Operating Manual

Pocket ISDN - TA

ISDN Terminal Adapter

INSYS
MICROELECTRONICS

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1   Introduction

We are very pleased to see that you have bought a INSYS product and would like to express our appreciation.
This documentation is valid for the product:

- POCKET ISDN-TA hardware version V2.0 or higher
                          Software version V5.351 or higher

1.1   Product description

- The POCKET ISDN-TA connects a PC (or other device with serial port) to the ISDN. It gives access to online services as the Internet, AOL/CompuServe and T-Online and is also suitable for remote LAN access. You can see it as a digital replacement for an analogue modem.

To work with POCKET ISDN-TA you need
- an ISDN Basic Rate Interface (BRI) (replacing an analogue telephone line). The basic rate access can be ordered by your local telephone company or PTT.
- a PC with online software for a modem (see chapter 3)

The serial port of the PC should be capable of a data rate of up to 115.2 kbps (230.4 kbps for Multilink PPP to increase performance). This might require an additional PC card for older PCs.

1.2   Internet Access

There are three ways to access the Internet via ISDN:
- by synchronous PPP or Multilink PPP
- by bit rate adaptation V.120
- by B channel protocol X.75
It depends on the access facilities of your Internet service provider (ISP) or Point-of-presence (POP) which one you may use (see figure 1).
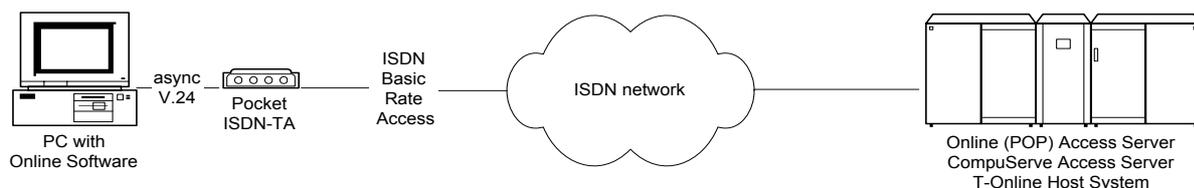
Figure 1: Usage of the Pocket ISDN-TA to access an Online Service

1.3   AOL/CompuServe Access

AOL/CompuServe is accessed via ISDN by the protocol V.120 or X.75 (see picture 1). It depends on the access facilities of your AOL/CompuServe access point which one you have to use (see figure 1). The increasingly common protocol used is X.75.

1.4   T-Online

T-Online (German Online Service) is accessed via ISDN by the protocol T.70NL / X.75 or synchronous PPP (see figure 1).

1.5   Remote LAN Access

To access a LAN remotely via ISDN you have to choose the appropriate protocol that is used by the ISDN router on the LAN.

1.6   Service

INSYS has installed a Windows-NT-Server just for test purposes. The Server supports the RAS (Remote Access Service) with full 64 kbps in one single B channel. The RAS service gives the possibility to connect PC's using Windows-2000/NT or Windows9x/ME with each other.
You have to install on your Windows PC the Dialup Networking – see the Windows helpdesk how to install and use. Please select at your machine the protocol stack TCP/IP.
The POCKET ISDN-TA has to be set to HDLC async to sync (like the configuration for Internet access) by selecting the Modem "TA Internet PPP".
The ISDN number is ++49 40 89088 328.
Please use the username "guest" and password "guest".

1.7   License

The POCKET ISDN-TA has the following license number for the connection to the PSTN according to CTR3/A1:

CE-0682 X   for Europe (EC), Switzerland, Norway.

POCKET ISDN-TA is conforming to the European safety requirements IEC 60 950. Please use only the delivered power supply or an original replacement from INSYS. Connect the POCKET ISDN-TA only to the S0-interfaces with SELV (**S**afety **E**xtra **L**ow **V**oltage) related to EN60950.

The POCKET ISDN-TA is conforming to the European rules of EMC. EN50081-1, here EN55022 Class B, for electromagnetic field emission and EN50082-1 for immunity against electromagnetic interference.

2   Installation

2.1   Contents

This packet contains the following items:

*   ISDN Terminal adapter POCKET ISDN-TA in desktop box
*   Mains plug power supply adapter
*   ISDN interface cable
*   DTE interface serial cable
*   Floppy disk with installation software Windows9x/ME/2000 and WindowsNT
*   This user manual

2.2   Installation procedure

*   Connect the serial port (DTE) of the POCKET ISDN-TA to the serial port
         (COM-port) of the PC by using the supported DTE interface serial cable.
         Please make sure that the COM-port of the PC is not used for other purposes
         or by other communication programs.
*   Connect the ISDN port of the POCKET ISDN-TA to the basic rate interface
         (BRI) of the ISDN using the delivered ISDN cable.
*   Connect the power supply with the POCKET ISDN-TA and plug it into mains.

Now the power-up sequence described in chapter 0 should appear.

The POCKET ISDN-TA is now ready for use; please refer to the next chapter for the
configuration to use the PC together with the POCKET ISDN-TA.

2.3   Windows 9x/ME/2000 Software Installation

This chapter describes the installation, configuration and usage of the POCKET
ISDN-TA for the operating system Windows 9x/ME/2000.

The following components will be installed:

• Modem driver into the modem list
• CAPI 2.0 driver
• Configuration program

2.3.1 <u>Preparation (Windows9x/ME/2000)</u>

Please check the following requirements before installing the software for Windows9x/ME/2000:

- PC-System with connected POCKET ISDN-TA.
- Access to a 3,5" Floppy disk drive and hard disk
- Installed Microsoft Windows 9x/ME/2000 operation system
- Windows 9x CD-ROM (Installation disks) (typically not required for ME/2000)
- Installation disk **SW-TA/Win9x/WinNT4.0/Win2000**

2.3.2 <u>Installation (Windows9x/ME/2000)</u>

1. When the POCKET ISDN-TA is connected and power up while booting your PC with Windows9x/ME/2000, the Plug and Play feature of the POCKET ISDN-TA will get active, so Windows9x/ME/2000 will request an installation disk.
    If you want to install manually the POCKET ISDN-TA driver, execute the program SETUPTA.EXE from the installation disk. This program leads you through the installation.
2. At the end of the installation you will get information about the installed software and modem types.

    The configuration of the POCKET ISDN-TA will be described in the following section. You can skip the configuration of the POCKET ISDN-TA now, if information is missing. The configuration can be done later by using the ISDN configuration generator.

    The installation program creates in addition a program folder with program icons.

    - The ISDN Configuration Generator is the configuration program for the POCKET ISDN-TA.
    - The file *Readme* shows actual information and changes of the product release.
    - The Patch icons add the POCKET ISDN-TA to the modem list of the software for the online service. Before configuring and using the online software (after installation) you have to execute the Patch ICON to add the POCKET ISDN-TA modem to the modem list of the online application. After making the patch please use one of the following POCKET ISDN-TA modems (see also page 9):
            America Online: use TA X.75
            T-Online Patch: use TA sync PPP
    - Using the program Uninstall Shield you can uninstall the actual software and delete the POCKET ISDN-TA modems from the modem list.

3. Please continue from this point with the configuration as described in the section Configuration.

2.3.3 Uninstallation

If you want to delete the software of the POCKET ISDN-TA from your hard disk, please start the program *UnInstallShield* from the program folder *POCKET ISDN-TA*.

2.4 Windows NT 4.0 Software Installation

This chapter describes the installation, configuration and usage of the POCKET ISDN-TA for the operating system Windows NT 4.0.

The following components will be installed:

- Modem driver into the modem list
- CAPI 2.0 driver
- Configuration program

2.4.1 Preparation (WindowsNT4.0)

Please check the following requirements before installing the software for WindowsNT4.0:

- PC-System with connected POCKET ISDN-TA.
- Access to a 3,5" Floppy disk drive and hard disk
- Installed Microsoft Windows NT operation system
- Windows NT4.0 CD-ROM (Installation disks)
- Installation disk **SW-TA/Win9x/WinNT4.0/Win2000**

2.4.2 Installation (WindowsNT4.0)

1. Execute the program SETUPTA.EXE from the installation disk. This program leads you through the installation.
2. At the end of the installation you will get information about the installed software and modem types.
    The configuration of the POCKET ISDN-TA will be described in the following section. You can skip the configuration of the POCKET ISDN-TA now, if information is missing. The configuration can be done later by using the POCKET ISDN-TA ISDN Configurator.
3. Restart Windows to activate new settings.
4. Now you have to add new Modems manually. Please go to
    START -> SETTINGS -> CONTROL PANEL -> MODEMS
    Select ADD and activate the button "Don't detect my modem, I will select it from a list".
    Please choose via the DISKETTE button the path to the POCKET ISDN-TA installation disk and open the file "mdmstdaa.inf".
    You can select the following POCKET ISDN-TA modems:

TA Internet PPP
TA Internet ML-PPP
TA T.70-BTX
TA V.120
TA X.75

Please note, that every modem has to be installed separately.

5.   Select the used COM port and finish to end the installation procedure.

2.5   Configuration

Using the *ISDN TA Configurator* the configuration parameter of the POCKET ISDN-TA will be set up. If you don't know the correct parameter please contact the provider of your ISDN basic rate interface (telephone company).

Please make sure, the POCKET ISDN-TA is connected to the serial interface and powered.

After providing the settings you can leave the configurator. The POCKET ISDN-TA is now ready to be used with Modem applications (i.e. Microsoft Dial-Up Networking) or CAPI compatible application programs.

Displays and control elements

At the back of the POCKET ISDN-TA you will find the connectors for the following devices:
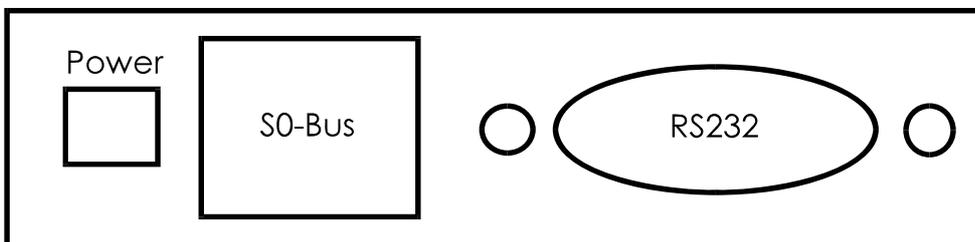
Fig. 2: Back view of the desktop model POCKET ISDN-TA

PWR: external power supply
S0-Bus: ISDN interface.
RS232:   V.24 interface for DTE, i.e. a PC

You can control the status of the POCKET ISDN-TA via 8 LEDs at the front side.
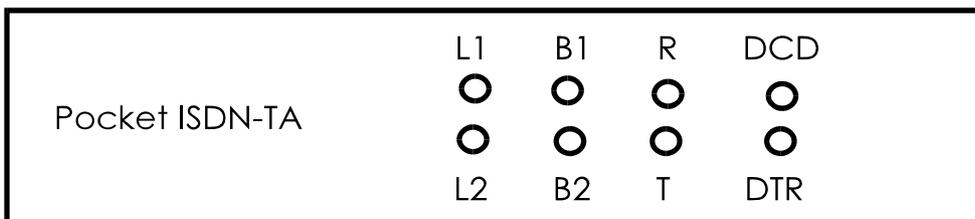
Fig. 3: Front view of the desktop model POCKET ISDN-TA

The 4 LEDs at the right show the status of the serial interface to the PC:

R : shows activity of receiving data from the POCKET ISDN-TA and ISDN line

T : shows activity of transmitted data from the terminal

DTR : shows the status of DTR line, i.e. the terminal is trying to connect via the POCKET ISDN-TA

DCD : represents the status of the DCD line (V.24); shows normally the connection to an access server.

Both LEDs, **B1** and **B2,** show the connection state of the ISDN B channels:
If ON this B channel is occupied due to an incoming or outgoing connection (data or voice).
Both of the LEDs, **L1** and **L2,** show the overall status of the POCKET ISDN-TA in coded form. The following list describes the view for an error free power on sequence of the POCKET ISDN-TA.

	Status	**L1**	**L2**	
1.	Power-On-Phase, wait	⊗	⊖	(about 2 sec)
2.	Active phase, ISDN ok	⊗	○	
3.	Connected, ISDN data connection established	⊗	⊗	

LED Legend:	⊗	On
	⊖	Continuously blinking
	○	Off

A complete list you can find in the appendix "LED displays"

3   Using the POCKET ISDN-TA with Application Software

To use the POCKET ISDN-TA with different application software and access points you have to look for the following items:

- Usually you need a contract with the service provider. They can help you to get an appropriate application program to run on a PC.
- The service provider will also supply you with the ISDN access number to call (has to be entered in the application program).
- The TAs parameter must fit the characteristics of the access point which be recommended in the next chapters.

3.1   Configuration for Internet

To access the Internet via ISDN you have to have a contract with an Internet service provider (ISP) who runs an ISDN access. To configure the POCKET ISDN-TA you need the following information from the ISP:

- ISDN access number (to be entered at the PC program)
- Layer two protocol, usually the protocol PPP by selecting Modem POCKET ISDN-TA Internet PPP.
- Access protocol (to be entered at the PC system software or Internet software)

To configure the Internet access software on the PC it may be necessary that you need some additional information like TCP/IP address, user name, password etc. Please refer to the software manual.

3.1.1 Configuration under Windows 9x/ME/2000

The configuration of the POCKET ISDN-TA can be dependent of the type of access the Internet provider is supporting. The following types of access are mostly used for public ISDN access.

- HDLC async to sync conversion
  This protocol has to be set up, if the service provider uses an access point where the protocol PPP is running.

Please get more information from your Internet provider if necessary.

3.2   Configuration for AOL/CompuServe

You need a contract with AOL/CompuServe to access the AOL/CompuServe network via ISDN. To configure the POCKET ISDN-TA you need the following information from AOL/CompuServe:
- ISDN access number
- Layer two protocol, usually the protocol-type X.75 by selecting Modem POCKET ISDN-TA X.75. Some accesses still use B channel protocol V.120 (select Modem TA V.120).
  How to select the modem see also page 4.

You can use a CompuServe access by running the CIM software package. For AOL use the AOL software.

3.3   Configuration for T-Online (Germany only)

To use the T-Online service via ISDN you have to have a contract for a T-Online access. For configuration you have to set up the following parameter:
- ISDN access number, "01910" for a basic rate access.
- The protocol T.70 by selecting Modem TA T-Online.
- Select the appropriate access type in your T-Online access software (COM port)

Alternatively since summer 1997 another access point for T-Online has been created (the latest T-Online software package has to be used):
- ISDN access number, "0191011" for a basic rate access.
- The protocol PPP by selecting Modem TA HDLC-PPP.

4   Configuring the POCKET ISDN-TA

The settings of the POCKET ISDN-TA for the V.24 interface and the S_0 interface are called configuration. The POCKET ISDN-TA is delivered with a set of pre-set values. In the following section it will be shown how, by using the configuration commands, you can examine the configuration of the POCKET ISDN-TA and if necessary change it. The values can be stored in non volatile memory; this means they´ll remain unchanged even if the power supply is disconnected.

You can configure the POCKET ISDN-TA in the following ways:
* by using the AT command set entered by the locally connected PC.
* by using TA configuration commands entered by the locally connected PC.
* by using TA configuration commands entered via the ISDN line (remote configuration).

Normally the configuration via AT commands is sufficient.
The latter case are for more sophisticated configuration and described in the chapter TA+Configurator command set

4.1   AT command set

All parameter can be changed by using an extended AT command set described in this chapter.
Please check if the factory setting will fit with your environment. The factory setting is described (highlighted) in the parameter list shown in chapter "AT command set" (see below).

If you want another configuration as set in the factory default setting, please do the following steps:

* Connect the POCKET ISDN-TA to ISDN interface
* Connect the PC s com-port to the DTE interface of the POCKET ISDN-TA.
* Connect the power supply to the mains socket.
* Start a terminal emulation on your PC, please verify that the baudrate setting of the terminal emulation fits those of the POCKET ISDN-TA.
* Set up the parameter of the POCKET ISDN-TA from the terminal emulation and save the parameter using the AT command set.
    Example:
    To change the used B channel protocol to X.75 please enter the following commands:
        ATB10<↵>   (set protocol to X.75)
        AT&W<↵>   (save the new configuration)
* Leave your terminal emulation and start your application program.

With the exception of the command **A/** (Repeat command) all commands begin

with the prefix **AT** and are terminated with <↵>. Corrections in a command line are done with <BACKSPACE>. A command line has a maximum of 80 characters. The command line is automatically cancelled by longer input. Blanks are ignored, capital/small letters are not significant.

The parameter settings of the POCKET ISDN-TA obtained when using the AT commands can be permanently stored (AT&W) and are not lost by resetting or by leaving the AT command mode.

To enter the AT command mode during an active data connection you must use the following sequence ("Escape sequence"):
>   at least 1 sec pause **<+><+><+>** 1 sec pause
The time gap between all three plus signs may not exceed 1 sec.
The escape sequence is transmitted transparent to the remote device.

Supported commands:

A/   Repeat last command line

This command repeats the commands of the last entered command line.
Note: No prefix **AT** is required.
>   A/

A   Accept incoming call

Using this command you can accept an incoming call, if automatic call acceptance is not set (Register S0 = 0). An incoming call is displayed by the message "RING" or the code "2".
Must be the last command in an AT command line.
>   ATA[//<*UUS1data*>]
>   ***UUS1data***   transmitted data with UUS1 signalling

B   B channel protocol

Transmission protocol for data communication in the B channel.
>   ATB0 : V.110 asynchronous   (i.e. for BBS access)
>   **ATB3** : HDLC async to sync conversion (PPP asynchronous, single link PPP,
>   default)
>   (i.e. for Internet / dial-up network
>   access)
>   ATB4 : HDLC transparent (octets are packed into HDLC frames)
>   ATB5 : Byte transparent (raw B channel data)
>   ATB10 : X.75-NL   (i.e. for BBS access)
>   ATB13 : V.120   (for AOL/CompuServe access)
>   ATB20 : X.31 B channel (X.25 B channel, option)

ATB21 : X.31 D channel (Option)
ATB22 : T.70-NL-CEPT   (for T-Online (videotex) access)
ATB23 : T.90-NL
ATB31 : Multilink PPP (ML-PPP)

%B   Set local baudrate

Sets the local baudrate of the POCKET ISDN-TA to the desired value (fix value) or to autodetection. When autodetection is set, the POCKET ISDN-TA will recognize the desired baudrate with every newly entered AT command by the terminal equipment (PC). With all other settings the PC must use the same baudrate.
Must be the last command in an AT command line.

    AT%B0   Automatic local baudrate detection enabled (autobauding, default)
    AT%B1   Local baudrate set to 1200 bit/s
    AT%B2   Local baudrate set to 2400 bit/s
    AT%B3   Local baudrate set to 4800 bit/s
    AT%B4   Local baudrate set to 9600 bit/s
    AT%B5   Local baudrate set to 19200 bit/s
    AT%B6   Local baudrate set to 38400 bit/s
    AT%B7   Local baudrate set to 57600 bit/s
    AT%B8   Local baudrate set to 115200 bit/s
    AT%B9   Local baudrate set to 230400 bit/s

Note: If autobauding is selected (default) and after powering on the TA+POC no AT command is entered, a response from the POCKET ISDN-TA (i.e. RING) will be sent with the baudrate 115200 bit/s.

CONF   Enter TA+Configurator

Enters directly into the TA+Configurator, the configuration prompt "#" will be displayed. Leave the TA+Configurator with the command "quit".
     ATCONF

&C   DCD control

Selects the behavior of the DCD control line from the POCKET ISDN-TA.
     AT&C   TA control line DCD is always ON
     AT&C1   DCD ON indicates ISDN connection is established and synchronized (default)

#C   Received bearer service

Shows the bearer service that is received with an incoming call in hexadecimal coding *hbhb*.
The value for *hbhb* (word) is the CIP value as defined in the CAPI 2.0 specification, , also to be found via INSYS URL http:\\www.insys-tec.de.
     AT#C

#C1=*hbhb*   Select bearer service outgoing

Selects the bearer service that will be sent with an outgoing call
The value for *hbhb* (word) is the CIP value as defined in the CAPI 2.0 specification (default 0000).
     Example: an outgoing call as a voice call: AT#C1=0004.

#C2=*hbhbhbhb*   Select bearer service incoming

Selects the bearer services that can be accepted with an incoming call. The definition of *hbhbhbhb* (double word) is the CIP mask as defined in the CAPI 2.0 specification (default 00000004).
     Example: AT#C2=00030012 : Accept analogue incoming calls
                     AT#C2=00000001 : Accept all incoming calls.
Note: Before issuing an outgoing call the command AT#C1 has to be set.
     To use the predefined services please setup factory defaults (AT&F).

D   Initiate outgoing call

Dials the number (D for Dial). The dial modifier "W", ">", "T", ";", "@" can be freely inserted in the dial string; they have no influence on the dial procedure of the TA. Must be the last command in AT command line.
Any character input while the POCKET ISDN-TA is dialing will cancel the dialing procedure.

ATD<*CALLEDnumber*>[/<*subaddr*>][//<*UUS1data*>]
    [,*X*[P*xxx*-][R][N<nuipwd>][G<cug>]<*X25number*>][*D*<*userdata*>]]

CALLEDnumber:	ISDN call number for a dialled B channel connection or X.25 number for X.31 D channel
subaddr	dialled subaddress
UUS1data	transmitted data with UUS1 signalling
P :	use packetsize xxx for X.25 connection
R :	request the facility reverse charging
G :	access to X.25 closed user group
O :	Outgoing call from X.25 closed user group
N :	use NUI and password with call setup
	allowed chars: a-z, A-Z, 0-9.
	(overrides setting of nui configuration command)
X25number:	dialled X.25 call number (X.25 B channel only)
D :	separator for userdata: "D" or ",": user data without protocol ID
	"P": user data with protocol ID ("01000000")

ATDL   Dial the last dialled number
ATDS=*n*   Dial number *n* from stored telephone number list (*n* = 1..3)
                    (See command AT&Z to store numbers)
ATD<*CALLEDnumber*>e Make a call for remote management (see note).

Note1:   To setup the own subaddress see configuration command **sub**.
Note1:   Adding an "e" to ***CALLEDnumber*** indicates that a connection to the internal remote access of a POCKET ISDN-TA shall be performed, the protocol X.75 (ATB10) has to be used.

&D	DTR control

Selects the behavior of the POCKET ISDN-TA, when the DTE control line DTR changes from ON to OFF.

AT&D   DTE control line DTR setting is ignored

AT&D2   DTE control line DTR is evaluated: dropping the DTR line by the DTE will disconnect an existing ISDN connection (default). An incoming call will accepted only with DTR active.

E	Local echo

Selects the local echo in command mode.

ATE   No local echo

ATE1   Local echo on in command phase (default)

&F	Load factory defaults

Factory default will be loaded, ISDN protocol setting and msn´s will not be overwritten. (for storing in non volatile memory please use the command AT&W).

AT&F   setup all parameter concerning data port

AT&F1setup all parameter including ISDN protocols, msn settings and passwords.

H	Disconnect

Disconnects existing ISDN data connection, after issuing the Escape sequence (see page 11).

ATH[//<*UUS1data*>]

UUS1data   transmitted data with UUS1 signalling

I	Display version information

Displays different information about version number and settings:

ATI   Returns the "Modem"-type; name of the terminal adapter ("TA")

ATI1   Returns internal checksum ("64")

ATI2   Returns "OK"

ATI3   Returns version string: "TA5.xy.z0"

ATI4   Returns manufacturers name: "INSYS MICROELECTRONICS GmbH"

ATI5   Returns ISDN selected protocol: "0 - DSS1"

ATI6   Returns copyright string: "(c) Copyright INSYS MICROELECTRONICS GmbH"

ATI7   Returns "OK"
ATI8   Returns "ERROR"
ATI9   Returns plug and play ID string
ATI77   Returns Bootloader version string
ATI99   Returns software creation date

&K   Flowcontrol

Selects the flow control behavior of the POCKET ISDN-TA while in data communication phase.

AT&K   No local flow control between the DTE and TA is used
AT&K3 Local flow control is set to hardware handshake RTS/CTS (default)
AT&K4   Local flow control is set to software handshake XON/XOFF

#M   Received CLID

Shows the called line identification (CLID) that is received with an incoming call – this is the number of the called party addressed on the local S-bus (selected msn).

AT#M

N   Set line baudrate V.110

Selects the line baudrate of the POCKET ISDN-TA to the desired value (only valid for B channel protocol V.110 asynchronous).

ATN0 Line baudrate automatic set (equals to local baudrate or less)
ATN1 Line baudrate set to 1200 bit/s
ATN2 Line baudrate set to 2400 bit/s
ATN3 Line baudrate set to 4800 bit/s
ATN4 Line baudrate set to 9600 bit/s
ATN5 Line baudrate set to 19200 bit/s

O	Return to online state

If the POCKET ISDN-TA is in command mode after issuing an escape sequence out of an existing connection, ATO brings the POCKET ISDN-TA back to data phase. Must be the last command in AT command line.
     ATO

#O	Received CLIP

Shows the calling line identification (CLIP) that is received with an incoming call – number of the calling party.
     AT#O

Q	Suppress results

With this command result codes or messages can be suppressed.
     ATQ   Returns status - codes after command input (default)
     ATQ1   No result codes are returned

&R	CTS control

Selects the behavior of the CTS control line from the POCKET ISDN-TA.
     AT&R   TA control line CTS is following all changes of RTS
     AT&R1 CTS is always ON (default)

#R	Handle incoming calls

Selects the behavior of the POCKET ISDN-TA when an incoming call is received. When set, all incoming calls are ignored independendent of all other settings.

     AT#R   Disable automatic reject of all incoming calls (default)
     AT#R1   Enable automatic reject of all incoming calls

S   Display and set internal S register

ATS*nn?*   Show actual values (decimal) of selected register *nn*
ATS*nn=xx*   Set selected register *nn* to the decimal value *xx*.

&S   DSR control

Selects the behavior of the DSR control line from the POCKET ISDN-TA.
AT&S   TA control line DSR is always ON (default)
AT&S1DSR ON indicates ISDN connection is established and synchronized

---

V   Result format

ATV   Result is presented as numbers (followed by <↵>)
ATV1   Result is presented as text (default)

&V   Display configuration

AT&V   Displays the actual configuration of AT command setting
               including stored ISDN numbers
AT&V1   Displays the actual configuration of extended AT command
               setting

W   Extended result codes

ATW   Result is presented with extended result codes
ATW1   Result is presented with extended result codes
               RING and CONNECT including ISDN address, all others include
               error causes.
               Message RINGING will be displayed.

&W   Store active configuration

The active configuration will be stored in non volatile memory.
AT&W

X	Reduce result messages

Reduces the number of result messages after trying to set up a connection
- ATX0 "CONNECT" only (without line speed)
- ATX1 "CONNECT" with line speed, "BUSY", "NO DIALTONE" not used
- ATX2 "CONNECT" with line speed, "BUSY" not used
- ATX3 "CONNECT" with line speed, "NO DIALTONE" not used
- **ATX4** "CONNECT" with line speed, all messages used (default).

Z	Load stored settings

The active configuration will be reset to the stored configuration.
Must be the last command in an AT command line.
- ATZ

&Z	Store call-number

Stores dialing number *nn* as entry number *x* into the telephone list (*x* = 1..3).
- AT&Z*x*=*nn*   set entry number *x* to dialling number *nn*
- AT&Z*x*=-   erases entry number *x*.
- AT&Z*x* shows entries number *x*.
- AT&Z   show all entries.

Note: Refer to TA+Configurator command *catab* for more information.
          See command ATDS for using.

#Z	Define own msn

Defines the msn *nn* (multiple subscriber number) for the data port.
If the number is set to "*" (default), all incoming calls are acceptable.
The msn can be displayed by command AT#H or AT&V.
- AT#Z=*nn*   set msn to *nn*
- AT#Z   shows currently set msn number.

The msn is automatically stored to non volatile ram (without issuing command AT&W).

Note: If 1TR6 D channel protocol is selected, only one or the last digit is valid.

DBITS   Number of data bits x asynchronous chars (7,8**)

Number of data bits x for asynchronous character (7,default: **8**)
>   AT**DBITS=x

**PRTY   Parity asynchronous chars

Selects the parity for asynchronous characters.
0: no parity; 1: even parity; 2: odd parity
>   **AT**PRTY=0**   No parity (default)
>   AT**PRTY=1   Even parity
>   AT**PRTY=2   Odd parity

4.1.1 <u>ISDN specific AT commands</u>

Setting up special ISDN parameter:
(only one command is allowed per AT command)

**BSIZE   Set B channel block size

Defines the maximum length x of a data block transmitted or received in B channel (default: BSIZE = 2048).
>   AT**BSIZE=x

Note: The value will be changed by setting the B channel protocol (ATBx).

**LLC   Set low layer compatibility (LLC)

Defines the LLC value for outgoing calls in hexadecimal format. In some situation a specific LLC value is required to pass detailed information about the used B channel protocol to the called party. This can be done by setting the LLC to a fix value.
An empty parameter has to be entered by "-" (default: LLC is empty).
>   Example: Deleting of LLC-value: AT**<u>LLC=-<↵></u>
>   Entering a new LLC: AT**<u>LLC=8890<↵></u>
Note: The value will be changed by setting the B channel protocol (ATBx).

**DTE	Set B channel Layer 2 address

Selects the Layer 2 link addresses. Only valid for protocols that are HDLC based (X.75, LAPB).

AT**DTE=0   Calling side reacts as DTE,
                     called side reacts as DCE (default, X.75 standard)
AT**DTE=1   TA reacts as DTE (own adr = 01)
AT**DTE=3   TA reacts as DCE (own adr = 03)

Note: The value will be changed by setting the B channel protocol (ATBx).

**ISDN	Select D channel protocol

Selects ISDN D channel protocol to the ISDN line. The protocol must fit the protocol running on the ISDN line otherwise a connection cannot be set up.

Note: after changing and storing the ISDN protocol the POCKET ISDN-TA has to be reset by powering it off and on (alternately you can use the command AT&W**RESET).

AT**ISDN=0   Select DSS1 (Euro-ISDN) (default)

AT**ISDN=5   Select Bellcore National ISDN-1/2 (USA) (Option)
AT**ISDN=6   Select NTT INS-NET (Japan)   (Option)
AT**ISDN=7   Select AT&T 5ESS (USA)   (Option)
AT**ISDN=8   Select VN-4 (France)   (Option)
AT**ISDN   Show selected ISDN protocol
AT**?ISDN   Show available ISDN protocols

**K	Set Layer 2 windowsize

Sets windowsize x layer 2 protocol B channel: x = 1 ..7, default: **7**
     AT**K=x
The default value is dependent of the selected B channel protocol.

**PTP	Set ISDN interface type

AT**PTP=0   select multipoint mode (to connect ISDN terminals, default)
AT**PTP=1   select point to point mode (to connect ISDN switching systems)

**RPWD   Password remote configuration

Sets password for remote configuration to *nn* (1..32 chars)
        AT**RPWD=*nn*
Default: empty.

**SPID1, SPID2   Set SPID   (Option)

For ISDN lines in the U.S. you have to set the SPID. You get it from your ISDN provider.
        AT**SPID1=xxxx   Set SPID 1
        AT**SPID2=xxxx   Set SPID 2

**<cmd>   Execute configuration command

Executes one configuration command, for definition of commands.
        AT**<cmd>

4.1.2 AT command S register set

S0   0: No automatic call acceptance, acceptance of an incoming call is controlled by the data terminal (command ATA after RING)
                1: Immediate call acceptance by the terminal adapter (default)
                2..*n*: Call acceptance through the terminal adapter after *n* "RING" messages.
                Note: The time between two ring messages can be configured using the TA-configuration command "ringtimer" (default = 5 sec.)
S1   Ring Counter (read only)
S2   Escape Character (default = 43h)
S3   Carriage Return Character (default = 0Dh)
S4   Line Feed Character (default = 0Ah)
S5   Backspace Character (default = 1Ah)
S7   Wait time for Carrier (sec) (default = 30 sec)
S9   Enable PNP functionality for Windows95 (default=1, enabled)
S16   Last occurred CAPI/ISDN error cause
S90   Last incoming ISDN calling number (CLIP)
S91   **0**: default
                1: all unknown AT commands will be answered with OK.
                2: Windows 2000 compatibility: some AT commands will be answered with OK (see list below), unknown AT commands will be answered with OK.

                Windows2000 AT command set change:

ATNxxx   all commands ATNxxx will respond OK without any functionality behind it. V.110 baudrates can be set with AT**BRN.

ATBxxx   All commands ATBxxx will respond OK without any functionality behind it. The B-channel protocol settings can be set with AT**PROT.

AT\Nxxx   All commands AT\Nxxx will respond OK without any functionality behind it. The B-channel protocol settings can be set with AT**PROT.

4.1.3 <u>AT result codes</u>

Result codes (numerical and verbose):

Code	Text	Meaning
0	OK	Command completed
1	CONNECT <rn>	Connection established (rn = call number of remote site)
2	RING <rn>	Indicates an incoming call (SETUP received)
3	NO CARRIER <xx>	No synchronization (xx = ISDN error cause)
4	ERROR	Illegal command or error that can not be indicated otherwise
5	CONNECT 1200 <rn>	Connection, line speed 1.2 kbps (V.110)
6	NO DIALTONE <xx>	No access to ISDN network (xx = ISDN error)
7	BUSY <xx>	Number engaged (xx = ISDN error cause)
8	NO ANSWER <xx>	No connection; called number can not be reached (xx = ISDN error cause)
10	CONNECT 2400 <rn>	Connection, line speed 2.4 kbps (V.110)
11	CONNECT 4800 <rn>	Connection, line speed 4.8 kbps (V.110)
12	CONNECT 9600 <rn>	Connection, line speed 9.6 kbps (V.110)
16	CONNECT 19200 <rn>	Connection, line speed 19.2 kbps (V.110)
19	CONNECT 64000 <rn>	Connection, line speed 64 kbps
-	RINGING <rn>	Outgoing call is ringing at called site

Call number display:
<rn> = call number of remote site

In AT command mode, call number display (does not belong to the AT command standard) can be turned on by issuing the command ATV2 or ATV3. If turned on, the call number of the caller is shown with the Connect- or Ring-message (in pointed brackets), depending on the signaling in D-channel.

If the POCKET ISDN-TA is used at the public network then the call number of the remote site (including area code) is displayed.

Example: CONNECT 64000 <040890880>

Error cause display:
<xx> = ISDN release (error) cause, hexadecimal
Example: NO CARRIER <#34F0>

In AT command mode, error cause display (does not belong to the AT command standard) can be turned on by issuing the command ATV2 or ATV3. The shown error causes use the coding defined by the CAPI definition. ISDN error causes from the ISDN network are always coded as 34xxH, where xx represents the hexadecimal version of the ISDN error cause (see page 30). All other causes are CAPI error causes (see page 32).

4.2   ISDN access control

Using these commands you can setup a table, to allow only dedicated callers to get a connection to the POCKET ISDN-TA.
If this list is empty (default) or one entry is set to star (*), any incoming call is allowed.
Every incoming call that does not fit to one of the entries of acctab will be ignored. The received calling party number is compared to every entry beginning at the last digit and is stopped when the shorter number is completely compared.

acctab**x** **nn/ss**	set entry number **x** to ISDN number **nn** and subaddress **ss**
acctab**x** -	clear entry number **x**
acctab**x** *	allows all incoming calls to be accepted
acctab**x**	shows entry number **x**
acctab	shows all entries

Maximum number of entries = 5; **x** = 1..5
Maximum length of ISDN number = 20 digits
Maximum length of subaddress = 20 digits
The ISDN number **nn** can contain wildcards:
        * : represents one or more digits
        ? : represents exactly one digit

Note: If a subaddress is set, the received calling subaddress must be identical to the subaddress that is set.

Examples:

acctab1	1234567890	accept only specified number
acctab2	*456*	accept all numbers with 456 somewhere in the middle
acctab3	?2345678??	accept all number with 2345678 in the middle peceeded by one digit and followed by two digits.
acctab2	*1234/987	accept all numbers that end with 1234 and have the subaddress 987
acctab3	*	accept all incoming calls without subaddress
acctab3	-	clear entry no. 3

Note:

If you are not sure, in which format the calling number will be presented with an incoming call, please use the command ATV2 to see the the format of the calling number in the RING message. This number can be entered into the acctab.

4.3 User to User Signalling UUS1

With outgoing and incoming calls the transmission of User-to-User-Data (UUS1-data) can be performed using the ISDN supplementary service UUS1. The UUS1-data are transmitted transparently from the calling party to the called party before the B channel connection is fully established.
Please note, that this ISDN service typically has to be enabled by the ISDN service provider and may be charged additionally.

See the command ATD in AT command set:

Example: **ATDisdnnumber[//<UUS1-data>]**
 (PAD:)   *X25number[I<ISDNnumber>[//<UUS1data>]]*

            "**//**": separator for UUS1-data

The UUS1-data have a maximum length of 128 Bytes and will be interpreted as ASCII characters.
Incoming UUS1-data are presented as enhencement to the RING and CONNECT message.

AT: RING [<rn>] [//<UUS1-data>]
       CONNECT [<rn>] [//<UUS1-data>]
PAD: <X.25addr>I<isdnnumber>[//<UUS1-data>]
       COM
Note: The presentation of UUS1-data has to be enabled by command ATW1.

The data are presented as ASCII characters.

An incoming call can be accepted (S0 register set to 0) by an ATA or rejected by an ATH combined with the transmission of UUS1-data (AT only):

    ATA [//<UUS1-data>]
    ATH [//<UUS1-data>]

Examples:
    ATD1234567890//userdata#010203*ende
    RING //userdata
    RING //#01020304

4.4 Subaddressing

With outgoing and incoming calls the transmission of subaddresses can be performed using the ISDN supplementary service SUB. The subaddress is transmitted transparently from the calling party to the called party before the B channel connection is fully established.
Please note, that this ISDN service typically has to be enabled by the ISDN service provider and may be charged additionally.

The subaddress is separated by an "**/**" from the called number.

The functionality Subaddressing can be used with the dialling procedures AT-command set, PAD X.3 and automatic call.

Examples:
    ATD*isdnnumber*[/*subaddr*]
        isdnnumber   Dialling called party number
        subaddr   Called subaddress

    RING [*<rn>*[/*subaddr*]]
    CONNECT [*<rn>*[/*subaddr*]]

        rn   Calling party number
        subaddr   Calling party subaddress

The own subaddress (calling subbaddress) can be setup using the configuration command **sub**.

Note: The subaddress can be entered additionally into all tables that contain ISDN numbers for dialling or checking an ISDN address.

4.5   Using Multilink PPP

To enable Multilink PPP handling within the POCKET ISDN-TA please enable the B channel protocol ML-PPP: atb31 rsp. prot = 31.

ML-PPP may be used with different authentification procedures during the call up of the line. One of these is CHAP. You may enable ML-PPP CHAP by the following steps:

- Enter "**at**chappwd=<password>**" to input your password in the POCKET ISDN-TA.
- Enter "**AT&W**" to store the setting in the POCKET ISDN-TA.

Afterwards a ML-PPP connection is initially made using CHAP authentification. If the server does not handle CHAP an automatic fallback to PAP is performed.

You may control the settings by typing "AT&V1".

Warning: Since the password is shown in plain text it may be disclosed by unauthorized persons.

4.5.1 Details on Multilink PPP

Currently on INSYS TAs running Multilink PPP (ML-PPP) the following *authentication protocols* (AP) are supported:

- Password Authentication Protocol (PAP)
- Challenge Handshake Authentication Protocol (CHAP) with the variants
- MD5 according to RFC 1321
- Microsoft Chap according to RFC 2433

PAP exchanges the password in clear text format in the B-channel, whereas CHAP encrypts the password according to the algorithms described in the RFCs mentioned above. For CHAP the password has to be stored in the POCKET ISDN-TA in addition to the setting in the Dial-up Network under Windows 95. Under Windows 98/ME/2000 this is not necessary.

The following basic rules apply when the POCKET ISDN-TA is configured to run ML-PPP:

1. If the remote side requests (in the Link Control Protocol LCP ConfigRequest) an AP that the POCKET ISDN-TA can handle, the request is forwarded to local side.
2. If the remote side requests an AP that the POCKET ISDN-TA cannot handle, the POCKET ISDN-TA proposes the safest protocol depending on its capabilities:
   - PAP if no password *chappwd* is locally stored,
   - CHAP/MS-CHAP MD5 if a password *chappwd* is locally stored.
   This step may be repeated a limited number of times only, if this number exceeds, the POCKET ISDN-TA falls back to single link operation until the next connection is tried.

3. Once the local side rejects (with a LCP ConfigNak) an AP that was alternatively proposed by the POCKET ISDN-TA (see previous rule), the POCKET ISDN-TA falls back to single link operation until the next connection is tried. Local and remote side may negotiate any AP they like.
4. At the end of the link setup procedure the negotiated AP is checked and, if supported, is used for the second link too. If the final AP is not supported the second link is not established, the POCKET ISDN-TA falls back to single link operation until the next connection is tried.

Note that some hosts are very strict, e.g. if PAP is proposed by the POCKET ISDN-TA due to the lack of a locally stored password *chappwd* they simply hang up the connection without any chance to negotiate anything else. In these cases the POCKET ISDN-TA should be configured for single link PPP operation, or, alternatively, the *chappwd* should be supplied and stored on the POCKET ISDN-TA.

4.5.2 <u>Call Bumping</u>

A ML-PPP connection uses both B-channels of the S bus. To accept an incoming call (i.e. for telephony) during a ML-PPP session one B-channel has to be released. This is called Call Bumping.

To enable Call Bumping proceed as follows:
- Activate call waiting on the S bus. It has to be activated in the ISDN switch and is a feature of the ISDN line you ordered.
- Open the "properties" of the dial-up link you are using for ML-PPP and "additional settings". Input "**at**cmlp=1**" as an additional parameter.

If there is an incoming call during a ML-PPP session the POCKET ISDN-TA will drop one B-channel and an ISDN telephone attached to the S bus will be ringing to accept the call.

4.5.3 <u>Bandwidth on demand ("BOD")</u>

Enabling this feature will cause the TA+PP2 to use the Multilink PPP protocol to enhance the ISDN throughput using the second B channel automatically:
- if the throughput of the internet connection is higher than a definable value a second B channel connection will be established automatically and for data transfer used.
- if the throughput of the internet connection is lower than a definable value the second B channel connection will be disconnected automatically.

> **at**bod=0**   disable BOD (default)
> **at**bod=1**   enable BOD
> **at**bodiv=<incrValue>**   Throughput level to add 2nd B channel connection (in kbit/s) (default=40)
> **at**bodit=<incrTime>** duration that bodiv has been reached to add 2nd b channel (in secs) (default=30)
> **at**boddv=<decrValue>** Throughput level to release 2nd B channel connection

(in kbit/s) (default=40)

at**boddt=<decrTime>   duration that boddv has been reached to release
2nd b channel (in secs) (default=30)

Note: call bumping ("cmlp") has higher priority than bandwidth on demand.

4.6   Software update

The POCKET ISDN-TA uses a Flash-EPROM to store the software. This software can be updated from a local connected PC via the COM port.

4.6.1 Software update

Please fulfil the following steps to update the POCKET ISDN-TA:

- Get a new software release for the POCKET ISDN-TA from your supplier and copy it to your PC.
- Start a terminal emulation on your PC with the capability to run an X-MODEM file transfer (i.e. HyperTerminal).
- Enter the AT command "at**flash".
- Wait for end of erasing the Flash-EPROM and the prompt to start your X-MODEM transfer.
- Start the 1kX-MODEM file transfer (send file or upload) by selecting the Transfer / Send File menu point in your terminal emulation and select the new software.
- After completion you will get the information whether the software update ended successfully or erroneous.
- Give the POCKET ISDN-TA about 20 seconds to activate the new software.
- Due to new functionality the last stored configuration setting may be lost, please check before using. To set factory default values please use the command "at&f1".

5   Diagnostic and error messages

For the diagnostic of erroneous situations the following functionality is supported. Please check first the behaviour of LED displays, if an ISDN connection can not be established. Refer to list of LED displays on page 34.

5.1   Error messages from AT command set

When the extended result messages are selected using the command ATV2 ISDN error codes are displayed in addition to the standard AT result messages.
ISDN error causes from the ISDN network are always coded as *34xxH*, whereas the last two digits xx represent the ISDN cause in hexadecimal coding. The meaning can be taken from the following tables ISDN causes (see page 30).

5.2   Table of ISDN causes and their explanation (DSS1)

Cause Decimal / Hexadecimal	Meaning	Translation to AT result codes
1 / 0x81	Unallocated (unassigned) number	3
2 / 0x82	No route to transit network	3
3 / 0x83	No route to destination	3
6 / 0x86	Channel unacceptable	6
7 / 0x87	Call awarded and being delivered in an established channel	6
16 / 0x90	Normal clearing	3
17 / 0x91	User busy	7
18 / 0x92	No user responding	8
19 / 0x93	No answer from user (user alerted)	8
20 / 0x94	No answer from user (device off)	8
21 / 0x95	Call rejected	8
22 / 0x96	Number changed	3
26 / 0x9A	Non selected user clearing	3
27 / 0x9B	Destination out of order	8
28 / 0x9C	invalid number format	3
29 / 0x9D	Facility rejected	3
30 / 0x9E	Response to STATUS ENQUIRY	3
31 / 0x9F	Normal disconnect, unspecified	3
34 / 0xA2	No circuit/channel available	7
38 / 0xA6	ISDN network out of order	6
41 / 0xA9	Temporarily failure	6
43 / 0xAB	Access information discarded	6
44 / 0xAC	Requested circuit/channel not available	6

Cause Decimal / Hexadecimal	Meaning	Translation to AT result codes
46 / 0xAE	Precedence call blocked	6
47 / 0xAF	Resource unavailable, unspecified	6
49 / 0xB1	Quality of service unavailable	3
50 / 0xB2	Requested facility not subscribed	3
53 / 0xB5	**OUTGOING CALLS BARRED WITHIN CUG**	**3**
55 / 0xB7	**INCOMING CALLS BARRED WITHIN CUG**	**3**
57 / 0xB9	**BEARER CAPABILITY NOT AUTHORIZED**	**3**
58 / 0xBA	Bearer capability not presently available	3
63 / 0xBF	Service or option not available, unspecified	3
65 / 0xC1	Bearer capability not implemented	3
66 / 0xC2	Channel type not implemented	3
69 / 0xC5	Requested facility not implemented	3
70 / 0xC6	Only restricted digital information bearer capability is available	3
79 / 0xCF	Service or option not implemented, unspecified	3
81 / 0xD1	Invalid call reference value	3
82 / 0xD2	Identified channel does not exist	3
83 / 0xD3	A suspended call exists, but this call identity does not	3
84 / 0xD4	Call identity in use	3
85 / 0xD5	No call suspended	3
86 / 0xD6	Call having the requested call identity has been cleared	
87 / 0xD7	User not member of CUG	3
88 / 0xD8	Incompatible destination	3
90 / 0xDA	Non-existent CUG	3
91 / 0xDB	Invalid transit network selection	3
95 / 0xDF	Invalid message, unspecified	3
96 / 0xE0	Mandatory information element missing	3
97 / 0xE1	Message type non-existent or not implemented	3
98 / 0xE2	Message not compatible with call state or message type non-existent or not implemented	3
99 / 0xE3	Information element /parameter non-existent or not implemented	3
100 / 0xE4	Invalid information element contents	3
101 / 0xE5	Message not compatible with call state	3
102 / 0xE6	Recovery on timer expiry	3
103 / 0xE7	Parameter non-existent or not implemented,	3

Cause Decimal / Hexadecimal	Meaning	Translation to AT result codes
	passed on	
111 / 0xEF	Protocol error, unspecified	6
127 / 0xFF	Network interworking error, unspecified	6

5.3   CAPI causes and their explanation

Coding of the CAPI cause in hexadecimal form.

0000   No error
0001   NCPI ignored
0002   Flags ignored
0003   Alert already sent

1001   Too many applications
1002   Logical block size too small
1003   Buffer exceeds 64k
1004   Message buffer size too small
1005   Too many logical connections
1006   Reserved1
1007   Message could not be accepted
1008   Register OS Resource Error
100a   External Equipment not supported
100b   External Equipment only
1101   Bad application ID
1102   Illegal cmd or message length
1103   Message queue full
1104   Message queue empty
1105   Message lost
1106   Unknown notification
1107   Message not accepted
1108   OS Resource Error
1109   CAPI not installed

2001   Bad State
2002   Illegal Identifier
2003   Out of PLCI
2004   Out of NCCI
2005   Out of LISTEN
2006   Out of Fax Resources
2007   Illegal Message Parameters

3001   B1 protocol not supported

3002	B2 protocol not supported
3003	B3 protocol not supported
3004	B1 protocol param not supported
3005	B2 protocol param not supported
3006	B3 protocol param not supported
3007	B Prot combination not supported
3008	NCPI not supported
3009	Unknown CIP value
300a	Flags not supported
300b	Facility not supported
300c	Data length not supported
300d	Reset procedure not supported
3301	Layer1 protocol error
3302	Layer2 protocol error, i.e. DTE address not correct, TEI not correct
3303	Layer3 protocol error
3304	Another application got the call
3311	Fax remote station is not fax
3312	Fax training failed
3313	Fax disconnect before transfer
3314	Fax disconnect remote abort
3315	Fax disconnect remote procedure
3316	Fax disconnect local transmitter underrun
3317	Fax disconnect local receiver overflow
3318	Fax disconnect local abort
3319	Fax illegal transmit data

34xx   Error cause from the ISDN line, xx represents the ISDN cause (see capter 5.2)

6   Appendix

A1:   Technical data:

One V.24 channel:
>   functional: V.24
>   electrical: V.28
>   mechanical: 9 pin DSUB connector (female)

Transmission speeds:
>   DTE: 1200 – 230400 bit/s (asynchronous)
>   B channel: 2 x 64000 bit/s (synchronous)

Character representation: 8Bit no Parity, 1 stop bit
                                     7Bit even/odd Parity, 1 stop bit

Character synchronization: asynchronous

Operating mode: half duplex or full duplex

ISDN interface: Basic rate interface according to ITU I.430 (RJ45)

Physical dimensions: desktop casing: 230 x 50 x 200 mm (WxHxD)

A2:   LED displays

Active states:

L1	L2	Status	
⊗	Θ (2sec)	Power-On-Phase	; Wait
Θ (1x1s)	O	ISDN not ok	; Check ISDN interface/ -connector
⊗	O	Active phase	; ISDN ok, no ISDN connection established
⊗	∅	Call active	; ISDN Connection will be established
⊗	⊕	Synch active	; Waiting for B channel synchronization
⊗	⊗	Connected	; Data connection is established

B1,B2   **Status B channels**

◯   B channel offline   ;

⊗   B channel online   ; ISDN connection established

Error states:

L1	L2	**Status**	
◯	◯	TA not ok	; Hardware error, TA repair necessary
⊖	◯	ISDN not ok	; Check ISDN interface/ -connector
◯	⊖ (nx1s)	TA not ok	; Hardware error, TA repair necessary
⊖	⊖	B1, B2 flashing: Bootloader aktive, no operational firmware programmed. Use command at**flash to download firmware with 115200 Bd,N81 (see page 29).	

LED Legend:

⊗	On		
∅	occ	short on, long off	Cycle 1 sec
⊕	fl	long on, short off	Cycle 1 sec
⊖	(*n*x*m*s)	continuous blinking: ***n*** times every ***m*** seconds	
◯	Off		

A3:   Pinout of the ISDN connector

Pinout of the 8 pin ISDN S-interface connector (RJ45) (ITU I.430/ISO 8877)

Pin	Signal (S_0)
1	Not connected
2	Not connected
3	Tx+ (Transmit +)
4	Rx+ (Receive +)
5	Rx- (Receive -)
6	Tx- (Transmit -)
7	Not connected
8	Not connected

A4:   Pinout of the V.24/V.28 interface TA (DSUB 9)

Pin	V.24/V.28			I/O	TEXT
	ITU	DIN	EIA		
1	109	M5	DCD	O	Data carrier detect
2	104	D2	R D	O	Receive data
3	103	D1	T D	I	Transmit data
4	108/1 108/2	S1.1 S1.2	DTR	I	Data terminal ready
5	102	E2	GND	---	Signal ground
6	107	M1	DSR	O	Data set ready
7	105	S2	RTS	I	Request to send
8	106	M2	CTS	O	Clear to send
9	125	M3	RI	O	Ring indicator

A5:   Pinout of the V.24/V.28 interface TA (DSUB 25):

| Pin	V.24/V.28			I/O	TEXT
	ITU	DIN	EIA		
1	101	E1		---	Protective ground
2	103	D1	T D	I	Transmit data
3	104	D2	R D	O	Receive data
4	105	S2	RTS	I	Request to send
5	106	M2	CTS	O	Clear to send
6	107	M1	DSR	O	Data set ready
7	102	E2		---	Signal ground
8	109	M5	DCD	O	Data carrier detect
20	108/1 108/2	S1.1 S1.2	DTR	I	Data terminal ready
22	125	M3	RI	O	Ring indicator

A6:   Cable layout for connection of terminals with 25 pin connectors (male or female) to a TA

Only the cable with a male plug at the terminal side is shown. The pin configuration for the female plug is the same.
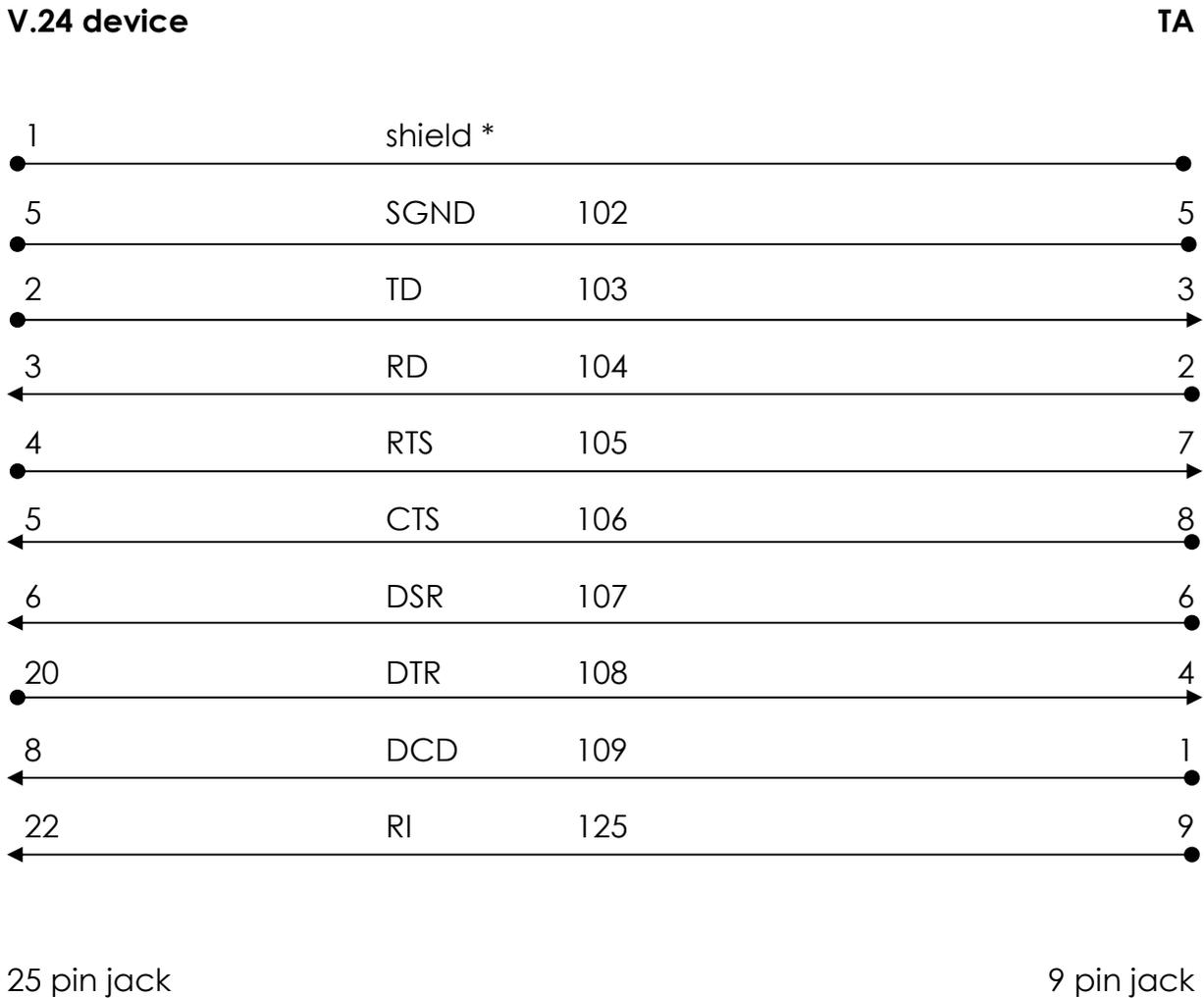
V.24 device   **TA**

25 pin	signal	number	9 pin
1	shield *		
5	SGND	102	5
2	TD	103	3
3	RD	104	2
4	RTS	105	7
5	CTS	106	8
6	DSR	107	6
20	DTR	108	4
8	DCD	109	1
22	RI	125	9

25 pin jack   9 pin jack

Attention: allowed cable length < 15m.
for transmission speeds > 19.200 bit/s < 2m.
* necessary if cable length > 2m

A7:   Cable layout to connect a PC with 9 pin male plug through a serial COM-port to a TA

PC   **TA**

	shield *		
5	SGND	102	5
3	TD	103	3
2	RD	104	2
7	RTS	105	7
8	CTS	106	8
6	DSR	107	6
4	DTR	108	4
1	DCD	109	1
9	RI	125	9

9 pin jack   9 pin jack

Attention: allowed cable length < 15m.
             for transmission speeds > 19.200 bit/s < 2m.
             * necessary if cable length > 2m