products (ISDN, modems, graphics boards and monitors). The ELSA Homepage provides continuously updated product information about your *ELSA TanGo 1000* and other ELSA products. You can also find answers to "frequently asked questions" (FAQs) and a wealth of tips and tricks, as well as selected links to other WWW pages. What's more, our page provides access to selected search engines.

How to set the Elsa Homepage as your default home page:

You can reach the ELSA Homepage immediately after establishing your connection to the Internet. In the following, we will describe how to reach the ELSA Homepage automatically at each startup using Netscape Navigator or Microsoft® Internet Explorer:

Netscape Navigator:

- ① Start the Netscape Navigator, and select **Options ► General Preferences ► Appearance**.
- ② Under **Start with:** enter the ELSA Homepage **<http://www.elsa.com>**.
- ③ Next, select **Home Page Location:**, and confirm the selection with **OK**.

Microsoft Internet Explorer

- ① Start the Microsoft® Internet Explorer, and select **View ► Options ► Navigation**.
- ② Under **Address**, enter the ELSA Homepage **<http://www.elsa.com>** and confirm with **OK**.

You will now automatically go to the ELSA Homepage every time you start your browser.

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1 Introduction

1.1 Brief Description and Characteristics

The *ELSA TanGo 1000* is a desktop terminal adapter of the ELSA ISDN product family, designed to connect your PC to an ISDN basic point-to-multipoint connection, ISDN-point-to-point connection or to a private branch exchange (PBX system) with an S₀ connection. *ELSA TanGo 1000* provides you all of the advantages of modern ISDN technology such as the swift establishment of connections and high transfer rates. The hardware installation is fast and user-friendly thanks to Plug & Play support (see Installation Guide).

The following is an outline of the essential features of the ISDN terminal adapter to provide a quick overview of its performance:

Transmission modes

The *ELSA TanGo 1000* supports the following transmission modes and speeds:

V.120 *ELSA TanGo 1000* supports the ITU-T recommendation V.120 (I.465) with 56,000 and 64,000 bps. Error-corrected asynchronous connections with effective transfer rates of up to 76,800 bps, as well as ISDN connections to subscribers in the USA are thus possible.

X.75 In addition, the *ELSA TanGo 1000* also supports X.75/T.70NL connections to ISDN PC boards with FOSSIL drivers.

HDLCP Internet providers can be reached using PPP protocol.

PPP implementation

The implementation of the point-to-point protocol permits the use of asynchronous PPP software on the computer in conjunction with synchronous PPP ISDN connections (e.g. routers). The conversion is effected as per RFC 1662.

Automatic protocol detection

Depending on its configuration, the terminal adapter supports automatic detection of the X.75, V.120 and HDLCP protocols for incoming and outgoing connections.

Automatic detection of 56,000 and 64,000 bps

If an incoming connection with 56,000 bps is indicated in the D channel (e.g. from the USA), the X.75 and V.120 protocols automatically switch to 56,000 bps.

D channel protocols

With the command **AT\$IDP** it is possible to switch between the DSS1 protocol (Euro-ISDN) and the 1TR6 protocol (German national ISDN). The DSS1 protocol is the default selection.

Terminal selection digits and MSNs

The ISDN terminal adapter supports the setting and querying of terminal selection digits and multiple subscriber numbers (MSN).

Delayed call answering

This function permits the delayed answering of incoming calls. This can be useful, for example, if several terminal adapters with the same terminal selection digit or MSN setting are attached to the same ISDN-S₀ connection.

Dial number lock

The terminal adapter can be locked for outgoing calls with specific dial numbers using the command **AT\$INCB**. A connection will not be established if the first digits of the number dialed correspond to the locked number (maximum of 5 digits).

User groups

The verification of the caller IDs of incoming calls permits the creation of closed user groups to protect the system against unauthorized access.

Additional information

In addition, the caller ID of the remote station can also be displayed before the connection is established. The connection charges can be reviewed during and after the connection. Information pertaining to the establishment of the connection can also be returned (e.g. ALERTING).

Status displays

LED displays with two colors at the front of the ISDN terminal adapter permit the monitoring of the ISDN connection and the line to facilitate troubleshooting of possible system faults.

ELSA-RVS-COM

With the included *ELSA-RVS-COM* software package, the *ELSA TanGo 1000* ready for immediate use with high performance components such as Group 3 fax, answering device and telephone functions.

Flash ROM technology

Firmware updates can be performed quickly and easily using flash ROM technology. This provides a convenient way to equip your unit with future functions.

Scope of Delivery

Please ensure that the delivery is complete before beginning with the installation of your ISDN terminal adapter. If anything should be missing, please contact your dealer:

- *ELSA TanGo 1000*
- AC adapter

- ISDN S₀ connector cable
- serial connector cable
- 9 pin/25 pin adapter
- CD-ROM with installation software and additional utilities
- documentation: Installation Guide and manual

2 Software Installation

After connecting the *ELSA TanGo 1000* to your computer in accordance with the Installation Guide, proceed with the software installation.

This chapter will provide information for the installation of the included software. A CD-ROM with software is provided as standard with the *ELSA TanGo 1000* terminal adapter. All of the utilities in described in this manual may be found on the CD.

System requirements

The following minimum requirements must be fulfilled for the use of the ISDN terminal adapter with *ELSA-RVS-COM* and *ELSA ZOC*:

- Computer: ELSA terminal adapters are designed for use with 486 or Pentium PCs.
- RAM: a minimum of 16 MB. To ensure secure operation, 32 MB or more are recommended.
- Hard disk space: a minimum of 25 MB prior to installation. A minimum of 12 MB hard disk space should be available on the hard disk during operation as virtual memory (swap file).
- Operating system: Microsoft Windows 95 or Windows NT 4.0
- Graphics board: VGA (640x480 pixels, 16 colors or shades of gray) or better.

The Microsoft Windows 95 or Windows NT 4.0 Inbox is required for the use of the fax and voice recording functions.

2.1 Installation ***ELSA-RVS-COM***

ELSA-RVS-COM for Windows 95 and Windows NT 4.0 is a powerful, universal communications program which provides you with the most important data communications applications in a convenient, easy-to-use package.

***ELSA-RVS-COM* provides the following functions:**

Fax

- Group 3 fax (analog)
- Fax operation at speeds of up to 14,400 bps
- Fax transmission from Windows applications via a Windows printer driver
- Fax operation via MS Exchange (Windows 95 only)

ISDN

- Terminal operation
- Internet access via Windows 95 and Windows NT 4.0 Dial-Up Networking
- Access to BBSs or online services

Telephone answering device

- Telephone answering device functions in conjunction with a sound board

Telephony functions

- Telephony functions when using a full-duplex audio board, including microphone and speakers

2.1.1 Installation Under Windows 95 or Windows NT 4.0

To install *ELSA-RVS-COM* on your computer under Windows 95 or Windows NT 4.0, proceed as follows:

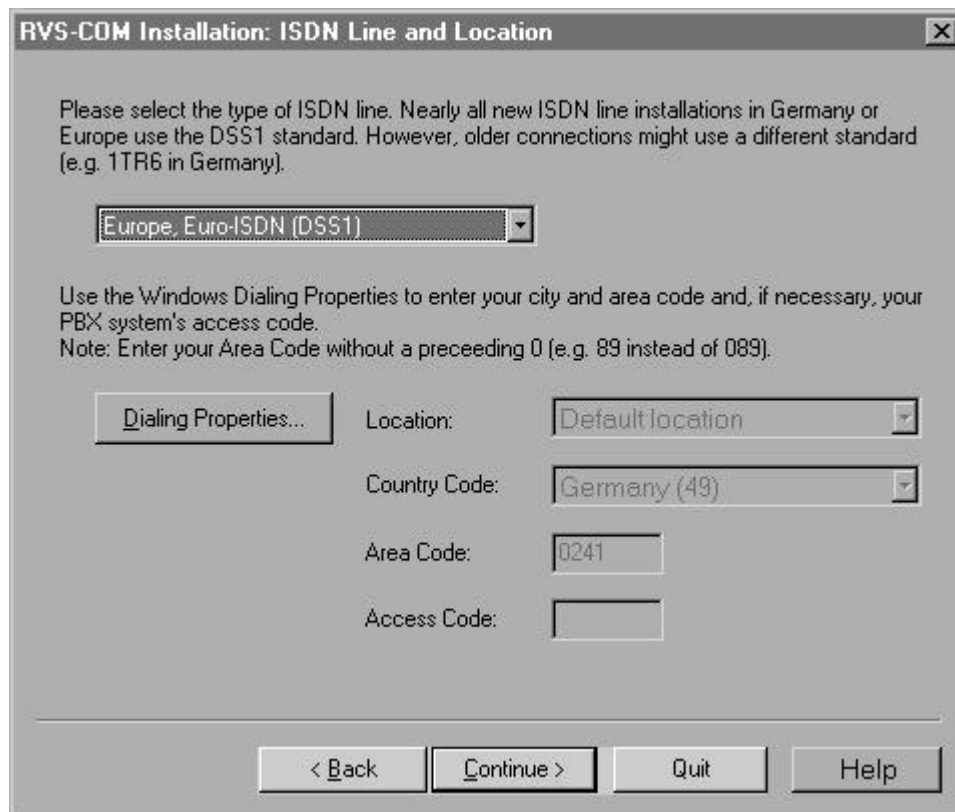
- ① Boot Windows 95 or Windows NT 4.0. When installing under Windows NT, ensure beforehand that you have administrative privileges.
- ② Insert the *ELSA TanGo 1000*-CD in your CD drive (e.g. D:). The CD-Setup will start automatically.
- ③ Under **Selection:** in the **ELSA CD-Setup**, select **ELSA-RVS-COM** in the list and click **OK** to start the setup program. The "RVS-COM" dialog box will appear.
- ④ In the field **KEY**, enter the serial number for *ELSA-RVS-COM* which can be found on the enclosed serial number sticker (please ensure that the number is entered correctly: upper case, etc.), and click the **Continue** button. The welcome screen appears.
- ⑤ Please read the following notes and click the **Continue** button. Please read the license agreement and confirm your agreement by clicking the **Yes** button. When installing under Windows NT 4.0, acknowledge the Windows NT information with the button. The "Installation Directory" dialog box will appear.
- ⑥ Accept the suggested installation directory or click on **Browse**, and enter the name and path of the directory that you would like to use for the installation. Click on the **Continue** button. The "Program Folder" dialog box will appear.
- ⑦ Use the **Continue** button to confirm the creation of the **ELSA-RVS-COM** program folder. The "Start Installation" dialog box will appear.
- ⑧ Click on the **Continue** button to start the installation. The files will now be copied to your hard disk. The "Setup Complete" dialog box is displayed after the successful installation.
- ⑨ Click on **Exit** to start the Installation Wizard. The Installation Wizard will guide you through the configuration of the various *ELSA-RVS-COM* components and will prompt you for the necessary information.



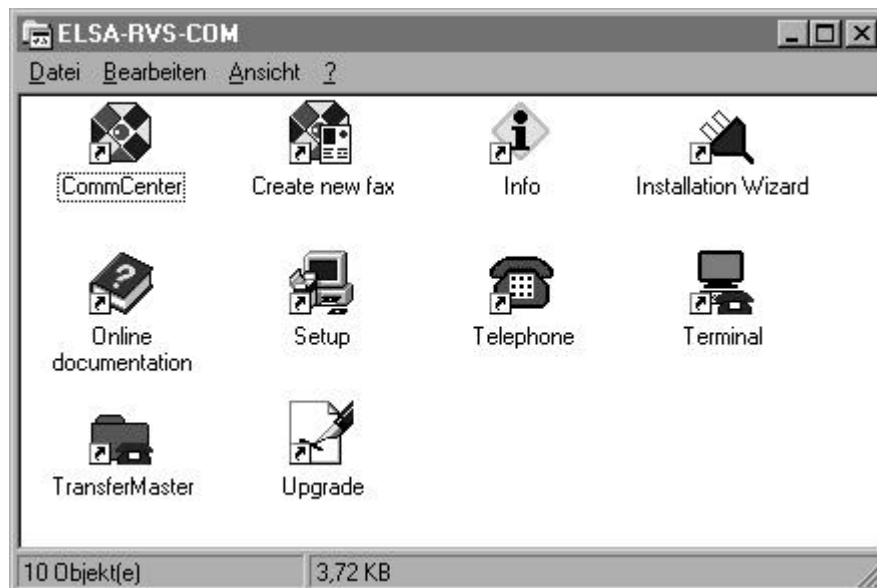
NOTE for Windows 95 users

If the Microsoft Inbox is not installed on your computer, a dialog box will appear requesting you to install it at this time.

The Wizard will now guide you in a self-explanatory manner up to the end of the installation. You will be asked to enter the dial numbers for your ISDN connection. The dialog boxes for Euro-ISDN (DSS1) and national ISDN (1TR6) differ. Almost all new ISDN connections in Europe correspond to the European standard (DSS1).



After the installation is complete, a status indicator for the new **ELSA-RVS-COM** program folder appears on the taskbar. Click on the status indicator to open the program group.

**NOTE:**

If you experience difficulties when configuring ELSA RVS-COM, support and further information is available at all times using the comprehensive ELSA-RVS-COM help function.

Starting *ELSA-RVS-COM*

In the taskbar, select **Start ► Programs ► ELSA RVS-COM**, and click on the component that you would like to start.

2.1.2 Icons and Their Meanings

The following icons can be found in the *ELSA-RVS-COM* program group:



CommCenter

The **CommCenter** works in the background and controls all of the "passive" services. It is the center for the installation and setup of additional communications links (ISDN channels). The various communications services provided by *ELSA-RVS-COM* (e.g. file transfer, fax reception, telephone answering device) may be used via these ISDN channels.



Info

Provides information pertaining to *ELSA RVS-COM*.



Installation Wizard

The Installation Wizard will guide you through the configuration of the various *ELSA-RVS-COM* components. It can also be used for subsequent, user-specific modifications and settings. The telephone answering device function can be configured in the *CommCenter*, for example.



Create new fax

You can send and receive faxes with your ISDN terminal adapter in conjunction with a Windows EMail system (e.g. Microsoft Exchange), as well as using the adapter's telephone answering device functions.



Online documentation

The online documentation provides an overview of *ELSA RVS-COM*. It also contains many hints and tips pertaining to the individual functions. Context-sensitive help can be called up using the **F1** key.



Setup

This icon can be used to start the setup program, which can also be used to uninstall *ELSA RVS-COM*.



Telephone

With this function, you can use your PC as a telephone in conjunction with a full-duplex audio board.



Terminal

This component is used to access BBSs and information systems.



TransferMaster

TransferMaster can be used to transfer files from one PC to another.

2.2 Installing *ELSA ISDNconfig* under Windows 95 and Windows NT 4.0

ELSA ISDNconfig is a utility program which permits the simple, convenient configuration of your *ELSA TanGo 1000*. It can be used to set the D channel protocol for example, to enter the MSN or to install the current firmware for the *ELSA TanGo 1000*.

- ① Switch the ISDN terminal adapter on and boot Windows 95 or Windows NT 4.0.
- ② Insert the *ELSA TanGo 1000*-CD in your CD drive (e.g. D:). The CD-Setup will start automatically.
- ③ Under **Selection:** in the **ELSA CD-Setup**, select **ELSA ISDNconfig** in the list, click the **OK** and **Continue** buttons to start the setup program. The welcome screen appears.
- ⑥ Accept the suggested installation directory or click on **Browse**, and enter the name and path of the directory that you would like to use for the installation. Click on the **Continue** button.
- ⑧ Click on the **Finish** button to start the installation. The files will now be copied to your hard disk. Conclude the installation by clicking **Close**.

Starting *ELSA ISDNconfig*

In the taskbar, select **Start ► Programs ► ELSA ISDN Utilities ► ISDNconfig** to start the program.

2.3 Installation of *Telix* Under DOS

The configuration program *Telix Lite* is included with your *ELSA TanGo 1000*. With the exception of the script functions SALT and SIMPLE, this version supports all features of the full version of *Telix*. The *Telix Lite* program may be found in the CD-Setup of the included *ELSA* CD. To install *Telix Lite* on your computer, proceed as follows:

- ① Insert the *ELSA TanGo 1000* CD in your CD drive (e.g. D:), switch to the **ELSAWARE\ENGLISH\DOSTELIX** directory and run the file INSTALL.BAT (INSTALL.BAT). Please read the following notes with .
- ⑥ Accept the suggested installation directory or enter the name and path of the directory that you would like to use for the installation and continue with **OK**. The files will now be expanded and copied to your hard disk.
- ③ In the field **Name**, enter your User ID (the name must be at least 5 characters long). In the field **Serial Number**, enter the serial number. The serial number may be found on the enclosed serial number sticker (software license). Conclude the installation by clicking **OK**.
- ④ Select **OK** to update your AUTOEXEC.BAT file or enter the modifications manually. Read the README.TXT and continue the installation with .
- ⑤ Enter the name of your ISDN terminal adapter or select it from the list and confirm the selection with . If it is not in the list, select a **generic** type (e.g. *MicroLink ISDN TLpro*) which best corresponds to your ISDN terminal adapter.
- ⑥ Use the key or the mouse to select the COM port to which your ISDN terminal adapter is connected and select the correct IRQ if it does not correspond to the default setting. Continue the installation with **OK**.
- ⑦ Select **OK** to save the changes to the settings in the Telix configuration file.



NOTE:

The computer must be restarted to ensure correct operation if the AUTOEXEC.BAT file was automatically updated.

Starting Telix

Enter `telix` in the Telix directory to start the program. If you are starting Telix for the first time, you will be prompted to configure the program before use.

2.4 Installation of *ELSA ZOC* Under Windows 95 and Windows NT 4.0

ELSA ZOC is a communications program which you can use to address your ISDN terminal adapter from your PC. After starting *ELSA ZOC*, you will be able to send individual AT commands to the terminal adapter. To install *ELSA ZOC* on your computer, proceed as follows:

- ① Switch the ISDN terminal adapter on and boot Windows 95 or Windows NT .
- ② Insert the *ELSA TanGo 1000*-CD in your CD drive (e.g. D:). The CD-Setup will start automatically.
- ③ Under **Selection:** in the **ELSA CD-Setup**, select **ELSA ZOC** in the list and click **OK** to start the setup program. The "ELSA ZOC Installation" dialog box will appear.
- ④ In the field **New ZOC Path**, enter the path and the name of the directory that you would like to use for the installation.
- ⑨ Click on **Install** to start the installation. The files will be copied to your hard disk and you will be able to start the program after the successful conclusion of the installation.

Starting *ELSA ZOC*

In the taskbar, select **Start ► Programs ► ELSA ZOC for Windows 95 ► ZOC** to start the program.

2.5 Installation of LapLink Under Windows 95

LapLink for Windows 95 is a remote control and file transfer program. After the successful establishment of a connection, it is possible to exchange files between two computers that are both running LapLink for Windows 95. To install LapLink for Windows 95, proceed as follows:

- ① Switch the ISDN terminal adapter on and boot Windows 95.
- ② Insert the *ELSA TanGo 1000*-CD in your CD drive (e.g. D:). The CD-Setup will start automatically.
- ③ Under **Selection:** in the **ELSA CD-Setup**, select **LapLink 7.5 for Windows 95** in the list and click the **OK** button to start the setup program. The welcome screen appears.
- ⑤ Please read the following notes and click the **Continue** button. The "User Information" dialog box will appear.
- ⑤ Enter your name, company and the serial number of the product in the appropriate fields. The serial number can be found on the enclosed serial number sticker (please ensure that the number is entered correctly: upper case, etc.). In the field **Computer Name:** enter a name for your computer and click the **Continue** button. The "Confirm Registration" dialog box will appear.
- ⑥ Confirm that your entries are correct by clicking **Yes**. The "Setup Type" dialog box will appear.
- ⑦ Click on the **Continue** button to start the installation. The "Copy program files" dialog box will appear. Click on the **Continue** button. The files will now be copied to your hard disk. The "Product Registration" dialog box will be displayed after the successful installation.
- ⑧ Click on **Exit** to complete the installation. After the installation is complete, a status indicator for the new **LapLink for Windows 95** program folder will appear on the taskbar.

Starting LapLink for Windows 95

In the taskbar, select **Start ► Programs ► LapLink für Windows 95 V7.5 ►** and click on **► LapLink for Windows 95 V7.5**, to start the program.

2.6 Online Services

2.6.1 Installation of AOL (America Online)

AOL is a service of AOL/Bertelsmann Online which will provide you with access to the Internet. To install AOL on your computer, proceed as follows:

- ① Switch the ISDN terminal adapter on and boot Windows 95.
- ② Insert the *ELSA TanGo 1000*-CD in your CD drive (e.g. D:). The CD-Setup will start automatically.
- ③ Under **Selection:** in the **ELSA CD-Setup**, select **Install AOL** in the list and click **OK** to start the setup program. The welcome screen appears.
- ④ Click on **Install** to start the automatic installation. The "Settings" dialog box will be displayed after the successful installation. Click on **OK** to finish the installation. The **AOL** program group will be created.

Starting AOL



To start the program, click on this icon in the **AOL** program group.



NOTE:

*To establish a connection to **AOL** with the included software and your terminal adapter, please modify the following settings in the AOL program:*

- Under **Settings**, select the item **Modem Settings**.
- Select the entry **ISDN ELSA MicroLink ISDN/TLpro X.75** in the list and confirm with **OK**. Follow the additional instructions which will then be displayed.

2.6.2 Installation of CompuServe

To install CompuServe on your computer, proceed as follows:

- ① Switch the ISDN terminal adapter on and boot Windows 95.
- ② Insert the *ELSA TanGo 1000*-CD in your CD drive (e.g. D:). The CD-Setup will start automatically.
- ③ Under **Selection:** in the **ELSA CD-Setup**, select **CompuServe Access Software** from the list and click on **OK**. The setup program will then start.
- ④ Read the license agreement and acknowledge with **YES**, to continue the installation. The "Welcome" dialog screen will appear.
- ⑤ Select an installation type. We recommend selecting the **Express** Installation. The "Setup Complete" dialog box will appear.
- ⑥ You now have the option of launching CompuServe directly. Click on **Exit** to close the setup program; your computer will restart.

Starting CompuServe

Click on ► **CompuServe 3.0.1** on the taskbar to start the program.



NOTE:

Please follow the on-screen instructions to open a CompuServe account.

Notes

3 AT Commands

The so-called **AT command set** has established itself as the worldwide standard for modem control command syntax (AT = command prefix **A**ttention). The *ELSA TanGo 1000* also operates with the AT command set, permitting users of data communications equipment to continue using a familiar command set for ISDN communications. A complete description of the AT command set can be found on the *ELSA TanGo 1000* CD. A terminal program is required to enter AT commands via a PC (e.g. ZOC).

Entering and executing AT commands

After switching on, the ISDN terminal adapter is in the **command mode**. Commands can only be accepted, interpreted and executed in this phase.

In the event that several commands are to be sent to the ISDN terminal adapter, these may be entered individually, each with an AT command prefix and a concluding **Enter**. It is also possible, however, to enter these commands consecutively in a single command line after an introductory AT and to conclude the line with an **Enter**.

The individual commands may be separated by spaces to improve the overview. No further characters may be entered once the end of the command line buffer has been reached. The command line can then only be edited with **↵** (backspace) or executed with **Enter**.

Escape command

The characters **Strg-X** and **Strg-C** may be used to abort the execution of a command line or a screen display (e.g. when returning the contents of the registers with **AT%R**).

Commands that must be specified with a parameter may also be entered without a parameter. The absence of a parameter corresponds to the parameter **0** (e.g. **ATI** = **ATI0**).

After the successful establishment of a connection to the remote station, the ISDN terminal adapter switches from the **command mode** to the **transfer mode**.

Transfer mode means that a connection to a remote data station (i.e. to another ISDN terminal adapter) exists: the ISDN terminal adapter is 'online'. This is the case after successful call establishment (outgoing call), as well as after answering a call (incoming call). The exchange of data between two data stations can take place during this phase.

A renewed transition to the **command mode** and back, also in the case of an existing connection, is possible with the **escape command** and the command **ATO**. The **escape command** consists of a series of three **escape characters** (default setting: **+++**) and a **valid command line**.

After the three escape characters have been entered, the ISDN terminal adapter is

already in the command mode. Data transfer is not interrupted until a valid command line has been recognized.

The **escape character** has nothing in common with the character **Esc** of the ASCII character set. It can be redefined in register S2.

All commands sent to the ISDN terminal adapter must begin with the ASCII characters **AT** or **at** (not valid: At or aT) and must be concluded with **Enter**. A valid command line in an escape sequence is restricted to a maximum of 40 characters.

The command **AT&F** loads most of the firmware default parameter settings. The ISDN terminal adapter is thus reset to its factory condition. This command does not execute during existing connections.

Bit-oriented registers

Bit-oriented registers are primarily used to provide status information. Please note that the modification of a single value in the bit-oriented register may have several functions. Great caution should thus be applied when changing bit-oriented registers. We recommend the use of the AT commands to change the configuration of the ISDN terminal adapter. A complete description of the S registers can be found on the *ELSA TanGo 1000* CD.

Modifying bit-oriented registers

The following example will illustrate the modification of the bit-oriented options of a register. To set the bit 6 of register S14, enter the command **ATS14.6=1** .

If you would like this value to be maintained after the ISDN terminal adapter is switched off, the new entry can be stored with the command **AT*W**.

4 Frequently Asked Questions and Answers

General questions

How can I send AT commands to the ISDN terminal adapter?

A communications or terminal program such as *ELSA ZOC* is necessary to address the ISDN terminal adapter from your PC. After starting *ELSA ZOC*, you will be able to send individual AT commands to the terminal adapter. These are sent to the ISDN adapter via the serial interface of your PC.

How do I configure the terminal adapter for the D channel protocols for Euro-ISDN (DSS1) or national ISDN (1TR6)?

ELSA ISDNconfig is a utility program which permits the simple, convenient configuration of your *ELSA TanGo 1000*. It can be used to set the D channel protocol for example, or to enter the MSN or the EAZ.

What is the optimal initialization string for BBS operations with my ISDN terminal adapter?

All ISDN terminal adapters have ideal default settings for BBS operation. If you have changed the configuration in the mean time, you can restore the ISDN adapter's factory defaults with the command **AT&F** and save this condition with the command **AT*W**.

How can I accelerate data communications programs such as the CompuServe Information Manager under Windows?

As the owner of a buffered UART 16550 interface chip, you should open the SYSTEM.INI file in your Windows directory and make the following entry in the [386Enh] section:

COMxFIFO=1

Replace the placeholder x with the number of the correct serial port (e.g. COM2FIFO=1; in this case, '2' stands for COM port 2). In the event that your computer does not have a UART 16550, we recommend the upgrade of your serial interface.

My ISDN terminal adapter no longer accepts AT commands. Is it incorrectly configured or defective?

If AT commands do not appear on your screen and are not executed by your terminal adapter, this can have a number of causes. You should check the following settings:

- Is your ISDN terminal adapter connected to the serial interface (COM port) specified in the settings of your communications software? You can determine the IRQ of your serial interface with the program *ELSA ISDNconfig*.
- If the configuration of your ISDN adapter is incorrect, try to restore the default settings with the command **AT&F**, even if the command isn't displayed on the screen when entering it. In this condition it should be possible to enter an AT, to which the ISDN adapter will return an **OK**.

Can I reach a Euro-ISDN (DSS1) remote station from a 1TR6 connection or vice versa?

The differing connection types or D channel protocols are not relevant in this case, as these are only significant for the communications between your ISDN connection and the local exchange. A connection can be established even if both sides are using different D channel protocols.

When Up and downloading from/to BBS systems, a large number of CRC errors result; in some cases the connection is even aborted. What are the possible reasons?

CRC errors can have a variety of reasons. A possible cause is an incorrectly-set or missing handshake process. In order to take proper advantage of data compression, the speed on the computer side should be set higher than on the telephone side (e.g. 115,200 bps instead of 64,000 bps). This, however, requires either a hardware- (RTS/CTS) or software-based (XON/XOFF) handshake process.

These processes must be set up identically in the software as well as in the ISDN terminal adapter. If this is not the case, CRC errors can result during data transfer. If you use RTS/CTS handshaking, the V.24 connection can also be the cause. When using a so-called mouse adapter (V.24 adapter from 25 to 9 pins), it is also possible that the RTS and CTS conductors (Pin 4 und 5) in the adapter are not connected. One should always ensure that V.24 cable adapters are fully wired for this reason.

The serial port of your computer can be a further source of errors. The use a type 16550 UART chip is advisable for speeds of 19,200 bps and higher under DOS and for general use under Windows and OS/2. This UART has a 16 byte FIFO buffer which permits significantly higher transfer speeds. Type 8250 and 16450 chips only function reliably at speeds of up to 9600 bps; individual characters can be lost in the interface at speeds of 19,200 bps upwards, leading to CRC errors.

Why do I always get CRC errors with my ISDN terminal adapter during ZModem downloads at 115,200 bps, even though I'm using a UART 16550 with FIFO in my COM port? The throughput for CONNECTs at 28,000 bps is only around 3000 cps.

The poor throughput is the result of the large number of CRC errors. Check the BIOS settings of your computer and ensure that `IDE HDD BLOCK MODE` is set to `DISABLED`.

Btx / T-Online (Germany)

I would like to use Btx / T-Online at 64,000 bps. What do I have to observe?

An error-controlled connection to Btx/T-Online (dial number 01910 - Germany only) can be established with the setting **AT\$IBP=BTX** in the init string of T-Online 1.2x in your Btx program. T-Online 2.0 requires the command **AT\$IBP=HDLCP**.

Notes

5 Advice and Help

In the event that questions arise during the installation or use of your ISDN terminal adapter, please consult this handbook first. In addition, README files in HTML format can be found on the included ELSA CD which contain modifications and advice.

If questions remain, please consult one of the following sources of information. Please ensure that you have the following information handy:

- The exact type designation and firmware version of your ISDN terminal adapter (the firmware version can be displayed with the command **ATS**).
- The operating system used and details of the computer environment
- Name and version of the communications program
- A detailed description of the fault. To be absolutely certain, try to reproduce the error at least three times and describe the exact steps leading to the error.
- In case of a "NO CARRIER" message, the command **ATS** can be used to display the code for the possible cause of failure which can be found on the error code list.

Who can you turn to?

First, consult the dealer from whom you purchased the ISDN terminal adapter. If questions remain, please consult one of the following sources of information:

ELSA in the Internet

The ELSA Internet Homepage	→ http://www.elsa.com
The ELSA <i>LocalWeb</i>	→ +49-(0)241-938800
(ELSA's dial-up WWW site:	ISDN: X.75, V.120
no Internet provider required!)	Analog: K56flex, V.34
	Protocol: PPP oder MLPPP
	User: guest
	No password

ELSA and CompuServe

The ELSA Forum in CompuServe	→ GO ELSA
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ELSA Support Faxline

By fax to the ELSA Support Faxline	→ +49-241-606-6499
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ELSA by conventional mail

In written form to ELSA

→ ELSA GmbH
Data Communications Support
Sonnenweg 11
D-52070 Aachen, Germany

ELSA Hotline

In urgent cases, call the ELSA Hotline → Tel. +49-241-606-6142

Monday to Thursday from: 9:00 AM to 4:30 PM

Fridays from: 9:00 AM to 1:30 PM

Current software

The current versions of our software are available for download on our Internet server **<http://www.elsa.com>** and in our dial-up web site, *ELSA LocalWeb*. You can also find answers to "frequently asked questions" (FAQs) and a wealth of tips and tricks. Before contacting ELSA Support, please ensure that you are using the current version of the software.

Repairs?

If you do not know whether your ISDN terminal adapter is defective or simply incorrectly configured, please call the ELSA Hotline before sending the unit in for repairs.

Should you need to send the ISDN terminal adapter in to be repaired, please use the original carton is used with suitable packing material to prevent damage during shipping. In addition, please send a copy of the original invoice.

You can help reduce repair times by including a detailed description of the fault with the unit to facilitate precise troubleshooting. Send your ELSA product directly to the ELSA GmbH Service Department.

Appendix

A Brief Overview of the AT Command Set

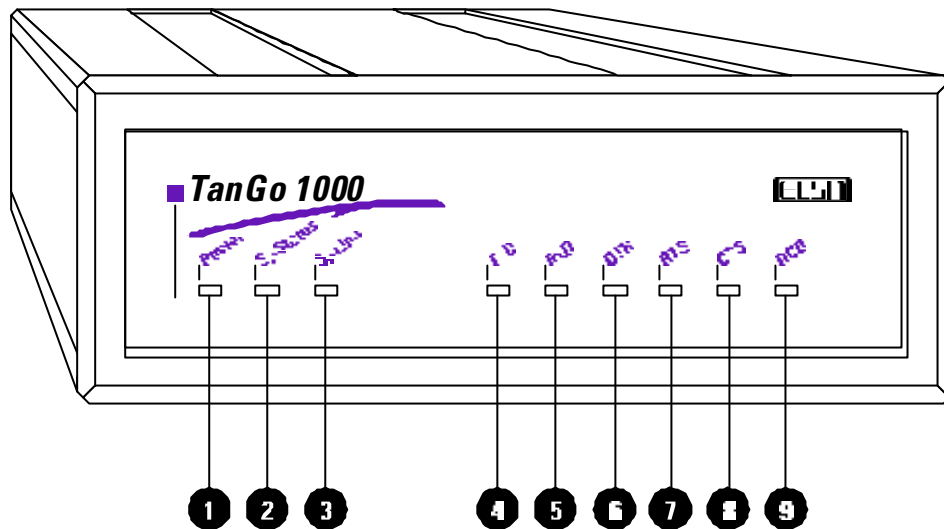
Command	Description
A	Answer incoming call
&C0 &C1	DCD is always active DCD indicates an existing connection
Dn	Call establishment
\$D0 \$D1	Disables DTR dialing Enables DTR dialing
&D0 &D1 &D2 &D3	Ignore transition of DTR status Switch to command mode if DTR → OFF Abort connection if DTR → OFF Abort connection and reinitialize if DTR → OFF
\D0 \D1 \D2 \D3	DSR and CTS always active DSR tracks transmission channel and CTS always active DSR always active and CTS tracks DCD DSR tracks transmission channel and CTS tracks DCD
E0 E1	Commands not echoed Commands echoed
&F	Load default configuration
\F	Dialing of stored telephone numbers
H	Hang up
H2	Call rejected
I0 I1 I2 I3 I4 I5 I6 I7 I9	Report product code in nnn format Report checksum Report checksum result Report version number and firmware release date Display of current parameters Report serial number and hardware release Display product name Report self-test result Report Plug & Play ID text
\$I?	Display of current ISDN parameters
\$IBP	Setting the B channel protocol
\$IBR	Setting the ISDN bit rate
\$ICI?	Display charge information
\$ICI=0,0	Delete charge information
\$ICLD	Store dial numbers for user groups
\$ICLI	Setting the outgoing multiple subscriber number (MSN)
\$IDBS	Setting the data block length
\$IDP	Setting the D channel protocol
\$IEAZ	Setting the terminal selection digit (EAZ)
\$IMSN	Call answering from multiple subscriber numbers (MSN)
\$INCB	block dial numbers
\$ISCI	Service characteristics for incoming analog calls

Command	Description
\$ISCO	Service characteristics for outgoing analog calls
-M0	Plain text CONNECT messages dependent on ATV
-M1	Plain text CONNECT messages independent of ATV
0	Transition to online status
\Pmn	Storing dial numbers (m = 0 to 9)
Q0	Return of messages from ISDN terminal adapter on
Q1	Return of messages from ISDN terminal adapter off
Q2	Messages off in answer mode
*Q0	CONNECT message after invalid escape sequence
*Q1	No CONNECT message after invalid escape sequence
\Q0	No handshake
\Q1	Bidirectional XON/XOFF handshake
\Q2	Unidirectional CTS handshake
\Q3	Bidirectional RTS/CTS handshake
\Q4	Unidirectional XON/XOFF handshake
Sn=x	Sets register n to value x
Sn?	Reads the value of register n
Sn	Sets pointer to register n
?	Reads value of last register used
=x	Sets value of last register used to x
\S	Display of the current settings
\Tn	Inactivity timer
\$UPX	Firmware upload in flash ROM
V0	Messages in short form as a digit
V1	Messages in plain text
%V	Display of firmware version
&V	Display configuration profiles
\V0	No modified CONNECT messages
\V1	Identification of connections with error correction
\V2	Additional distinction of correction processes
\V8	Detailed CONNECT messages
&Wn	Save configuration profile
*Wn	Save complete configuration profile
X0	Busy signal returns NO CARRIER
X1	Busy signal returns NO CARRIER
X2	Busy signal returns NO CARRIER
X3	Busy signal returns BUSY
X4	Busy signal returns BUSY
\X0	XON/XOFF characters are not sent
\X1	XON/XOFF characters are sent
&Y	Set pointer to configuration profile
Zn	Load configuration profile
&Zm=n	Store dial number n at location m
&Z=n	Store dial number n at location 0
AT.m=x	Sets the bit n to the value m (m = 0 to 7; m = 0 to 1)
AT.m?	Reads the value of bit m
ATSn.m=x	Sets bit m in S register n to value x (m = 0 to 7; x = 0 to 1)

Command	Description
=?	Query of the value range of a command

B Status Display and Troubleshooting

The LEDs on the front panel show the condition of the interface lines as well as the status of the ISDN S_0 connection.



①	ISDN terminal adapter power on
②	S_0 status
③	S_0 line
④	TxD (D1) - Data or command to ISDN terminal adapter
⑤	RxD (D2) - Data or command from ISDN terminal adapter
⑥	DTR (S1) - Computer operational
⑦	RTS (S2) - Switch on transmit
⑧	CTS (M2) - ISDN terminal adapter clear to send
⑨	DCD (M5) - Connection established

Status display

Green and yellow LEDs on the front panel of the ISDN terminal adapter serve as the status display of the ISDN connection.

Green LED

The green LED shows the status of your ISDN line and the connection to the exchange.

Normal connections (Dial-up and fixed D channel connections):

State of LED	Status
Off	S ₀ bus not activated
Blinking (quickly)	S ₀ bus active, no TEI assigned
On	S ₀ bus active, TEI assigned

Yellow LED

The yellow LED shows the connection status of the ISDN terminal adapter:

State of LED	Description
Off	No call, no connection
Blinking slowly (once per sec.) (total 2 to 3x)	Incoming call, terminal device is not responsible or terminal unit establishes connection itself
Blinking quickly (3x per sec.)	Valid call pending, not (yet) answered
Constantly lit	Connection being/is established

V.24 display

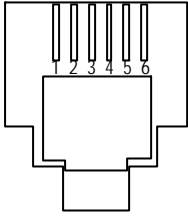
The V.24 display shows the status of the V.24 connection to the computer:

LED	Description
TxD (D1)	Data or command to ISDN terminal adapter
RxD (D2)	Data or signals from ISDN terminal adapter
DTR (S1)	Computer operational (see also command AT&D)
RTS (S2)	Switch on transmit (see also command ATQ)
CTS (M2)	ISDN terminal adapter clear to send (see also commands ATD and ATQ)
DCD (M5)	Connection established (see also command AT&C) LED lights up red for insecure or fax connections LED lights up green for secure connections

C Technical Specifications

Power supply	9 V _{AC} , max. 500 mA
Power consumption	5 W
Dimensions and design:	108 x 36 x 140 mm (W x H x D) metal case
Ambient conditions:	5 to 40°C 0 to 80%, non-condensing
ISDN connection:	Basic Rate Interface (S ₀ connection, I.430) and ISDN PBXs with S ₀ connections
Transmission modes	Euro-ISDN/DSS1, 1TR6 (incl. SPC) and point-to-point protocol
Transfer protocols	V.120 at 56,000 bps, 64,000 bps X.75 at 56,000 bps, 64,000 bps X.75/T.70NL at 56,000 bps, 64,000 bps X.75 T-Online (VT-100, CEPT, KIT) Bit transparent, HDLC transparent, PPP synchronous/asynchronous conversion
Max. data throughput:	230,400 bps asynchronous at the DTE interface
Protocol detection:	Automatic switching between X.75, V.120 and PPP synchronous
Error correction:	When operating in ITU-T V.120 and X.75
Command set	Extended AT command set (incl. EAZ and MSN support, as well as polling options for the remote station caller ID and connect charges, status of the connection)
Computer interface:	V.24/V.28 MDIN8m
Status display	LED in various colors for the monitoring of the ISDN line and connection status, V.24 display
CE conformity:	Yes; tested in accordance with EN 50082/Part 1, EN 55022, Class B, EN 60950
Permits:	EU
Germany, BAPT	D131655J
Switzerland, BAKOM	97.0687.I.N

RJ11 Pin Assignment



Line	IAE	S ₀ socket
-	-	1
T+	2a	2
R+	1a	3
R-	1b	4
T-	2b	5
-	-	6

CE Conformity

CE 0188 X This unit has been tested and has been found to comply under realistic operating conditions to the protective requirements laid down by the European Community for the alignment and mutual recognition of the member states' laws concerning telecommunications devices.

All ISDN terminal units with the CE seal therefore comply with:

- NET 3 (ISDN Basic Rate Access)
- EMC compatibility standards
- Safety standards

and may therefore be connected to the Euro-ISDN in all EU countries with the exception of Germany and France. ISDN terminal equipment to be used in these countries must have an additional national approval certificate for a transitional period.

Declaration of conformity



DECLARATION OF CONFORMITY

This declaration applies to the following product:

Equipment type:	ISDN terminal adapter
Type designation:	TanGo 1000
EC type sample test certificate No.:	D131655J
Empowered authority:	Federal Telecommunications Type Approval Office

We confirm herewith that the product complies with the following EC standards:

	89/336/EWG (EMC regulations)
amended by	91/263/EWG; 92/31/EWG; 93/68/EWG
	73/23/EWG (low-voltage regulations)
amended by	93/68/EWG
	94/797/EWG (I-CTR3)

Standards applied:

EN 50082-1
EN 55022: Class B
ETS 300 047- 3
EN 60950

This declaration has been made on behalf of the manufacturer / importer

ELSA GmbH
Sonnenweg 11
D-52070 Aachen
GERMANY

by

Peter Padar
Quality management mandatary

Aachen, 12 June 1997

by order, Peter Padar
Quality management mandatary

D Glossary

1TR6 *1TR6* is a specification by the German Telekom for ISDN terminal devices with S_0 interface. This specification defines the →D channel protocol and is used mainly in Germany. Most other European countries use the →DSS1 protocol.

5ESS *5ESS* is a US standard for the ISDN →D channel protocol developed by AT&T. It is a preliminary standard to the National ISDN-1 standard (→NI-1).

Asynchronous transmission In serial data transmission a method is needed to synchronize transmitter and receiver in order to enable the receiver to detect the beginning and end of a transmitted character. In *asynchronous transmission* this structuring is achieved by marking each byte to be sent with one start bit and one or two stop bits. Especially in the microcomputer sector, this start/stop method is one of the most commonly used transmission methods, since, unlike →synchronous transmission, it is comparatively easy to perform.

AT command set The extended *AT command set* (AT = command prefix **AT**tention) has become a world-wide standard for the syntax of →modem control commands. To give data communications users the possibility to maintain their familiar command interface when changing over to ISDN, ELSA *MicroLink*® ISDN products can be controlled with AT commands as well.

B channel →Data channel

Basic Rate Interface ISDN terminal connector providing two →data channels (64,000 bps each) and one →control channel (16,000 bps). The link between the Basic Rate Interface and the terminal device is the → S_0 bus.

Baud *Baud* (abbreviation: Bd) is the unit for the step rate (1 Bd = 1 step per second), i.e. the frequency of status changes on a transmission channel per second. Erroneously, the unit Baud is often confused with the transmission rate measured in →bps. In the case of signals having only two states (as in the ISDN), the step rate is identical with the transmission rate.

CAPI **C**ommon ISDN **API** (**API** = **A**pplication **P**rogramming **I**nterface). This is a software interface developed by German ISDN adapter manufacturers in cooperation with the German FTZ, which is used for communication between ISDN adapters and ISDN application software.

CCITT →ITU-T

Communications In order to access *MicroLink ISDN/TLpro* from a personal computer, for **software** example to choose transmission parameters or to start a data transfer(→Download, →Upload), a suitable *communications software*, also called *terminal program*, is needed. Such a program emulates an "intelligent terminal" on the PC, i.e. a simple input/output device equipped with additional features for saving received data and transmitting stored data. All ELSA *MicroLink*® products supporting the →AT command set are shipped with the communications program **Telix**.

- Control channel** ISDN signaling channel (also called *D channel*) for the transmission of control data (e.g. message about incoming call etc.) between the ISDN interface and the public exchange. In Europe the bit rate of a D channel is normally 16,000 bps, while the →data channels use 64,000 bps (in the US also 56,000 bps).
- D channel** →Control channel
- Data channel** ISDN transmission channel (also called *B channel*) for the transmission of data with a transmission rate of 64,000 bps (in the US also 56,000 bps).
- Data format** To allow a data exchange between two stations in an →asynchronous transmission, the parties must agree on the length and structure of the bytes to be transferred. This specification is called *data format*. The most common data formats for asynchronous transmission are: 8N1 (1 start bit, **8** data bits, **no** parity bit and **1** stop bit = 10 bits per byte) and 7E1 (1 start bit, **7** data bits, 1 parity bit (**e**ven parity) and **1** stop bit = 10 bits per byte).
- DSS1** A European standard developed by the →ETSI for the →D channel protocol (also called *Euro-ISDN*). In Germany, this standard has been introduced in 1993 and is likely to replace the older national 1TR6 protocol. For an intermediate period, ISDN interfaces in Germany will support both protocols.
- EAZ** The **Endgeräteauswahlziffer** (German for *Terminal Device Selection Digit*) is used by the →1TR6 protocol to distinguish between several terminal devices connected to the same ISDN Basic Rate Interface. Unlike the →MSN in the →DSS1 protocol, this digit is appended to the ISDN number as the last digit.
- Effective transfer rate** The *effective transfer rate* must be distinguished from the transmission rate. The transmission rate indicates the number of bits per second physically transmitted over a data line as a theoretical maximum value, whereas the transfer rate is a measure of the average amount of transmitted utilizable data per time. Control data and protocol headers, which are to be sent in addition, can reduce the effective speed of transmission. On the other hand, using data compression methods can result in an increase of the effective transfer rate to a multiple of the physical transmission bit rate.
- ETSI** **European Telecommunications Standards Institute**. This standardization committee has developed a European standard for the →D channel protocol (→DSS1).
- Euro-ISDN** →DSS1
- Firmware** *Firmware* means the totality of control software integrated with the hardware of a device, which cannot be modified by the user.
- FOSSIL** **Fido/Opus/SEAdog Standard Interface Layer** was developed for the use of hardware-independent interfaces in data communications and is supported by many standard communications programs (e.g. Telix, Telemate, Frontdoor or Binkly).
- I.430** This →ITU-T standard describes layer 1 of the user/network interface of an ISDN →Basic Rate Interface.
- I.463** →V.110

I.465	→V.120
ISDN	Abbreviation of <i>Integrated Services Digital Network</i> .
ITU-T	The <i>Telecommunications Standardization Sector</i> of the <i>International Telecommunications Union</i> (ITU) is working on the standardization of data and telephone services. The ITU-T standards of the V. series mainly deal with data transmission across telephone networks, while the I. and Q. series are standards for the ISDN. The ITU-T is the successor organization of the CCITT (<i>Comité Consultatif International Télégraphique et Téléphonique</i>).
MSN	<i>Multiple Subscriber Number</i> . The →DSS1 protocol allows several numbers to be assigned to one ISDN line by the responsible exchange. Normally these are three numbers, but may be up to eight. Similar to the →EAZ digits of the →1TR6 protocol, these numbers can be used to select one of several terminal devices connected to the same →S ₀ bus. Unlike the EAZ digit, which is appended to the actual number, an MSN can be up to eight digits long.
Multiple Subscriber Number →MSN	
National ISDN-1 →NI-1	
NI-1	The <i>National ISDN-1</i> standard is a common specification in the US for the ISDN →D channel protocol.
NT	<i>Network Terminator</i> . This is a device installed on the terminal side of an ISDN →Basic Rate Interface which converts the signals coming from the exchange into the form needed by the →S ₀ interface, and vice versa.
Parity bit	The parity bit is a control bit that is sent in addition to a number of data bits in a data transmission. The data bits set to "1" are supplemented by the parity bit to an even or odd bit sum. The parity check is a simple method of error detection. However, this method is not very reliable, as for example double bit errors are not recognized. Therefore in data communications normally "no parity" is selected, which besides results in an increase of the transmission speed, since no additional parity bit has to be sent.
S₀ bus	Link between →Basic Rate Interface and terminal device. Up to eight ISDN terminal devices can be operated simultaneously on one S ₀ bus, and up to 12 connection sockets can be connected to the bus.
Synchronous	<i>Synchronous transmission</i> is, like →asynchronous transmission, a method to transmission synchronize transmitter and receiver. Unlike asynchronous transmission, in this method of data transmission the synchronization is not achieved by start and stop bits for an entire character, but by clock pulses for each single bit. Due to the elimination of the additional start and stop bits, synchronous transmission is faster, but also requires a considerably greater technical effort.
T.70NL	T.70NL is a data packet header used in the transmission standard →X.75. The T.70NL header must be enabled or disabled on both ends of the transmission.
TA	→Terminal adapter

TEI *TEI (Terminal Endpoint Identifier)* is an identification code negotiated with the exchange in the →D channel protocol, in order to distinguish several terminal devices connected to the same S₀ interface. *MicroLink TLpro* has a green LED that indicates whether a TEI has been assigned to the terminal adapter.

Terminal Endpoint Identifier →TEI

Terminal adapter *Terminal adapters (TA)* are used to connect non-ISDN devices to the ISDN. An a/b terminal adapter, for example, can be used to connect devices designed for analog telephone networks, such as analog telephones, class 2 and 3 fax devices, modems etc. *MicroLink ISDN/TLpro* is an external RS-232/V.24 terminal adapter, allowing the access of the ISDN through the serial RS-232/V.24 interface of a computer.

Transmission protocol To transmit data files from one computer to another, a range of *transmission protocols* exists in order to provide a trouble-free file transfer. Over the years, protocols of different efficiency and convenience have been developed. In principle, they all work as follows: Data are usually transmitted as data blocks and are checked for errors and incompleteness on the receiving side. If an error has been detected, the defective block is requested once more and transmitted again. The →communications software **Telix** (supplied with every ELSA *MicroLink*® product that uses the AT command set), supports many common transmission protocols, such as →Xmodem, Xmodem-1k, Ymodem and →Zmodem.

V.110 V.110 (also referred to as I.463) is an →ITU-T standard for the adaptation of asynchronous or synchronous serial data streams to the ISDN line bit rate of 64,000 bps for the transmission over an ISDN →B channel.

V.120 V.120 (also referred to as I.465) is an →ITU-T standard for the packing of asynchronous or synchronous data in (error-corrected) HDLC frames on an ISDN →B channel. Unlike →X.75, V.120 also supports a line bit of 56,000 bps as commonly used in the USA.

V.42bis The →ITU-T standard V.42bis describes a data compression method which can increase the →effective transfer rate of (previously uncompressed) data by a factor up to four. *MicroLink ISDN/TLpro* supports V.42bis. Thus effective line transfer rates of (theoretically) up to 256,000 bps can be achieved, if the serial interface supports these high rates.

X.75 Similar to →V.120, X.75 is an →ITU-T standard for the error-corrected transmission of data with HDLC frames on an ISDN →B channel (64,000 bps).

E

Warranty Conditions

This warranty is given to purchasers of ELSA products in addition to the warranty conditions provided by law and in accordance with the following conditions:

1. Warranty coverage

- a) The warranty covers the equipment delivered and all its parts. Parts will be replaced free of charge if, despite proven proper handling and adherence to the operating instructions, these parts became defective due to fabrication and material defects. Operating manuals and possibly supplied software are excluded from the warranty.
- b) Material and service charges shall be covered by us, but not shipping and handling costs involved in transport to the service station.
- c) Replaced parts become property of ELSA.
- d) ELSA are authorized to carry out technical changes (e.g. firmware updates) beyond repair and replacement of defective parts in order to bring the equipment up to the current technical state. This does not result in any additional charge for the customer. A legal claim to this service does not exist.

2. Warranty period

The warranty period is 36 months for color monitors, data communications and computer graphics products. It begins at the day of delivery from the authorized ELSA dealer. Warranty services do not result in an extension of the warranty period nor do they initiate a new warranty period. The warranty period for installed replacement parts ends with the warranty period of the device as a whole.

3. Warranty procedure

- a) If defects appear during the warranty period, the warranty claims must be made immediately, at the latest within a period of 7 days.
- b) In the case of any externally visible damage arising from transport (e.g. damage to the housing), the transport company representative and ELSA should be informed immediately. On discovery of damage which is not externally visible, the transport company and ELSA are to be immediately informed in writing, at the latest within 7 days of delivery.
- c) Only authorized ELSA dealers may accept warranty claims. ELSA will supply the purchaser with a list of names and addresses of authorized dealers on request.
- d) Transport to and from the location where the warranty claim is accepted and/or the repaired device is exchanged, is at the purchaser's own risk and cost.
- e) Warranty claims are only valid if a copy of the original purchase receipt is returned with the device.

4. Suspension of the warranty

All warranty claims will be deemed invalid

- a) if the device is damaged or destroyed as a result of acts of nature or by environmental influences (moisture, electric shock, dust etc.);
- b) if the device was stored or operated under conditions not in compliance with the technical specifications;
- c) if the damage occurred due to incorrect handling, especially to non-observance of the system description and the operating instructions;
- d) if the device was opened, repaired or modified by persons not authorized by ELSA;
- e) if the device shows any kind of mechanical damage;

- f) if, in the case of an ELSA Monitor, damage to the cathode ray tube (CRT) has been caused by mechanical load (e.g. from shock to the pitch mask assembly or damage to the glass tube), by strong magnetic fields near the CRT (colored dots on the screen), or through the permanent display of an unchanging image (phosphor burnt).
- g) if the warranty claim has not been reported in accordance with 3a).

5. Operating mistakes

If it becomes apparent that the reported malfunction of the device has been caused by unsuitable software, hardware, installation or operation, ELSA reserves the right to charge the purchaser for the resulting testing costs.

6. Additional regulations

- a) The above conditions define the complete scope of ELSA's legal liability. The warranty gives no entitlement to additional claims, such as any refund in full or in part. Compensation claims, regardless of the legal basis, are excluded. This does not apply if e.g. injury to persons or damage to private property are specifically covered by the product liability law, or in cases of intentional act or culpable negligence. Claims for compensation of lost profits, indirect or consequential detriments, are excluded. ELSA is not liable for retrieval of lost data unless ELSA employees intentionally or by culpable negligence caused its loss and the purchaser has guaranteed that the data can be retrieved with justifiable effort from data material kept in machine legible form.
- b) The warranty is valid only for the first purchaser and is not transferable.
- c) The court of jurisdiction is located in Aachen, Germany in the case that the purchaser is a merchant. If the purchaser does not have a court of jurisdiction in the Federal Republic of Germany or if he moves his domicile out of Germany after conclusion of the contract, ELSA's court of jurisdiction applies. This is also applicable if the purchaser's domicile is not known at the time of institution of proceedings.
- d) The law of the Federal Republic of Germany is applicable. The UN commercial law does not apply to dealings between ELSA and the purchaser.

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