# MicroLink™ ISDN i

# Preface

**Thank you for placing your trust in this devolo product.**

With the MicroLink ISDN i you have chosen a modem which will permit you to take advantage of the ISDN technology.

Exacting manufacturing standards and stringent quality control are the basis for high product standards and consistent quality to ensure your fullest satisfaction with this modem.

**About this manual**

This manual will inform you about all aspects of your MicroLink ISDN i. In addition, a brief overview and a detailed description of the AT commands are provided.

This documentation was compiled by several members of our staff from a variety of departments in order to ensure you the best possible support when using your devolo product.

**Additional information in the Internet at 'www.devolo.de'.**

Our online services www.devolo.de are available to you around the clock should you have any queries regarding the MicroLink ISDN i. Under 'service & support', you can find answers to frequently asked questions (FAQs).

**Package Contents**

Please ensure that the delivery is complete before beginning with the installation of your MicroLink ISDN i:

- MicroLink ISDN i
- Power adapter
- ISDN $S_0$ connector cable
- Serial connector cable (Mini-DIN8) to 9-pin subminiature socket
- 9pin/25pin adapter
- CD including drivers and manual
- Manual (in print)

devolo reserves the right to change the package contents without prior notice.

**CE conformity**

This product meets the requirements of the 1999/5/EG Directive (R&TTE) and is designed for connection to public telecommunications networks in the EU and Switzerland.

Connect the device to the public telecommunications network with the supplied cable.

The declaration of conformity with the basic requirements can be found in the appendix of this manual.

# Contents

# 1 Introduction

The MicroLink ISDN i is an external desktop model housed in a robust flat aluminum case. The hardware installation is fast and user-friendly thanks to plug&play support.

The manufactured modem MicroLink ISDN i is delivered as integrated sub-components of an entire system. If the system should not yet be installed, please establish the following connections.

## 1.1 Installation

① Connection of the modem to the power supply

② Connection of the modem to the serial interface of the computer

③ Connection of the modem to an ISDN telephone socket

④ Please insert the supplied devolo product CD into your CD-ROM drive.

⑤ To install the driver, please follow the instructions of the hardware wizard.

*The MicroLink ISDN i driver contains information (e. g. device name, connecting messages, initialization commands) for your Windows operating system. It could also be found in the download area of our homepage www.devolo.de. In case you need more information, please refer to the system documentation.*

## 1.2 Highlights of the MicroLink ISDN i

The following is an outline of the essential technical features of the Micro-Link ISDN i to provide a quick overview of its performance:

● **Transfer rates**—MicroLink ISDN i supports the following transfer rates and velocities:
  ○ X.75 mit 56,000 bps, 64,000 bps
  ○ V.120 mit 56,000 bps, 64,000 bps
  ○ X.75/T.70NL mit 56,000 bps; 64,000 bps;
  ○ X.75-T-Online (VT-100, CEPT, KIT)

● **Automatic protocol detection**—Depending on its configuration, the ISDN modem supports automatic detection of the X.75, V.120 and HDLC-PPP protocols for incoming and outgoing connections.

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- **D-channel protocol**—You can choose between the DSS1 protocol (Euro ISDN) and the 1TR6 protocol (German national ISDN). The DSS1 protocol is the default selection.
- **Terminal selection digits and MSN**—The ISDN modem supports the setting and querying of terminal selection digits.
- **Delayed call answering**—This function permits the delayed answering of incoming calls. This can be useful if several ISDN modems with the same terminal selection digit or MSN (multiple subscriber number) are connected to one ISDN $S_0$ interface.
- **Dial number lock**—The ISDN modem can be locked for outgoing calls. 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 your system against unauthorized access.
- **Status displays**—LED displays at the front of the ISDN modem permit the monitoring of the ISDN connection and the line to facilitate troubleshooting of possible system faults.
- **Error correction**—The V.120 and X.75 error correction protocols implemented in the modems guarantee a 100% error-free data transmission even with poor telephone connections. MicroLink ISDN i with V.120 and X.75, reliable, error-free connections can be established with other similarly equipped modems.
- **Flash ROM technology**—With the help of flash ROM technology, firmware updates can be implemented quickly and easily.
- **Warranty**—two years warranty for the MicroLink ISDN i
- **Protected**—The MicroLink ISDN i satisfies the CE requirements.

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# 2 Control commands

The so-called AT command set established itself as the worldwide standard for modem control command syntax (AT = command prefix Attention). The MicroLink ISDN i also operates with the AT command set, permitting users of data communications equipment to continue using a familiar command set for ISDN communications. A terminal program is required to enter AT commands via a PC.

*The complete AT command set can be found in the chapter 'AT commands: Detailed description'.*

## 2.1 Entering and executing AT commands

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

In the event that several commands are to be sent to the ISDN modem, 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).

### 2.1.1 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 modem switches from the command phase to the transfer phase.

Transfer phase means that a connection to a remote data station (i.e. to another ISDN modem) exists: the ISDN modem 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 phase 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 modem is already in the command phase. 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 modem 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 the firmware default parameter settings. The ISDN modem is thus reset to its factory defaults. This command is not executed during existing connections.

## 2.2 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 modem. A complete description of the S registers can be found in the chapter 'AT commands: Detailed description'.

### 2.2.1 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 modem is switched off, the new entry can be stored with the command **AT*W**.

## 2.3 Overview of AT commands and registers

The following structured short overview will provide you with frequently used AT commands and registers to change the configuration of your modem. The column "Commands and registers" lists AT commands and registers to change the basic settings of the modem. In addition, you will find AT commands and registers in the column "Additional commands and registers" to affect the performance of the modem.

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## 2.3.1 Basic controlling

| Configuration | Commands and register | Additional commands and register |
|---|---|---|
| Basic modem initialisation | AT&F | |
| Control of connection establishment (dial-up) | ATD, ATP, ATT, ATX | AT$D, AT:D, S6, S7, S8, S14 (Bit 6) |
| Answering of incoming call, line acceptance, hang up | ATA, ATD, ATH, AT&D2, S0 | AT-H, AT\T, S14.6, S28 (Bit 7) |
| Switch between command and transmission phase | +++, ATO | S2 |
| Control of call signaling | ATL, ATM | |
| Selection of modem information | ATI, ATS, AT&V | AT%R, AT\S, AT%V, S86 |
| Control of error correction | AT+ES | |
| Control of dial lock or dial delay | S31 (Bit 7) | |

## 2.3.2 Additional controlling

| Configuration | Commands and registers | Additional commands and registers |
|---|---|---|
| Working with stored initialisations | AT&V, AT&W, AT*W, AT&Y, ATZ | |
| **Special controlling** | | |
| Control of modem signaling lines | AT&C | AT\D, AT&S |
| Control of DTR effect | AT&D | AT$D, AT:D, S28 (Bit 7) |
| Control of modem answers | ATE, ATQ, ATV, AT\V | AT&D, AT-H, AT-M, AT*Q, S96 |
| Control of dial tones | AT&G | |
| Control of data format | S28 (Bit 0-1), S53 | |

## 2.4 Overview of the AT command set

| Command | Meaning |
| --- | --- |
| A | Answering an incoming call |
| &C0<br>&C1 | DCD is always active<br>DCD indicates an existing connection |
| Dn | Establishing a connection |
| $D0<br>$D1 | Disables DTR dialing<br>Enables DTR dialing |
| &D0<br>&D1<br>&D2<br>&D3 | Ignore transition of DTR status<br>Switch to command phase if DTR -> **OFF**<br>Abort connection if DTR -> OFF<br>Abort connection and reinitialize if DTR -> OFF |
| \D0<br>\D1<br>\D2<br>\D3 | DSR and CTS always active<br>DSR tracks transmission channel and CTS always active<br>DSR always active and CTS tracks DCD<br>DSR tracks transmission channel and CTS tracks DCD |
| E0<br>E1 | Commands not echoed<br>**Commands echoed** |
| &F | Load default configuration |
| \F | Dialing of stored telephone numbers |
| H | Hang up |
| H2 | Call rejected |
| I0<br>I1<br>I2<br>I3<br>I4<br>I5<br>I6<br>I7<br>I9 | Report product code in nnn format<br>Report checksum<br>Report checksum result<br>Report version number and firmware release date<br>Display of current parameters<br>Report serial number and hardware release<br>Display product name<br>Report self-test result<br>Report plug&play ID text |
| $I? | Display of current ISDN parameters |
| $IBP | B-channel protocol setting |
| $IBR | Setting the ISDN bit rate |
| $ICI? | Display charge information |
| $ICI | Delete charge information |

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| Command | Meaning |
|---------|---------|
| $ICLD | Store dial numbers for user groups |
| $ICLI | Setting the outgoing multiple subscriber number (MSN) |
| $ICLI | Suppression of caller ID display |
| $IDBS | Setting the data block length |
| $IDP | D-channel protocol setting |
| $IEAZ | Setting the terminal selection digit (EAZ) |
| $IMSN | Call acceptance from multiple subscriber numbers (MSNs) |
| $INCB | Block dial numbers |
| $IRES | Reset ISDN settings |
| $ISCI | Service characteristics for incoming analog calls |
| $ISCO | Service characteristics for outgoing analog calls |
| -M0<br>-M1 | Plain text CONNECT messages dependent on AT\V<br>Plain text CONNECT messages independent of AT\V |
| O | Transition to online status |
| \Pmn | Storing dial numbers (m = 0 to 9) |
| Q0<br>Q1<br>Q2 | Return of messages from ISDN terminal adapter on<br>Return of messages from ISDN terminal adapter off<br>Messages off in answer mode |
| *Q0<br>*Q1 | CONNECT message after invalid escape sequence<br>No CONNECT message after invalid escape sequence |
| \Q0<br>\Q1<br>\Q2<br>\Q3<br>\Q4 | No handshake<br>Bidirectional XON/XOFF handshake<br>Unidirectional CTS handshake<br>Bidirectional RTS/CTS handshake<br>Unidirectional XON/XOFF handshake |
| Sn=x<br>Sn?<br>Sn<br>?<br>=x | Sets register n to value x<br>Reads the value of register n<br>Sets pointer to register n<br>Reads value of last register used<br>Sets value of last register used to x |
| \S | Display of the current settings |
| \Tn | Inactivity timer |
| $UPX | Firmware upload in flash ROM |
| V0<br>V1 | Messages in short form as a digit<br>Messages in plain text |

| Command | Meaning |
|---------|---------|
| %V | Display of firmware version |
| &V | Display configuration profiles |
| \V0<br>\V1<br>\V2<br>\V8 | No modified CONNECT messages<br>Identification of connections with error correction<br>Additional distinction of correction processes<br>Detailed CONNECT messages |
| &W | Save configuration profile |
| *W | Save complete configuration profile |
| X0<br>X1<br>X2<br>X3<br>X4 | Busy signal returns NO CARRIER<br>Busy signal returns NO CARRIER<br>Busy signal returns NO CARRIER<br>Busy signal returns BUSY<br>Busy signal returns BUSY |
| \X0<br>\X1 | XON/XOFF characters are not sent<br>XON/XOFF characters are sent |
| &Y | Set pointer to configuration profile |
| Zn | Load configuration profile |
| &Z | Store dial number |
| AT.m=x<br>AT.m?<br>ATSn.m=x | Sets the bit m to the value x (m = 0 to 7; x = 0 to 1)<br>Reads the value of bit m<br>Sets bit m in S register n to value x (m = 0 to 7; x = 0 to 1) |
| =? | Query of the value range of a command |

*The complete AT command set can be found in the next chapter 'AT commands: Detailed description'.*

# 3 AT commands: Detailed description

**Labeling of the Default Configuration**

The *character marks the default AT command settings. The standard values of the individual register bits are marked in bold type.

# A Answer Incoming call

## ATA

Incoming calls can be answered using this command. If acknowledgments by the modem are not suppressed, the result code RING (plain text) or 2 (short form) is displayed for an incoming call. (See register S154/S155 and register S160 for further information regarding call establishment).

*Calls cannot be answered manually if automatic call answering has been set, as the call establishment will be aborted by the entry of any character other than a line feed (see register S0). Call establishment is not aborted, however, if bit 6 of register S14 has been set to 1 (default = 0). This setting permits the attached computer to send characters to the MicroLink ISDN i during call establishment.*

*Please also observe the register S152 ("call display delay") with regard to this command. No further commands can be executed from the same command line after this command.*

# &C Significance of DCD

## AT&C0 : DCD is always active

## *AT&C1 : DCD indicates an existing connection

Communications programs normally evaluate the line DCD to verify the presence of a connection. The MicroLink ISDN i supports this evaluation with the setting **AT&C1**.

# D Establishing a connection

## ATDn

When this command is issued, the MicroLink ISDN i attempts to establish a connection and dials the telephone number n. n may consist of the numerals 0 to 9, * and #. The maximum length for the complete dialing string is 36 characters, not including **ATD**. The following special characters may be inserted; all other characters will be ignored:

| Special characters | Description |
|---|---|
| **\*** or **#** | External call |
| **L** <br> **Sm** <br> **S=m** or **/m** | **Dialing of stored telephone numbers** <br> Redial <br> Dial the number stored with **AT&Z** at location m <br> Dial the number stored with **AT\P** at location m |
| **;** | Remain in command mode after dial string (for the addition of further dialing commands in the event of excessively long dial strings)) |
| **S** | Establishment of a semi-permanent connection (SPC) with a following 'S' |
| **(Px)** <br> **(M+)** <br> **(M-)** <br> **(Mnr)** | **Defining ports and outgoing multiple subscriber numbers** <br> Defining port 0 (V.24 interface) <br> Outgoing MSN displayed <br> Outgoing MSN not displayed <br> Define calling number specified in nr as outgoing MSN |

*The call establishment can be aborted at any time during the dialing process by entering any character other than line feed, XON or XOFF.*

# $D Automatic dialing with DTR

## \*AT$D0    : Disables DTR dialing

## AT$D1    : Enables DTR dialing

When DTR dialing is enabled and the condition of the control line switches from OFF to ON, the MicroLink ISDN i establishes a connection to the number

stored in the first location (see **AT\P** or **AT&Z** commands). If no number has been stored, the MicroLink ISDN i returns ERROR.

# &D Effect of DTR

## AT&D0 : Ignore transition of DTR status

## AT&D1 : Switch to command phase if DTR -> OFF

## *AT&D2 : Abort connection if DTR -> OFF

## AT&D3 : Abort connection and reinitialize if DTR -> OFF

These commands are used to set the response of the MicroLink ISDN i to a transition of the control line DTR from ON to OFF.

With the setting **AT&D0**, the MicroLink ISDN i ignores the DTR transition from ON to OFF.

With **AT&D1**, the transition of the DTR control line from ON to OFF has the following effects: If the MicroLink ISDN i is in the command phase, the transition has no effect. During the establishment of a connection, the ON to OFF DTR transition aborts the connection. If the MicroLink ISDN i is in the transmission phase (i.e. with an existing connection), it will switch to the command phase.

With **AT&D2**, the transition of the DTR control line from ON to OFF has the following effects: If the MicroLink ISDN i is in the command phase, the transition has no effect. During the establishment of a connection, the ON to OFF DTR transition aborts the connection. If the MicroLink ISDN i is in the transmission phase (i.e. with an existing connection), it will abort the connection and switch to the command phase.

With **AT&D3** the MicroLink ISDN i's response is the same as with **AT&D2**. In addition, the MicroLink ISDN i is reinitialized by the DTR transition from ON to OFF (see also **ATZ** and **AT&Y**).

With **AT&D2** and **AT&D3** as well as DTR = OFF, the MicroLink ISDN i does not return a RING for incoming calls. Automatic call answering is not possible until after the DTR transition from OFF to ON. A RING message with sub-

sequent call answering can be enabled despite DTR = OFF by setting bit 7 in register S28.

## \D     DSR/CTS control

**\*AT\D0     : DSR and CTS always active**

**AT\D1     : DSR tracks transmission channel
and CTS always active**

**AT\D2     : DSR always active and CTS tracks DCD**

**AT\D3     : DSR tracks transmission channel
and CTS tracks DCD**

This command affects the significance of the signal lines DSR and CTS. If hardware flow control is used, the **AT\D** command setting has no effect on the CTS signal line in the transmission phase.

## E     Command Echo to Host

**ATE0     : Commands not echoed**

**\*ATE1     : Commands echoed**

This command permits the choice of whether the MicroLink ISDN i returns the input commands as an echo or not.

## &F     Load default configuration

**AT&F**

This is used to load the firmware's default parameter settings. The MicroLink ISDN i is thus reset to its factory defaults. This command is not executed during existing connections.

The dial-number memory, charge statistics, configuration profiles and ISDN settings are not reset by the command **AT&F**, however.

# \F        Display of stored telephone numbers

## AT\F

This command lists the calling numbers in position 0 to 9 that were stored by means of the **AT\P** and **AT&Z** commands.

# H        Hang up

## ATH

This command is used to hang up an existing connection if the MicroLink ISDN i is in the command mode after an escape command or a DTR transition from ON to OFF with a preceding **AT&D1**.

# H2        Call rejected

## ATH2

If **ATH2** is input in response to an incoming RING, the caller receives the message "call rejected".

# I        Report version number

**ATI0**        **: Report product code in nnn format**

**ATI1**        **: Report checksum**

**ATI2**        **: Report checksum result (OK or ERROR)**

**ATI3**        **: Report version number and firmware release date**

**ATI4**        **: Display of current parameters**

**ATI5**        **: Report serial number and hardware release**

**ATI6** **: Display product name**

**ATI7** **: Report self-test result**

**ATI9** **: Report Plug & Play ID text**

# $I? Display of current ISDN parameters

## AT$I?

Use this command to display the modem's current ISDN configuration.

# $IBP Setting the B-channel protocol

## AT$IBP=<Wert1>

This command is used to select the operating mode of the MicroLink ISDN i. The ISDN modem attempts to establish an error-corrected X.75 connection by default. If the remote station does not support X.75, the adapter automatically falls back to HDCLP mode via V.120:

| Parameter | Value | Description |
|-----------|-------|-------------|
| <Value1> | X75 | X.75 protocol |
| | X75T70 | T.70NL protocol |
| | V120 | V.120 protocol |
| | V110 | V.110 protocol |
| | HDLC | HDLC protocol |
| | TRANS | Transparent |
| | HDLCP | HDLC-PPP protocol |
| | BTX | X.75, T.70NL and Cept/Kit |
| | X75FB1 | X.75 $\rightarrow$ HDLCP |
| | **X75FB2** | **X.75 $\rightarrow$ V.120 $\rightarrow$ HDLCP** |
| | X75FB3 | X.75 $\rightarrow$ V.120 |
| | V120FB1 | V.120 $\rightarrow$ HDLCP |

*Example*    *To establish an error-corrected V.120 connection with the MicroLink ISDN i, enter the following command:*

## AT$IBP=V120

The default value for the MicroLink ISDN i is X75FB2.

# $IBR    Setting the ISDN bit rate

## AT$IBR=<Value1>

This command is used to select the desired bit rate on the ISDN side. The MicroLink ISDN i operates at a transmission speed of 64,000 bps by default.

| Parameter | Value | Description |
|---|---|---|
| <Value1> | 64000 | ISDN bit rate 64,000 bps |
|  | 56000 | ISDN bit rate 56,000 bps |

# $ICI    Charge information

## AT$ICI?    : Display charge information

## AT$ICI=p,0: Delete charge information for port

This command is used to display the total connect charges, as well as the connect charges for the previous connection. The charges could be displayed as follows:

**$ICI:=0,113,1 (**113 = total charges, 1 = last call on port 0).

| Parameter | Value | Description |
|---|---|---|
| p | **0** | **Port 0 (V.24 interface)** |

The current-charge display is automatically reset to 0 after the next dialing process. The total-charge information can be deleted with the command **AT$ICI=0,0**.

# $ICLD Store dial numbers for user groups

## AT$ICLD=p,<"DialNo1">,<"DialNo2">,<"DialNo3">

This command is used to restrict call answering to specific remote stations (user group) for access protection purposes. If no caller IDs are entered in this table, all calls with a correct service indicator and terminal selection digit or MSN (multiple subscriber number) are reported and a connection established.

If one or more caller IDs are stored, the reporting of the call or establishment of the connection is only effected if the caller ID of the remote station corresponds to one of the stored numbers. A maximum of three caller IDs can be stored. The caller ID may consist of a maximum of 16 digits (0 to 9). All changes are automatically recorded in the nonvolatile memory and are preserved until the next change. No further commands can be executed from the same command line after this command. The following settings are valid:

| Parameter | Value | Description |
|---|---|---|
| p | 0 | Port 0 (V.24 interface) |
| <"DialNo1"> | 0..9 | Store first caller ID |
| <"DialNo2"> | 0..9 | Store second caller ID |
| <"DialNo3"> | 0..9 | Store third caller ID |

Caller IDs of the remote stations must be stored as follows:

**Caller is**

- within a private branch exchange:
  extension number (with terminal selection digit if applicable, e.g. xxxx)
- within a city/a country:
  with area code (e.g. 024118279820)
- international:
  country code (e.g. 0049241182799820)

*Example*  *To enable the MicroLink ISDN i for the dial number 024118279820, enter the following command:*

## AT$ICLD=0,"024118279820"

To change the third dial number only, enter the following command:

**AT$ICLD=0,,,"024118279820"**

All dial numbers are enabled by default.

# $ICLI Setting and suppressing your own calling number

## AT$ICLI=p,"MSN",i

Use this command to stop your own multiple subscriber number (MSN) being transmitted to the other party.  The following settings are valid:

| Parameter | Value | Description |
|-----------|-------|-------------|
| p | 0 | Port 0 (V.24 interface) |
| i | 0 | MSN is suppressed |
|   | 1 | MSN is transmitted |

*Example*          *If the calling number is not to be transmitted, enter the following command:*

## AT$ICLI=0,"",0

By default no calling number is entered on the MicroLink ISDN i.

# $IDBS Setting the data block length

## AT$IDBS=<Value1>,<Value2>,<Value3>

This command is used to set the data block length.  It can be used to ensure compatibility to other B-channel protocols.  The following settings are valid:

| Parameter | Standard | Description |
|-----------|----------|-------------|
| <Value1> | 2048 | Data block length for X.75 (4-2048) bytes |
| <Value2> | 2048 | Data block length for HDLCP and HDLC (1-2048) bytes |
| <Value3> | 259 | Data block length for V.120 (5-259) bytes |

# $IDP Setting the D-channel protocol

## AT$IDP=\<Value1\>

This command is used to set the D-channel protocol. The adjustment may not be made during a connection or with a call pending. All changes are automatically recorded in the nonvolatile memory and are preserved until the next change.

| Parameter | Value | Description |
|-----------|-------|-------------|
| \<Value1\> | DSS1 | Euro-ISDN (DSS1 protocol) |
|  | 1TR6 | German national ISDN (1TR6 protocol) |
|  | AUTO | Automatic setting of the D-channel protocol |

*Example*

*To set the MicroLink ISDN i to the 1TR6 protocol, enter the following command:*

## AT$IDP=1TR6

The MicroLink ISDN i is set to the DSS1 protocol by default.

*The DSS1PP may interfere with other units on the same ISDN Basic Rate Interface. This protocol should only be selected when using an ISDN point-to-point connection.*

# $IEAZ Setting the terminal selection digit (EAZ)

## AT$IEAZ=p,\<"EAZ"\>

This command is only relevant for the German national protocol (1TR6). If the command is entered in the DSS1 mode, it will not become valid until switching to the 1TR6 protocol. This command is used to determine which terminal selection digit should be used to answer incoming calls.

In addition, the terminal selection digit used for outgoing calls is also established. All changes are automatically recorded in the nonvolatile memory and are preserved until the next change.

| Parameter | Value | Description |
|---|---|---|
| p | 0 | Port 0 (V.24 interface) |

The terminal selection digit is accepted as follows:

| n | Terminal selection digit used for incoming calls | Terminal selection digit used for outgoing calls |
|---|---|---|
| 0 | 0 | 0 |
| 1 to 9 | 0 and corresponding 1 to 9 | corresponding 1 to 9 |
| 10 to 19 | corresponding 0 to 9 | corresponding 0 to 9 |

*Example*  *If you wish to assign EAZ 8 enter the following command:*

## AT$IEAZ=0,2,"8"

Use the command **AT$IEAZ=0**,"" to delete the EAZ. No EAZ is assigned to the MicroLink ISDN i by default. All calls are thus answered.

# $IMSN  Call acceptance from Multiple Subscriber Numbers (MSNs)

## AT$IMSN=p,<"MSN1">,<"MSN2">,<"MSN3">

This command is only relevant for the DSS1 protocol (Euro-ISDN). This command can be used to restrict call answering. If no multiple subscriber number (MSN) is specified here, all calls will be answered, regardless of the target dial number specified for the incoming call. A maximum of three caller IDs can be stored. The caller ID may consist of a maximum of 20 digits (0 to 9). No further commands can be executed from the same command line after this command.

Incoming calls without stated target dial numbers will always be answered. All changes are automatically recorded in the nonvolatile memory and are preserved until the next change

| Parameter | Value | Description |
|-----------|-------|-------------|
| p | 0 | Port 0 (V.24 interface) |
| <"MSN1"> | 0..9 | Store 1st MSN |
| <"MSN2"> | 0..9 | Store 2nd MSN |
| <"MSN3"> | 0..9 | Store 3rd MSN |

*The dial number is entered in Germany without the use of the local or national codes.*

*Example*

To assign the dial number 12345 to the modem for MSN1, enter the following command:

## AT$IMSN=0,"12345"

To change MSN3 only, enter the following command:

## AT$IMSN=0,,,"12347"

The MSN can be deleted with the command **AT$IMSN=0,""**. No MSN is assigned to the MicroLink ISDN i by default.

# $INCB    Blocking of dial numbers

## AT$INCB=0,<"DialNo1">,<"DialNo2">,<"DialNo3">

The modem can be locked for outgoing calls with this command. A connection will not be established if the first digits of the number dialed correspond to the locked number (maximum of 5 digits).

A maximum of three dial numbers can be stored. The dial number may consist of a maximum of 5 digits (0 to 9). All changes are automatically recorded in the nonvolatile memory and are preserved until the next change:

| Parameter | Value | Description |
|---|---|---|
| p | 0 | Port 0 (V.24 interface) |
| <"DialNo1"> | 0..9 | Block 1st dial number |
| <"DialNo2"> | 0..9 | Block 2nd dial number |
| <"DialNo3"> | 0..9 | Block 3rd dial number |

*Example*   If you wish to block all calling numbers with the area code 0190, enter the following command:

## **AT$INCB=0,"0190"**

*All dial numbers are enabled by default.*

# $IRES   Reset of ISDN settings

## **AT$IRES**

This command is used to reset all ISDN settings to factory default. The current ISDN configuration of the terminal adapter may be displayed using the **AT$I?** command.

# $ISCI   Service characteristics for incoming analog calls

## **AT$ISCI=p,<Value1>,<Value2>,<Value3>,<Value4>**

This command is used to determine which incoming analog calls will be answered. Modifications must be saved using the **AT\*W** or **AT&W** commands. The following settings are valid:

| Parameter | Value | Description |
|---|---|---|
| p | 0 | Port 0 (V.24 interface) |
| <Value1> | 0 | Telephone service (3.1 kHz telephone service) off |
| | 1 | Telephone service (3.1 kHz telephone service) on |
| <Value2> | 0 | Telephone service (analog telephone service) off |
| | 1 | Telephone service (analog telephone service) on |
| <Value3> | 0 | Group 2 fax operation off |
| | 1 | Group 2 fax operation on |
| <Value4> | 0 | Group 3 fax operation off |
| | 1 | Group 3 fax operation on |

*Example*

To set the MicroLink ISDN i for Group 3 fax operation, enter the following command:

## **AT$ISCI=0,0,0,0,1**

# $ISCO    **Service characteristics for outgoing analog calls**

## **AT$ISCO=p,<Value1>**

This command is used to set the bearer capability for outgoing calls. You may select the terminal devices (e.g. telephone or fax) which are to be addressed. Modifications must be saved using the **AT\*W** or **AT&W** commands. The following settings are valid:

| Parameter | Value | Description |
|---|---|---|
| p | 0 | Port 0 (V.24 interface) |
| <Value1> | 0 | Telephone service (3.1 kHz telephone service) |

| Parameter | Value | Description |
|-----------|-------|-------------|
|  | 1 | Telephone service (analog telephone service) |
|  | 2 | Group 2 fax operation |
|  | 3 | Group 3 fax operation |

*Example*

To set the MicroLink ISDN i for Group 3 fax operation, enter the following command:

### AT$ISCO=0,3

The MicroLink ISDN i is set to the value 1 (telephone service (analog telephone service)) by default.

# -M      Plain text CONNECT messages

## *AT-M0   : Plain text CONNECT messages dependent on AT\V

## AT-M1    : Plain text CONNECT messages independent of AT\V

With the default setting **AT-M0**, the return of plain text CONNECT messages is dependent on the setting of the command **AT\V**. The bit rate at which the connection was established is always returned.

The transfer speeds are not differentiated in plain text with the setting **AT-M1**. (CONNECT messages in short form are identical to those of **AT-M0**). If the MicroLink ISDN i is configured to **ATX0**, then the command **AT-M** has no effect.

# O      Transition to online status

## ATO

The command **ATO** can be used to switch back into the transfer mode to resume online data transmission if the MicroLink ISDN i is in the command mode after an escape command or a DTR transition from ON to OFF with a preceding **AT&D1**.

# \P       Storing dial numbers

## AT\Pmn

Up to ten dial numbers (m = 0 to 9) can be stored using this command.

The stored numbers n can be dialed using the commands **ATDS**, **ATDS=m**, **ATD/** or **ATD/m**. These numbers remain when the modem is switched off. The command AT\Pm deletes the number stored at location m.

The command **AT\P** corresponds to the command **AT&Z**. The numbers stored with the command **AT\P** can thus be overwritten with the command **AT&Z**. The number stored at location 0 is also used for automatic dialing with DTR (see **AT$D**).

The command **AT\F** can be used to display and verify the stored numbers.

No further commands can be executed from the same command line after the command **AT\P**.

# Q       Suppressing messages

## \*ATQ0     : Return of messages from ISDN modem on

## ATQ1     : Return of messages from ISDN modem off

## ATQ2     : Messages off in answer mode

With this command, messages to the attached computer by the ISDN modem can be completely suppressed (**ATQ1**) or suppressed in the answer mode only (**ATQ2**).

# \*Q       Message after return to transfer phase

## \*AT\*Q0     : CONNECT message after invalid escape sequence

## AT\*Q1     : No CONNECT message after invalid escape sequence

The return of the CONNECT message can be suppressed after an invalid escape sequence with this command.

## \Q  Data flow control on the serial port

**AT\Q0** : **No handshake**

**AT\Q1** : **Bidirectional XON/XOFF handshake**

**AT\Q2** : **Unidirectional CTS handshake**

**\*AT\Q3** : **Bidirectional RTS/CTS handshake**

**AT\Q4** : **Unidirectional XON/XOFF handshake**

This command is used to select a variety of handshake procedures for serial port data flow control.

Data flow control is especially important if the transmission speed to/from the computer is not identical to the speed on the telephone side. This is the case when using error correction and data compression, for example. Without a handshake procedure the danger of a buffer overflow is inevitable.

The data flow in the interface lines is monitored RTS (Request To Send) and CTS (Clear To Send) when using a hardware handshake with the commands **AT\Q2** and **AT\Q3**. Data output to the computer is stopped if the RTS signal line is OFF. The transition to ON permits the output of the received data to continue. If the MicroLink ISDN i continues to receive from the telephone line, the data is temporarily stored in the receive buffer. If the send buffer of the MicroLink ISDN i is full, it switches the CTS (Clear To Send) signal line to OFF, stopping the data output from the computer.

The commands **AT\Q1** and **AT\Q4** are used to select a software handshake using the XON/XOFF characters. If the MicroLink ISDN i receives the <DC3> character (S-s = XOFF) from the computer, then the data output is stopped until a <DC1> (S-q = XON) is sent. Conversely, the MicroLink ISDN i sends a <DC3> or <DC1> sequence to the computer if a transmission buffer is full or ready again. Whether the XON and XOFF characters are sent to the MicroLink ISDN i depends on the setting of the command **ATX**. They are not sent by default.

In unidirectional handshake processes, the handshake signals issued by the computer are ignored.

# S         Set and read the internal register

### ATSn=x   : Sets register n to value x

### ATSn?    : Reads the value of register n

### ATSn     : Sets pointer to register n

### AT?      : Reads the value of last register used

### AT=x     : Sets the value of last register used to x

The register number n and register value x are returned as a numerical ASCII string. The valid values for x may be restricted (see register S0, for example). Please refer to chapter "Description of registers" for information about the S register and changing bit-oriented registers. If a register is set to an invalid value the command is ignored and returns ERROR. If an invalid setting is made in a bit-oriented register, only that particular setting will be ignored; all other valid bits will be accepted.

# \T        Inactivity timer

### AT\Tn : (n = 0..255 * 10 seconds; default value = 0)

This command can be used to control the period of time after which the MicroLink ISDN i automatically breaks the connection if no data has been sent in the mean time. The default value 0 switches the inactivity timer off.

# $UPX      Firmware upload in flash ROM

### AT$UPX

New firmware can be loaded to the flash ROM using the command **AT$UPX**. After issuing the command, the firmware file must be sent to the MicroLink ISDN i using the XModem protocol. The firmware file can be found on the CD

which was included with the unit.  The current version can be found in our online services www.devolo.de.

# V          Messages in short form/plain text

## ATV0      : Messages in short form as a digit

## *ATV1      : Messages in plain text

This command can be used to select numerical short form or plain text for the messages sent by the MicroLink ISDN i to the attached computer.  The messages in short form and plain text are covered in the chapter "Description of messages".

# %V          Display of firmware version

## AT%V

This command is used to display the firmware version of the ISDN modem.

# &V          Display configuration profiles

## AT&V

This command returns the current, as well as the two stored configuration profiles, 0 and 1 (see also commands **AT&W** and **AT*W**) of the MicroLink ISDN i.

# \V          CONNECT with error-free connections

## AT\V0      : No modified CONNECT messages

## AT\V1      : Identification of connections with error correction

## AT\V2      : Additional distinction of correction processes

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### \*AT\V8  : Detailed CONNECT messages

With the setting **AT\V0**, call establishment messages are issued in the **CONNECT xxxxx** form.

With the setting **AT\V1**, call establishment messages are issued in the **CONNECT xxxxx/REL** form.

**AT\V2** provides additional information regarding the correction process in the form of **CONNECT xxxxx/REL-LAPB**.

With the configuration **AT\V8** the call establishment messages are issued in the **CONNECT xxxxx/ISDN/X75** form.

**xxxxx** stands for the speed with which the connection was established.

*If the MicroLink ISDN i is configured to **ATX0** or **AT-M1**, then the command **AT\V** will have no effect on the plain text CONNECT messages.*

## &W        Save configuration profile

### AT&Wn   : Save configuration profile n (n = 0, 1)

This command is used to save the current configuration of the MicroLink ISDN i. All parameters that were set using AT commands, as well as a number that were set using the S registers are saved. These values are preserved when the modem is switched off.

Registers for which the current value cannot be saved using the command **AT&W** are saved with their default values.

## \*W        Save complete configuration profile

### AT\*Wn   : Save complete configuration profile n (n = 0, 1)

This command is used to save the current configuration of the MicroLink ISDN i. All parameters that were set using AT commands and S registers are saved. These values are preserved when the modem is switched off.

*A configuration profile should be saved using the command **AT\*W**.*

# X      Handling of busy signals/CONNECT messages

**ATX0**     **: Busy signal returns NO CARRIER**

**ATX1**     **: Busy signal returns NO CARRIER**

**ATX2**     **: Busy signal returns NO CARRIER**

**ATX3**     **: Busy signal returns BUSY**

**\*ATX4**     **: Busy signal returns BUSY**

This command can be used to set the modem to respond to busy signals on outgoing connections with the messages NO CARRIER or BUSY.

*The command **ATX0** is also relevant for messages returned during call establishment. Regardless of the speed or type of connection, only the messages CONNECT (plain text) or 1 (short form) are issued.*

# \X      Handling of XON/XOFF

**\*AT\X0**     **: XON/XOFF characters are not sent**

**AT\X1**     **: XON/XOFF characters are sent**

This command affects the handling of the XON and XOFF characters used for flow control when XON/XOFF software handshaking is selected (see also **AT\Q**).

When **AT\X0** is set, the XON/XOFF characters are used solely to control the data flow between the local MicroLink ISDN i and the computer and are not sent to the remote system.

When this is set to **AT\X1**, these characters control the data flow between the local MicroLink ISDN i and computer and are sent to the remote system.

# &Y      Set pointer to configuration profile

**\*AT&Y0**     **:Set pointer to configuration profile to 0**

### AT&Y1      :Set pointer to configuration profile to 1

This command is used to set a pointer to one of the two stored configuration profiles (0 or 1). The marked configuration profile is loaded when switching the adapter on or during an initialization triggered by the transition of DTR from ON to OFF (see command **AT&D**).

# Z         Load configuration profile

### ATZn      : Load configuration profile n (n = 0, 1)

If a connection exists it will be aborted. Then any parameter settings saved with the **AT&W** or **AT*W** commands (configuration profile 0 or 1) are loaded. No further commands can be executed from the same command line after the command **ATZ**.

# &Z        Storing dial number

### AT&Zm=n  : Store dial number n at location m

### AT&Z=n    : Store dial number n at location 0

Up to ten dial numbers (m = 0 to 9) can be stored using this command.

The stored numbers n can be dialed using the commands **ATDS**, **ATDS=m**, **ATD/** or **ATD/m**. These numbers remain when the modem is switched off. The command **AT&Zm** deletes the number stored at location m.

The command **AT&Z** corresponds to the command **AT\P**. The numbers stored with the command **AT&Z** can thus be overwritten with the command **AT\P** (see also the command **AT\P**).

The command **AT\F** can be used to display and verify the stored numbers. The same remarks apply to n as for the command **ATD**.

No further commands can be executed from the same command line after the command **AT&Z**.

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## . Setting and reading a bit in a register

### AT.m=x : Sets the bit m to the value x
### (m = 0 to 7; x = 0 to 1)

### AT.m? : Reads the value of bit m

### ATSn.m=x : Sets bit m in register n to value x
### (m = 0..7; x = 0..1)

Register values can be changed using this command. The value set for the bit m can be set to the value x in the corresponding register. If access is not permitted, the value in the S register remains unchanged and the MicroLink ISDN i returns ERROR.

*Example*     If bit 6 is to be set in register S14, then the command **ATS14.6=1** must be executed.

## =? Query of the value range of a command

This command can be used to display all valid values for an AT command.

If the command **AT$IDP=?** is entered for example, all valid values for the command **AT$IDP** are returned.

If, for example, the command **AT$IMSN=?** is entered, the value range for the ASCII code for the individual characters is returned (48-57 correspond to '0' to '9').

### 3.1 Description of registers

The modem has internal registers with which you can change the configuration (see also **ATSn** command). Please refer to the following description for the significance of the registers.

# S0 **Automatic call answering**

| Valid values | 0 to 255 RING signals |
|---|---|
| Default value | 0 (no automatic call answering) |
| Store in nonvolatile memory | **AT&W** or **AT*W** |

The automatic answering of calls can be set in the register S0. If S0>0, every incoming call will be automatically answered. The S0 value determines the number of messages to wait for before the call is answered. These messages (e.g. 'RING') are returned at 5-second intervals during the time that a call is pending.

If S0>0, the call establishment can be aborted by the input of any character other than line feed. Call establishment is not aborted, however, if bit 6 of register S14 has been set to 1 (default = 0). This setting permits the attached computer to send characters to the MicroLink ISDN i during call establishment.

# S1 **Counter for messages for a pending call**

| Valid values | 0 to 255 RING signals |
|---|---|
| Default value | 0 |
| Store in nonvolatile memory | no |

Register S1 contains the number of messages for a pending call ('RING' every 5 seconds). The S1 value is reset to 0 when the call is answered or is no longer pending.

# S2 **Escape code characters**

| Valid values | 0 to 255 decimal |
|---|---|
| Default value | 43 (+) |
| Store in nonvolatile memory | **AT*W** |

The escape command '+++', which is used to switch from the transfer phase to the command phase, can be changed in register S2.

*The transition to the command phase is blocked by values >127.*

# S3 Carriage return characters

| Valid values | 0 to 127 decimal |
|---|---|
| Default value | 13 (carriage return) |
| Store in nonvolatile memory | **AT*W** |

The character for (Enter) can be redefined in register S3.

# S4 Line-feed character

| Valid values | 0 to 127 decimal |
|---|---|
| Default value | 10 (line feed) |
| Store in nonvolatile memory | **AT*W** |

The line-feed character can be redefined in register S4.

# S5 Backspace character

| Valid values | 0 to 32, 127 decimal |
|---|---|
| Default value | 8 (backspace) |
| Store in nonvolatile memory | **AT*W** |

The backspace character can be redefined in register S5.

# S12 Escape prompt delay

| Valid values | 0 to 255 (1/50 sec.) |
|---|---|
| Default value | 50 (1 sec.) |
| Store in nonvolatile memory | **AT*W** |

The length of the escape prompt delay is established in register S12.

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# S14 **Bit-oriented option**

The contents of register S14 is stored in the nonvolatile memory with the commands **AT&W** or **AT*W**. The individual bits have the following significance:

| Bit | Dec. | Description | | Command |
|-----|------|-------------|---|---------|
| 0 | 0 | 0 | Reserved | |
| 1 | 0 | 0 | No command echo to host | ATE0 |
| | **2** | **1** | **Command echo to host** | **ATE1** |
| 2 | **0** | **0** | **Messages on** | **ATQ0** |
| | 4 | 1 | Messages off | ATQ |
| 3 | 0 | 0 | Messages in short form | ATV0 |
| | **8** | **1** | **Messages in plain text** | **ATV1** |
| 4..5 | 0 | 0 | Reserved | |
| 6 | 0 | 0 | Polling not possible during call establishment (the call establishment is aborted by any characters other than LF, XON and XOFF) | |
| | 64 | 1 | Polling possible during call establishment | |
| 7 | **0** | **0** | **ISDN modem in answer mode** | |
| | 128 | 1 | ISDN modem in originate mode | |

# S21 **Bit-oriented option**

The contents of register S21 is stored in the nonvolatile memory with the commands **AT&W** or **AT*W**. The individual bits have the following significance:

| Bit | Dec. | Description | | Command |
|-----|------|-------------|---|---------|
| 0..2 | 0 | 0 | Reserved | |
| 3..4 | 0 | 0 | Ignore transition of DTR status | AT&D0 |
| | 8 | 1 | Switch to command phase if DTR → OFF | AT&D1 |

| Bit | Dec. | Description | | Command |
|-----|------|-------------|--|---------|
| | **16** | **2** | **Abort connection if DTR → OFF** | **AT&D2** |
| | 24 | 3 | Reinitialize if DTR → OFF | AT&D3 |
| 5..7 | 0 | 0 | Reserved | |

# S22     **Bit-oriented option**

The contents of register S22 is stored in the nonvolatile memory with the commands **AT&W** or **AT*W**. The individual bits have the following significance:

| Bit | Dec. | Description | Command |
|-----|------|-------------|---------|
| 0..3 | 0 | Reserved | |
| 4..6 | 0 | Busy situation → NO CARRIER | ATX0 |
| | 64 | Busy situation → NO CARRIER | ATX1 |
| | 80 | Busy situation → NO CARRIER | ATX2 |
| | 96 | Busy situation → BUSY | ATX3 |
| | **112** | **Busy situation → BUSY** | **ATX4** |
| 7 | 0 | Reserved | |

# S23     **Bit-oriented option**

The contents of register S23 is stored in the nonvolatile memory with the commands **AT&W** or **AT*W**. The individual bits have the following significance:

| Bit | Dec. | Description | |
|-----|------|-------------|--|
| 0..3 | 0 | 0 | Reserved |
| 4..5 | 0 | 0 | 7E1 (7 data bits, even parity, 1 stop bit) |
| | **16** | **1** | **8N1 (8 data bits, no parity, 1 stop bit)** |
| | 32 | 2 | 7O1 (7 data bits, odd parity, 1 stop bit) |
| | 48 | 3 | 7N2 (7 data bits, no parity, 2 stop bits) |
| 6..7 | 0 | 0 | Reserved |

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The values in bit 4 and 5 are overwritten with each **AT** command issued unless the automatic bit rate identification is switched off in register S51.

# S30 **Inactivity timer**

| Valid values | 0 to 255 (10 sec.) |
|---|---|
| Default value | 0 (timer off) |
| Store in nonvolatile memory | **AT&W** or **AT*W** |

In the S30 register you can set the time period after which the MicroLink ISDN i automatically terminates the connection if no data is sent or received in the meantime.  The value 0 switches the inactivity timer off.

# S31 **Bit-oriented option**

The contents of register S31 is stored in the nonvolatile memory with the commands **AT&W** or **AT*W**.  The individual bits have the following significance:

| Bit | Dec. | Description | | Command |
|---|---|---|---|---|
| 0..4 | 0 | 0 | Reserved | |
| 5 | **0** | **0** | **DTR dialing off** | **AT$D0** |
| | 32 | 1 | DTR dialing on | AT$D1 |
| 6..7 | 0 | 0 | Reserved | |

# S51 **Bit-oriented option**

The contents of register S51 is stored in the nonvolatile memory with the commands **AT&W** or **AT*W**. The individual bits have the following significance:

| Bit | Dec. | Description | | Command |
|---|---|---|---|---|
| 0..3 | 0 | 0 | No handshake | AT\Q0 |
| | 1 | 1 | XON/XOFF bidirectional | AT\Q1 |
| | 2 | 2 | RTS/CTS unidirectional | AT\Q2 |

| Bit | Dec. | Description | | Command |
|-----|------|-------------|---|---------|
| | **3** | **3** | **RTS/CTS bidirectional** | **AT\Q3** |
| | 4 | 4 | XON/XOFF unidirectional | AT\Q4 |
| 4 | **0** | **0** | **XON/XOFF characters are not sent** | **AT\X0** |
| | 16 | 1 | XON/XOFF characters are sent | AT\X1 |
| 5..6 | 0 | 0 | Reserved | |
| 7 | **0** | **0** | **Automatic bit rate identification on** | |
| | 128 | 1 | Automatic bit rate identification off | |

# S52　Bit-oriented option

The contents of register S52 is stored in the nonvolatile memory with the commands **AT&W** or **AT\*W**. The individual bits have the following significance:

| Bit | Dec. | Description | | Command |
|-----|------|-------------|---|---------|
| 0..1 | **0** | **0** | DSR always active, CTS always active | **AT\D0** |
| | 1 | 1 | DSR tracks answer signal, CTS always active | AT\D1 |
| | 2 | 2 | DSR always active, CTS tracks DCD | AT\D2 |
| | 3 | 3 | DSR tracks answer signal, CTS tracks DCD | AT\D3 |
| 2 | 0 | 0 | DCD always active (ON) | AT&C0 |
| | **4** | **1** | DCD displays existing carrier | **AT&C1** |
| 3..7 | 0 | 0 | Reserved | |

# S53　Bit-oriented option

The contents of register S53 is stored in the nonvolatile memory with the commands **AT&W** or **AT\*W**. The setting of the bits 0 to 1 only applies to the data format between the MicroLink ISDN i and the computer. The setting is only effective in the transfer phase. The telephone-side data format is

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always 8N1, regardless of this setting.  In the default setting, the data format from register S23 is used.  The individual bits have the following significance:

| Bit | Dec. | | Description |
|-----|------|---|-------------|
| 0..1 | **0** | **0** | **10-bit data format in the transfer phase (8N1, 7E1, 7O1 or 7N2)** |
| 2..7 | 0 | 0 | Reserved |

# S54 **Bit-oriented option**

Register S54 is independent of the command **AT&F**.  The contents of register S54 are stored in the nonvolatile memory with the command **AT*W**.

| Bit | Dec. | | Description |
|-----|------|---|-------------|
| 0..4 | 0 | 0 | Reserved |
| 5 | **0** | **0** | **Serial speed is loaded during reinitialization (ATZ)** |
| | 32 | 1 | Serial speed is not modified during reinitialization (**ATZ**) |
| 6..7 | 0 | 0 | Reserved |

# S93 **Computer-side speed**

The contents of register S93 is stored in the nonvolatile memory with the commands **AT&W** or **AT*W**.  The individual bits (0 to 16 decimal) have the following significance:

| Bit | Dec. | | Description |
|-----|------|---|-------------|
| 0..7 | 3 | 3 | Computer-side bit rate 300 bps |
| | 4 | 4 | Computer-side bit rate 600 bps |
| | 5 | 5 | Computer-side bit rate 1200 bps |
| | 6 | 6 | Computer-side bit rate 2400 bps |
| | 7 | 7 | Computer-side bit rate 4800 bps |
| | 8 | 8 | Computer-side bit rate 7200 bps |
| | 9 | 9 | Computer-side bit rate 9600 bps |
| | 10 | 10 | Computer-side bit rate 12,000 bps |

| Bit | Dec. | Description |
|-----|------|-------------|
| 11 | 11 | Computer-side bit rate 14,400 bps |
| 12 | 12 | Computer-side bit rate 19,200 bps |
| 13 | 13 | Computer-side bit rate 38,400 bps |
| 14 | 14 | Computer-side bit rate 57,600 bps |
| 15 | 15 | Computer-side bit rate 76,800 bps |
| 16 | 16 | Computer-side bit rate 115,200 bps |
| 17 | 17 | Computer-side bit rate 230,000 bps |

*The S93 value is overwritten after every **AT** unless the automatic bit rate identification is switched off in register S23.*

# S95      Bit-oriented option

The contents of register S95 is stored in the nonvolatile memory with the commands **AT&W** or **AT\*W**. The individual bits have the following significance:

| Bit | Dec. | Description | | Command |
|-----|------|-------------|---|---------|
| 0..3 | 0 | 0 | CONNECT messages not modified | AT\V0 |
| | 1 | 1 | Identification of error-free connections | AT\V1 |
| | 2 | 2 | Differentiation of MNP – V.42 | AT\V2 |
| | 8 | 8 | Detailed acknowledgment | AT\V8 |
| 4 | **0** | **0** | **CONNECT messages dependent on AT\V** | **AT-M0** |
| | 16 | 1 | CONNECT messages independent of AT\V | AT-M1 |
| 5 | **0** | **0** | **CONNECT message after invalid escape sequence** | **AT\*Q0** |
| | 32 | 1 | No CONNECT message after invalid escape sequence | AT\*Q1 |
| 6..7 | **0** | **0** | **Messages on** | **ATQ0** |
| | 64 | 1 | Messages off | ATQ |
| | 128 | 2 | Messages off in answer mode | ATQ2 |

# S96 Bit-oriented option

The contents of register S96 is stored in the nonvolatile memory with the command **AT\*W**. The individual bits have the following significance:

| Bit | Dec. | | Description |
|-----|------|---|-------------|
| 0..1 | **0** | **0** | **Decimal display of S registers** |
| | 1 | 1 | Hexadecimal display of S registers |
| | 2 | 2 | Binary display of S registers |
| 2 | **0** | **0** | **Message 'Continue with any character...' yes** |
| | 4 | 1 | Message 'Continue with any character...' no |
| 3 | **0** | **0** | **Display of messages in plain text (German)** |
| | 8 | 1 | Display of messages in plain text (English) |
| 4..7 | 0 | 0 | Reserved |

# S150 Display of ISDN bit rate/operating mode

The transmission speed achieved can be displayed in register S150 after the establishment of a connection. This register can be read only.

| Bit | Dec. | Description |
|-----|------|-------------|
| 0..4 | 0 | No ISDN connection |
| | 8 | ISDN connection 56,000 bps |
| | 9 | ISDN connection 64,000 bps |
| | 10 | Reserved |
| | 11 | Reserved |
| | 12 | Reserved |
| 5..7 | 0 | Reserved |

# S151 ISDN protocol configuration

The contents of register S151 can be stored with the commands **AT&W** or **AT*W**. The details of the D-channel protocol can be set with the S151 register:

| Bit | Dec. | Description | |
|-----|------|-------------|---|
| 0 | 0 | 0 | Error message to network if unit is busy or not operational |
| | 1 | 1 | No response to network if unit is busy or not operational |
| 1 | 0 | 0 | Incoming calls are acknowledged with ALERT |
| | 2 | 1 | No ALERT is sent upon incoming calls |
| 2 | 0 | 0 | No LLC for V.120 |
| | 4 | 1 | LLC for V.120 |
| 3 | 0 | 0 | Reserved |
| 4 | **0** | **0** | **Incoming calls on B channel 1 are answered** |
| | 16 | 1 | Incoming calls on B channel 1 are ignored |
| 5 | **0** | **0** | **Incoming calls on B channel 2 are answered** |
| | 32 | 1 | Incoming calls on B channel 2 are ignored |
| 6..7 | 0 | 0 | Reserved |

*All V.120 CompuServe nodes can be reached by using Low Layer Compatibility (LLC) for V.120.*

# S152 Call signaling delay

| | |
|---|---|
| Valid values | 0 to 50  1/10 seconds |
| Default value | 0 |
| Store in nonvolatile memory | **AT&W** or **AT*W** |

A delay of the signaling of incoming calls can be set in register S152. An incoming call is not signaled to the computer until a preset period of time has elapsed and the call is still pending on the network side. This register can be used to prevent a conflict of multiple terminal devices on the same line with

the same service indicator/bearer capability and EAZ/MSN by giving a different device priority. No signaling delay takes place with the default value 0.

# S153 CONNECT/NO CARRIER message

The contents of register S153 can be stored with the commands **AT&W** or **AT\*W**. The individual bits have the following significance:

| Bit | Dec. | | Description |
|-----|------|---|-------------|
| 0 | **0** | **0** | **Caller ID of the remote station is not displayed after a CONNECT** |
| | 1 | 1 | Caller ID is displayed after a CONNECT |
| 1 | **0** | **0** | **Caller ID of the remote station is not displayed after RING** |
| | 2 | 1 | Caller ID is displayed after RING |
| 2 | 0 | 0 | No display of the EAZ/MSN selected by the remote station |
| | 4 | 1 | With bit 0 and/or bit 1=1, the selected EAZ/MSN is displayed |
| 3..5 | | 0 | Reserved |
| 6 | **0** | **0** | **No display of the messages: ALERTING, CALL SENT, CONNECTING** |
| | 64 | 1 | Display of the messages: CONNECTING, ALERTING, CALL SENT |
| 7 | **0** | **0** | **Cause of the aborted connection is not displayed** |
| | 128 | 1 | Cause of the aborted connection displayed by S154/S155 after NO CARRIER |

# S154/S155 Error codes

In the event of errors (no connection established or aborted connections), the contents of the registers S154 and S155 return error codes which may be used to localize the problem. These registers can be read only. A list of error messages may be found in the appendix "Error Messages".

EN

# S156    Receiving packet retransmissions on D-channel

| Valid values | 0 to 255 1/250 data packets |
|---|---|
| Default value | 0 |
| Store in nonvolatile memory | No |

Register S156 contains the number of incorrectly received data packets in the signaling channel (D channel) for every 250 data packets. This register can be read only. The contents of this register can only be reset by switching the adapter off and back on.

# S157    Sending packet retransmissions on D channel

| Valid values | 0 to 255 1/250 data packets |
|---|---|
| Default value | 0 |
| Store in nonvolatile memory | No |

Register S157 contains the number of transmit repetitions required in the signaling channel (D channel) for every 250 data packets. This register can be read only. The contents of this register can only be reset by switching the adapter off and back on.

# S158    Current/previous B channel

Register S158 describes which B channel is currently in use, or which one was used last. This register can be read on.

| S158 | Description |
|---|---|
| 000 | No connection has been established |
| 001 | Current/previous connection on B channel 1 |
| 002 | Current/previous connection on B channel 2 |

EN

# S159 Status of the $S_0$ interface

Register S159 contains the current status of the ISDN $S_0$ interface. This register can be read only.

| Bit | Dec. | Description | |
|-----|------|-------------|---|
| 0..1 | 0 | 0 | Reserved |
| 2 | 0 | 0 | $S_0$ bus not activated |
| | 4 | 1 | $S_0$ bus activated |
| 3 | 0 | 0 | No TEI assigned |
| | 8 | 1 | TEI is assigned |
| 4 | 0 | 0 | D channel level 2 not established |
| | 16 | 1 | D channel level 2 is established |
| 5..7 | 0 | 0 | Reserved |

# S160 Call signaling information

Register S160 contains information on the last call present at the ISDN $S_0$ interface. This register can be read only.

| Dec. | Hex. | Description |
|------|------|-------------|
| 000 | 00h | No call was pending |
| 016 | 10h | Call currently being signaled |
| 017 | 11h | Call answered |
| 018 | 12h | Call attempt ended or answered by another device on the $S_0$ bus |
| 032 | 20h | Call had incorrect Service Indicator (1TR6) or incorrect Bearer Capability (DSS1) |
| 033 | 21h | Call had incorrect EAZ or incorrect MSN/DN |
| 048 | 30h | DTR (line S1) was in off-state, call was ignored |
| 049 | 31h | ISDN adapter had another connection or establishing another connection (BUSY) |
| 064 | 40h | Dial number monitoring not in order |
| 065 | 41h | Dial number monitoring not in order, no number specified |

# S162 B-channel settings for outgoing calls

The contents of register S162 are stored in the nonvolatile memory with the commands **AT&W** or **AT*W**. The individual bits have the following significance.

| Bit | Dec. | Description | |
|-----|------|---|---|
| 0..1 | 0 | 0 | B channel is random |
| | 1 | 1 | B1 channel has priority, can be changed to B2 by exchange if B1 is busy. |
| | 2 | 2 | B2 channel has priority, can be changed to B1 by exchange if B2 is busy. |

# S163/S164 Service indicator/additional service indicator

Registers S163 and S164 contain the Service Indicator and the Additional Service Indicator of the last connection or the last incoming call if the connection attempt failed. These registers can be read only. The coding is effected as 1TR6 code.

| S163 | S164 | Description |
|------|------|-------------|
| 007 | 169 | Bit rate adjustment to 56,000 bps (automatic switching to 56,000 bps at V.120/X.75/HDLC) |
| Other | | Data transfer 64,000 bps |

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# S174 ISDN/modem operation

Register S174 may be used to toggle between ISDN and modem operation. The contents of register S174 can be stored with the commands **AT&W** or **AT*W**. The individual bits in register S174 have the following significance:

| Bit | Dec. | Description | |
|-----|------|---|---|
| 0..1 | 0 | 0 | Answer digital calls |
| | 1 | 1 | Answer analog calls |
| | **2** | **2** | **Answer digital and analog calls** |
| 2..3 | 0 | 0 | Outgoing digital call |
| | 4 | 1 | Outgoing analog call |
| | **8** | **2** | **First digital, then analog call** |
| 4..7 | 0 | 0 | Reserved |

# S180 B-channel protocol settings

Register S180 is used to select the operating mode of the MicroLink ISDN i. The individual bits in register S180 have the following significance:

| Bit | Dec. | Description | |
|-----|------|---|---|
| 0..4 | 0 | 0 | No protocol selected |
| | 1 | 1 | X.75 |
| | 2 | 2 | T.70NL (X.75/T70) |
| | 3 | 3 | V.120 |
| | 4 | 4 | HDLC |
| | 5 | 5 | Transparent |
| | 6 | 6 | HDLC-PPP |
| | 7 | 7 | X.75, T.70NL and Cept/Kit |
| | 8 | 8 | V.110 |
| | 12 | 12 | X.75 $\longrightarrow$ HDLCP |
| | **13** | **13** | **X.75 $\longrightarrow$ V.120 $\longrightarrow$ HDLCP** |
| | 14 | 14 | X.75 $\longrightarrow$ V.120 |
| | 18 | 18 | V.120 $\longrightarrow$ HDLCP |
| 5..7 | 0 | 0 | Reserved |

# S185 D-channel protocol settings

The D-channel protocol can be set using the register S185.  The contents of register S185 can be stored with the commands **AT&W** or **AT\*W**.  The individual bits in register S185 have the following significance:

| Bit | Dec. | | Description |
|-----|------|---|-------------|
| 0..1 | **0** | **0** | **Euro-ISDN (DSS1 protocol)** |
| | 1 | 1 | German national ISDN (1TR6 protocol) |
| | 2 | 2 | Point-to-point protocol in DSS1 |

# S194 Displaying the B-channel protocol

The agreed B-channel protocol can be displayed in register S194 after the establishment of a connection.  This register can be read only.

| Bit | Dec. | | Description |
|-----|------|---|-------------|
| 0..3 | 0 | 0 | No protocol selected |
| | 1 | 1 | X.75 |
| | 2 | 2 | T.70NL (X.75/T70) |
| | 3 | 3 | V.120 |
| | 4 | 4 | HDLC |
| | 5 | 5 | Transparent |
| | 6 | 6 | HDLC-PPP |
| | 7 | 7 | X.75, T.70NL and Cept/Kit |
| | 8 | 8 | V.110 |
| 4..7 | 0 | 0 | Reserved |

## 3.2 Description of messages

### 3.2.1 Commands with effect on messages

Insofar as the command **ATQ1** is not active (messages off), the MicroLink ISDN i will acknowledge input commands and provide messages—regarding incoming calls or the establishment of a connection, for example.

With the default setting **ATV1**, the MicroLink ISDN i returns messages in plain text (followed by (Enter) and a line feed character). With the command **ATV0**, the messages are returned in short form as a digit (with a leading and concluding (Enter)).

| V1 | V0 | Description |
|---|---|---|
| OK | 0 | Command line executed |
| RING | 2 | Incoming call |
| NO CARRIER | 3 | No connection established, connection ended by exchange of remote station, or inactivity timer elapsed (see also register S154/S155) |
| ERROR | 4 | Error during command input |
| NO DIALTONE | 6 | No connection to ISDN exchange or own connection is busy |
| BUSY | 7 | Requested subscriber or communication paths busy |
| CALL SENT | 252 | Dial number complete, call being processed |
| ALERTING | 253 | Remote station alerting to call |
| CONNECTING | 254 | Call answered by remote station, line protocol being negotiated |

## 3.3 Caller ID of remote station

The ISDN supplies the caller ID of the incoming call, if this has not been suppressed by the remote station. Register S153 can be used to set whether this number should be displayed together with the RING and/or CONNECT message.

*Examples*  RING;0241938800

CONNECT;0241938800

CONNECT 64000/ISDN/V120;0241938800

or, if the short form has been set:

2;0241938800

1;0241938800

70;0241938800

In addition, the target EAZ or target MSN used by the remote station can be displayed. This setting is also made in register S153

*Example*                RING;0241938800;MSN

**CONNECT messages**

The CONNECT messages, i.e. the messages regarding a successful connection, are influenced by the AT-M, AT\V and ATX commands.

**NO CARRIER**

The cause of the failed connection may also be displayed together with the "NO CARRIER" message (see also register S153).

*Example*                NO CARRIER;053;016 = normal cancellation of the connection by the remote station.

The following table provides an overview of the CONNECT messages that may be displayed during ISDN operation:

| Short form | Plain text |
|------------|------------|
| 60 | CONNECT 1200 |
| 61 | CONNECT 2400 |
| 62 | CONNECT 4800 |
| 63 | CONNECT 9600 |
| 64 | CONNECT 19200 |
| 65 | CONNECT 38400 |
| 66 | CONNECT 48000 |
| 67 | CONNECT 56000 |
| 68 | CONNECT 56000/REL |
| 69 | CONNECT 64000 |
| 70 | CONNECT 64000/REL |

## 3.3.1        V.24 interface

The interface between the MicroLink ISDN i and the computer consists of a variety of data, control and signaling lines. The condition of most of the interface lines is displayed by LEDs on the front of the unit.

The pin assignment of the V.24 interface for 9-pin or 25-pin connectors is as follows:

| 9-pin | 25-pin | DIN | ITU-T | USA | Designation (USA) |
|-------|--------|-----|-------|-----|-------------------|
| U* | 1 | E1 | 101 | GND | Protective Ground |
| 5 | 7 | E2 | 102 | GND | Signal Ground |
| 3 | 2 | D1 | 103 | TxD | Transmit Data |
| 2 | 3 | D2 | 104 | RxD | Receive Data |
| 6 | 6 | M1 | 107 | DSR | Data Set Ready |
| 8 | 5 | M2 | 106 | CTS | Clear to Send |
| 9 | 22 | M3 | 125 | RI | Ring Indicator |
| 1 | 8 | M5 | 109 | DCD | Data Carrier Detect |
| 47 | 20 | S1 | 108 | DTR | Data Terminal Ready |
| | 4 | S2 | 105 | RTS | Request to Send |

  \* U = Housing/shield

*The designations in the table name the functions of the lines (e.g. transmission data) as related to the data terminal (computer).*

## 3.3.2 The interface lines have the following significance:

### Computer/terminal operational – DTR = Data Terminal Ready

The effect of this control line on the MicroLink ISDN i is determined by the command **AT&D**.

### Switch on transmission – RTS = Request To Send

### Operational – DSR = Data Set Ready

This signal line is normally always active (ON), but is influenced by the commands **AT\D** and **AT&S**.

### Clear to send – CTS = Clear To Send

This output is normally always active (ON), but is influenced by the commands **AT\D**, **AT\Q** and **AT&R**.

### Incoming call – RI = Ring Indicator

This MicroLink ISDN i output becomes active (ON) when the adapter detects an incoming call (see also command **ATA**). Incoming calls are detected only if the DTR control line is active (ON) or the command **AT&D0** has been issued.

### Connection – DCD = Data Carrier Detect

This MicroLink ISDN i output normally becomes active (ON) when the adapter has established a valid connection.

## 3.4    Error messages

In the event of errors, the contents of the registers S154 and S155 return error codes which may be used to localize the problem.  These registers can be read using the commands **ATS154?** or **ATS155?**.

| Error codes S154/S155 | Description | Cause and possible correction |
|---|---|---|
| **AT-level error group** | | |
| 001/001 | Establishment of connection aborted by character input during establishment | Input of characters during establishment of connection not permitted.  If the input of characters is to be permitted during call establishment, bit 6 must be set in register S14 (polling enabled during establishment of connection). |
| 001/003 | Call not (no longer) present (with **ATA** or **ATO**) | Opposite station has hung up or another unit has answered the call. |
| 001/004 | Internet service provider protocol error at the serial port | Reestablish the connection. |
| 001/005 | Connection aborted by **ATZ** | The command **ATZ** in the command phase causes the abort of an existing connection. |
| 001/006 | Inactivity timer elapsed (connection aborted) | No more data was transmitted during the time period specified in register S30 or by the **AT\Tn** command. |
| 001/007 | Establishment of connection aborted by DTR = off | The DTR signal was deactivated, e.g. by the terminal program. |
| 001/009 | Establishment of connection aborted by **ATH** | Establishment of connection canceled. |
| 001/010 | Establishment of connection aborted by locking of dial numbers | The dial number is not approved.  See **AT$INCB** regarding dial number locking. |
| **Local error messages** | | |

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| Error codes S154/S155 | Description | Cause and possible correction |
|---|---|---|
| 051/001 | Error in establishment of D channel level 1 | Check the cables and the ISDN $S_0$ connection and remove additional ISDN terminal units from $S_0$ bus to exclude other |
| 051/002 | Error in establishment of D channel level 2 | possible sources of errors. If applicable, test the modem directly at the NT (network terminator). |
| 051/003 | Error in establishment of B channel level 1 | Check the B-channel protocol of the opposite station. |
| 051/004 | Error in establishment of B channel level 2 | Check the B-channel protocol of the opposite station. |
| 051/005 | Abort of D channel level 1 | Check the cables and the ISDN $S_0$ connection and remove additional ISDN terminal units from $S_0$ bus to exclude other |
| 051/006 | Abort of D channel level 2 | possible sources of errors. If applicable, test the modem directly at the NT (network terminator). |
| 051/007 | Abort of D channel level 3 | Verify the selected D-channel protocol (**AT$IDP**). |
| 051/008 | Connection aborted, B channel level 1 | Connection aborted by the remote station or possible connection error. |
| 051/009 | Connection aborted, B channel level 2 | Connection aborted by the remote station or possible connection error.. |
| 051/010 | Connection aborted, B channel level 3 | Reestablish the connection. |
| 051/011 | Restart of connection, B channel level 2 | Connection error resulting in |
| 051/012 | Restart of connection, B channel level 3 | Restart—data loss possible. |
| 051/013 | B2 abort due to time-out T1 | Register S30 timer elapsed, inactivity timer |

**ISDN error messages (valid for 1TR6 protocol)**

| | | |
|---|---|---|
| 052/000 | Abort by network, no reason given or reason not translatable | Dial again. |
| 052/128 | Normal end of connection | The connection was correctly ended by both stations. |

| Error codes S154/S155 | Description | Cause and possible correction |
|---|---|---|
| 052/131 | Service not available at own or remote connection or dialing of an incorrect number | Check the dial number and the enabling of the desired services (also applies to PBX systems). |
| 052/138 | Own connection is busy. | Connection is in use by other terminal devices. End existing connection if necessary. |
| 052/144 | Semi-permanent connection (SPC) not supported by network | SPC must be requested from network operator. |
| 052/145 | Requested service not available | Service must be requested from network operator. |
| 052/160 | Outgoing connection blocked | Have blockage removed by network operator. |
| 052/161 | Remote station busy | Dial again later. |
| 052/165 | Semi-permanent connection (SPC) not permitted between these subscribers | SPC must be requested from network operator. |
| 052/181 | Target number, service or service characteristic incorrect | Check the dial number and the enabling of the desired services (also applies to PBX systems). |
| 052/184 | Target dial number has changed | Obtain new number from the remote station. |
| 052/185 | From remote terminal unit: Not operational | Check the operational readiness of the remote station. |
| 052/186 | Remote terminal unit does not answer | Check the operational readiness of the remote station and the terminal selection digit of the dial number. |
| 052/187 | Message from remote terminal unit: Unit busy | Dial again later. |
| 052/189 | Target subscriber: Blocked against incoming connections | Check with remote station regarding blockage. |
| 052/190 | Target subscriber rejected connection | Check with remote station. |
| 052/217 | Network bottleneck (e.g. congestion) | Dial again later. |

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| Error codes S154/S155 | Description | Cause and possible correction |
|---|---|---|
| 052/218 | Rejected or disconnected by remote terminal unit | Dial again later or check with remote station. |
| 052/240 | Local procedure error (protocol fault) | Dial again. |
| 052/241 | Remote procedure error (protocol fault) | Dial again. |

| Error codes S154/S155 | Description |
|---|---|
| **ISDN error messages (valid for DSS1 protocol)** | |
| 053/001 | Dial number is not assigned |
| 053/002 | No path to the requested transfer network |
| 053/003 | No path available to destination |
| 053/006 | Channel not accepted |
| 053/016 | Normal call trigger |
| 053/017 | Remote station busy |
| 053/018 | No response from remote station |
| 053/019 | Remote station does not answer |
| 053/021 | Call rejected |
| 053/022 | Dial number has changed |
| 053/027 | Remote station not operational |
| 053/028 | Incorrect number |
| 053/029 | Service feature rejected |
| 053/034 | No channel available |
| 053/038 | ISDN network not operational |
| 053/041 | Temporary fault |
| 053/042 | ISDN network overloaded |
| 053/044 | Channel or service not available |
| 053/047 | Service not available |
| 053/049 | Service not available |
| 053/050 | Requested service not ordered |
| 053/057 | Service feature not permitted |
| 053/058 | Service feature not available |

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| Error codes S154/S155 | Description |
|---|---|
| 053/063 | Service or option not available |
| 053/065 | Service not available |
| 053/066 | Channel type not implemented |
| 053/069 | Requested characteristic does not exist |
| 053/070 | Data transfer service available only |
| 053/079 | Service or option does not exist |
| 053/088 | Remote station does not support requested service |
| 053/091 | Invalid transmission network selection |
| 053/127 | Unknown ISDN error |

# 4 Appendix

## 4.1 Status display and troubleshooting

The LEDs on the front panel show the condition of the interface lines or the condition of the modem.



$S_0$ status

$S_0$ line

Power

TxD (D1)– Data or command from local PC to ISDN modem

RxD (D2) – Data or messages from ISDN modem to local PC

DTR (S1)– Computer operational

RTS (S2) – Switch on transmit

CTS (M2) – ISDN modem clear to send

DCD (M5) – Connection established (red LED)

## 4.1.1 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 (S$_0$ status)

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

| State of LED | Description |
|---|---|
| Off | S$_0$ bus not activated, normal state |
| Blinking quickly | S$_0$ bus activated, no TEI assigned |
| On | S$_0$ bus activated, TEI assigned |

### Yellow LED

The yellow LED indicates the connection state of the MicroLink ISDN i:

| 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 state of the V.24 connection to the computer:

| LED | Description |
|---|---|
| TxD (D1) | Data or commands from the local PC |
| RxD (D2) | Data or messages from the MicroLink ISDN i |
| DTR (S1) | Computer operational |
| RTS (S2) | Switch on transmit |
| CTS (M2) | MicroLink ISDN i clear to send |
| DCD (M5) | Connection established |
| | LED lights up red for insecure or fax connections |
| | LED lights up green for secure connections |

EN

## 4.2 Technical data

Users with specific technical interests should refer to this chapter for detailed information on MicroLink ISDN i. All connections and their pin assignments are described in detail.

|  | **MicroLink ISDN i** |
|---|---|
| Data transfer standards and protocols | V.120, X.75, X:75T/70 NL, V.110, X.75-T-Online (VT-100, CEPT, KIT) (Germany) full-duplex |
| Transfer rates | 38.400 – 64.000 bit/s |
| Transfer procedure | Asynchronous |
| Error correction | V.120 and X.75 |
| Protocol recognition | Automatic switching between X.75, V.120 and PPP synchronous |
| Command set | Advanced AT command set |
| Operating surveillance | 9 LEDs:<br>$S_0$ status<br>$S_0$ line<br>Power<br>TxD (transmit data)<br>RxD (receive data)<br>DTR (data terminal ready)<br>DSR (data set ready)<br>RTS (request to send)<br>CTS (clear to send)<br>DCD (data carrier detect) |
| Computer interface | V.24/RS-232<br>Automatic recognition:<br>Bit rate: 300 – 230.40 bps asynchronous<br>Data format:: 10/11 bit, parity: even/odd/none<br>(7, e,1 – 7,o,1 – 8,n,1 – 8,e,1) |
| Line adapter | Country-specific |
| ISDN connection | DSS1 (Euro ISDN), basic rate interface (point-to multipoint connection), 1 TR6 (Germany) and ISDN PBX with $S_0$ port |
| Line type | DSS1 (Euro ISDN), Basic Rate Interface (point-to-multipoint connection), 1TR6 as well as ISDN PBXs with $S_0$ ports |
| Power supply | $9 - 30V_{AC}$, $9 - 30V_{DC*}$ |

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|  | **MicroLink ISDN i** |
|---|---|
| Power consumption | 5 W |
| Security | Integrated watchdog |
| Environment | Temperature: 5..40°C, humidity 0..80%, non-condensating |
| Operating systems | Windows 98, Windows Me, Windows NT 4.0, Windows 2000, Windows XP |
| CE conformity | CE-compliant in accordance with R&TTE technical requirements for all EU countries and Switzerland Tested in accordance with EN 55024, EN 55022, EN 60950, CTR3 A1 |

*The device can be supplied with direct current (DC). If power is put into the socket a potential difference of 0.7V between the DC source ground and the interface ground occurs (due to the rectifier diode). If these grounds are connected galvanically the electric current flows back via the interface ground—following the lowest resistance. Normally, this does not cause problems.

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### RJ11 socket contact assignments
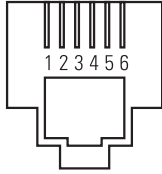


| $S_0$ socket | Line | IAE |
|---|---|---|
| 1 | - | - |
| 2 | T+ | 2a |
| 3 | R+ | 1a |
| 4 | R- | 1b |
| 5 | T- | 2b |
| 6 | - | - |

### Mini-DIN 8 socket pin assignments
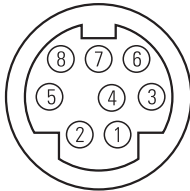


**Mini DIN 8**

| DIN | Mini DIN 8 | Explanation (USA) |
|---|---|---|
| E1 | – | GND |
| E2 | U | GND |
| D1 | 5 | TxD |
| D2 | 3 | RxD |
| M1 | 6 | DSR |
| M2 | 1 | CTS |
| M3 | 4 | RI |
| M5 | 7 | DCD |
| S1.1 | – | – |
| S1.2 | 8 | DTR |
| S2 | 2 | RTS |

**EN**

# 4.3 Declaration of conformity

$$CE$$

## KONFORMITÄTSERKLÄRUNG

**gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)**

EC- DECLARATION OF CONFORMITY
appropriate to the law of radio and telecom terminal equipment and Directive 1999/5/EC (R&TTE)

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| Die Firma:<br>The Company: | **devolo AG**<br>**Sonnenweg 11**<br>**52070 Aachen** |

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| erklärt, daß das Produkt:<br>declares that the product: | **MicroLink™ ISDN i** |

Telekommunikations (TK-) Endeinrichtung
telecommunications terminal equipment radio equipment

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| Verwendungszweck:<br>intended purpose: | **ISDN-Adapter** |

den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.
complies with the appropriate essential requirements of the FTEG (Article 3 of R&TTE) and the other relevant provisions.

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| Harmonisierte Normen:<br>Harmonised Standards: | Gesundheit und Sicherheit gemäß §3 (1) 1. (Artikel 3 (1) a))<br>Health and Safety requirements contained in §3 (1) 1. (Article 3 (1) a)) |

**EN 60 950: 1992 +A1: 1993 +A2: 1993 +A3: 1995 +A4: 1996 +A11: 1998**

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| Harmonisierte Normen:<br>Harmonised Standards: | Schutzanforderungen in Bezug auf die EMV §3 (1) 2, Artikel 3 (1) b))<br>Protection requirements with respect to EMC §3 (1) 2, (Article 3 (1) b)) |

**EN 55 022: 1998**
**EN 55 024: 1998**

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| Schnittstellenspezifikation:<br>Interface specification: | Netzabschluss eines öffentlichen TK-Netzes<br>Termination point of a public telecom. network |

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| Spezifikation<br>specification: | **I-CRT 3: 1994** |

Diese Erklärung wird verantwortlich abgegeben durch:
This declaration is submitted by:

Aachen, 21. Januar 2003
Aachen, 21st January 2003

Heiko Harbers
Vorstandsvorsitzender
CEO

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# 4.4 Warranty conditions

The devolo AG warranty is given to purchasers of devolo 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, at devolo's sole discretion, be replaced or repaired free of charge if, despite proven proper handling and adherence to the operating instructions, these parts became defective due to fabrication and/or material defects. Alternatively, devolo reserves the right to replace the defective product with a comparable product with the same specifications and features. Operating manuals and possibly supplied software are excluded from the warranty.

b) Material and service charges shall be covered by devolo, but not shipping and handling costs involved in transport from the buyer to the service station and/or to devolo.

c) Replaced parts become property of devolos.

d) devolo is 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 for this devolo product is two years. This period begins at the day of delivery from the devolo dealer. Warranty services carried out by devolo 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 person carrying out the transportation and the sender should be informed immediately. On discovery of damage which is not externally visible, the transport company and the sender are to be immediately informed in writing, at the latest within 3 days of delivery.

c) 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.

d) Warranty claims are only valid if a copy of the original purchase receipt is returned with the device. devolo reserves the right to require the submission of the original purchase receipt.

**4   Suspension of the warranty**

All warranty claims will be deemed invalid

a) if the label with the serial number has been removed from the device,

b) if the device is damaged or destroyed as a result of acts of nature or by environmental influences (moisture, electric shock, dust, etc.),

c) if the device was stored or operated under conditions not in compliance with the technical specifications,

d) if the damage occurred due to incorrect handling, especially to non-observance of the system description and the operating instructions,

e) if the device was opened, repaired or modified by persons not contracted  by devolo,

f) if the device shows any kind of mechanical damage,

g) if the warranty claim has not been reported in accordance with 3a) or 3b).

## 5    Operating mistakes

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

## 6    Additional regulations

a) The above conditions define the complete scope of devolo's legal liability.

b) 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.

c) Claims for compensation of lost profits, indirect or consequential detriments, are excluded.

d) devolo is not liable for lost data or retrieval of lost data in cases of slight and ordinary negligence.

e) In the case that the intentional or culpable negligence of devolo employees has caused a loss of data, devolo will be liable for those costs typical to the recovery of data where periodic security data back-ups have been made.

f) The warranty is valid only for the first purchaser and is not transferable.

g) 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, devolo's court of jurisdiction applies. This is also applicable if the purchaser's domicile is not known at the time of institution of proceedings.

h) The law of the Federal Republic of Germany is applicable. The UN commercial law does not apply to dealings between devolo and the purchaser.