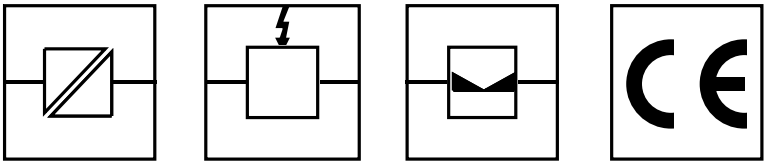
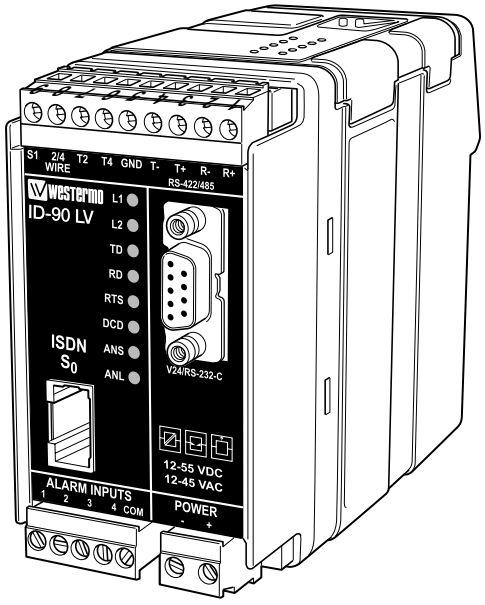
ID-90 HV/LV
V.90

INSTALLATION MANUAL

6607-2204



Galvanic Isolation | Transient Protection | Balanced Transmission | CE Approved



ISDN
Terminal Adapter

westermo®
www.westermo.com

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Introduction

The Westermo ID-90 is an industrialised ISDN Terminal adapter. This Terminal adapter has been developed with high speed industrial data communications in mind and has some features you would not expect to find on normal adapters.

The unit is DIN rail mounted and has both an RS-232/V.24 and RS-485 interface in 2 or 4 wire connections.
Terminal data rates of up to 115.2 kbit/sec can be handled with a 128 kbit/s ISDN B-channel bit rate.
The ID-90 has been designed to meet the European ISDN standard DSS1 as well as French VN4. All standard ISDN transport protocols are supported including HDLC transparent, X75, PPP and ML-PPP.
V.110 asyncronous is supported with flow control at data rates up to 19.2 kbit/sec.

A watchdog facility continually monitors the power supply and internal hardware as well as the operational software. In the event of a problem the modem automatically resets. This feature has been included to make the unit more suitable for use in unmanned locations.

The ID-90 is available in two standard versions:
One for high input voltages, version HV with nominal voltage range 95–240V AC and 110–240V DC ±10%.
One low voltage version, version LV with nominal input voltages 12–45V AC and 12–55V DC ±10%.

The ID-90 has 4 Alarm inputs that can be used to trigger 20 character SMS paging messages or establish automatic data connections, making the unit ideal for alarm monitoring and remote diagnostics.
The ID-90 features DIP-switch configuration and can be programmed using AT-commands, and a Configurator for local as well as remote configuration and CAPI 2.0 compatibility.

The ID-90 is also available in an optional configuration with an internal analogue V90 modem enabling connections from ISDN to analogue modem end locations.

The ID-90 has been designed with the engineer in mind, hence the extensive information on the command set, S registers, DIP-switches and error codes. We have endeavoured to include all necessary information however if you need more please do not hesitate to call us.

Safety

This equipment should only be installed by professional service personnel. If the unit is intended for permanent connection to mains supply, there should be a readily accessible disconnect device (circuit breaker) incorporated into the fixed wiring.
The ID-90 ISDN S_0 is compliant to the requirement for TNV1 circuits for connection to Telecommunication networks. The mains connection is classified as hazardous voltage and the ID-90 classified as a Class I equipment.
The supply voltage to the Alarm input must use a SELV classified voltage source.
The RS-232/V.24 and RS-485 interface must only be connected to SELV circuits.
Description of the above classifications are given in SS-EN 60950 Issue 5.
The mains input is protected with a 1A, 250V time lag fuse. The fuse must only be replaced with the same type and rating. Wickman type no: 19372 1A/250V or Littelfuse® 664 001.

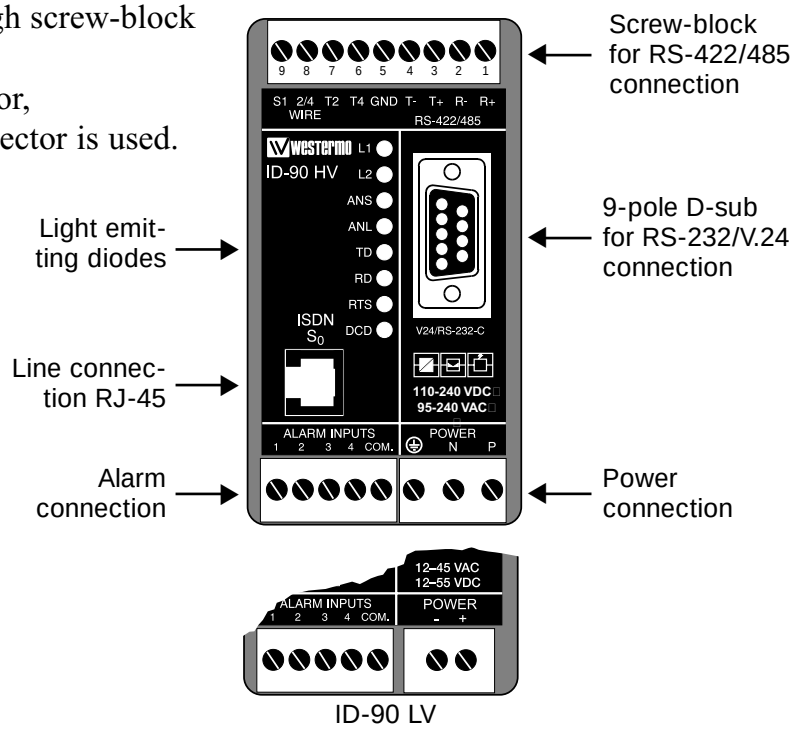
Specifications

Transmission	**Interface 1**	Asynchronous, full/half duplex or simplex PPP and ML-PPP Asynchronous & Synchronous conversion V110 Asynchronous adaptation up to 19.2 kBit/s
	Interface 2	*B-channel protocols* V.110 async, V.120 async. HDLC async. to sync. HDLC transparent HDLC transparent Byte transparent X.75 SLP X.25 B-Channel T.70NL and T.90NL PPP and ML-PPP *D-channel protocols* Euro ISDN DSS1 and French VN4 X.31 Case B D-Channel
	Interface 1	RS-232/V.24 9-pin D-sub female. RS-422 and RS-485 2- and 4-wire with screw terminals
	Interface 2	RJ-45
Transmission speed	**Interface 1**	Up to 115.2 kbit/s
	Interface 2	Up to 128 kbit/s
Command interface	**Interface 1**	AT-command Configurator remote/local X3 PAD Hotline DTR, TxD, Alarm call.
Alarm inputs	**Supply voltage**	10–60 V DC 1mA/input @ 10V DC
Power supply	**HV-version**	95–240 V AC, 110–240V DC ±10%
	LV-version	12–45 V AC, 12–55V DC ±10%
Power consumption	**HV-version**	0.02A, 1.6W With V90 option 0.05A, 3.5W
	LV-version	Max 0.1A, 1.2W With V90 option 0.25A, 3.0W
Isolation	**S_0 Interface**	1 500 V AC
	Alarm	500 V AC
	Mains	3 000 V AC
Indicator LED's	TD, RD, DCD, RTS, L1, L2, ANS, ANL	
Temperature	5–50°C ambient temperature	
Humidity	0–95% without condensation	
Dimensions	55x100x128 mm (WxHxD)	
Weight	0.4 kg	
Mounting	35 mm DIN-rail	

Installation

The Terminal Adapter should be connected in the following way:
Power connection is made through screw-block at bottom right corner.
For HV-version a 3-pole connector, and for LV-version a 2-pole connector is used.

Computers or other equipment are connected through an RS-232/V.24 or RS-485 connection. The RS-232/V.24 uses a 9-pole D-sub and the RS-485 a 9-pole screw connector.
Do not use ribbon cable for RS-232/V.24 connections.



RS-232/V.24 Connections

Pinouts for the 9-pole D-sub

Direction	Pin no.	CCITT V.24 Description	Signal description
O	1	109	DCD/Data Carrier Detect
O	2	104	RD/Received Data
I	3	103	TD/Transmitted Data
I	4	108/2	DTR/Data Terminal Ready
–	5	102	SG/Signal Ground
O	6	107	DSR/Data Set Ready
I	7	105	RTS/Request to Send
O	8	106	CTS/Clear to Send
O	9	125	RI/Ring Indicator

I = input **O** = output on ID-90

RS-422/485 interface connection

The ID-90 is supplied with a RS-422/485 interface.

The RS-422/485 interface is internally in parallel to the RS-232/V.24 interface using the 9-pole D-sub. The two interfaces can not be used or be connected simultaneously, but the interface connected will automatically be selected as the DTE source.

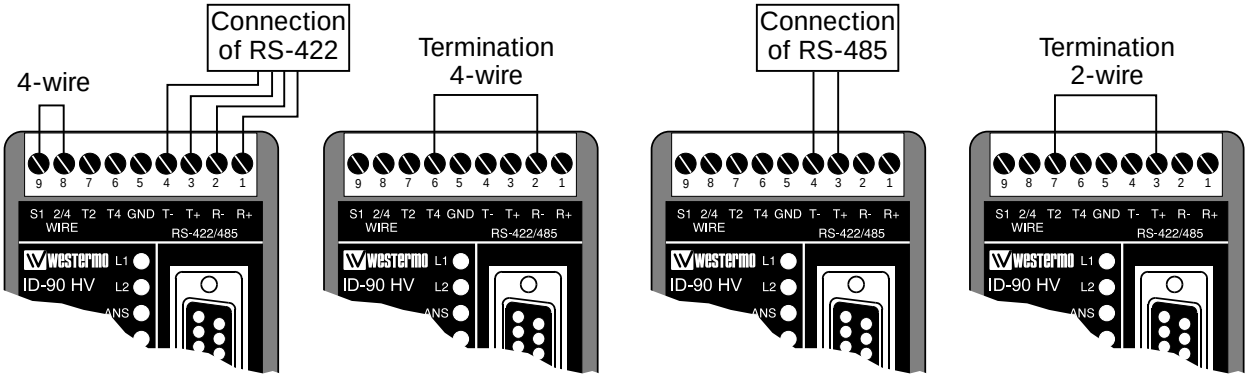
The RS-422/485 connections are made as shown below. Please note that the selection of 2- or 4- wire and termination or no termination is done by linking between some of the screw terminals.

Direction	Terminal	Name	Description
I	1	R+ (A')	ID-90 Receive
I	2	R– (B')	ID-90 Receive
I/O	3	T+ (A)	ID-90 Transmit, at RS-485
I/O	4	T– (B)	ID-90 Transmit, at RS-485 Bidirectional
–	5	Shield	If shielded cable is used, connect the shield only at one end to avoid ground currents.
–	6	T4	Termination 4-wire, connect to terminal 2 to terminate a 4-wire connection.
–	7	T2	Termination 2-wire, connect to terminal 3 to terminate a 2-wire connection.
–	8	2-/4-wire	2/4 wire input selector. Input open selects 2-wire and connected to terminal 9 for 4-wire.
–	9	S1	Select 1. Wired to terminal 8 when 4-wire connection is used. Internally connected to +5V via pull-up resistor.

I = input **O** = output on ID-90

The defination R+/R–, T+/T– can be various between different manufactures.

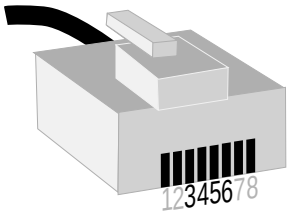
ID-90 uses the defination that in a "MARK"-condition R+/T+ is more negative than R–/T–.



ISDN S_0 interface

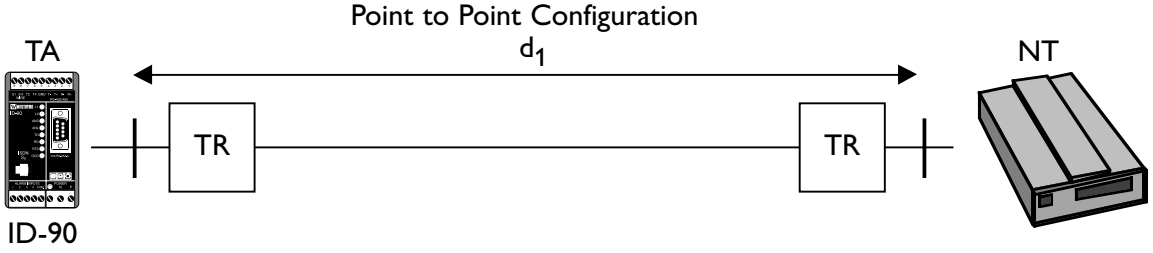
The ISDN S_0 interface is connected via a 8-pol RJ-45 connector.

Pin number	Function
3	Transmit +
4	Receive
5	Receive
6	Transmit
1, 2, 7, 8	No connection

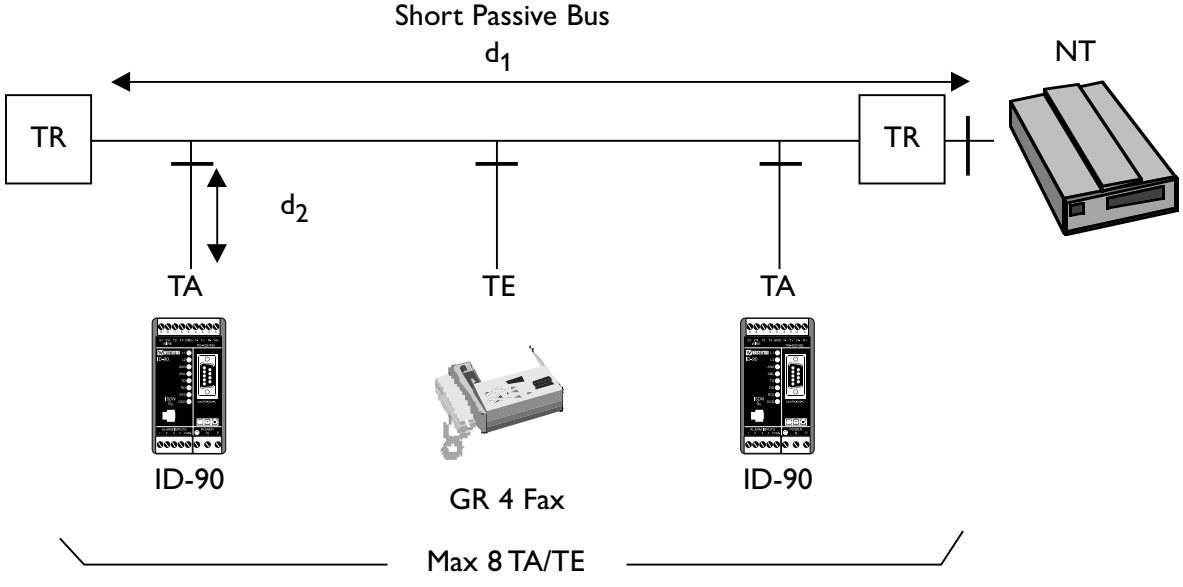


Typical S_0-bus connections

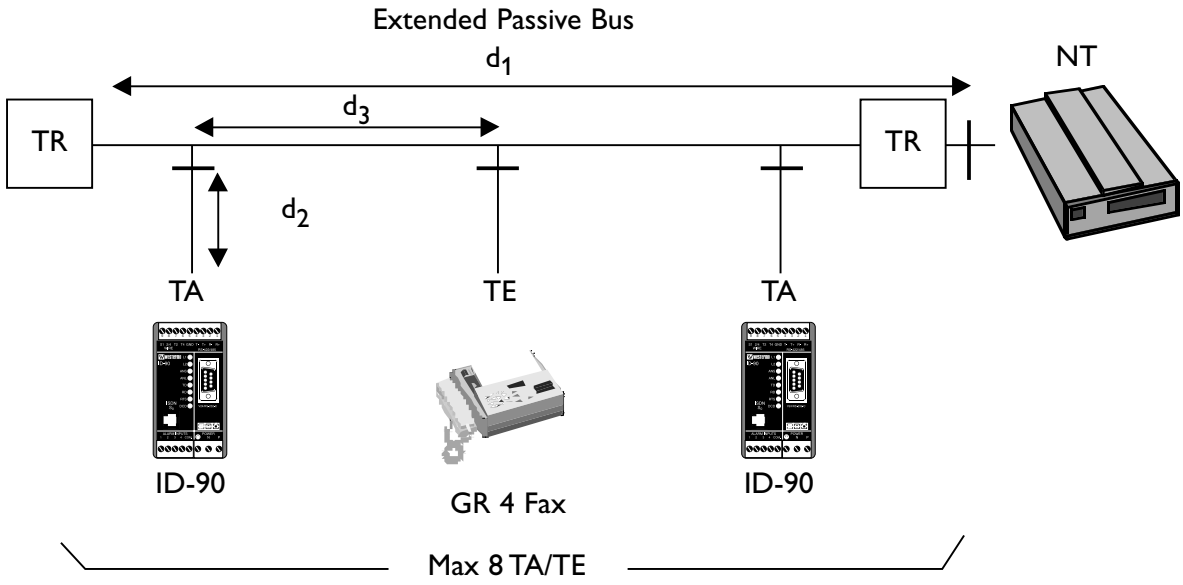
The Terminal equipment TE/TA like the ID-90 Terminal adapter can be connected to the NT in 3 different ways always with a terminating resistor TR in each end of the bus, TR should in all three cases be 100 ohm:



- **Point to Point**. In this configuration the ID-90 is the only TA on the S_0 bus. A distance d1 of 1000 m is generally archived with a 0.3 mm^2 40 nF/km cable.



- **Short Passive Bus**. The short passive bus puts no restriction on the distance between units, but only specifying the maximum round trip delay to be 10 to 14 µs giving a d1 of 100 to 200 m depending on the cable impedance. Up to 8 ID-90 in combination with other terminal equipment can be connected to the S_0 bus with a maximum connection length d_2 = 10 m.



- **Extended Passive Bus.** The difference between the short passive bus and the extended passive bus is that the extended passive bus specifies a distance between the units, d3 and that the units are located at the far end from the NT at a distance of d3 from the far end terminating resistor TR. The range of d3 is from 25 to 50 m giving at least d1 =500 m. (d2 see Short Passive Bus).

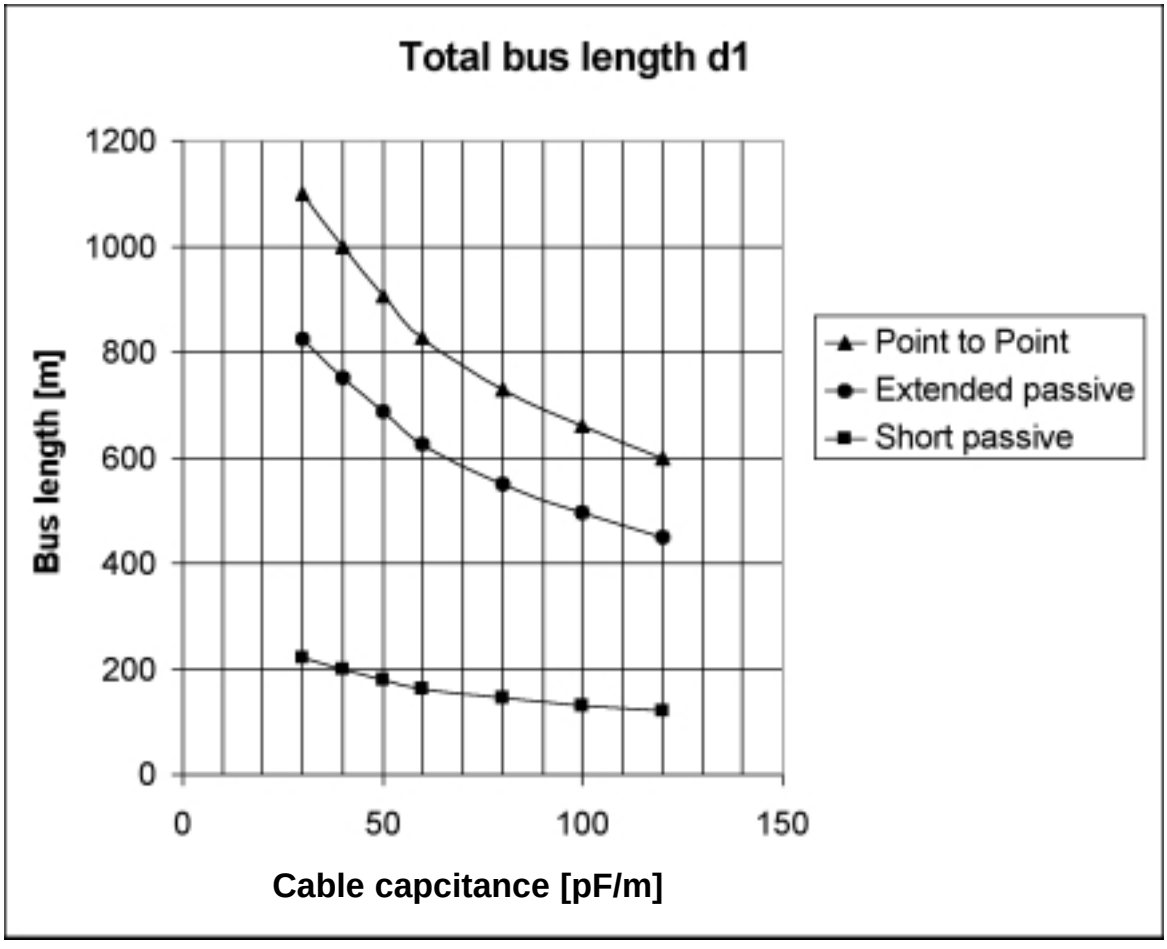
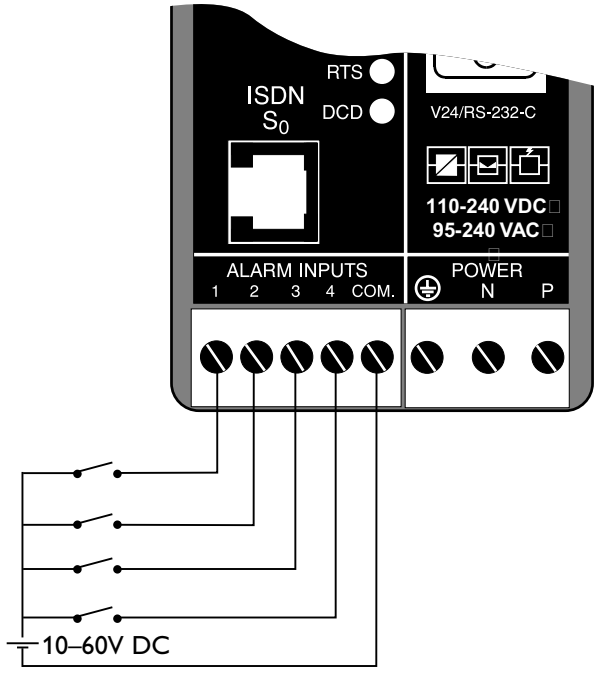


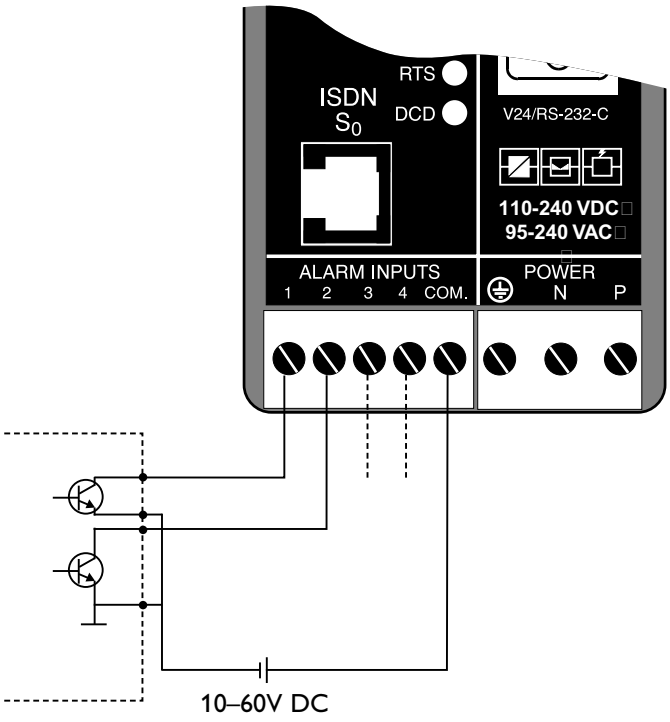
Diagram specifies practically achievable cable lengths as function of cable capacitance for a 0.3 mm^2 wire.

Alarm inputs

The four alarm inputs are accessed through screw terminals, the alarm inputs are opto-isolated from all other parts of the ID-90. The alarm inputs need an external supply voltage of 10–60V DC to be operated. The supply is connected between the alarm input common and the four inputs via making or breaking contacts. The inputs is not polarity sensitive but all inputs must use the same common. The alarm inputs can use any mix of making and breaking contacts as the alarm trigger condition is programmable through AT-commands.



Example 1
Alarm through relay contacts.



Example 2
Alarm from a PLC with open collector.

LED Indicators

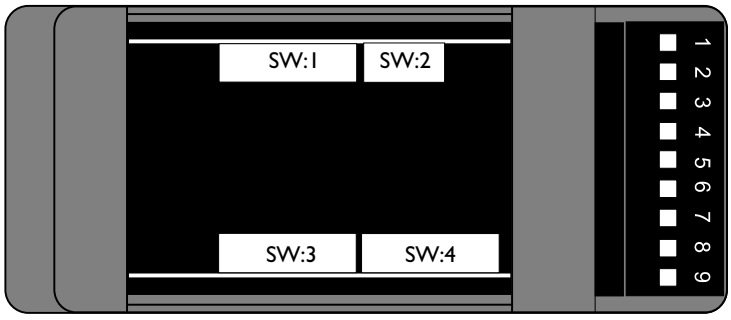
Indications via LED's:		
L1	ISDN Line status	LED normally showing the status of the ISDN S_0 interface. L1 together with L2 is also used to indicate error conditions in the ID-90 and the connection to the ISDN S_0 interface.
L2	ISDN Data connection	LED Normally showing the state of the data connection
ANS	Auto answer	OFF = ID-90 will reject incoming calls. ON = ID-90 will respond to incoming calls
ANL	Analogue line	Only used when V.90 option installed. OFF = No analogue connection established BLINK = Analogue call in progress ON = Analogue line established
TD	Transmit Data	LED showing data from the DTE, the LED will blink when data received
RD	Receive Data	LED showing data transmitted to the DTE, the LED will blink when data transmitted
RTS	Request to Send	LED showing the status of the handshake line RTS from DTE, LED is ON when DTE requests to send data.
DCD	Data Carrier Detect	LED showing the status of the handshake line DCD from ID-90, The behavior of the DCD-line is programable, see configuration command cdcd.

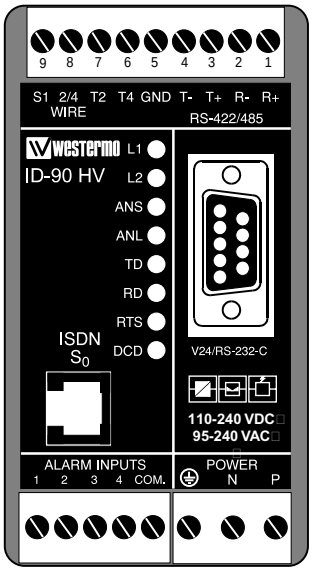
Active states:			
L1	**L2**	**Status**	**Action**
⊗	Θ 5x1s	Start up phase	
⊗	O	Connection to ISDN S_0 OK	; ISDN ok, no ISDN connection established
⊗	∅	Call setup in progress	
⊗	⊕	Waiting for B channel synchronization	
⊗	⊗	Data connection is established	
Error states:			
L1	L2	Status	
O	O	ID-90 NOT OK	No power or Hardware error, check power distribution, send ID-90 for repair if necessary
Θ 1x1s	O	Connection to ISDN S_0 NOT OK	Check ISDN interface/ -connector
O	Θ 2x1s	ID-90 internal RAM error	ID-90 repair necessary
O	Θ 1x1s	ID-90 internal ROM error	Reload Flash firmware, repair ID-90 if necessary
LED Legend:			
⊗	ON		
∅	Short on, long off Cycle 1 s		
⊕	Long on, short off Cycle 1 sec		
Θ	Continuous blinking: ***n*** times every ***m*** seconds, (***n*x*m*s**)		
O	Off		

DIP-Switch Setup

Disconnect power before changing DIP-switches.

Use ESD-protection when changing switches.



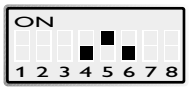
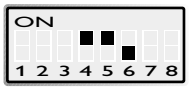
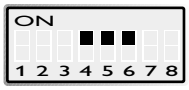


Data bits parity

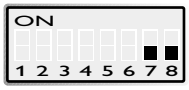
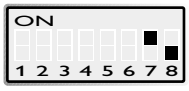
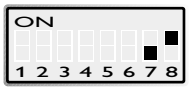
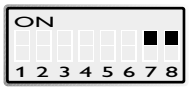
When using DIP-swithes for parity and data bits
remember to set DTE baudrate switches as well.

			Related AT-command
S1	Stored setting from ID-90 database is used		–
S1	No Parity	8-data bits	AT**prty=0 AT**dbits=8
S1	Even Parity	8-data bits	AT**prty=1 AT**dbits=8
S1	Odd Parity	8-data bits	AT**prty=2 AT**dbits=8
S1	Not used		–
S1	Not used		–
S1	Even Parity	7-data bits	AT**prty=1 AT**dbits=7
S1	Odd Parity	7-data bits	AT**prty=2 AT**dbits=7

DSR and DCD line control

			Related AT-command
S1		Stored setting from ID-90 database is used	–
S1		ID-90 control line DSR and DCD is always ON	AT&S AT&C
S1		DSR is always ON DCD ON indicates ISDN connection is established and synchronized	AT&S AT&C1
S1		DSR ON indicates ISDN connection is established and synchronized DCD always ON	AT&S1 AT&C
S1		DSR ON indicates ISDN connection is established and synchronized DCD ON indicates ISDN connection is established and synchronized	AT&S1 AT&C1
S1		Reserved	–
S1		Reserved	–
S1		DSR and DCD follows DTR	AT**cdsr=2 AT**cdcd=2

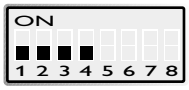
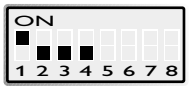
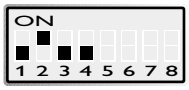
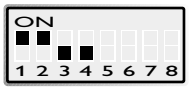
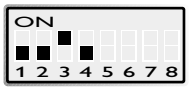
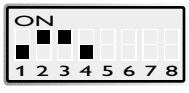
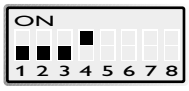
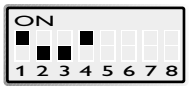
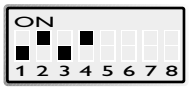
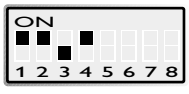
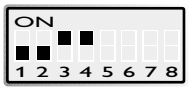
DTR line control

			Related AT-command
S1		Stored setting from ID-90 database is used	–
S1		DTR is evaluated: Ignored	AT&D AT**cdtr = 0
S1		DTR is evaluated: Dropping the DTR line by the DTE will disconnect an existing ISDN connection. An incoming call will be accepted only with DTR active	AT&D2 AT**cdtr = 2
S1		DTR is evaluated: Incoming calls will be accepted independent of DTR status; DTR drop disconnects an active connection	AT&D4 AT**cdtr = 4

DTE baudrate

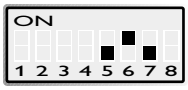
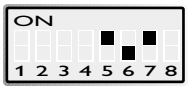
		Related AT-command
S2 	Stored setting from ID-90 database is used	–
S2 	Automatic baud detection	AT%B0
S2 	1 200 bit/s	AT%B1
S2 	2 400 bit/s	AT%B2
S2 	4 800 bit/s	AT%B3
S2 	9 600 bit/s	AT%B4
S2 	19 200 bit/s	AT%B5
S2 	38 400 bit/s	AT%B6
S2 	57 600 bit/s	AT%B7
S2 	115 200 bit/s	AT%B8

B-Channel protocol

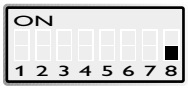
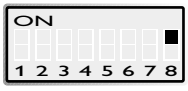
		Related AT-command
S3	 Stored setting from ID-90 database is used	–
S3	 V.110 asynchronous	ATB0
S3	 HDLC asynchronous to synchronous conversion (for PPP asynchronous and single link PPP)	ATB3
S3	 HDLC transparent (DTE data octets packed into HDLC frames)	ATB4
S3	 Byte transparent (raw B-channel data)	ATB5
S3	 X.75 SLP	ATB10
S3	 V.120 asynchronous	ATB13
S3	 X25 / X31 B channel (X.25 B channel)	ATB20
S3	 X25 / X31 D channel	ATB21
S3	 T.70-NL-CEPT	ATB22
S3	 T.90-NL	ATB23
S3	 ML-PPP Multilink PPP	ATB31

Command set

Selects the flow control behaviour of the ID-90 while in data communication phase.

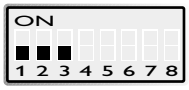
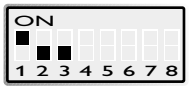
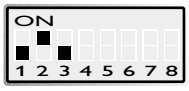
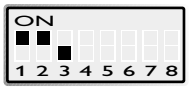
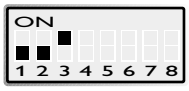
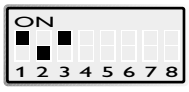
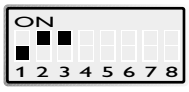
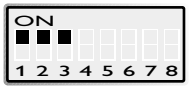
		Related AT-command
S3 	Stored setting from ID-90 database is used	–
S3 	AT-command set	AT**cmds = 0
S3 	X.3 PAD	AT**cmds = 1
S3 	Hot line DTR call	AT**cmds = 6
S3 	Hot line TxD call	AT**cmds = 7
S3 	Reserved	–
S3 	Configurator	AT**cmds = 10

Incomming call handling

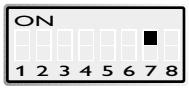
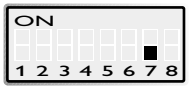
		Related AT-command
S3 	Stored setting from ID-90 database is used	–
S3 	Reject all incoming calls	AT#R1

Flow control

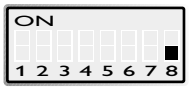
Selects the flow control behaviour of the ID-90 while in data communication phase.

		Related AT-command
S4 	Stored setting from ID-90 database is used	–
S4 	No local flow control between the DTE and ID-90 is used CTS is always ON, RTS ignored	AT&K AT&R1
S4 	No local flow control between the DTE and ID-90 is used CTS follows DTR, RTS ignored	AT&K AT&R2
S4 	No local flow control between the DTE and ID-90 is used CTS follows changes on RTS	AT&K AT&R
S4 	Local flow control is set to hardware handshake RTS/CTS	AT&K3
S4 	Local flow control is set to software handshake XON/XOFF CTS is always ON, RTS ignored	AT&K4 AT&R1
S4 	Local flow control is set to software handshake XON/XOFF CTS follows DTR, RTS ignored	AT&K4 AT&R2
S4 	Local flow control is set to software handshake XON/XOFF CTS follows changes on RTS	AT&K4 AT&R

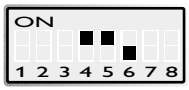
Selection of analogue coding V-90

S4 	A-Law, European analogue data coding standard
S4 	μ-Law, US analogue data coding standard

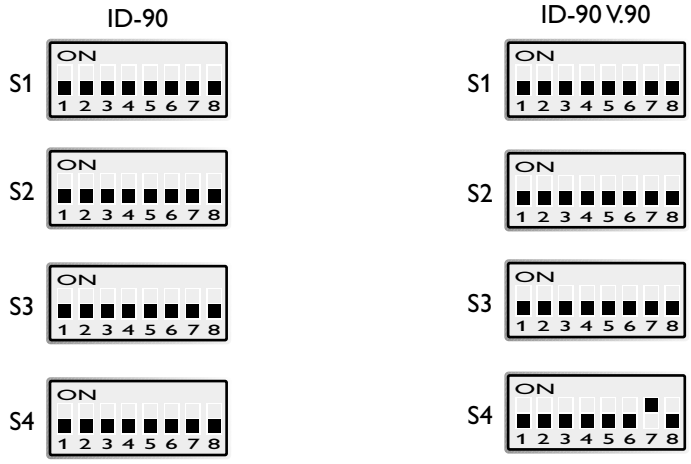
Software update

S4 	Enable Flash programming, should always be in OFF position for normal operation, ref. software update

Line baudrate at V.110

		Related AT-command
S4 	Default setting from ID-90 database is used	–
S4 	1 200 bit/s	ATN1
S4 	2 400 bit/s	ATN2
S4 	4 800 bit/s	ATN3
S4 	9 600 bit/s	ATN4
S4 	19 200 bit/s	ATN5

Factory settings



The ID-90 DIP-switches will be read at Power on and override the current database setting. If an AT-command or Configurator command given after Power on addressing the same parameter as a DIP-switch setting the command will in turn override the DIP-switch setting.
A Save command AT&W will store the current configuration set by DIP-switches or configuration commands.

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 ID-90 to ISDN interface
- Connect the PC’s com-port to the DTE interface of the ID-90.
- 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 ID-90.
- Set up the parameter of the ID-90 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 AT!, where the prefix AT! is used to identify commands to the analogue V90 option. Commands are terminated with <CR>. 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 ID-90 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.

AT-command	Description
A/	Repeat last command line
A	Accept incoming call
##An	Only analogue outgoing call (only ID-90V90)
B	B channel protocol
%B	Set local baudrate
CONF	Enter TA+Configurator
&C	DCD control
#C	Received bearer service
#C1=hbhb	Select bearer service outgoing
#C2=hbhbhbhb	Select bearer service incoming
!%C	Enable/Disable Data Compression
D	Initiate outgoing call
&D	DTR control
!+DS	Data Compression
E	Local echo 1
!%E	Enable/Disable Line Quality Monitor and Auto Retrain or Fallback/Fall Forward
!+ES	Error Control
&F	Load factory defaults ISDN
!&F	Load factory defaults analogue option
!&G	Select Guard Tone
H	Disconnect
#H	Display msn
I	Display version information
!I	Display version information for analog V.90 option
&K	Flowcontrol
!K	MNP Extended Services
!%L	Report Line Signal Level
\K	Break Control
#M	Received CLID
!+MS	Modulation Selection
N	Set line baudrate V.110

AT-command	Description
!\N	Operating Mode
O	Return to online state
#O	Received CLIP
Q	Suppres result
!%Q	Report Line Signal Quality
&R	CTS control
#R	Handle incoming calls
S	Display and set internal S register
&S	DSR control
V	Result format
&V	Display configuration
!&V1	Display Last Connection Statistics
W	Enhance result messages
&W	Store active configuration
!&W	Store active configuration for V.90 option
X	Reduce result messages
##X	Send an alarm message
Z	Load stored settings
&Z	Store call number
#Z	Define own msn
**DBITS	Number of data bits x asynchronous chars (7,8)
**PRTY	Asynchronous parity
**BSIZE	Set B channel blocksize
**LLC	Set low layer compatibility (LLC)
**DTE	Set B channel Layer 2 address
**ISDN	Select D channel protocol
**K	Set Layer 2 windowsize
**RPWD	Password remote configuration
**<cmd>	Execute configuration command
!#UD	Last Call Status Report

A/ – Repeat last command line

This command repeats the commands of the last entered command line.

*Note: No prefix **AT** is required.*

A/

##An – Only analogue outgoing call (only ID-90V90)

Can enable the adapter to make analogue calls even if no control character ('#' or '!') is used in the dial string.
This also implies that no digital outgoing call can be made when AT##A1 is set.
Digital incoming calls can still be received.

AT##A0:	configures the adapter to be able to make both analogue and digital outgoing calls. (**default**)
AT##A1:	configures the adapter only to make analogue outgoing calls.

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	(For file and data transfer i.e. for BBS access)
ATB3:	HDLC async to sync conversion	(Async PPP to sync PPP, single link i.e. for Internet / PPP dial-up network access)
ATB4:	HDLC transparent	(octets are packed into HDLC frames)
ATB5:	Byte transparent	(raw B channel data)
ATB10:	X.75- SLP	(For file and data transfer i.e. for BBS access, **default**)
ATB13:	V.120	For file and data transfer i.e.AOL/CompuServe access
ATB20:	X.31 B channel	(X.25 B channel, access to X.25 packet switched network over B-channel)
ATB21:	X.31 D channel	(X.25 D channel , access to X25 packet switched network over D-channel
ATB22:	T.70-NL-CEPT	(For telematic services over ISDN i.e. T-Online videotex access)
ATB23:	T.90-NL	For telematic services over ISDN
ATB31:	ML-PPP	(ML-PPP, Async to sync PPP conversion in Multilink PPP mode, for internet access)

%B – Set local baudrate

Sets the local baudrate of the ID-90 to the desired value (fix value) or to autodetection. When autodetection is set, the ID-90 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 1 200 bit/s
AT%B2	Local baudrate set to 2 400 bit/s
AT%B3	Local baudrate set to 4 800 bit/s
AT%B4	Local baudrate set to 9 600 bit/s
AT%B5	Local baudrate set to 19 200 bit/s
AT%B6	Local baudrate set to 38 400 bit/s
AT%B7	Local baudrate set to 57 600 bit/s
AT%B8	Local baudrate set to 115 200 bit/s

Note: Autobauding (AT%B = 0) is available for AT command set only. If autobauding is set and cmds is changed to PAD, br will be set to 4 (9 600 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 behaviour of the DCD control line from the ID-90.

AT&C0	ID-90 control line DCD is always ON
AT&C1	DCD ON indicates ISDN connection is established and synchronised (**default**)
AT&C2	DCD follows DTR
AT&C3	DCD indicates link level established (X.31-D only)

#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.

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 0002**).

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 00010016**).

Example: AT#C2=00010016: 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).

!%C – Enable/Disable Data Compression V.90

Enables or disables data compression negotiation. The modem can only perform data compression on an error corrected link.
The parameter value, if valid, is written to S41 bits 0 and 1.

AT!%C<value>

0 Disables data compression. Resets S46 bit 1.
1 Enables MNP 5 data compression negotiation. Resets S46 bit 1.
2 Enables V.42 bis data compression. Sets S46 bit 1.
3 Enables both V.42 bis and MNP 5 data compression. Sets S46 bit 1. (**default**)

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 ID-90. Must be the last command in AT command line.
Any character input while the ID-90 is dialing will cancel the dialing procedure.

ATD<CALLEDnumber>[/<subaddr>][//<UUS1data>]
[,X[Pxxx-][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)

AT!D<CALLEDnumber>
ATD#<CALLED number>
ATDT#<CALLED number>

CALLEDnumber: Call number for a dialed connection to an analogue PSTN number over ISDN using the internal analogue modem

AT!DL	Dial the last dialed number
AT!DS=n	Dial number n from stored telephone number list (n = 1..3) (See command AT&Z to store numbers) and catab *n*

*Notes: – To setup the own subaddress see configuration command **sub**.*
*– Adding an “e” to **CALLEDnumber** indicates that a connection to the internal remote access of a ID-90 shall be performed, the protocol X.75 (ATB10) has to be used.*

&D – DTR control

Selects the behaviour of the ID-90, when the DTE control line DTR changes from ON to OFF.

AT&D0	DTR is evaluated: ignored
AT&D2	DTR is evaluated: dropping the DTR line by the DTE will disconnect an existing ISDN connection. An incoming call will accepted only with DTR active. (**default**)
AT&D4	DTR is evaluated: Incoming calls will be accepted independent of DTR status; DTR drop disconnects an active connection

!+DS – Data Compression V.90

This extended-format compound parameter controls the V.42bis data compression function if provided in the modem. It accepts four numeric subparameters:

AT!+DS=[<direction>[,<compr_neg>[,<max_dict>[,<max_string>]]]]

<direction>	Specifies the desired direction(s) of operation of the data compression function; from the DTE point of view. 0 Negotiated; no compression (V.42bis P0=0). **3** both directions, accept any direction (V.42bis P0=11). (**default**)
<compr_neg>	Specifies whether or not the modem should continue to operate if the desired result is not obtained. 0 Do not disconnect if V.42bis is not negotiated by the remote modem as specified in <direction>
<max_dict>	Specifies the maximum number of dictionary entries (2 048 entries) which should be negotiated (may be used by the DTE to limit the codeword size transmitted, based on its knowledge of the nature of the data to be transmitted).
<max_string>	Specifies the maximum string length (32 bytes) to be negotiated (V.42bis P2).

Reporting Current or Selected Values

Command:	AT!+DS?
Response:	+DS: <direction>,<compr_neg>,<max_dict>,<max_string>
Example:	+DS: 3,0,2048,32 for the defaults and 2048 entry max dictionary

Reporting Supported Range of Parameter Values

Command:	AT!+DS=?
Response:	+DS: (<direction>range),(<compr_neg>range), (<max_dict>range),(<max_string>range)
Example:	+DS: (0,3),(0),(2048),(32)

E – Local echo

Selects the local echo in command mode.

ATE0	No local echo
ATE1	Local echo on in command phase (**default**)

!%E – Enable/Disable Line Quality Monitor and Auto-Retrain or Fallback/Fall Forward

Controls whether or not the modem will automatically monitor the line quality and request a retrain (%E1) or fall back when line quality is insufficient or fall forward when line quality is sufficient (%E2). The parameter value, if valid, is written to S41 bits 2 and 6.
If enabled, the modem attempts to retrain for a maximum of 30 seconds.

AT!%E0	Disable line quality monitor and auto-retrain.
AT!%E1	Enable line quality monitor and auto-retrain.
AT!%E2	Enable line quality monitor and fallback/fall forward.

Fallback/Fall Forward. When %E2 is active, the modem monitors the line quality (EQM). When line quality is insufficient, the modem will initiate a rate renegotiation to a lower speed within the V.34/V.32 bis/V.32 modulation speeds. The modem will keep falling back within the current modulation if necessary until the speed reaches 2 400 bit/s (V.34) or 4 800 bit/s (V.32). Below this rate, the modem will only do retrains if EQM thresholds are exceeded. If the EQM is sufficient for at least one minute, the modem will initiate a rate renegotiation to a higher speed within the current modulation speeds. The rate renegotiations will be done without a retrain if a V.32 bis connection is established. Speeds attempted during fallback/fall forward are those shown to be available in the rate sequences exchanged during the initial connection. Fallback/fall forward is available in error correction and normal modes, but not in direct mode.

!+ES – Error Control

This extended-format command specifies the initial requested mode of operation when the modem is operating as the originator, optionally specifies the acceptable fallback mode of operation when the modem is operating as the originator, and optionally specifies the acceptable fallback mode of operation when the modem is operating as the answerer. It accepts three numeric subparameters:

AT!+ES=[<orig_rqst>[,<orig_fbk>[,<ans_fbk>]]]

<orig_rqst> Decimal number which specifies the initial requested mode of operation when the modem is operating as the originator. The options are:

- 0 Not supported.
- 1 Initiate call with Normal Mode (also referred to as Buffered Mode) only.
- 2 Initiate V.42 without Detection Phase. If V.8 is in use, disable V.42 Detection Phase.
- **3** Initiate V.42 with Detection Phase. (**default**)
- 4 Initiate MNP.
- 6 Not supported.
- 7 Initiate Frame Tunneling Mode when connection is complete, and Data Mode is entered.

<orig_fbk> Decimal number which specifies the acceptable fallback mode of operation when the modem is operating as the originator.

- **0** LAPM, MNP, or Normal Mode error control optional. (**default**)
- 1 Not supported.
- 2 LAPM or MNP error control required; disconnect if error control is not established.
- 3 LAPM error control required; disconnect if error control is not established.
- 4 MNP error control required; disconnect if error control is not established.

<ans_fbk> Decimal number which specifies the acceptable fallback mode of operation when the modem is operating as the answerer or specifies V.80 Synchronous Access Mode.

- 0 Not supported.
- 1 Error control disabled, use Normal Mode.
- **2** LAPM, MNP, or Normal Mode error control optional. (**default**)
- 3 LAPM, MNP, or Direct Mode error control optional.
- 4 LAPM or MNP error control required; disconnect if error control is not established.
- 5 LAPM error control required; disconnect if error control is not established.

6 MNP error control required; disconnect if error control is not established.
8 Not supported.
9 Not supported.

Example:

AT! +ES=3 Enable V.42 with Detection Phase originator.
Disable V.80 Synchronous Access Mode originator.

AT!+ES=,,2 Allow LAPM, MNP, or Normal Mode connection answerer.
Disable V.80 Synchronous Access Mode answerer.

AT!+ES=3,,2 Enable V.42 with Detection Phase originator, allow LAPM, MNP, or Normal Mode connection answer.
Disable Synchronous Access Mode originator and answerer.

Reporting Current or Selected Values

Command: AT!+ES?
Response: +ES: <orig_rqst>,<orig_fbk>,<ans_fbk>
Example: +ES: 3,0,2 For default settings.

Reporting Supported Range of Parameter Values

Command: AT!+ES=?
Response: +ES: (<orig_rqst> range),(<orig_fbk>range), (<ans_fbk>range)
Example: +ES: (0-4,6,7),(0-4),(0-6,8,9)

&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&F0 Setup all parameter concerning data port
AT&F1 Setup all parameter including ISDN protocol and msn settings.

!&F – Load factory defaults V.90

Factory default will be loaded for the analogue option (for storing in non volatile memory please use the command AT!&W).

AT!&F The V90 modem loads the factory default configuration (profile)

H – Disconnect

Disconnects existing ISDN data connection, after issuing the Escape sequence (+++).

ATH[//<UUS1data>]
UUS1data transmitted data with UUS1 signalling

#H – Display msn

Shows own msn (multiple subscriber number) for the data port.
default: msn = "*" (no msn).
The msn can be set by command AT#Z.

AT#H

I – Display version information

Displays different information about version number and settings:

ATI0	Returns the "Modem"-type; name of the terminal adapter ("ID-90")
ATI1	Returns internal checksum ("64")
ATI2	Returns "OK"
ATI3	Returns version string: "410045vv" vv = version number.
ATI4	Returns manufacturers name: "Westermo Teleindustri AB"
ATI5	Returns ISDN selected protocol: "0 – DSS1"
ATI6	Returns copyright string: "(c) Copyright Westermo Teleindustri AB"
ATI7	Returns the status of the ID-90 configuration switches.

1 1 1 1
"00000000.0000.00000000.00000000"
SW1 SW2 SW3 SW4

'0' = switch OFF and '1' = switch ON.

ATI9	Returns plug and play ID string
ATI99	Returns software version creation date

!I – Display version information for analog V.90 option

Displays different information about version number and settings for the analog V.90 modem :

AT!I0	Reports product code, e.g., 56 000
AT!I1	Reports the least significant byte of the stored checksum in decimal (see firmware release notes). Reports 255 if the prestored checksum value is FFh.
AT!I2	Reports "OK".
AT!I3	Reports identification codes in the form VX.X-F_A where: VX.X = Firmware version (e.g., V3.400) F = Firmware model and ROM Size: V90 or V34 = V90 or V34 in 1M ROM V90_2M or V34_2M = V90 or V34 in 2M ROM A = Application DLP = Desktop parallel Example: V3.400-V90_2M_DLP
AT!I4	Reports OEM Manufacturer string e.g.: Westermo ID-90 V90
AT!I5	Reports Country Code parameter, e.g., 42.
AT!I6	Reports modem data pump model and internal code revision, e.g., RCV56DPF-PLL L8571A Rev 39.00/39.00
AT!I7	Reports OK.

&K – Flowcontrol

Selects the flow control behaviour of the ID-90 while in data communication phase.

AT&K0	No local flow control between the DTE and ID-90 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

!-K – MNP Extended Services

Enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection. The parameter value, if valid, is written to S40 bits 0 and 1.

AT!-K0	Disables V.42 LAPM to MNP 10 conversion. (**default**)
AT!-K1	Enables V.42 LAPM to MNP 10 conversion.
AT!-K2	Enables V.42 LAPM to MNP 10 conversion; inhibits MNP Extended Services initiation during V.42 LAPM answer mode detection phase.

!%L – Report Line Signal Level

Returns a value which indicates the received signal level. The value returned is a direct indication of the receive level at the MDP, For example, 009 = –9 dBm, 043 = –43 dBm, and so on. This command is only valid in online command mode.

#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

! +MS – Modulation Selection V.90

This extended-format compound parameter controls the manner of operation of the modulation capabilities in the modem. It accepts six subparameters:
AT!+MS=[<carrier>[,<automode>[,<min_tx_rate>[,<max_tx_rate>[,<min_rx_rate>[,<max_rx_rate>]]]]]]
Where: Possible <carrier>, <min_tx_rate>, <max_tx_rate>, <min_rx_rate>, and <max_rx_rate values are listed below.

!+MS Command Supported Rates

Modulation	<carrier>	Possible (<min_rx_rate>, <max_rx_rate>, (<min_tx_rate>) and <max_tx_rate>) Rates (bit/s)
Bell 103	B103	300
Bell 212	B212	1 200 Rx/75 Tx or 75 Rx/1 200 Tx
V.21	V21	300
V.22	V22	1 200
V.22 bis	V22B	2 400 or 1 200
V.23	V23C	1 200
V.32	V32	9 600 or 4 800
V.32 bis	V32B	14 400, 12 000, 9 600, 7 200 or 4 800
V.34	V34	33 600, 31 200, 28 800, 26 400, 24 000, 21 600, 19 200, 16 800, 14 400, 12 000, 9 600, 7 200, 4 800 or 2 400
V.90	V90	56 000, 54 667, 53 333, 52 000, 50 667, 49 333, 48 000, 46 667, 45 333, 42 667, 41 333, 40 000, 38 667, 37 333, 36 000, 34 667, 33 333, 32 000, 30 667, 29 333, 28 000
K56flex	K56	56 000, 54 000, 52 000, 50 000, 48 000, 46 000, 44 000, 42 000, 40 000, 38 000, 36 000, 34 000, 32 000

Defined Values

<carrier> — A string which specifies the preferred modem carrier to use in originating or answering a connection. <carrier> values are strings of up to eight characters, consisting only of numeric digits and upper case letters. <carrier> values for ITU standard modulations take the form: <letter><1-4digits><other letters as needed>.

<automode> — A numeric value which enables or disables automatic modulation negotiation (e.g., ITU-T V.32 bis Annex A or V.8).
0 = Automode disabled.
1 = Automode enabled. **(default)**

<min_rx_rate> and <max_rx_rate> — Numeric values which specify the lowest (<min_rx_rate>) and highest rate at which the modem may establish a receive connection. May be used to condition distinct limits for the receive direction as distinct from the transmit direction. Values for this subparameter are decimal encoded,

in units of bit/s. The possible values for each modulation are listed in Table 1.
Actual values will be limited to possible values corresponding to the entered <carrier> and fall-back <carrier> as determined during operation. (**default** = lowest (<min_rx_rate>) and highest (<max_rx_rate>) rate supported by the selected carrier.

<min_tx_rate> and <max_tx_rate>: Numeric values which specify the lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate at which the modem may establish a transmit connection. Non-zero values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in Table 1.
Actual values will be limited to possible values corresponding to the entered <carrier> and fall-back <carrier> as determined during operation. (**default** = lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate supported by the selected carrier.)

Reporting Current or Selected Values

Command: !+MS?
Response: +MS:
carrier>,<automode>,<min_tx_rate>,<max_tx_rate>,<min_rx_rate>,<max_rx_rate>

Note: The current active settings are reported under control of the !+MR parameter.

Example: !+MS=V90, 1 300, 33 600, 300, 56 000 — This example uses default values, allowing maximum system flexibility to determine optimal receive and transmit rates during operation.

Reporting Supported Range of Parameter Values

Command: !+MS=?
Response: +MS: (< carrier> range),(<automode> range),(<min_tx_rate> range),(<max_tx_rate> range), (<min_rx_rate> range), (<max_rx_rate> range)

Example: +MS: (B103, B212, V21, V22, V22B, V23C, V32, V32B, V34, K56, V90), (0,1), (300-33 600), (300-33 600), (300-56 000), (300-56 000)

N – Set line baudrate V.110

Selects the line baudrate of the ID-90 to the desired value (only valid for B channel protocol V.110 asynchronous).

ATN0	Line baudrate automatic set (equals to local baudrate or less, **default**)
ATN1	Line baudrate set to 1 200 bit/s
ATN2	Line baudrate set to 2 400 bit/s
ATN3	Line baudrate set to 4 800 bit/s
ATN4	Line baudrate set to 9 600 bit/s
ATN5	Line baudrate set to 19 200 bit/s

!\N – Operating Mode

This command controls the preferred error correcting mode to be negotiated in a subsequent data connection.

AT!\N0	Selects normal speed buffered mode (disables error-correction mode).
AT!\N1	Same as !\N0
AT!\N2	Selects reliable (error-correction) mode. The modem will first attempt a LAPM connection and then an MNP connection. Failure to make a reliable connection results in the modem hanging up. (Forces !&Q5, S36=4, and S48=7.)
AT!\N3	Selects auto reliable mode. This operates the same as \N2 except failure to make a reliable connection results in the modem falling back to the speed buffered normal mode. (Forces S36=7, and S48=7, **default**)
AT!\N4	Selects LAPM error-correction mode. Failure to make an LAPM error-correction connection results in the modem hanging up. (Forces S48=0.) Note: The !-K1 command can override the !\N4 command.
AT!\N5	Selects MNP error-correction mode. Failure to make an MNP error-correction connection results in the modem hanging up. (Forces S36=4, and S48=128.)

O – Return to online state

If the ID-90 is in command mode after issuing an escape sequence out of an existing connection, ATO brings the ID-90 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 – Suppres result

With this command result codes can be suppressed.

ATQ0	Return status – codes after command input (**default**)
ATQ1	No result codes are returned

!%Q – Report Line Signal Quality

Reports the line signal quality. Returns the higher order byte of the EQM value.
Based on the EQM value, retrain or fallback/fall forward may be initiated if enabled by !%E1 or !%E2.
Only valid in online command mode.

&R – CTS control

Selects the behaviour of the CTS control line from the ID-90.

AT&R0	ID-90 control line CTS is following all changes of RTS
AT&R1	CTS is always ON (**default**)
AT&R2	CTS follows DTR

#R – Handle incoming calls

Selects the behaviour of the ID-90 when an incoming call is received.

AT#R0	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 behaviour of the DSR control line from the ID-90.

AT&S0	ID-90 control line DSR is always ON (**default**)
AT&S1	DSR ON indicates ISDN connection is established and synchronized

V – Result format

ATV0	Result is presented as numbers (followed by <↵>)
ATV1	Result is presented as text (**default**)
ATV2	Result is presented as text RING and CONNECT including ISDN address, all others include error causes

&V – Display configuration

AT&V0 Displays the actual configuration of AT command setting including stored ISDN numbers

```
at&v
ACTIVE PROFILE:
B10 E1 Q0 V1 W0 X4 &C1 &D2 &K3 &R1 &S0 %B0 #R0
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:003 S07:040 S09:001
S16:0000H S90:

TELEPHONE NUMBERS:
NO1:
NO2:
NO3:

OK
```

AT&V1 – Displays the actual configuration of extended AT command setting

```
cm
 g711law: 0-Automatic

alarm
 OpNumber1: 00491722278000      OpNumber2: 00491712521002
 OpNumber3: 02403745101041      OpNumber4:
 message1: SMS via D2 Germany   message2: SMS via D1 Germany
 message3: Telia X31/X25 SMS    message4: Plain test msg.
 recno1: 01725555555        recno2: 01711234567    recno3: 0046123456789
 recno4: 004616987654321    mtype1: 0-SMS (UCP)    mtype2: 2-SMS (TAP)
 mtype3: 0-SMS (UCP)        mtype4: 1-Text         TransNo: 00461661200
 trigcnd1: 1-Break Cond.    trigcnd2: 2-Make Cond.
 trigcnd3: 1-Break Cond.
 trigcnd4: 1-Break Cond.    maxretries: 0 opwd1:
 opwd2: PG1                 opwd3:                 opwd4:
 alprot1: 0-X.75            alprot2: 0-X.75        alprot3: 1-X.31D
 alprot4: 0-X.75

remote
 rmsn: *                    rsub: *                rpwd:

trc
 trcdln: 256   trcmsk: 0000000300020500

cim
 cmds: 0-ATcmd

dialci
 isdn: 0-DSS1  ptp: 0-P-MP

dial
 msn: *                     sub: *                 prot: 10-X.75 SLP
 cha: 0        chatol: 0    bsize: 2048   dte: 0   k: 7
 br: 0-adaptive             dbits: 8      sbits: 1 prty: 0-none
 cdtr: 2-control            cdcd: 1-connected      ccts: 1-on
 cdsr: 0-on    flc: 3-RTS/CTS              idle: 0  svcio: 1
 x31rr: 0       cmlp: 0     chappwd:
 v25bisout: 0   dabort: 1
```

!&V1 – Display Last Connection Statistics

Displays the last connection statistics in the following format (shown with typical results):

```
TERMINATION REASON..... LOCAL REQUEST
LAST TX rate.......... 26400 BIT/S
HIGHEST TX rate....... 26400 BIT/S
LAST RX rate.......... 49333 BIT/S
HIGHEST RX rate....... 49333 BIT/S
PROTOCOL.............. LAPM
COMPRESSION........... V42Bis
Line QUALITY.......... 038
Rx LEVEL.............. 015
Highest Rx State...... 67
Highest TX State...... 67
EQM Sum............... 00B4
Min Distance.......... 0000
RBS Pattern........... 00
Rate Drop............. 00
Digital Loss.......... 2000
Local Rtrn Count...... 00
Remote Rtrn Count..... 00
Flex 9481814347C4
```

RBS Pattern: *Shows which bits are being robbed in the least significant 6 bytes, e.g., 03 indicates 2 robbed bits in bit positions 0 and 1.*

Digital Loss: *Shows if a pad was encountered and if so, what was the digital loss. 2000 means 0dB.*

W – Enhance result messages

ATW0	Shows result code (RING, CONNECT) without additional info (**default**)
ATW1	Shows result code (RING, CONNECT) with address

&W – Store active configuration

The active configuration will be stored in non volatile memory.

AT&W0
AT!&W

!&W – Store active configuration

The active configuration for the analogue option 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
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**).

##X – Send an alarm message

Sends the preprogrammed alarm message which is associated with alarm input addressed with the command parameter.

AT##X1	Send alarm message 1
AT##X2	Send alarm message 2
AT##X3	Send alarm message 3
AT##X4	Send alarm message 4

Z – Load stored settings

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

ATZ

When the V90 option is present this command will also cause a soft reset of the V90 modem with a recall of stored configuration profile .

&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*	shows entries number *x*.
AT&Z	show all entries.

#Z – Define own msn

Defines the msn *nn* 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&V1.

AT#Z=*nn*

The msn is automatically stored to non volatile ram.

**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 – Asynchronous parity

Selects the parity for asynchronous characters.
0: no parity; 1: even parity; 2: odd parity

ATPRTY=0**	No parity (**default**)
AT**PRTY=1	Even parity
AT**PRTY=2	Odd parity

ISDN specific AT commands

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

**BSIZE – Set B channel blocksize

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 (ATB**x**).*

**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**LLC=-<↵>
	Entering a new LLC:	AT**LLC=8890<↵>

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

**DTE – Set B channel Layer 2 address

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

ATDTE=0** Calling side reacts as **DTE**,
called side reacts as **DCE (default, X.75 standard)**
AT**DTE=1 ID-90 reacts as DTE (own adr = 01)
AT**DTE=3 ID-90 reacts as DCE (own adr = 03)

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

**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 ID-90 has to be resetted by powering it off and on.

ATISDN=0** Select DSS1 (Euro-ISDN) (**default**)
AT**ISDN=8 Select VN4 (France)

**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.

**RPWD – Password remote configuration

Sets password for remote configuration to ***nn*** (1..32 chars)

AT**RPWD=***nn*

Default: empty.

**<cmd> – Execute configuration command

Executes one configuration command, for definition of commands see TA+Configurator commands section.

AT**<*cmd*>

S-registers

Table 1

Register	Function	Range	Units	Saved	Default	Note
S0	Rings to Auto-Answer	0–255	rings	*	1	
S1	Ring Counter	0–255	rings		0	
S2	Escape Character ASCII	0–255	ASCII	*	43 (02Bh)	
S3	Carriage Return Character	0–127	ASCII		13 (0Dh)	
S4	Line Feed Character	0–127	ASCII		10 (0Ah)	
S5	Backspace Character	0–128	ASCII		8	
S6	Dial delay	0–255	ASCII	*		
S7	Wait Time for Carrier, Silence, or Dial Tone	0–60	s	*	50	
S9	Enable PNP functionality for Windows	0–1	ASCII		1	
S10	Lost Carrier To Hang Up Delay	1–255	0.1 s	*	14	1
S16	Last occurred CAPI/ISDN error cause	–	–			
S36	LAPM Failure Control	–	–	*	7	1
S40	General Bit-Mapped Options Status	–	–	*	104 (68h)	1
S41	General Bit-Mapped Options Status	–	–	*	195 (C3h)	1
S46	Data Compression Control	–	–	*	138	1
S48	V.42 Negotiation Control	–	–		7	1
S86	Analogue Call Failure Indication	0–26	–		21	1
S90	Last incoming ISDN calling number (CLIP)	–	–			
S91	PSTN Transmit Attenuation Level	0–15	dBm		13	1
S92	Fax Transmit Attenuation Level	0–15	dBm		13	1
S93	Unknown AT command handling	0,1	ASCII	*	0	
S210	V.34 Symbol Rate	0–255	–		13 (0Dh)	1

Note 1. Only present when analogue option is V90 or V34

** Register value may be stored in the user profiles with the &W command.*

S0 – Number of Rings to Auto-Answer

S0 sets the number of the rings required before the modem automatically answers a call. Setting this parameter to zero disables auto-answer mode.

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 ID-90-configuration command "ringtimer" (**default** = 5 sec.)*

S1 – Ring Counter

Ring Counter (read only), S1 is incremented each time the modem detects a ring signal.

S2 – Escape Character

S2 holds the decimal value of the ASCII character used as the escape character.
The **default** value 43 corresponds to an ASCII '+'..

S3 – Carriage Return Character

S3 sets the command line and result code terminator character. **Default**: 13 Carriage Return

S4 – Line Feed Character

S4 sets the character recognised as a line feed. The Line Feed control character is output after the Carriage Return control character if verbose result codes are used. **Default**: 10 Line Feed.

S5 – Backspace Character

S5 sets the character recognised as a backspace. The terminal adapter will not recognise the Backspace character if it is set to a value that is greater than 128 ASCII. This character can be used to edit a command line. When the echo command is enabled, the modem echoes back to the local DTE the Backspace character, an ASCII space character and a second Backspace character; this means a total of three characters are transmitted each time the modem processes the Backspace character.
Default: 8 (Backspace)

S6 – Dial delay

This S-register defines how many seconds the unit will delay a call attempt.
The timer starts counting after the ATD command has been sent to the adapter.

S7 – Wait time for Carrier

S7 sets the time the terminal adapter will wait for synchronization and also the time the analogue modem will wait for carrier. **Default**: 50 sec

S9 – Enable PNP functionality for Windows

S9 enables and disables the Windows Plug and Play identification of the terminal adapter. (**default**=1, enabled)

S10 – Lost Carrier To Hang Up Delay V.90

Only valid with analogue modem option
S10 sets the length of time, in tenths of a second, that the analogue modem waits before hanging up after a loss of carrier. This allows for a temporary carrier loss without causing the local modem to disconnect. When register S10 is set to 255, the modem functions as if a carrier is always present.
The actual interval the modem waits before disconnecting is the value in register S10 minus 0.6s.
Therefore, the S10 value must be greater than 0.6s or else the modem disconnects before it recognises the carrier.
Range: 1–255 tenths of a second
Default: 14 (1.4 seconds)

S16 – Last ocurred CAPI/ISDN error cause

See table 6 on page 96.

S36 – LAPM Failure Control V.90

Only valid with analogue modem option
Bits 0–2 This value indicates what should happen upon a LAPM failure. These fallback options are initiated immediately upon connection if S48=128. If an invalid number is entered, the number is accepted into the register, but S36 will act as if the default value has been entered.

0 Modem disconnects.
1 Modem stays on-line and a Direct mode connection is established.
2 Reserved.
3 Modem stays on-line and a Normal mode connection is established.
4 An MNP connection is attempted and if it fails, the modem disconnects
5 An MNP connection is attempted and if it fails, a Direct mode connection is established.
6 Reserved.
7 An MNP connection is attempted and if it fails, a Normal mode connection is established. **(default)**

S40 – General Bit Mapped Options Status V.90

Only valid with analogue modem option
S40 indicates the status of command options.
Default: 104 (68h) (01101000b)

Bits 0–1 MNP Extended Services (-Kn)
0 Disable extended services (-K0) (**default**)

1 Enable extended services (-K1)
2 Enable extended services (-K2)

Bit 2 Reserved

Bits 3–5 Break Handling (\Kn)

0 \K0
1 \K1
2 \K2
3 \K3
4 \K4
5 \K5 **(default)**

Bits 6–7 Reserved.

S41 – General Bit Mapped Options Status V.90

Only valid with analogue modem option.
S41 indicates the status of command options.
Default: 195 (C3h) (1100011b)

Bits 0–1 Compression selection (%Cn)

0 Disabled (%C0)
1 MNP 5 (%C1)
2 V.42 bis (%C2)
3 MNP 5 and V.42 bis (%C3) **(default)**

Bits 2, 6 Auto retrain and fallback/fall forward (%En)

0 0 Retrain and fallback/fall forward disabled (%E0)
0 1 Retrain enabled (%E1)
1 0 Fallback/fall forward enabled (%E2) **(default)**

Bits 3–5, 7 Reserved.

S46 – Data Compression Control V.90

Only valid with analogue modem option
S46 controls selection of compression. The following actions are executed for the given values:

S46	
136	Execute error correction protocol with no compression.
138	Execute error correction protocol with compression. **(default)**

S48 – V.42 Negotiation Control

Only valid with analogue modem option

The V.42 negotiation process determines the capabilities of the remote modem. However, when the capabilities of the remote modem are known and negotiation is unnecessary, this process can be bypassed if so desired.

S48

0	Disable negotiation; bypass the detection and negotiation phases; and proceed with LAPM.
7	Enable negotiation. **(default)**
128	Disable negotiation; bypass the detection and negotiation phases; and proceed at once with the fallback action specified in S36. Can be used to force MNP.

S86 – Call Failure Reason Code

Only valid with analogue modem option

When the internal analogue modem issues a NO CARRIER result code, a value is written to S86 Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The S86 register is only updated when the NO CARRIER is sent as result from a broken connection to an analogue subscriber. The code definitions are:

S86

0	Normal hangup, no error occurred.
1	Reserved.
2	Reserved.
3	Call Waiting caused disconnect.
4	Physical carrier loss.
5	No error correction at the other end.
6	No response to feature negotiation.
7	This modem is async only; the other modem is sync only.
8	No framing technique in common.
9	No protocol in common.
10	Bad response to feature negotiation.
11	No sync information from the remote modem.
12	Normal hangup initiated by the remote modem.
13	Retransmission limit reached.
14	Protocol violation occurred.
15	Lost DTR.
16	Received GSTN cleardown.
17	Inactivity timeout.
18	Speed not supported.
19	Long space disconnect.
20	Key abort disconnect.
21	Clears previous disconnect reason.
22	No connection established.
23	Disconnect after three retrains.
24	Call Waiting tone detected.

25	Extension pickup detected.
26	Remote hangup detected.

S90 – Last incoming ISDN calling number (CLIP)

S90 displays the ISDN line identification of the last incoming call.

S91 – PSTN Transmit Attenuation Level V.90

Only valid with analogue modem option
In non-PCM modes (V.90 or K56flex are PCM modes), S91 sets the transmit attenuation level from 0 to 15 dBm for the PSTN mode, resulting in a transmit level from 0 to –15 dBm. In some countries, the transmit level may not be changed. **Default**: 13.

S92 – Fax Transmit Attenuation Level V.90

Only valid with analogue modem option
S92 sets the transmit attenuation level from 0 to 15 dBm for the fax mode, resulting in a transmit level from 0 to –15 dBm. The fax mode is used when alarm message type (mtype) is set to Fax. In some countries, the transmit level may not be changed. **Default**: 13.

S93 – Unknown AT command handling

Controls the response to unknown AT-commands

0	Undefined AT commands will be responded with ERROR (**default**)
1	Undefined AT commands will be responded with OK

S210 – V.34 Symbol Rates V.90

The bits in this parameter control V.34 symbols rates and enables/disables V.34 asymmetric rates. This parameter is used for diagnostic purpose only.

Bits 0–2
Selects the range of allowed V.34 symbol rates.

Bit			Symbol Rates (baud)
2	1	0	
0	0	0	2 400 only
0	0	1	2 400 only (no 2 734)
0	1	0	2 400, 2 800
0	1	1	2 400, 2 800, 3 000
1	0	0	2 400, 2 800, 3 000, 3 200
1	**0**	**1**	2 400, 2 800, 3 000, 3 200, 3 429 (**default**)

Bit 3
Enable/disable V.34 asymmetric rates.
0 = Disable asymmetric rates
1 = Enable asymmetric rates (**default**)
Bits 4–7 Reserved.
Default: 13.

AT result codes

Table 2
Result codes (numerical and verbose):

Short Form	Long Form	Description	Note
0	OK	A command line has been executed.	
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) or if the the call was to and analogue destination Replaces BUSY and NO DIALTON dependant on ATXn setting. Also sent when the modem auto-disconnects due to loss of carrier.	
4	ERROR	Illegal command or error that can not be indicated otherwise e.g. 1. The command line contains a syntax error. 2. The modem cannot execute a command contained in the command line, i.e., the command does not exist or is not supported. see register S93 3. A command parameter within the command line is outside the permitted range.	
5	CONNECT 1 200 <rn>	A connected with a line speed of 1200 bit/s has been established. (V110 or analogue connection)	
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) or if the the call was to and analogue destination The modem is attempting to originate a call if a continuous ringback signal is detected on the line until the expiration of the timer S7.	
9	CONNECT 600 <rn>	Connection, line speed 600 bit/s.	1
10	CONNECT 2 400<rn>	Connection, line speed 2 400 bit/s. (V110 or analogue connection)	
11	CONNECT 4 800<rn>	Connection, line speed 4 800 bit/s. (V110 or analogue connection)	
12	CONNECT 9 600<rn>	Connection, line speed 9 600 bit/s. (V110 or analogue connection)	
13	CONNECT 7 200<rn>	Connection, line speed 7 200 bit/s.	1
14	CONNECT 12 000<rn>	Connection, line speed 12 000 bit/s.	1
15	CONNECT 14 400<rn>	Connection, line speed 14 400 bit/s.	1
16	CONNECT 19 200<rn>	Connection, line speed 19 200 bit/s. (V110 or analogue connection)	1
19	CONNECT 64 000<rn>	Connection, line speed 64 000 bit/s.	

Table 2 cont.

Short Form	Long Form	Description	Note
59	CONNECT 16 800<rn>	Connection, line speed 16 800 bit/s	1
61	CONNECT 21 600<rn>	Connection, line speed 21 600 bit/s	1
62	CONNECT 24 000<rn>	Connection, line speed 24 000 bit/s	1
63	CONNECT 26 400<rn>	Connection, line speed 26 400 bit/s	1
64	CONNECT 28 800<rn>	Connection, line speed 28 800 bit/s	1
84	CONNECT 33 600<rn>	Connection, line speed 33 600 bit/s	1
91	CONNECT 31 200<rn>	Connection, line speed 31 200 bit/s	1
165	CONNECT 32 000<rn>	Connection, line speed 32 000 bit/s.	2
166	CONNECT 34 000<rn>	Connection, line speed 34 000 bit/s.	2
167	CONNECT 36 000<rn>	Connection, line speed 36 000 bit/s.	2
168	CONNECT 38 000<rn>	Connection, line speed 38 000 bit/s.	2
169	CONNECT 40 000<rn>	Connection, line speed 40 000 bit/s.	2
170	CONNECT 42 000<rn>	Connection, line speed 42 000 bit/s.	2
171	CONNECT 44 000<rn>	Connection, line speed 44 000 bit/s.	2
172	CONNECT 46 000<rn>	Connection, line speed 46 000 bit/s.	2
173	CONNECT 48 000<rn>	Connection, line speed 48 000 bit/s.	2
174	CONNECT 50 000<rn>	Connection, line speed 50 000 bit/s.	2
175	CONNECT 52 000<rn>	Connection, line speed 52 000 bit/s.	2
176	CONNECT 54 000<rn>	Connection, line speed 54 000 bit/s.	2
177	CONNECT 56 000<rn>	Connection, line speed 56 000 bit/s.	2
180	CONNECT 28 000<rn>	Connection, line speed 28 000 bit/s.	2
181	CONNECT 29 333<rn>	Connection, line speed 29 333 bit/s.	2
182	CONNECT 30 667<rn>	Connection, line speed 30 667 bit/s.	2
183	CONNECT 33 333<rn>	Connection, line speed 33 333 bit/s.	2
184	CONNECT 34 667<rn>	Connection, line speed 34 667 bit/s.	2
185	CONNECT 37 333<rn>	Connection, line speed 37 333 bit/s.	2
186	CONNECT 38 667<rn>	Connection, line speed 38 667 bit/s.	2
187	CONNECT 41 333<rn>	Connection, line speed 41 333 bit/s.	2
188	CONNECT 42 667<rn>	Connection, line speed 42 667 bit/s.	2
189	CONNECT 45 333<rn>	Connection, line speed 45 333 bit/s.	2
190	CONNECT 46 667<rn>	Connection, line speed 46 667 bit/s.	2
191	CONNECT 49 333<rn>	Connection, line speed 49 333 bit/s.	2
192	CONNECT 50 667<rn>	Connection, line speed 50 667 bit/s.	2
193	CONNECT 53 333<rn>	Connection, line speed 53 333 bit/s.	2
194	CONNECT 54 667<rn>	Connection, line speed 54 667 bit/s.	2

Note 1. Only present when analogue option is V90 or V34
Note 2. Only present when analogue option is V90 ,
not present when analogue option is V34

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 ID-90 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 92). All other causes are CAPI error causes (see page 98).

X.3 PAD

If you connect an asynchronous DTE to the X.31-service, you can use the integrated PAD of the ID-90. You can use for example the command stat to see the status of the connection.
To setup PAD mode please use the configuration command “cmds = 1”.

X.3 command set – integrated PAD

The following PAD-Commands regarding the specifications X.28/X.29 are supported:

- *(dot)* Displays PAD identification

[Pxxx-][R][N<nuipwd>][G<cug>]X25number[I<ISDNnumber>][D<userdata>]
Establishes an X.25 connection

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
ISDNnumber:	ISDN call number for a dialled B channel connection
D:	separator for userdata: “D”, “P” or “,”

clr Clears an X.25 connection

conf Enters directly into the TA+Configurator, the configuration prompt “#” will be displayed. Leave the TA+Configurator with the command “quit”.

stat Showing the PAD connection status

set Set the PAD Profile to Profile 0

set *x:n* Set the PAD Profile parameter *x* to value *n*
Note: PAD parameter can be stored using the command “exec save”.

prof *x* Configures to the PAD Profile *x, x* = 0..7, 90, 91
Note: PAD parameter can be stored using the command “exec save”.

prof? Displays the configured PAD Profile values

par [*x*][,*x*] Displays all configured PAD Profile values or the PAD parameter *x*
“par” without parameter displays all parameter.

ver Displays the version number

Parameter of the integrated PAD

Using the PAD command “set *x:n*” you can change the parameter according to ITU specification X.3.
After changing one or more X.3 parameter you can store the change non volatile by issuing “exec save”. The stored parameter can be reloaded with the command “exec load”.
After an X.25 connection is cleared the PAD parameter will be reset to the last active profile (rsp. default).

International Parameters 1 through 12

1 **Enable (disable) switch to command mode**

Defines whether the terminal user may switch from data to command mode (e.g. to change a X.3 parameter), and – if he may – which key(s) must be pressed to make the switch.

Valid Parameter Values:

0 Switch to command mode disabled.

1 Switch to command mode enabled
switch by pressing the key combination **<CTRL>+P**
(hexdecimal 10, decimal 16)

n Switch to command mode enabled
switch by entering the ASCII character, that corresponds to the parameter value ***n*** (decimal integer value in the range between 32 and 126).

2 **Echo**

Determines whether a character will be echoed to the terminal data transfer mode.

Valid Parameter Values:

0 No echo

1 Echo

3 **Data Forwarding Characters**

This parameter defines a control character to be used as the Data Forwarding Character. This character can be used to force the transmission of the collected data to the other end, even when the defined packet size has not yet been reached.

Valid Parameter Values:

0 Only send full packets, thus no Data Forwarding Character
2 < > or **<CR>**
6 <ESC>, <BEL>, <ENQ>, <ACK>,<CR>
18 <ETX>, <EOT>,<CR>
128 All ASCII control codes, which are not listed above

Regardless of the value set in parameter 3, the data packet will always be forwarded under any of the following conditions:

- when the input buffer holds a full data packet and parameter 15 is set to 0 (zero)
- when the input buffer is full and parameter 15 is set to 1 in this case, one data packet will be sent and the remaining data will be shifted forward in the input buffer
- after the first character of a PAD command is entered
- following the entry of the BREAK signal (command INTD) – also see parameter 7
- after the timeout of the timer set with parameter 4

4 **Timer for Data Forwarding**

Defines the timeout interval, following which the collected data will be sent as a data packet even if the defined packet size was still not reached. The timer is reset each time a data packet is sent, even if it was sent as the result of the Data Forwarding Character (see parameter 3).

Valid Parameter Values:

0 No timeout, thus no time interval
1 Immediate transfer, thus each character is immediately transferred as a data packet.
n ***n*** time interval in units of 50 msec. (1/20 of a second) and the value must be an integer in the range from 2 to 255.
Example: ***n*** = 40 => time out interval of 2.0 seconds

A data transfer timeout is only permitted, when parameter 15 is set to 0 (zero).

5 **Control of additional devices**

Not implemented, all values ignored !

6 **Displaying PAD Messages**

Defines, whether the PAD messages should be displayed. PAD messages are service signals, that the PAD generates in response to PAD commands.

Valid Parameter Values:

0 No display of PAD messages
1 Display of X.28-PAD-Messages (CCITT) without PAD-Prompt.
5 Display of X.28-PAD-Messages (CCITT) with PAD-Prompt.
9 Display of DATEX-P PAD-Messages without PAD-Prompt.
13 Display of DATEX-P PAD-Messages with PAD-Prompt.

17 Display of extended PAD-Messages without PAD-Prompt.
21 Display of extended PAD-Messages with PAD-Prompt.
To add one of the following features, add the described value to one of the previous selected:
+32 Suppress X.25 address and ISDN no. when connected
+64 Display CAPI error cause.

7 **Handling the BREAK Signal**

Defines, how the PAD should react, when it receives a BREAK signal from the terminal of the other communications partner (command INTD).

Valid Parameter Values:

0 No reaction
1 Send Interrupt packet
2 Send Reset packet
5 Send Interrupt and break packet
8 Change to command mode (can be useful when parameter 1 is set to 0 (zero).
21 Discard local data and send Interrupt and break packet

8 **Display Received Data ON/OFF**

Defines, whether received data should be displayed on the screen.

Valid Parameter Values:

0 Display all received data.
1 Don’t display the received data.

9 **Fill Characters Following a Carriage Return (<CR>)**

Defines, how many fill characters (<NULL>) the PAD should insert into the character string following a <CR> (carriage return).

Valid Parameter Values:

0 No fill characters <NULL>
n Number of fill characters <NULL> following a <CR>.
n is an integer in the range from 1 to 255.

Note: This parameter is ignored for output to the screen, since the fill characters serve no useful function on a screen display (left over from the days of the teletype).

10 **Screen Line Width**

not suppported

11 **Local baudrate** (Read only)

Displays actual used baudrate on asynchronous line.
1: 1 200 bit/s
2: 2 400 bit/s
3: 4 800 bit/s
4: 9 600 bit/s
5: 19 200 bit/s
6: 38 400 bit/s
7: 57 600 bit/s
8: 115 200 bit/s

12 **Local flow control** (Read only)

Handles and displays used flow control on asynchronous line.
0: no flow control
3: flow control RTS / CTS
4: flow control XON / XOFF

Extended Parameters 13 through 24

13 Automatic Line Feed

Defines, whether the PAD should automatically append a line feed following a carriage return <CR> and – if so – in which case. See parameter 126 also.

Valid Parameter Values:

0 No <LF> added

1 When receiving data from the remote party add a <LF> automatically after each <CR> received.

2 Add a <LF> automatically after each <CR> received from the local keyboard.

4 By each echo of a <CR> to the screen, also send a <LF>.

Note: This parameter is interpreted bit-wise, thus any combination of the above listed values can be combined to form a sum of the desired values

14 **Line Feed Fill Characters**

Defines, whether fill characters <NULL> should be sent following a line feed <LF> .

Valid Parameter Values:

0 No fill characters <NULL> after a <LF>

n Following a <LF> on the screen, append ***n*** fill characters <NULL>. ***n*** is an integer in the range from 1 to 255.

15 **Control Input Buffer Editing**

Defines, whether characters in the input buffer may be edited.

Valid Parameter Values:

0 No editing; the values of the parameters 16, 17, 18, and 19 will be ignored.

1 Editing enabled and the editing features set by the parameters 16, 17, 18, and 19 may be used; in this case, it is not possible to do a preemptive transmission of a data packet using the Data Forwarding Character (see parameter 4).

16 **Delete Character**

Defines the Character-Delete character, thus the ASCII value of the character that when entered will delete the previously entered character. Only possible, when parameter 15 is set to 1 (PAD has editor capability).

Valid Parameter Values:

n ***n*** is an integer in the range from 1 to 255 and gives the ASCII value (decimal) of the desired Character-Delete character.
default = 8 (=> < BACKSPACE> key)

17 **Delete Line**

Defines the Line-Delete character, thus the ASCII value of the character, with which you can delete the previous line. Only possible, if parameter 15 is set to 1 (PAD has editor capability).

Valid Parameter Values:

n ***n*** is an integer in the range from 1 to 255 and gives the ASCII value (decimal) of the desired Line-Delete character.
default = 127 (=> <Delete> key)

18 **Repeat Line**

Defines the Line-Display character, thus the ASCII value of the character, with which you can cause the characters that were entered on the previous line to be repeated on the current line. Only possible, if parameter 15 is set to 1 (PAD has editor capability).

Valid Parameter Values:

n ***n*** is an integer in the range from 1 to 255 and gives the ASCII value (decimal) of the desired Line-Display character. **default** = 0

19 **Handling Delete Characters**

Defines, what should be sent to the screen when a Character-Delete or a Line-Delete character is received.

Valid Parameter Values:

0 Nothing

2 Send a <BS><Space><BS>, so that the last character displayed is deleted.

20 **Echo Filter**

If parameter 2 is set to 1 (= character echo during data transfer), this parameter can be used to determine which characters, entered from the keyboard, will not be echoed to the screen.

Valid Parameter Values:

0 No echo filter, thus echo all characters

1 No echo for <CR>

2 No echo for <LF>

4 No echo for <VT>, <HT>, <FF>

8 No echo for <BEL>, <BS>

16 No echo for <ESC>, <ENQ>

32 No echo for <ACK>, <NAK>, <STX>, <SOH>, <EOT>, <ETB>, <ETX>

64 No echo for editing characters, those set with the parameters 118, 119, and 120

128 No echo for <DEL> or any other ASCII control character not listed above

Note: This parameter is interpreted bitwise, thus any combination of the above listed values can be combined to form a sum of the desired values

21 **Parity handling (Read only)**

Handles and displays used parity on asynchronous line.

0: no parity

1: even parity

2: odd parity

3: no parity

National Parameters 118 – 126

118 **Character-Delete Character**

See parameter 16.

119 **Delete Line**

See parameter 17.

120 **Repeat Line – Line-Display Character**

See parameter 18.

123 **Parity handling**

See parameter 21.

126 **Generating a Line Feed**

See parameter 13.

Note: The following parameter values are not implemented: 5, 10, 22, 121, 122, 125

Note: The following parameters are read only 11, 12, 21*,*
can be changed using configuration commands: br, flc, prty

Table 3
The X.29 standard profiles

Param	Prof 0	Prof 1	Prof 2	Prof 3	Prof 4	Prof 5	Prof 6	Prof 7	Prof90	Prof91
1	1	0	1	0	1	1	0	1	1	0
2	1	0	0	0	0	0	0	1	1	0
3	2	0	2	0	2	2	0	2	126	0
4	0	1	0	20	0	0	4	0	0	20
(5)	–	–	–	–	–	–	–	–	–	–
6	21	0	9	0	9	9	0	9	1	0
7	0	0	21	2	21	2	0	21	2	2
8	0	0	0	0	0	0	0	0	0	0
9	0	0	2	0	2	2	0	2	0	0
10	0	0	0	0	0	0	0	0	0	0
(11)	–	–	–	–	–	–	–	–	–	–
(12)	–	–	–	–	–	–	–	–	–	–
13	5	0	4	0	0	5	0	4	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	1	1	0	0	0	0
16	0	0	127	127	127	127	127	127	127	127
17	0	0	24	24	24	24	24	24	24	24
18	0	0	18	18	18	18	18	18	18	18
19	2	2	2	2	2	2	2	2	1	1
20	0	0	0	0	0	0	0	0	0	0
21	0	0	1	0	0	1	1	1	0	0
22	0	0	0	0	0	0	0	0	0	0

Note: Parameter in Brackets are not implemented or not setup by command profxx

ISDN access control

Using these commands you can setup a table, to allow only dedicated callers to get a connection to the ID-90.

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*** *****	allow all incoming calls to be accepted
acctab***x***	show entry number ***x***
acctab	show 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.

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 enhancement 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

Sub addressing

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, X.3 PAD 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.

"Hotline" call

Automatic call establishment can be activated in three ways:
1. Initiated by an activation of the DTR control line (**cmds**= 6).
2. Initiated by activity of the Data line from DTE (**cmds**=7), autobauding is disabled in this mode.
3. Initiated at power on reset, "always on" (**cmds**=8).

When the cmds-parameter is set to 6,7 or 8 baudrate will automatically be set to 9 600 bit/s (**br**=4). The status line DCD can be used to indicate a successful connection, (see command **cdcd**).
If a connection cannot be established successfully an automatic retry will be started. The duration of trying to establish the connection and the pause for next retry can be configured. The dialled numbers are taken from the table **catab**, all numbers from the call table catab will be taken one after each other.The parameter **cato** sets the timeout for establishing the call, **capa** the pause between call attempt and **catry** the number of retries.
The call can be disconnected through deactivating DTR see **cdtr** parameter, or through using the inactivity timer **idle**.
To return to the AT- or Configurator command set the DIP-switches can be used SW3:5-7.

Using Multilink PPP

To enable Multilink PPP handling within the ID-90 please enable the B channel protocol ML-PPP: **atb31** or **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:

- Type "**at**chappwd=<password>**" to input your password in the ID-90.
- Type "**AT&W**" to store the setting in the ID-90.

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

Details on Multilink PPP

The following authentication protocols (AP) are supported by ID-90 when running Multilink PPP (ML-PPP)

- 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. Due to the fact that the password cannot (at least not with reasonable effort) be derived from the data exchanged on the first link during connection establishment the much safer CHAP protocol can be used only if the password **chappwd** is locally stored on the TA.
The following basic rules apply when the TA is configured to run ML-PPP:

1. If the remote side requests (in the Link Control Protocol LCP ConfigRequest) an AP that the TA can handle, the request is forwarded to local side.
2. If the remote side requests an AP that the TA cannot handle, the TA proposes the safest protocol depending on its capabilities:
   - PAP if no password **chappwd** is locally stored,
   - 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 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 TA (see previous rule), the 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 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 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 TA should be configured for single link PPP operation, or, alternatively, the chappwd should be supplied and stored on the TA.

Call Bumping

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 TA will drop one B-channel and an ISDN telephone attached to the S bus will be ringing to accept the call.

Bandwidth on demand ("BOD")

Enabling this feature will cause the TA+POC 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.

See commands **bod, bodiv, bodit, boddv** and **boddt**.
Note: call bumping (**cmlp**) has higher priority than bandwidth on demand.

X.25 address translation table

With every outgoing X.25 call the ISDN number will be taken out of the corresponding entry table in **xtab**.

If no entry is found the X.25 address will be used as the ISDN number.

When an ISDN number is setup in the dialling command string with AT commands or X.3 PAD commands, the xtab entries will not be used.

If an ISDN number is setup using the command dad, the table xtab will not be used.

xtab***x***	<***xadr***>**I**<***nn/ss***>	set entry number ***x*** to ISDNnumber ***nn/ss*** and X.25 address xadr The X.25 address can contain wildcards: ***** : represents one or more digits **?** : represents exactly one digit
xtab***x*** **-**	clear entry number ***x***	
xtab***x***	show entry number ***x***	
xtab	Show all entries	

Maximum number of entries = 5; ***x*** = 1..5
Maximum length of ISDN number = 20 digits
Maximum length of subaddress = 20 digits

Note: The table is valid for X.25 in B channel and X.31D rerouting only.

Examples: xtab1 4540002900 3i04089928392

X.25 D channel rerouting

If the protocol **X.25 D channel** (prot = 21) is selected an automatic establishment of a B channel connection can be selected, if the X.25 call using the X.31-D channel is not successful.
The B channel connection will be started if

- no successful X.25 connection is established within of a timeout set by command "**cato**" in seconds
- an error is reported from X.31 D channel line.

The rerouting will be activated by setting the configuration command "x31rr=1"
(from PAD please enter "exec x31rr=1").
The ISDN number used for establishment of the B channel connection will be taken from the table *xtab* dependent of the entry found in the table.
If the X.25 address meets no entry, the rerouting will not be used.

Example:

1. To enable rerouting for all X25 addresses:

   ```
   x31rr      1
   xtab1      *i04089928392
   ```

2. To enable rerouting for the x25 address 45400012345 and 45400012389:

   ```
   x31rr 1
   xtab1  45400012345i04089928392
   xtab2  45400012389i04089928392
              or
   xtab1  454000123*i04089928392
              or
   xtab1  454000123??i04089928392
   ```

Alarm Input settings

With configuration commands you can set up the conditions for the four alarm inputs.
By entering the command **at**alarm** the settings made to all four inputs will be presented.
There is one entry for each alarm input and parameter except for **transno** and **maxreties** witch has only one entry each that is common to all alarm inputs.
To execute a ID-90-configuration command out of the AT command mode you have to issue the command **at**** together with the parameter name e.g. **at**mtype2 1**.
In configuration mode or at remote access you just have to enter the parameter name.

Maximum number of entries = 4; ***x*** = 1..4
The following parameters has to be set to accomplish the alarm setting.

opnumber***x***	ISDN number to the operator that provides SMS service
message***x***	Alarm text message
mtype***x***	Type of transfer method for the message (SMS, Hotline text).
recno***x***	Telephone number to the receiver of the text message.
transno	Transmitter (calling party) ISDN number (Used as information to the receiver of a SMS call)
maxretries	Max number of retries on failed transmission of a message.
trigcnd***x***	Trig condition for the alarm input Break or Make.
opwdx	Password, used by TAP-protocol

Example:

To set the alarm input 1 to be triggered on a Making contact condition and transfer a SMS text message to a receiver GSM telephone:

opnumber1 00491722278000	
message1 Motor 1 Over temp	
mtype1 0	(0 = SMS UCP-protocol [**default**], 1 = Hotline text, 2 = SMS TAP-protocol)
recno1 0172555555	
transno 01721234567	(Common for all alarm inputs)
maxretries 4	(0 default, limits 0..9)
trigcnd1 2	(0 = No cond.(default) 1 = Break cond. 2 = Make cond.)

Note:
*It is of importance that you check the physical connection to the alarm inputs before setting parameter **trigcnd** to avoid unintentional transmission of alarm messages.*

TA+Configurator command set

The settings of the ID-90 for the serial interface and the S_0 interface are called configuration. The ID-90 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 ID-90 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 ID-90 in the following ways:
- by using TA+ configuration commands entered by a locally connected PC.
- by using TA+ configuration commands entered via the ISDN access (remote configuration).
- by using the AT command set entered by a locally connected PC.

The configurator can be entered in the following ways:
- remote via ISDN.
- by using a special command from the asynchronous dialup command interface (AT: “ATCONF”).

Configuring the ID-90 with AT commands

To execute one TA+configuration command cmd out of the AT command mode you have to issue the command: “at**_cmd_” .
To call up the TA+configurator please use the command “atconf”.
You can leave the TA+configurator by the command “quit”.

Note: After altering one of the profile values you have to give the additional commands save and reset. This is necessary to save and activate these new parameters.

Configuring the ID-90 with X.3 PAD

To execute one TA+configuration command cmd out of the X.3 – PAD command mode you have to issue the command: “exec cmd” .
To call up the TA+configurator please use the command “conf”.
You can leave the TA+configurator by the command “quit”.

Note: After altering one of the values you have to give the additional commands save *and go. This is necessary to save and activate these new parameters.*

Configuration using the TA+Configurator commands (remote)

The ID-90 to be configured is referred here as "*remote* ID-90".
The ID-90 to configure is referred as "*local* ID-90".
Please make sure that the *remote* ID-90 to be configured at the other end is connected to the ISDN line and powered up.

- Connect the *local* ID-90 to ISDN interface
- Connect the PC's com-port to the DTE interface of the *local* ID-90.
- Connect the power supply to the mains socket.
- Start a terminal emulation program (i.e. Windows-Terminal)
- Configure the *local* ID-90 with the B channel protocol X.75 and blocksize 2048 (ATB10).
- Set up an ISDN connection to the *remote* ID-90 to be configured by using the command: ATD<ISDN-No>e<↵>. The extension "e" at the end of the calling number gives a connection to the internal remote access of the *remote* TA+PP2.
  The called ID-90 configurator acknowledges by requesting the remote password. Please enter the correct password (**default**: no password, just return). Now you can work with the configurator by using the TA+Configurator commands.
- Configure the parameter for the *remote* ID-90 from your terminal program and store them (if wanted).

Example: To change the used B channel protocol to X.75 please enter the following commands:
prot 10<↵> (set protocol to X.75 – blocksize 2048)
save<↵> (save the new configuration)

Hint: The active set of parameters can be displayed on screen by the configurator with the command "**show**<↵>".
If necessary the *remote* ID-90 can be reset using the command "**reset**<↵>".

- Hang up the ISDN connection by leaving the configurator using the command **quit**. Leave your terminal program. After the next reset the changes will be active.

Now the configured *remote* ID-90 with the new set of parameters can be used by running the needed PC program.

Remote access control

Using the following commands you can setup a table, to allow only dedicated callers to get a connection to the remote management facilities inside the TA.
If this list is empty (**default**) or one entry with a star (*) is set, any incoming call is allowed. Every incoming call that does not fit to one of the entries of acctab will be rejected with the ISDN cause “call rejected”.

racctab***x*** ***nn/ss***	set entry number ***x*** to ISDN number ***nn*** and subaddress ***ss***
racctab***x*** **-**	clear entry number ***x***
racctab***x*** *****	Allow all incoming calls to be accepted
racctab***x***	Show entry number ***x***
racctab	Show all entries

Maximum number of entries = 3
Maximum length of ISDN number = 20 digits
Maximum length of subaddress = 20 digits
The ISDN number can contain wildcards:
*****: represents one or more digits
?: represents exactly one digits

Example:	racctab1	1234567890	; accept the only specified number
	racctab2	*456*	; accept all number with 456 somewhere in the middle
	racctab3	?2345678??	; accept all number with 2345678 in the middle peceeded by one digit and followed by two digits.
	racctab3	*	; accept all incoming calls
	racctab3	-	; clear entry no. 3

List of TA+Configurator commands

The TA+Configuration commands typed in must have the correct syntax and be complete, including all blanks. Capital/small letter use is not important. The entry is not case sensitive. The bolded values are factory defaults. The usage is:

[?]<command>[=parameter]

Example to set the ISDN B channel protocol to X.75:

prot=10

Example to **show** the selected ISDN protocol:

prot

Example to **show all** selectable ISDN protocols:

?prot

<cmd>? – More information for one command

Displays the allowed values for one selected command <cmd>

acctab – isdn access control

This command enables the user to setup a table, to allow only dedicated users to make a connection to the adapter.
Please also refer to the section ”ISDN access control”

alarm – Show alarm parameters

Lists the current setting of alarm parameters

```
alarm
 OpNumber1: 00491722278000              OpNumber2: 00491712521002
 OpNumber3: 02403745101041              OpNumber4:
 message1: SMS via D2 Germany           message2: SMS via D1 Germany
 message3: Telia X31/X25 SMS            message4: Plain test msg.
 recno1: 01725555555        recno2: 01711234567     recno3: 0046123456789
 recno4: 004616987654321    mtype1: 0-SMS (UCP)     mtype2: 2-SMS (TAP)
 mtype3: 0-SMS (UCP)        mtype4: 1-Text          TransNo: 00461661200
 trigcnd1: 1-Break Cond.    trigcnd2: 2-Make Cond.
 trigcnd3: 1-Break Cond.
 trigcnd4: 1-Break Cond.    maxretries: 0 opwd1:
 opwd2: PG1                 opwd3:                  opwd4:
 alprot1: 0-X.75            alprot2: 0-X.75         alprot3: 1-X.31D
 alprot4: 0-X.75
```

alprot – SMS message protocol

Defines the protocol used to communicate with the SMS operator. Protocol has to be defined for each alarm message.

alprot***x***=**0**	Selects protocol to be X.75, normally used by operators on circuit switched network. Also used for Hotline alarm text messages. (**default**)
alprot***x***=1	Selects protocol to be X.31 over D-channel, used when the SMS service is accessed through a X.25 network.
alprot***x***=2	selects analogue protocol (only in ID-90 V90). Used when the SMS service center has an analogue modem as connection point.

astatus – Show status of alarm inputs

This comand displays the status of the four alarm inputs.
Example:

A1: 0	Contact open
A2: 1	Contact closed
A3: 0	Contact open
A4: 0	Contact open

atsx, atopt, atrej – AT command parameter set

AT command set only:

Handle AT specific settings.
Show and change AT S registers by entering the new value.

ats0	show setting of S_0-Register
ats0=1	set Register S_0 to 1
atopt	show option register (bit-values):
	bit 0 : 01 => ATV1
	bit 1 : 02 => ATW1
	bit 2 : 04 => ATQ1
	bit 3 : 08 => ATE1
	bit 4 : 10 => ATS9=0
atrej	show reject register => setting of AT#R (0,1)

autoreset – TA reset option

The autoreset command is default 0 but if value is 1 then the unit make a reset every time a disconnect occurs.
If the value is more that 1 and less that 255 the unit resets periodically every minute specified by this command.

Example: autoreset=0 (**default**)
autoreset=1
autoreset=20

bc – Bearer capability

Bearer capability for outgoing data calls. (**default**: 00 00; hex bytes) *(see note 2, page 84)*

bod – Bandwidth On Demand enable

0 disable BOD (**default**)
1 enable BOD

bodiv – BOD increase value

bodiv=<incrValue>	Set the bit-rate in kbit/s at which a second B channel is connection (**default**=40).

bodit – BOD increase timer

bodit=<incrTime>	Sets the time in seconds the bit-rate has to be over the increase value before the second B-channel is connected (**default**=30)

boddv – BOD decrease value

boddv=<decrValue> Set the bit-rate in kbit/s at which the second B channel is disconnected (**default**=40).

boddt – BOD decrease timer

boddt=<incrTime> Sets the time in seconds the bit-rate has to be under the increase value before the second B-channel is disconnected (**default**=30)

br – Baudrate asynchronous

Selection of the asynchronous baudrate for the DTE interface

0: Autobauding, (automatic local bit rate adaption) (**default**)
1: 1 200 bit/s
2: 2 400 bit/s
3: 4 800 bit/s
4: 9 600 bit/s
5: 19 200 bit/s
6: 38 400 bit/s
7: 57 600 bit/s
8: 115 200 bit/s

Note: Autobauding (br = 0) is available for AT command set only. If autobauding is set and cmds is changed to PAD, br will be set to 4 (9 600 bit/s).

brn – Line baudrate asynchronous V.110

Selection of the asynchronous baudrate for V.110 line (B channel)

0: Line baudrate equals local baudrate
1: 1 200 bit/s
2: 2 400 bit/s
3: 4 800 bit/s
4: 9 600 bit/s
5: 19 200 bit/s

bsize – Frame length

Maximum length of a data frame (**default** 2048) Note changing the B-channel protocol will affect the bsize parameter.

Values: 32 .. 2048

catab – Hot line table

With this command the priority table of hot line DTR and TxD calling number is set-up The ID-90 will call the numbers defined in order from catab1 to catab3 until a connection is established. The character # is used as prefix to signal that the call shall use an analogue connection

catab***x***	***nn***		set entry number ***x*** to receiver number ***nn***.
	catab***x***	**-**	clear entry number ***x***
	catab***x***		show entry number ***x***
	catab		show all entries

Maximum number of entries = 3
Maximum length of number = 20 digits.

In below example entry 1 tells ID-90 to make a call using the analogue modem, while entry 2 and 3 making ISDN –ISDN connections.

Example:
catab1 #00461661200
catab2 004616480130
catab3 0123987652

cato – Call timeout to abort

Time to abort a call if not successfully connected after n seconds.
n = 3..255, (**default** 15 s).

capa – Call pause

Automatic call: set a call pause for n seconds before next call attempt.
n = 0 .. 255: ***n***=0 no call retry, (**default 3s**).

catry – Calls retry

Automatic call: max. no of tries of every number entry in catab.
n = 1 .. 255 (**default 1**)

cb – callback security

The callback functionality makes the established link more secure. After an incoming call the adapter will make a callback to either a preconfigured number or to the incoming number. The callback can be protected by a password. The unit can also be configured for a secure access without callback.

If the password is enabled, the calling part will be prompted for the password directly after connection. When the password is entered correctly, the adapter will disconnect the current link and make a callback after a preconfigured number of seconds (configurator command: **capa** [**default 3**]).

If the unit is configured as ”secure access”, it will allow data only after the password is correctly entered.

After 3 retries of entering wrong password or after 60 seconds, the link will be disconnected and the callback/secure access aborted.

The number to callback must be entered in the catab number table (**catab1, catab2** or **catab3**).
The passwords is stored in: **cbpwd1, cbpwd2** or **cbpwd3**.
When making a callback to a number stored in catab, the password in **cbpwd1** is connected to the number in **catab1** (and **cbpwd2** to **catab2** and **cbpwd3** to **catab3**)

A callback to an analogue modem can be done with ID90-V90 and by storing an ’#’ before the number in catab. (see also the catab command in this manual)

For an even more secure connection please also refer to the **acctab** command.

Callback control:

0:	callback disabled (**default**)
1:	callback enabled, No password needed, callback number only in position1 in catab (catab1)
2:	callback enabled, No password needed, callback to incoming number
3:	access security enabled, Password in one or more positions in cbpwd***x*** (***x***= 1,2 or 3)
4:	callback enabled, Password in one or more positions in cbpwd***x*** (***x***= 1,2 or 3), callback to number in catab, (cbpwd1 corresponds to catab1…)
5:	callback enabled, Password in one or more positions in cbpwd***x*** (***x***= 1,2 or 3), callback to incoming number
6:	callback enabled, Password in one or more positions in cbpwdx (x= 1,2 or 3), callback to number that is entered after password check is OK.

see also the following commands: catab, cbpwd, capa, acctab

cbpwd – callback/secure access password

This command is used to store the password used in the callback and the secure access functionality.
Three different passwords can be stored.

Example:

AT**cbpwd1=qwerty
AT**cbpwd2=asdfgh
AT**cbpwd3=zxcvbnm

The password may contain any writable character.
The maximum number of characters is 20.

see also the following commands: catab, cb, capa

ccts – CTS control

CTS control

0: CTS follows RTS
1: CTS always ON (**default**)
2: CTS follows DTR

cdcd – DCD control

DCD control

0: DCD always ON
1: DCD indicates a connection (**default**)
2: DCD follows DTR
3: DCD indicates link level established (X.31-D only)

cdsr – DSR control

DSR control

0: DSR always ON (**default**)
1: DSR indicates a connection
2: DSR follows DTR

cdtr – DTR control

Usage of DTR to control ISDN connection

0: No control:
Incoming calls will be accepted independent of DTR status;
DTR drop does not disconnect an active connection.
2: DTR off disconnects (**default**)
Incoming calls will be accepted only when DTR is ON;
DTR drop disconnects an active connection.
4: DTR is evaluated: Incoming calls will be accepted independent of DTR status; DTR drop disconnects an active connection

cha – Charging information

Charging account of the last connection (in units)

chatol – Charging information total

Accumulated charging information (in units)

= 0: Reset charging info.

The charging information is automatically stored to non volatile ram.

chappwd – Set password for PPP chap authorisation

Enable ML-PPP CHAP authorisation by setting the password corresponding to the user name used for the PPP connection. If the server does not handle CHAP an automatic fall-back to PAP is performed.

chappwd=<password> set password for CHAP

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

cipm – cip value mask

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 CAPI2.0 specification (**default 00010016h**).

Example: cipm=00010016: Accept analogue incoming calls

cipm=00000001: Accept all incoming calls.

See also AT command AT#C1.

cipo – cip value 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 0002h**).

Example: An outgoing call as a voice call: cipo =0004.

See also AT command AT#C2.

cmds – Command set *(note 1, page 85)*

Command set for connection control

0: AT command set (**default**)

1: X.3 PAD

6: Hot line DTR call

7: Hot line TXD call

10: TA+Configurator

cmlp – Multilink PPP control

Call bumping: control of the second B channel connection with multlink PPP protocol. When set, any incoming voice call will automatically drop one B channel connection if a multilink PPP session is active. The second B channel of the Multilink session will not be established after voice connection is released.

0: no call bumping (**default**)
1: call bumping for incoming voice calls

conntime – Connection timer

The functionality connected to the ”conntime” command does a periodic check every 10:th second to see if there is only a D-channel without a B-channel connected, if that is the case then the unit waits for another time period specified by the ”conntime” command (in seconds) before it checks again if the same faulty state is present, if true then the unit resets, else it returns to the periodic 10 second monitor routine.

Example: conntime=30 (**default**)
conntime=60

dabort – Dial abort

Dialling will normally be aborted by characters coming from the DTE, by setting parameter dial =0 characters received during the dial procedure will be ignored.

0: Dialling will not be aborted by incoming characters.
1: Characters from DTE aborts dial during the connection process (**default**).

dbits – Asynchronous databits

Number of data bits asynchronous chars (**default**: 8) 7, 8

defa – Default settings

Sets up factory default parameter setting.

defa 0: setup all parameter concerning data port
defa 1: setup all parameter including ISDN protocol and msn settings.

dte – B channel link address

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

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

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

flc – Flowcontrol

Flowcontrol to DTE

0: No flowcontrol
3: Hardware flowcontrol RTS/CTS (**default**)
4: Software flowcontrol XON/XOFF

hlc – Higher layer compability

Higher layer compatibility for outgoing call.

(see note 2 page 85)

help

Displays help texts for all commands

idle – Idle data timeout

Timer to disconnect the ISDN B channel connection after inactivity.

0: inactive (**default**)
1..*n*: delay time to disconnect in seconds (1..255).

isdn – ISDN D channel protocol *(note 1, page 85)*

Selects ISDN D channel protocol

0: DSS1 (Euro-ISDN)
8: VN4 (French)

k – Windowsize

Layer-2 protocol: windowsize (**default**:**7**). k = {1..7}
Value will be automatically changed with changing B channel protocol prot.

lcgr – Logical group number X.25

Logical group number for X.25 packet layer protocol.

lcgr = {0..255}, **default**: **0**

llc – Low layer compatibility

Low layer compatibility for outgoing calls (Hex bytes)

(see note 2 and 3, page 85)

load – Load stored parameter setting

All parameters stored in non volatile ram will be loaded.

loadsw – load DIP-switches parameter setting

Parameters entered via the DIP-switches will be loaded and active the same way as if a power on was exexuted.

maxretries – Max number of retries on sending alarm messages

With this command you can set the maximum allowed retries on sending an alarm message. The highest allowed value for maxretries = 9 (**default** = 0).

message – Text message setting

With this command you can set the message text that will be sent at an alarm trig.
There is one entry for each alarm input.

message***x***	***mm***	Set entry number ***x*** to message text ***mm***.
message***x***	**-**	Clear entry number ***x***.
message***x***		Show entry number ***x***.
message		Show all entries.

Maximum number of entries = 4.
Maximum length of message text = 20.

Example: message command (show all entries)

message1:	Alarm on input 1
message2:	Motor 4 over temp
message3:	
message4:	

msn – Multiple Subscriber Number

Own MSN (Multiple Subscriber Number)

*****: no specific MSN, all incoming calls accepted
The msn is automatically stored to non volatile ram.

mtype – Transfer method for alarm message

With this command you can set up the transfer method for an alarm message.
Selectable transfer methods are SMS, and Hotline text
There is one mtype entry for each alarm input.

mtype***x***	***n***	Set entry number ***x*** to method number ***n***.
mtype***x***	**-**	Clear entry number ***x***
mtype***x***	**?**	Show all selectable transfer methods
mtype***x***		Show entry number ***x***
mtype		Show all entries

Maximum number of entries = 4.

0:	SMS text (UCP) according to UCP- (Universal Computer Protocol) (**default**)
1:	Hotline text (expects a <CR> acknowledged from receiver to avoid retries)
2:	SMS text (TAP) (Telocator Alpanumeric Protocol)

Example: mtype command (show all entries)

mtype1:	**0**	SMS (**default**)
mtype2:	0	SMS
mtype3:	1	Text
mtype4:	0	SMS

nui – Nui and password

Setup nui and password sent with an outgoing X.25 call packet.
nui and password has to be entered as ASCII characters.
(X.25 B channel and X.31 D channel only)

opnumber – SMS operator number

This command is used when an alarm message should be transferred as SMS-text.
The ISDN number should be to an operator providing SMS service.
A separate operator number for each alarm input could be defined.

opnumber***x***	***nn***	set entry number ***x*** to ISDN number ***nn***.
opnumber***x***	**-**	clear entry number ***x***
opnumber***x***		show entry number ***x***
opnumber		show all entries

Maximum number of entries = 4.
Maximum length of ISDN number = 20 digits.

Example: opnumber command (show all entries)

OpNumber1: 04912345678
OpNumber2: 78563798
OpNumber3: 3588
OpNumber4: 04610286745

opwd – Operator password

The operator password is used by some SMS operator using the TAP-protocol.

Example:

Opwd1: nFYgu8
Opwd2: 247936

pxxx – X3 parameter set

X.3 PAD command set only:
show setting of one X3 parameter.
Change X3 parameter by entering the new value.

p001	show setting of X3 parameter 1
p001=1	set X3 parameter 1 to 1

prot – B channel protocol

Transmission protocol for data transfer

0:	V.110 asynchronous	(For file and data transfer i.e. for BBS access)
3:	HDLC async to sync conversion	(Async PPP to sync PPP, single link i.e. for Internet / PPP dial-up network access)
4:	HDLC transparent	(octets are packed into HDLC frames)
5:	Byte transparent	(raw B channel data)
10:	X.75- SLP	(For file and data transfer i.e. for BBS access, **default**)
13:	V.120	For file and data transfer i.e.AOL/CompuServe access
20:	X.31 B channel	(X.25 B channel, access to X.25 packet switched network over B-channel)
21:	X.31 D channel	(X.25 D channel, access to X25 packet switched network over D-channel
22:	T.70-NL-CEPT	(For telematic services over ISDN i.e. T-Online videotex access)
23:	T.90-NL	For telematic services over ISDN
31:	ML-PPP	(ML-PPP, Async to sync PPP conversion in Multilink PPP mode, for internet access)

prty – Asynchronous parity

Parity of asynchronous character (**default**: no parity)
0: No parity; 1: Even parity; 2: Odd parity

ptp – ISDN interface type

Select type of ISDN interface:

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

pvc – X.25 connections permanent virtual circuits usage

Enable usage of permanent virtual connections instead of switched logical connections. X.25 channel number 0 will be used.

pvc = 1: enable (**default** 0)

quit, exit – Activate parameter changes

Activates the actual parameter settings and leave the configurator (without storing the parameter in non volatile memory).

recno – Alarm message receiver number

With this command you can set up the receivers number of a alarm message. There is one entry for each alarm input.

recno***x***	***nn***	set entry number ***x*** to receiver number ***nn***.
recno***x***	**-**	clear entry number ***x***
recno***x***		show entry number ***x***
recno		show all entries

Maximum number of entries = 4.
Maximum length of receiver number = 20 digits.

Example: recno command (show all entries)

recno1: 01661200
recno2: 049701098505
recno3: 046609734
recno4:

reset – Reset ID-90

Resets the whole functionality of the ID-90 by a forced hardware reset.

ringtimer – Delay of RING messages

Delaytime between two RING messages, if S_0 register is set not equal to 1, value in 100 ms.

Default: ringtimer = **50** (5 sec).

rmmsg – Message for remote access

Display message on the local port, **"rmon"** for established **"rmoff"** for disconneced remote configuration access. If an PAD connection is established the message will be discarded.

0: display no messages (**default**)
1: display messages

rmsn – Multiple Subscriber Number for remote

MSN (Multiple Subscriber Number) for remote configuration

*: no specific MSN, all incoming calls accepted

rpwd – Password

Password for remote configuration (character input)

To disable password please enter: rpwd –

rsttim – Startup timer

Startup delay timer after reset. Within this period the configuration can be entered after reset.

1 .. 255: reset phase in 100 milliseconds, **default**: 40 (4 seconds)

rsub – Subaddress for remote access

Subaddress for remote configuration.

*: no specific subaddress, all incoming calls fitting to msn accepted (**default**).

S_0led – Automatic ISDN (S_0) activation

Defines how the terminal adapter will handle an automatic ISDN (S_0) activation.
When automatic, the LED L1 will always state the activation state of the ISDN line.

0: Automatic activation after deactivation from ISDN network

1: no automatic activation (**default**).

save – Store parameter changes

Stores the actual set of parameters in non volatile memory

sbits – Number of stopbits.

Sets the number of stopbits 1 or 2, (**1 default**).

send3p – Transmit AT escape characters

Setting determines whether the escape characters of AT command set to switch to command mode will be transmitted via ISDN connection.

0: Escape characters will not be sent

1: Escape characters will be sent (**default**)

show – Show parameters

Displays the actual set of parameters, see &V1.

showall – Show all parameters

Displays all the accessable parameters

spid1, spid2 – Set spid

For ISDN lines in the U.S. you have to set the SPID. You get it from your ISDN provider.

spid1=xxxx	Set SPID 1
spid2=xxxx	Set SPID 2

status – Status of serial line and ISDN

Returns the status of the serial line and ISDN channels.
Example: current status information ID-90

```
Current status information ID-90
serial line: DTR:on, RTS:on, DSR:on, CTS:on, DCD:off, RI:off
ISDN: L1:down
Dch: Prot:DSS1 State:disconnected, CdPN:, CgPN:, prev error: 0
Bch: Prot:X.75 SLP State:disconnected, CdPN:, CgPN:
```

sub – Subaddress

Select own subaddress that will be sent with an outgoing call as called party subaddress with max. 20 digits

*: no subaddress setup
The subaddress is automatically stored to non volatile ram.

svcio – Logical channels svc

Maximum number of switched virtual logical channels for incoming and outgoing X.25 connections.
svcio = {1..15}, (**default**: 1)

swstatus – TA-DIP Switches status

Returns the status of the TA-Configuration switches
This command has the same function and result as ATI7 command.

See ATI7 command for presented result.

tdi – Timer delay incoming call

Delay time between receiving ISDN incoming data call and signalling via RING or CONNECT message.

0: no delay (**default**)
1..*n*: delay time in 50 ms ticks.

tei – TEI value

X.31 D channel only:

Terminal equipment identifier. This value must be identical to the tei of your basic rate access, will be defined by your ISDN supplier.
default: **1**

transno – Transmitter telephone number for this TA

With this commend you can set the ISDN number for this TA. This information will be sent together with a SMS alarm connection.

Maximum length of transmitter number = 20 digits.

trigcnd – Trig condition for alarm input

With this command you can set up the trig condition for an alarm input.
Selectable trig conditions are No condition, Break and Make condition

Maximum number of entries = 4.

trigcnd***x***	***n***	Set entry number ***x*** to condition number ***n***.
trigcnd***x***	**-**	Clear entry number ***x*** (disarm)
trigcnd***x***	**?**	Show all selectable trig conditions
trigcnd***x***		Show entry number ***x***
trigcnd		Show all entries

Maximum number of entries = 4.

0:	No condition (disarmed, **default**)
1:	Break condition
2:	Make condition

Example: trigcnd command (show all entries)

trigcnd1:	0	No Cond.
trigcnd2:	2	Make Cond.
trigcnd3:	1	Break Cond.
trigcnd4:	0	No Cond.

txfwd – Timer for data forwarding

If no character is entered within the defined period, the received data will be transmitted to the ISDN using the selected transmission protocol. (comparable to the functionality of X.29 parameter 2, data forwarding timer)

0:	minimum delay time (appr. 10 ms)
1..n:	delay time in 50 ms ticks. (**default**: 1)

Note: Valid for AT command set and X.25 B channel or X.25 D channel only.

t320 – Timer delay ISDN disconnect

Delay time between the clear message of the last X.25 connection and an automatic ISDN disconnect. Only valid for X.25 B channel.

0: immediate ISDN disconnect (**default**)
1..*n*: delay time in seconds (1..254).
255: immediate ISDN disconnect

Note: The released X.25 connection will be signalled due to the selected mode (via response "NO CARRIER", CLR xxx or DCD goes inactive). The not yet released ISDN connection is not signalled, also the released ISDN connection has no signal.

v110llc – Usage of LLC for V.110 connections

If set the LLC parameter will be used for incoming and outgoing V.110 connections.

0: LLC is ignored and not created (**default**).

1: Ougoing call: An LLC is sent deriving from the settings of the TA
incoming call: The received LLC is used to setup the parameters for the V.110 connection.

v110flc – Usage of V.110 flowcontrol

0: V.110 flowcontrol via xbits will be ignored.

1: V.110 flowcontrol via xbits enabled (**default**).

w – X.25 L3 windows size

L3 window size parameter. This parameter is only valid when X.25 protocol is used.
(**default**: 2)

xnr – Own X.25 address

Setup an origination X.25 address.
Only necessary, if not supported from the network (**X.31B channel only**)

xtab – Show table xtab

Show setting of all entries of the table xtab for translation of X.25 address to set ISDN number.

X25mb – Handling more data bit (M-Bit)

All characters out of X.25 packets that are continued using the “more data bit” (M-Bit) will output to the V.24 interface as a contiguous data stream (without any pauses). All from the ISDN line received X.25 packets with more data bit set will be collected inside the ID-90. Ouput to the V.24 interface will be started if an X.25 packet without “more data bit” set is received or a data length of 2 048 octetts is assembled.

0: received X.25 data will be output independent of setting of M-Bit (**default**)

1: received X.25 data will be collected til M-Bit off.

x31rr – Enable rerouting for X.31 D channel

Enable automatic establishment of an X.25 B channel connection if the X.31 D channel connection fails using the entries of table **xtab**.

0: no rerouting (**default**).

1: automatic rerouting enabled.

(X.31 D channel only)

Notes:

(Note1) After issuing one of these parameter you should execute the “save” command to store the configuration in non volatile memory. To activate and use the new setting you have to run the “reset” command.

(Note2) Command syntax for setting *hlc, llc* and *bc*
An empty parameter has to be entered by “-”.
Example: Deleting of bc-value: bc -<↵>
Entering a new bc: bc 8890<↵>

(Note3) **Different modes for V.110 baudrate adaption**

Outgoing call:

brn # 0: ISDN message SETUP will be created with or without LLC(brn) depending on the setting of ***v110llc***;
The B channel (V.110 baudrate) will use the baudrate set by ***brn*** (independent of br or recognized local baudrate)

brn = 0: “Adaptive”: same mechanism as ***brn*** # 0; the V.110 baudrate will be created by br rsp. the recognized local baudrate.

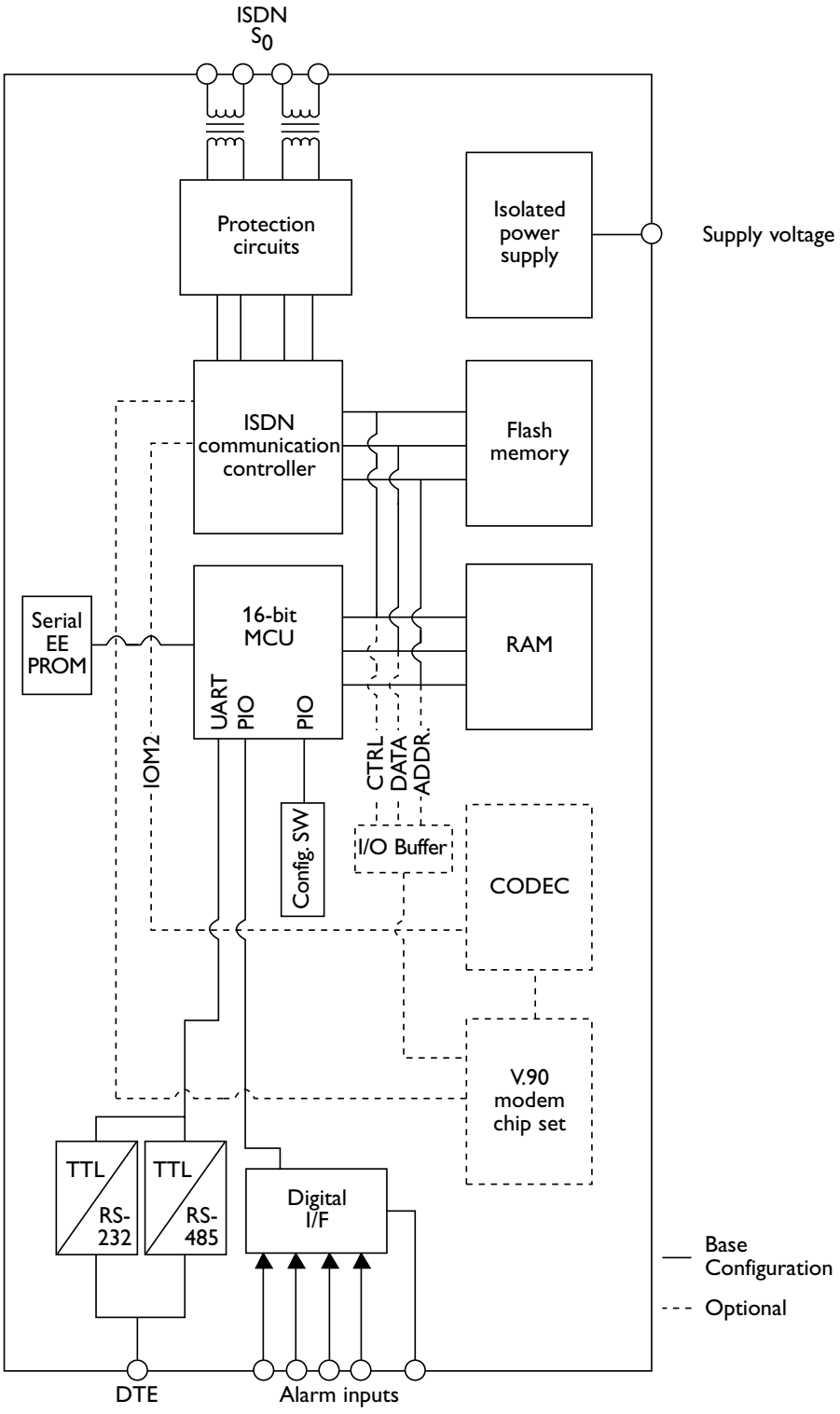
Incoming call:

brn # 0: No LLC received: accept incoming call, use in B channel brn for V.110 baudrate.
LLC received compliant to ***brn***: accept incoming call
LLC received not equal to ***brn***: Reject incoming call:
DISCONNECT (cause = incompatible destination).

brn = 0: “adaptive”: No LLC received: accept incoming call, use in B channel br rsp. the recognized local baudrate for V.110 baudrate.
LLC received: accept incoming call, use in B channel the baudrate derived from the LLC as V.110 baudrate.

The usage of the LLC is controlled by the TA+Configurator command v110llc

Block diagram



Application examples

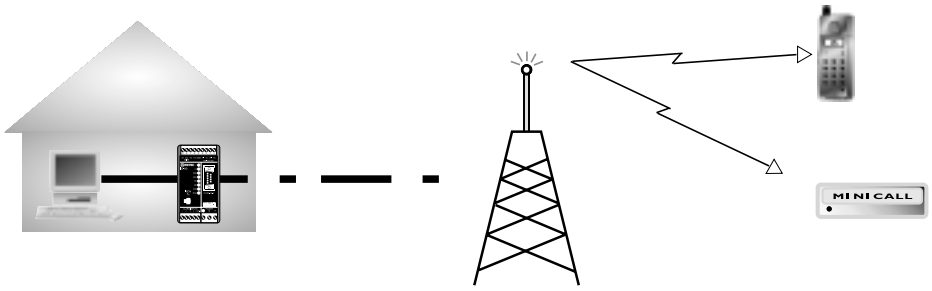
Command line

Several commands can be stacked on each command-line. For example:
ATEQ1%B4D12345
can be used instead of

`ATE0`	No local echo
`OK`	
`ATQ1`	Suppres 5 results
`OK`	
`AT%B4`	DTE baudrate 9 600 bit/s
`OK`	
`ATD12345`	Call 1234

with the same result

To use Alarm inputs for SMS Call and MINICALL paging.

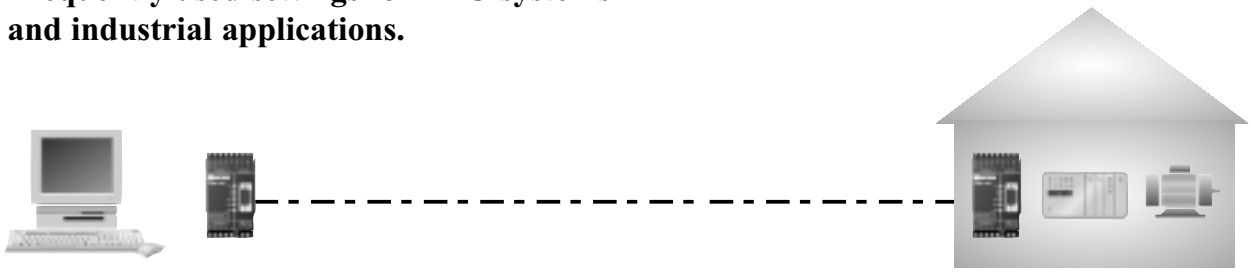


To set the alarm input 1 to be triggered on a contact breaking condition and transfer a SMS or MINICALL text message to a receiver GSM telephone or a MINICALL. For example a house supervision alarm system.

`ATCONF`	Set ID-90 in configuration mode
`OK`	
`#`	Configurator prompt
`OPNUMBER1 00491722278000`	Number to SMS/MINICALL service provider
`#`	
`MESSAGE1 Main Door Opened`	Text message to sent
`#`	
`MTYPE1 0`	**0** = SMS/MINICALL (**default**), 1 = Hotline text
`#`	
`RECNO1 0172555555`	GSM number that will receive the text message
`#`	
`TRANSNO 01721234567`	Calling party number
`#`	
`MAXRETRIES 4`	Number of times ID-90 will retry to send after failed transmission
`#`	
`TRIGCND1 1`	**0** = No cond.(**default**) 1 = Break cond. 2 = Make cond.
`#`	
`SAVE`	Save above parameters in EEPROM
`#`	
`EXIT`	Exit from configurator and enter AT-command mode

Note: It is of importance that you check the physical connection to the alarm inputs before setting parameter **trigcnd** to avoid unintentional transmission of alarm messages.

Frequently used settings for PLC-systems and industrial applications.



Most PLC-systems and other industrial applications require the same changes to the standard settings.

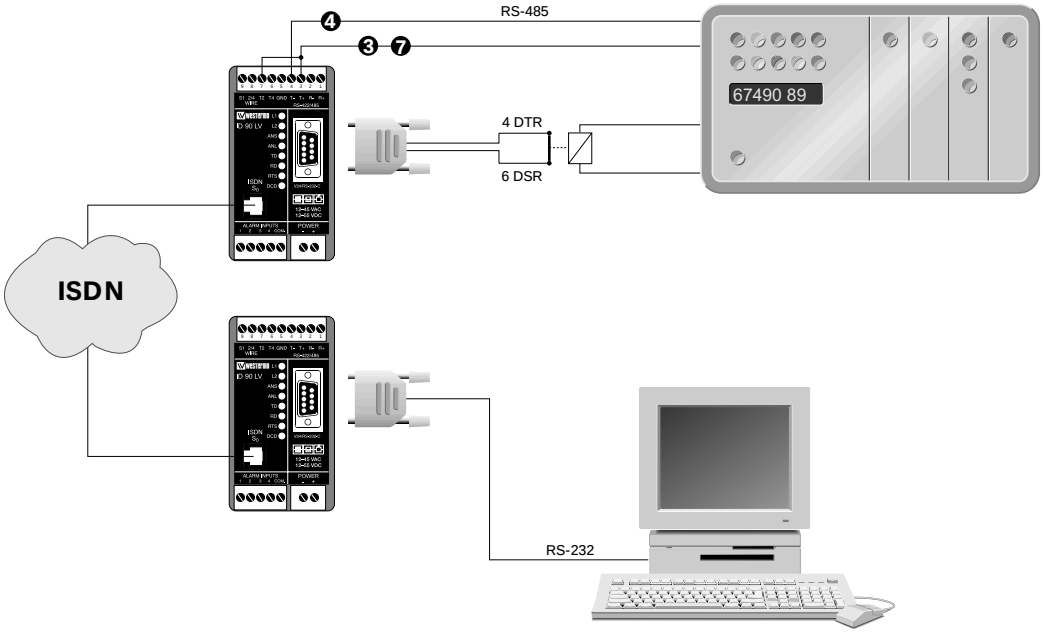
The most commonly encountered problems concern speed, parity and control signals from the connected equipment.

Speed and parity are changed with the switches under the cover. If this action does not solve the problem the modem's answering codes and possible echoing of commands might be the source of the difficulty. Here below follows a list of commands that might resolve the problems. (The commands may of course be placed on one single command line if desired, as per the example1):

ATV	Gives the answering codes in short format. (digits)
ATQ1	No result codes are sent on the RS-232/V.24 connection.
ATE	Commands that are sent from the terminal/computer etc. are not echoed back to the RS-232/V.24 connection.
AT&C1	DCD will follow the ISDN line status DCD on when ID-90 has detected and synchronised to the ISDN line.
AT&K	No handshaking.
AT**dabort=0	Dialing, answering is not aborted by characters from DTE.

For further information regarding these commands please refer to the specific section of this manual.

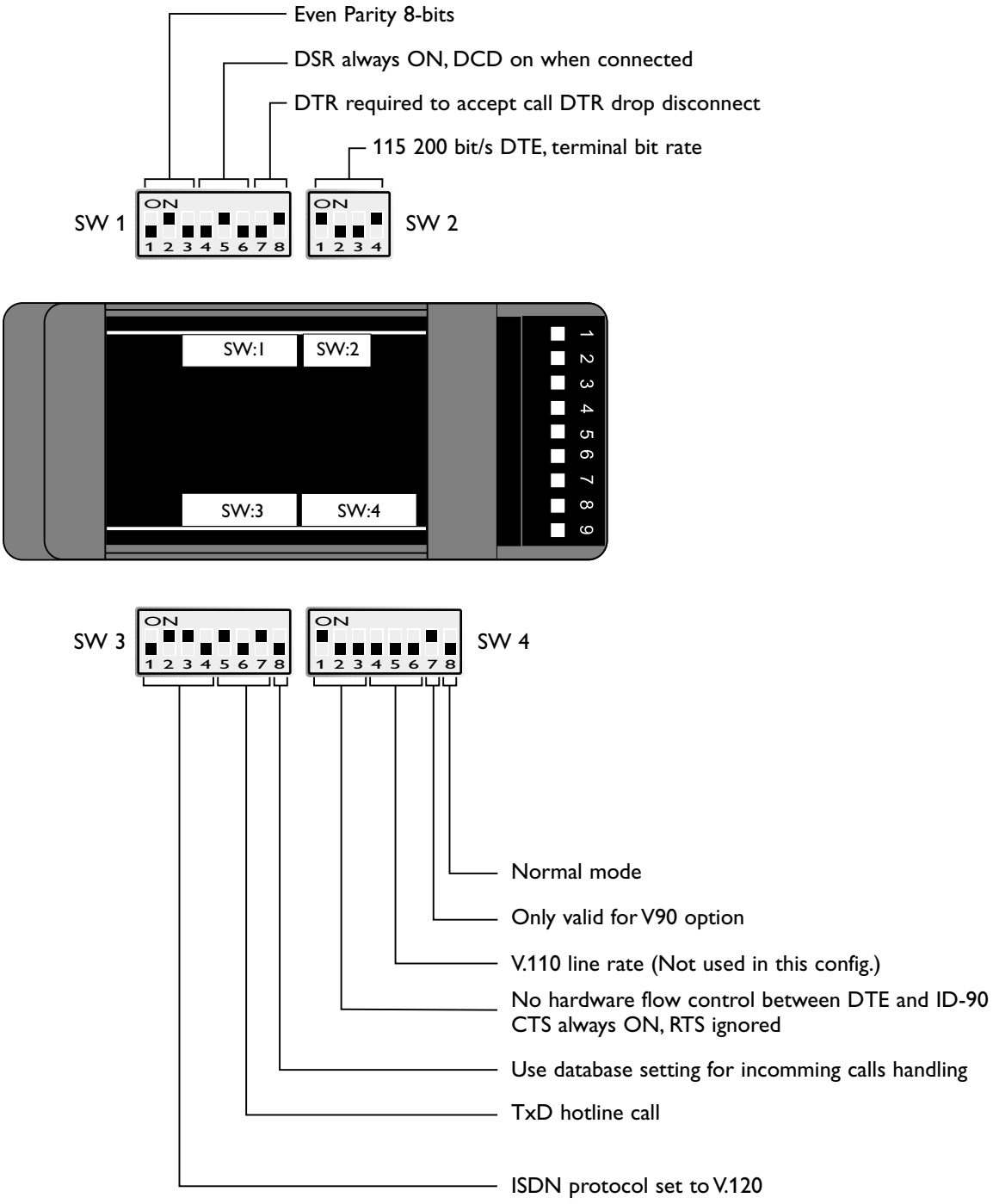
Dial up with hardware signalling.



Dial-up can be made by sending an arbitrary character to ID-90 and the DTR-pin can be used to disconnect. A typical application using this method is shown in the example below. The PLC periodically polls a supervisory system, the poll causes the ID-90 to establish a connection to the supervisory system. The PLC also controls the connection breakdown through the contact connecting DSR and DTR. The contact shall normally be closed and only opened shortly to break down the connection.
The number(s) to be called is controlled by the variables *catab1 – catab3*
The modem does not have a redialling function. If necessary this must be handled by other equipment connected. The RS-232/V.24 control signal DCD can be used to indicate the success of connection.
Before the command mode is set to Tx hotline the numbers to be dialled has to be defined by the below command.

AT**catabX=nn	Where X is 1,2 or 3 and nn the number to dial. The ID-90 will first try to dial the number stored for catab1 and continue to establish connection to the number stored for *catab2* if connection to catab1 is unsuccessful. Only *catab1* has to be defined if only one number is to be called.
AT**save	Save the number(s).

Now power down the ID 90 and set the DIP-switches according to below figure.
After switches has been set power up the ID 90 again (the switches is only reed by ID-90 at power on)


Even Parity 8-bits
DSR always ON, DCD on when connected
DTR required to accept call DTR drop disconnect
115 200 bit/s DTE, terminal bit rate
SW 1
ON
1 2 3 4 5 6 7 8
ON
1 2 3 4
SW 2
SW:1
SW:2
SW:3
SW:4
1 2 3 4 5 6 7 8 9
SW 3
ON
1 2 3 4 5 6 7 8
ON
1 2 3 4 5 6 7 8
SW 4
Normal mode
Only valid for V90 option
V.110 line rate (Not used in this config.)
No hardware flow control between DTE and ID-90
CTS always ON, RTS ignored
Use database setting for incomming calls handling
TxD hotline call
ISDN protocol set to V.120

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.

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 chapter: LED indicators).

Table 4 ISDN causes and their explanation (DSS1)

ISDN Cause Code		Explanation	Translation to AT result code
Dec	Hex		
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	Subscriber absent (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 (incomplete number)	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
42	0xAA	Switching equipment congestion	6
43	0xAB	Access information discarded	6
44	0xAC	Requested circuit/channel not available	6
46	0xAE	Precedence call blocked	6
47	0xAF	Resource unavailable unspecified	6
49	0xB1	Quality of service unavailable	3

Table 4 cont.

ISDN Cause Code			Translation to AT result code
Dec	Hex		
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	3
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 passed on	3
111	0xEF	Protocol error unspecified	6
127	0xFF	Network interworking error unspecified	6

Table 5 X.25 diagnostic codes

No. hex	Restart-ind.	Clear-ind.	Reset-ind.	Diag-nostics	Meaning
00	X	X	X	–	No additional information
01	–	–	X	–	Invalid P (S)
02	–	–	X	–	Invalid P (R)
10	–	–	–	X	Packet type invalid
11	X	–	PVC	X	Packet type invalid for state r1
12	X	–	PVC	X	Packet type invalid for state r2
13	–	–	–	–	Packet type invalid for state r3
14	–	X	–	–	Packet type invalid for state p1
15	–	X	–	–	Packet type invalid for state p2
16	–	X	–	–	Packet type invalid for state p3
17	–	X	–	–	Packet type invalid for state p4
18	–	X	–	–	Packet type invalid for state p5
19	–	X	–	–	Packet type invalid for state p6
1A	–	X	–	–	Packet type invalid for state p7
1B	–	–	X	–	Packet type invalid for state d1
1C	–	–	X	–	Packet type invalid for state d2
1D	–	–	–	–	Packet type invalid for state d3
20	–	–	–	–	Paket not allowed
21	–	X	PVC	–	Unidentifiable packet
22	–	X	–	–	Call on one-way logical channel
23	–	–	PVC	–	Packet type invalid for state at PVC
24	–	X	–	X	Paket on unassigned logical channel
25	–	–	X	–	Reject not subscried to
26	X	X	X	–	Paket too short
27	X	X	X	–	Paket too long
28	–	X	–	X	Invalid general format identifier
29	–	X	X	X	Restart or registration packet »0«
2A	–	X	–	–	Paket type not compatible with facility
2B	–	–	X	–	Unauthorized interrupt conformation
2C	–	–	X	–	Unauthorized interrupt
2C	–	–	X	–	Unauthorized reject
30	–	–	–	–	Time expired:
31	–	X	–	–	• for incoming call
32	–	–	–	X	• For clear indication
33	–	X	PVC	–	• For reset indication
34	X	–	–	X	• For restart indication
35	X	–	–	X	• For call deflaction
40	–	X	–	–	Call set-up, call clearing or registration problem
41	–	X	–	–	Facility/registration code not allowed
42	–	X	–	–	Facility parameter not allowed

Table 5 cont.

No. hex	Restart-ind.	Clear-ind.	Reset-ind.	Diag-nostics	Meaning
43	–	X	–	–	Invalid called DTE address
44	–	X	–	X	Invalid calling DTE address
45	–	X	–	–	Invalid facility/registration length
46	–	X	–	–	Incoming call barred
47	–	X	–	–	No logical channel available
48	–	X	–	–	Call collision
49	–	X	–	–	X.25: repeated facility request
					X-75: missing transit DNIC
4A	–	X	–	–	Non zero address length
4B	–	X	–	–	Non zero facility length
4C	–	X	–	–	Facility not provided when expected
4D	–	X	–	–	Invalid CCITT-speciffied DTE-facility
4E	–	X	–	–	max. number of call redirections or call deflections exceeded
51	X	X	X	–	Improper cause code from DTE
52	–	X	X	–	Not aligned octet
53	–	–	X	–	Inconsisstent Q bit setting
54	–	X	–	–	NUI problem
61	–	X	–	–	DNIC not accessable
62	–	X	–	–	Unknown transition DNIC
64	–	X.75	–	–	Wrong use of facility
65	–	X	–	–	Erroneous length of Net-Indicator
66	–	X	–	–	Length of Net-Indicator not equal zero
67	–	–	X	–	Erroneous M-Bit
71	–	X	X	–	Problem concerning remote net
72	–	X	X	–	International net problem
73	–	X	PVC	–	Transmission section out of operation
74	–	X	PVC	–	International line engaged
75	–	X	PVC	–	Error in the transit net
76	–	X	–	–	Error in the destination net – invalid facility found
78	–	X	–	–	Temporary routing problem
79	–	X	–	–	Unknown called DNIC
7A	–	X	X	–	Service
80	–	–	X	–	Erroneous Q-Bit or
80	–	X	X	–	No operation means available
81	–	X	–	–	Single packet not agreed upon or
81	–	X	X	–	Temporarily out of operation
82	X	X	X	–	Cause-flied not equal 00 (hex.) or
82	–	X	X	–	Closed by service provider, e.g. DATEX-P
83	–	X	PVC	–	Incompatible paket length

Table 5 cont.

No. hex	Restart-ind.	Clear-ind.	Reset-ind.	Diag-nostics	Meaning
84	–	–	X	–	Erroneous M-Bit
85	–	X	–	–	Rejection of the connection request or
85	–	X	–	–	NUI-call no more granted
86	–	–	X	–	PVC-Access description erroneous
87	–	X	PVC	–	Clear by service provider, e.g. DATEX-P
88	–	X	–	–	DNIC not accessable
89	–	X	–	–	Reverse charging not agreed upon
8A	–	X	–	–	Missing agreement
8B	–	X	–	–	Missing number of calling station
8C	–	X	–	–	Erroneous number of calling station
8D	–	X	PVC	–	Transmission section interrupted
8E	–	X	PVC	–	Transmission section out of operation
8F	–	X	PVC	–	Time expired DATEX-P state P1
90	X	–	–	–	Erroneous coding of cause
91	–	X	–	–	Erroneous direct call
92	–	X	X	–	Uncomplete octet found
93	–	X.75	–	–	Facility valid
94	–	X.75	–	–	Erroneous use of facility
95	–	X.75	–	–	Erroneous address in packet »Call-Accepted«
96	–	–	X	–	Invalid interrupt packet in subnet
97	–	–	X	–	Invalid interrupt acknowledge in subnet
98	–	X	–	–	Only single packet with limitation of response entry permitted
99	–	–	PVC	–	Incompatible PVC
9A	–	X	–	–	Erroneous agreement of window size
9B	–	X	–	–	Missing fields
9C	–	X	–	–	Erroneous adress length
9D	–	X	–	–	Erroneous lemngth of facilities
9E	–	X	–	–	Incomplete field
9F	–	X	–	–	Incompatible transmission rate class
A0	–	X	–	–	Group call number out of order
A1	–	X	–	–	Group call number not accessable
A2	–	X	–	–	Group call number temprarily out of order
A3	–	X	–	–	Erroneous address
A4	–	X	–	–	Erroneous sub address
A5	–	X	–	–	Erroneous format of net facility
A6	–	X	–	–	Length of net facility not equal 0
A7	–	X	–	–	No user data
A8	–	X	–	–	Missing indicator for national facility
A9	–	X	–	–	Access to users of the same service blocked

Table 5 cont.

No. hex	Restart-ind.	Clear-ind.	Reset-ind.	Diag-nostics	Meaning
AA	–	X	–	–	Number temporarily not accessable
AB	–	X	–	–	User recognition required in the packets "Connection-Request" and "Call-Accepted"
AC	–	X	–	–	Called subscriber has not aggreed upon the facility "Single Packet"
AD	–	X	–	–	Network internal Load-Request received *)
AE	–	X	–	–	Network component error *)
AF	–	X	–	–	Network failure of a virtual connection *)
B0	–	X	–	–	Network internal restart request received *)
B1	–	X	–	–	Erroneous number of called station in the packet »Call-Accepted«
B2	–	X	–	–	Unknown network facilty
B5	–	X	–	–	X.32 dial access not available
B6	–	X	–	–	X.32 dial access not available
B7	–	–	X	–	Reserved
C0	–	X	–	–	X.25 dial access: Service data error
C1	–	X	–	–	X.25 dial access: Service data error
C2	–	X	–	–	X.25 dial access: User data erroneous
C3	–	X	–	–	X.25 dial access: Procedural error
C4	–	X	–	–	X.25 / X.32 dial access: Modem error
C5	–	X	–	–	X.25 / X.32 dial access: Modem error
C8	–	X	–	–	X.25 dial access: successful connection establishment
C9	–	X	–	–	X.25 dial access: dialling procedure running now
FF	X	X	X	X	System error

Notes:

X *The diagnostic indication will be used by the above shown packet.*

- *The diagnostic indication will not be used by the above showed packet.*

PVC *The above showed packet will use this diagnostic indication only with PVC (Permanent Virtual Call).*

X.75 *The diagnostic indication will be used with international connections.*

**)* *Only valid for special network components (concentrator).*

X.25 causes in Reset packet

00 Triggered by DTE
01 Out of operation (virtual connections only)
03 Remote sequence error
05 Local sequence error
07 Temporarily network disturbance
09 Remote station ready (virtual connections only)
0F Network ready (virtual connections only)
11 Incompatible destination

X.25 causes in Clear packet

Coding of the field “cause” in packet “Indicate-Cause”.

00	DTE/CONF	Triggered by the remote DTE/DCE
01	OCC	Remote DCE busy, dialled number busy/engaged
03	INV	Facility requested not valid/supported
05	NC	Temporary disturbance in network
09	DER	Remote DTE doesn´t answer/out of operation
0B	NA	Access not available
0D	NP	No access with this dial number
11	RPE	Remote procedural error, sequence error
13	ERR	Local procedural error, sequence error
19	RNA	Reverse charging not accepted
21	ID	Remote DTE/DCE imcompatible
29	FNA	Incompatible connection request; receipt of single packet not agreed upon

X.25 causes in Restart packet

Coding of the field “Reason for Restart” in the packet “Indicate-Restart”.

01	Local sequence error
03	Temporarily disturbance in the network
07	Network ready

Table 6 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

Table 6 cont.

Coding of the CAPI cause in hexadecimal form.	
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	Layer 1 protocol error
3302	Layer 2 protocol error, i.e. DTE address not correct, TEI not correct
3303	Layer 3 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 table 4)

Diagnostic using the internal Trace

For more sophisticated debugging an internal trace functionality is implemented. This logging mechanism allows to write activities of the ISDN and the serial interface into a wrap around buffer. The type of entries can be selected by a trace mask.

trcmsk – set tracemask

trcmsk *par* Setup the mask to select the type of data to be written into the tracebuffer. **Default**: D channel Layer 1 and 3, DTE interfacelines, DTE-Data in connection-setup and clearing-phase.
The parameter *par* has to be setup in the following way, all bytes have to be entered (**default** 00 00 00 07 00 02 05 00):
par := bl1 bl2 bl3 dl1 dl2 dl3 sl1 app

bl1	reserved
bl2	reserved
bl3	reserved
dl1	D channal layer 1 status **default** 07 bit0: status bit1: C/I codes after change
dl2	D channel LAPD frames: **default** 00 bit1: HDLC frames
dl3	D channel layer 3 messages: **default**: **02** bit1: Messages
sl1	Serial line 1; i.e. first V.24 port; **default**: **05** bit0: control lines after change bit2: data bytes while connection control (call phase)
app	reserved (00)

trcdln – length of trace entry

trcdln *xx* set trace buffer entries to a maximum length of xx. (**default**: **256**)

trcon – start trace write

trcon set trace to active regarding to tracemask

trcoff – stop trace write

trcoff set trace to OFF independent of tracemask

trcclr – clear trace buffer

trcclr clear actual tracebuffer contents

trcread – read trace buffer

trcread Output of the complete tracebuffer in hexadecimal chars (ASCII, max. linelength 72 chars).

Every entry ot the trace buffer is output using the following format:
Entry number – Timestamp – Type – Length – Databyes

Entry number Sequence number of entry
Timestamp in units of 10 ms
TypeAndSource Source of traceentry:
bit0–7: type from tracemask
bit8–14: source of traceentry:
0500 : D channel layer 1 (dl1)
0600 : D channel layer 2 (dl2)
0700 : D channel layer 3 (dl3)
0900 : Serial line (sl1)
bit15: 0xxx : incoming event (from ISDN line)
8xxx : outgoing event (to ISDN line)
"FFFF" : Reset for firmware
Length Length of following data bytes
Databytes Data bytes; continued lines are indicated by an ">".

Coding of trace data bytes dependent of *TypeAndSource:*

0501/8501: D channel layer 1 status
0 : deactivated
1 : activation pending
2 : activated
3 : deactivation pending

0502/8502: D channel layer 1 C/I code
1c : Power up
00 : Deactivate request
08 : Slip detected
0c : Disconnected
18 : Error indication
10 : Level detected
20 : Activate request downstream
28 : Test indication
2c : Awake test indication
30 : Activate ind priority 8
34 : Activate ind priority 10
3c : Deactivate ind downstream

0702/8702: D channel messages, coding refers to Q.931 and ETS 300102-1. Coding of Message Type see table 7 within D channel layer 3 message – 4th databyte in trace output:

Table 7

Message code (Hex)	Message name
01	ALERTING
02	CALL PROCEEDING
03	PROGRESS
05	SETUP
07	CONNECT
0D	SETUP ACKNOWLEDGE
0F	CONNECT KNOWLEDGE
20	USER INFORMATION
21	SUSPEND REJECT
22	RESUME REJECT
25	SUSPEND
26	RESUME
2D	SUSPEND ACKNOWLEDGE
2E	RESUME ACKNOWLEDGE
45	DISCONNECT
46	RESTART
4D	RELEASE
4E	RESTART ACKNOWLEDGE
5A	RELEASE COMPLETE
60	SEGMENT
6E	NOTIFY
75	STATUS ENQUIRY
79	CONGESTION CONTROL
7B	INFORMATION
7D	STATUS

0602/8602: D channel LAP-D frames, coding refers to Q.921

0901/8901: Serial line control line change:
bit0 : 1 = DSR is ON
bit1 : 1 = DCD is ON
bit2 : 1 = CTS is ON
bit3 : 1 = RING is ON
bit4 : 1 = RTS is ON
bit5 : 1 = DTR is ON

Call logging

Within the trace module functionality the logging of ISDN connection attempts – successful or not – can be selected (**default**).
The buffer is build as a wrap around buffer, if full the oldest entries will be deleted.
The maximum number of entries is about 80.

Every entry is formatted in the following way:
EntryNo, dw(timestamp), **int(TypeandSource)**, int(Length), **Date**, **Time**, int(Appl), **int(Service)**, **Duration**, int(State), **Cause**, **ChargingInfo, ISDN-No.**

For detailled information about the Disconnect cause refer to chapter ISDN causes.
All not highlighted information are for internal use only.

The following commands can be used:

trcmsk 0000000000000080.
Enable call logging

trcread
Readout all available logging data

trcclr
Clear logging data

Examples:

Reset
00000 0000000002 FFFF
Outgoing Call, normal clearing:
00001 0000013349 **8A80** 002F **98/06/16 14:48** 80 **02 00:00:01** 00 **349F 0000 291**
Outgoing Call busy:
00002 0000020676 **8A80** 002F **98/06/16 14:49** 80 **02 00:00:04** FF **3491 0000 500**
Incoming Call, normal clearing:
00003 0000020875 **0A80** 002F **98/06/16 14:59** 80 **02 00:00:06** 03 **349F 0000 270**

Diagnostic using V90 chipset status report

For sophisticated diagnostic and debugging of analogue connections using the V90 option the following command is available.

!#UD – Last Call Status Report

!#UD is an action command requesting reporting of logged operation events. It does not take parameters and must be the last command in the command line.
The modem logs aspects of their operation for each call, and saves these results until cleared by one of the following events:

1. Power off
2. Hard reset (en)
3. Soft reset = ATZ or AT&F
4. AT!D or ATD# command issued
5. Automatic answer (e.g., set register !S0>0 and ring detected)

Data Call State Model

For purposes of this command, there are four data call states, and associated status issues:

- Call Setup
  - Calling DCE: get dial tone, generate dial digits, detect call progress signals.
  - Answering DCE: detect ringing, detect CallerID, etc.
- Negotiation
  - V.25 calling tone/answer tone exchanges
  - V.8 or V.8bis call function negotiations
  - V-series modem carrier detection and training
  - Modem-to-modem protocols (e.g., V.42, V.42bis).
- Data Transfer
  - Bit-error rates, for each direction
  - Rate renegotiation
  - Retraining
- Call Termination
  - protocol disconnect signals
  - carrier disconnect signals
  - loss of carrier
  - excessive error rates.

Command Syntax

In response to this command, the modem will report one or more lines of information text as defined below. Information text format conforms to V.250; each line is preceded by a <CR><LF> pair, and terminated by <CR><LF>. (CR and LF characters may be changed by writing new values to the contents of registers S3 and S4, respectively.)
The modem may generate a single line or multiple lines, followed by a standard OK final result code. For example, if call setup failed, only that result is useful. Each information text line is formatted as follows, including one or more key=value pairs:

Command AT!#UD

Response	DIAG <token key=value [[key=value] [key=value]] …>

Defined Values

DIAG	5 hexadecimal characters (44h, 49h, 41h, 47h, 20h)
<	Left angle bracket (less than sign) (3Ch)
token	Unique 32-bit hexadecimal string 2A4D3263(32h, 4h1, 34h, 44h, 33h, 32h, 36h, 33h)
space	space character (20h)
Key	One- or two-digit hexadecimal number (see Key in Table 8)
=	Equal sign (3Dh)
Value	Any string as defined below (Table 8 as appropriate)
>	Right angle bracket (greater than sign) (3Eh)

Unless otherwise noted, all values are hexadecimal numbers. Any numeric values from tables in ITU V.58 are converted to hexadecimal. Multi-digit values are reported MSD first. Leading 0's may be deleted. See examples in Table 17.

callCleared codes from 3.6.4/V.58-1994

callCleared: indicates that the DCE has gone on hook and that the previously existing network connection has been cleared.These value are hex, converted from decimal in V.58. callCleared codes are described in Table 16.

Table 8
AT!#UD Last Call Status Report Format

Key	Value(s)	Definition
0	2 digits	Diagnostic Command Specification revision number, digit.digit
1	Table 9	Call Setup Result code
2	Table 10	Multi-media mode
3	Table 11	DTE-DCE interface mode
4	String	V.8 CM octet string, same format as V.250, in quotes
5	String	V.8 JM octet string, same format as V.250, in quotes
10	0–2F	Received signal power level, in –dBm (0-43)
11	0–1F	Transmit signal power level, in –dBm (e.g., 0–17)
12	0–64	Estimated noise level, in –dBm (e.g., 10–90)
17	0–FFF	Round Trip delay, in units of ms
18	Table 12	V.34 INFO bit map
20	Table 13	Transmit Carrier Negotiation Result
21	Table 13	Receive Carrier Negotiation Result
22	0–1F40	Transmit Carrier symbol rate (0–8 000) in symbol/s
23	0–1F40	Receive Carrier symbol rate (0–8 000) in symbol/s
24	0–FA0	Transmit Carrier frequency (0–4 000) in Hz
25	0–FA0	Receive Carrier frequency (0–4 000) in Hz
26	0–FA00	Initial transmit carrier data rate (0–64 000) in bit/s
27	0–FA00	Initial receive carrier data rate (0–64 000) in bit/s
30	0–FF	Temporary carrier loss event count
31	0–FF	Carrier Rate re-negotiation event count
32	0–FF	Carrier Retrains requested
33	0–FF	Carrier Retrain requests granted
34	0–FA00	Final transmit carrier data rate in bit/s
35	0–FA00	Final receive carrier data rate in bit/s
40	Table 14	Protocol Negotiation Result
41	0–400	Error Control frame size in bytes
42	0–FF	Error control link timeouts in transmission
43	0–FF	Error control link NAKs received
44	Table 15	Compression Negotiation Result
50	0–2	Transmit flow control: 0 = off; 1 = DC1/DC3; 2 = V.24 ckt 106/133
51	0–2	Receive flow control: 0 = off; 1 = DC1/DC3; 2 = V.24 ckt 106/133
52	0–FFFFFFFF	Transmit characters sent from DTE
53	0–FFFFFFFF	Received characters sent to DTE
54	0–FFFF	Transmit characters lost (data overrun errors from DTE)
55	0–FFFF	Received characters lost (data overrun errors to DTE)
56	0–FFFFFFFF	Transmit I- Frame count, if error control protocol running
57	0–FFFFFFFF	Received I-Frame count, if error control protocol running
58	0–FFFF	Transmit I-Frame error count, if error control protocol running
59	0–FFFF	Received I- Frame error count, if error control protocol running
60	Table 16	Termination Cause
61	0–FF	Call Waiting event count.

Table 9
Call Setup Result Codes

Code	Definition
0	No previous call (modem log has been cleared since any previous calls)
1	No dial tone detected
2	Reorder signal detected, network busy
3	Busy signal detected
4	No recognized signal detected (e.g., no signal, or nothing recognizable)
5	Voice detected * if this is a voice modem (e.g., V.253) operating in voice mode (e.g., +FCLASS=8.0)
7	Data Answering signal detected (e.g., V.25 ANS, V.8 ANSam)
8	Data Calling signal detected (e.g., V.25 CT, V.8 CI)
9	Fax Answering signal detected (e.g., T.30 CED, DIS)
A	Fax Calling signal detected (e.g., T.30 CNG)
B	V.8bis signal detected

Table 10
Multimedia Modes

Code	Definition
0	Data Only
1	Fax Only
2	Voice
3	VoiceView(tm)
4	ASVD, V.61
8	DSVD, V.70
9	Video-telephony, H.324
A	Other V.80 call

Table 11
DTE-DCE modes

Code	Definition
0	Async data
1	V.80 transparent synchronous mode
2	V.80 framed synchronous mode

Table 12
V.34 INFO bit report

Bits	Source bits	Definition
31–30	INFO0 bit 20; 0	
20–29	INFOc bits 79–88	
16–19	INFOc bits 26–29 or 35–38 or 44–47 or 53–56 or 62–65 or 71–74	Pre-emphasis field, selected by the symbol rate chosen
12–15	INFOa bits 26–29	
10–11	MP bit 50; 0	
0–9	INFOa bits 40-49	

Table 13
gstnModulationSchemeActive from 3.7.2/V.58

Value	Description
0	V.17 (G3 Fax call)
1	V.21
2	V.22
3	V.22bis
4	V.23 Constant Carrier (1200/75)
8	V.27ter (G3 Fax call)
9	V.29 HD (G3 Fax call)
A	V.32
B	V.32bis
C	V.34
E	V.90
81	K56flex
84	Bell 212A
85	Bell 103

Table 14
errorControl Active from 3.5.2/V.58

Value	Description
0	Disable/none
1	V.42 LAPM
2	V.42 Alternative protocol (MNP™)
80	MNP10™

Table 15
compressionActive from 3.2.2/V.58

Value	Description
0	None
1	V.42bis
80	MNP5™

Table 16
callCleared codes from 3.6.4/V.58-1994

Value	Description	Notes
0	CauseUnidentified	Call setup issues
1	No Previous call	Not in V.58
2	Call is still in progress	Not in V.58
3	Call Waiting signal detected	Not in V.58, only if modem can detect it
4	Delayed	Same as value 2A, CallAttemptsLimitExceeded
19	InactivityTimerExpired	
1F	cct108isOffInhibitsDial	DTR low
20	cct108turnedOff	DTR drop
29	BlacklistedNumber	
2A	CallAttemptsLimitExceeded	Same as "Delayed", see ETS 300 001
2B	ExtensionPhoneOffHook	If extension detection supported
2C	CallSetupFailTimerExpired	e.g., S7 timeout
2D	IncomingCallDetected	If incoming call while sending dial command.
2E	LoopCurrentInterrupted	
2F	NoDialTone	
31	ReorderTone	Fast busy
33	EngagedTone	Busy
34	LongSpaceDisconnect	And if modem program to abort on long space
3C	CarrierLost	Signal Converter
3D	TrainingFailed	
3E	NoModulationinCommon	
3F	RetrainFailed	
40	RetrainAttemptCountExceeded	
41	GstnCleardownReceived	
42	FaxDetected	If this was not a fax call attempt
46	InTestMode	Test
50	AnyKeyAbort	Call Control
51	DteHangupCommand	If ATH was used to terminate the previous call.
52	DteResetCommand	If ATZ was used to terminate the previous call.
5A	FrameReject	Error Control
5B	NoErrorControlEstablished	Error control was required
5C	ProtocolViolation	
5D	n400exceeded	LAPM retransmission Count Timer
5E	NegotiationFailed	
5F	DisconnectFrameReceived	
60	SabmeFrameReceived	
64	LossOfSynchronization	Data Compression

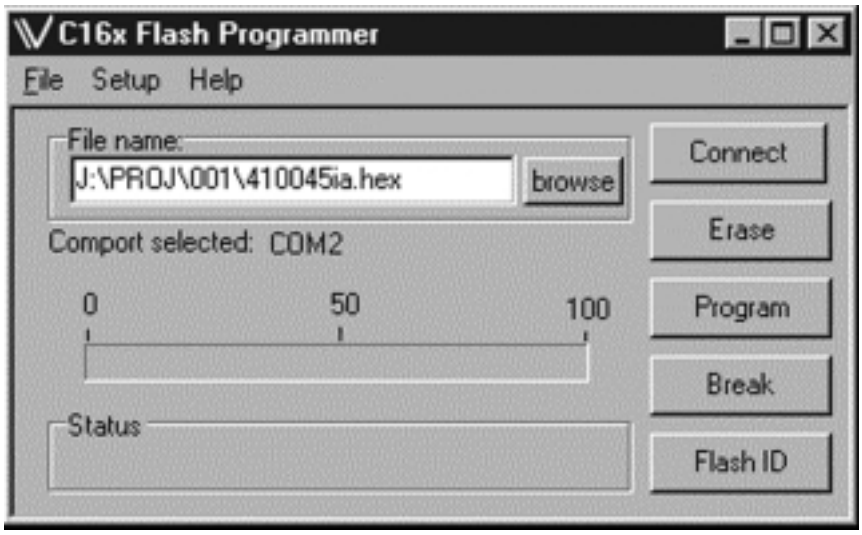
Example Modem Response and Usage

Example: !#UD command response are shown in Table 17

Table 17
Completed Data Call, with some errors and rate retrain during the call

Modem Response line Description	Description
DIAG <2A4D3263 0=09>	This is version 0.9
DIAG <2A4D3263 1=06 2=0 3=0>	Data Answer signal detected; Data only; Character async
DIAG <2A4D3263 5="C14513902A" 6="A145">	V.8 Call Menu indicates: V.8 Joint Menu selects:
DIAG <2A4D3263 10=1F 11=0C 12=52>	Receive level = -31 dBm; transmit level = –12 dBm; noise level = -82 dBm
DIAG <2A4D3263 14=03 15=05 16=10>	Far end echo delay in milliseconds; Far end echo loss in dB; Near end echo loss = 16 dB
DIAG <2A4D3263 20=C 22=780 24=0C80 26=79E0>	Transmitter: V.34 training completed; V.34 carrier frequency = 1920; V.34 symbol rate = 3 200; initial transmit rate is 31 200 bit/s
DIAG <2A4D3263 21=D 25=1F40 27=DAC0>	Receiver: V.90 training completed; V.90 symbol rate = 8 000; initial receive rate is 56 000 bit/s
DIAG <2A4D3263 30=00 31=03 32=01 33=01>	No carrier loss events, 3 carrier rate renegotiations attempted; 1 carrier retrain requested; 1 carrier retrain granted
DIAG <2A4D3263 34=7080 35=CB20>	Final transmit rate is 28 800 bit/s; final receive rate is 52 000 bit/s
DIAG <2A4D3263 40=1 41=100>	LAPM negotiation completed; frame size = 256
DIAG <2A4D3263 42=0 43=0>	No error control timeout or link NAKs
DIAG <2A4D3263 44=1 45=400>	V.42bis data compression used; dictionary size = 1024
DIAG <2A4D3263 50=2 51=2>	Hardware transmit and receive flow control
DIAG <2A4D3263 52=343CC 54=0>	213964 DTE characters transmitted, w/o underrun
DIAG <2A4D3263 53=7230E6 55=47>	7483622 DTE characters received, 71 characters lost due to receive data overrun
DIAG <2A4D3263 56=29D 58=0001>	597 (decimal) frames transmitted, with 1 frame error
DIAG <2A4D3263 58=2A4B 59=0004>	10827 (decimal) frames received, with 4 frame errors
DIAG <2A4D3263 60=51>	Local PC initiated hangup

Software update



Please fulfil the following steps to update the ID-90:

1. Get a new software release for the ID-90 and the C16x Flash Programmer software from your supplier.
2. Copy end expand the file winflash.zip to an empty directory.
3. Run the Setup file located in the new directory and follow the instructions during the set-up.
4. Place the ID-90 software in a directory of your choice (In this example. J:\PROJ\001\410045ia.hex).
5. Start the C16x Flash Programmer program from the start menu.
6. Select the file with the “browse” buttom.
7. Select the COM-port to which the ID-90 is connected, ensure no other application uses the port.
8. Turn OFF the power to ID-90.
9. Set SW4:8 to “ON” position.
10. Turn ON power to ID-90.
11. Click the Connect button. Status field updates.
12. Click the Erase button. Status field updates.
13. Click the Program button, operation will take approx. 2 min.
14. When the program is loaded, exit from the C16x Flash Programmer from the File menu
15. Turn OFF the power to ID-90.
16. Set SW4:8 to “OFF” position.
17. Turn ON power to ID-90 and the new program will start.

Glossary

-law

Coding standard in use in USA for Pulse Code Modulated (PCM) voice-band signals.

A-law

Coding standard in use in Europe for Pulse Code Modulated (PCM) voice-band signals (CCITT G.711).

ASCII

A binary code system which defines 128 characters using different combinations of 1s and 0s. ASCII = American Standard Code for Information Interchange.

Asynchronous Data

Transmission where the characters are transmitted one at a time, starting with a start bit and ending with a stop bit. About 90–95% of all serial data communications are asynchronous.

Baud

The number of data symbols transmitted every second. In local data communications, baud = bit/s. In telecommunication, each symbol may encode several bits.

BC

Bearer Capability, one of the services obtained through a request sent on the D-channel. Bearer services provide data transfer at layers 1, 2, and 3 of the OSI reference model, but do not verify the compatibility at a higher layer of the connected devices.

B-channel

64 kbit/s, can be splitted in (8, 16 and 32 kbits/s), the sub-channels must although be addressed to the same final destination. Example of information carried in the B-channel is:
Voice encoded at 64 kbit/s according to Recommendation G.711;
Data information corresponding to circuit or packet-switching user classes of service at bit rates less than or equal to 64 kbit/s, according to Recommendation X.1;
Videband voice encoded at 64 kbit/s according to Recommendation G.722;
voice encoded at bit rates lower than 64 kbit/s alone, or combined with other digital information streams.

B-ISDN

Broadband-ISDN.

BOD

Bandwidth On Demand.

BRI/BRA

Basic Rate Interface / Basic Rate Access; the interface configuration with two 64 kbit/s information channels 2B and one 16 kbit/s signalling channel D, 2B + 1D, B=Bearer D=Delta.

Buffer
A memory for storing data for a short time, e.g. until the receiver is ready.

Byte
A quantum of data consisting of 8-bits. I.e. an ASCII character which consists of 7–8 data bits can be stored in a byte.

CLIP
Calling Line Identification Presentation.

CLIR
Calling Line Identification Restriction.

Called party number
The number to which the call is made.

Calling party number
The number from which the call is initiated.

CODEC
An assembly comprising an encoder and decoder in the same equipment.

CTS
Clear To Send. Hardware handshake by DCE in response to an RTS signal.

Data Rate
In modems this is often different to the baud rate. For instance the Data Rate of V.32bis is 14 400 bit/s and the baud is 2 400 symbols/second.

DCD
Data Carrier Detect. A signal from the DCE showing that a carrier is present and a line is ready for data transmission.

DCE
Data Communication Equipment. Like a Terminal adapter, Modem, protocol converter or line driver.

DIN rail
Deutsche Industri Norme standard mounting for the installation of equipment in an apparatus cubicle.

D-Channel
16kbit/s at BRA. A D-channel is primarily intended to carry signalling information for circuit switching by the ISDN.
A D-channel uses a layered protocol according to Recommendations I.440, I.441, I.450 and I.451. In particular the link access procedure is frame oriented (Note).
In “Idle” state the D-cannel is transmitting binary 1:s.
The D-cannel bits are not echoed from NT to TE, collision is detected throug the “echo-bit”.

DLCI
Data Link Connection Identifier Layer 2 address field contains SAPI and TEI.

DPSK
Differential Phase Shift Keying. Employed in data rates up to 4800bit/s.

DSR
Data Set Ready. A signal from the DCE used to say that is powered and usable.

DSS1
Digital Subscriber Signalling System No. one.

DTE
Data Terminal Equipment like PC,s, terminals and printers.
Data Compression and Error Correction.

DTMF
Dual Tone Multi-Frequency.

DTR
Data Terminal Ready. A signal from the DTE showing it is powered and usable.

Duplex
Means that the communication is bi-directional. In half duplex, the devices take turns sending and receiving. In full duplex, sending and receiving can take place simultaneously.

EPB
Extended Passive Bus.

EEPROM
Non Volatile Electrically erasable and rewriteable . Used to store profile information and numbers even when the unit has no power.

ET
Exchange Terminal, function in the telephone station with adaption of the switching system in the station.

ETR
ETSI Technical Report.

ETS
European Telecommunication Standard.

ETSI
European Telecommunication Standards Institute.

Euro-ISDN
The ISDN, implemented based on European standards, another name of DSS1.

FSK
Frequency Shift Keying. Used in the lowest data rate standards.

Handshaking
Confirmations and status signals sent between communicating devices in order to check the data stream. There are two general types, hardware (RTS/CTS) and software (XON/XOFF). In hardware handshaking the RS-232/V.24 status lines are used to control data flow, whereas with the software method characters are transmitted to control the data.

Hayes commands
A set of commands for controlling ISDN Terminal adapters and PTT modems. Often refered to as the AT command set. Most adapters/modems support these commands however there are many variations between manufactures.

HDLC
High level Data Link Control.

HLA
High Layer Attribute.

HLC
High Layer Compatibility.

I.430
Basic user-network interface – Layer 1 specification.

IA5
International Alphabet No. 5.

IIFC
Inhibition of Incoming Forwarded Calls.

in-band command
An In-Band Command is a two or multiple character sequence, consisting of a data link escape Character followed by a command character. If the command character is followed by additional characters as defined in the command definition, this is an extended command; otherwise, it is a short command. Except for the escape character, all short or extended command characters are limited to the range of 20h to 7Eh and A0h to FEh.

ISDN
Integrated Services Digital Network.

IWU
InterWorking Unit, adapter working like a gateway between two networks.

LAPD
Link Access Protocol on the D-channel. LAPD provides the interface between an ISDN device and the network termination equipment. LAPD performs functions such as addressing data frames, maintaining their order, error-checking, and flow control. It is a serial, synchronous, full-duplex protocol.

LAPM
Link Access Procedure for Modems. An error correction method used in transmissions via PTT modems.

LED
Light-Emitting Diode. A semi-conductor which emits light when it receives an electrical current. Used as indicators.

LLA
Low Layer Attribute.

LLC
Low Layer Compatibility.

LT
Line Terminal, the telephone station counterpart to the NT1.

ML-PPP
Multi Link Point to Point.

MNP
Microcom Networking Protocol. Several methods for error correction and data compression for PTT modems.

Modem
Acronym of the words modulator and demodulator. Modulates or transforms the signal from computer equipment into electrical signals for transmission. The receiver has a similar modem which retransform the signal, demodulation.

MSN
Multiple Subscriber Number.

N-ISDN
Narrowband-Integrated Service Digital Network.

NT
Network Termination.

NT1
Network termination 1 (NT1), functional group includes functions broadly equivalent to layer 1 (physical) of the OSI reference model.

NT2
Network termination 2 (NT2), This functional group includes functions broadly equivalent to layer 1 and higher layers of the Recommendation X.200 reference model. PABXs, local area networks, and terminal controllers are examples of equipment or combinations of equipment that provide NT2 functions.

Off Hook
Term used to describe when the modem is not connected to a telephone line.

On Hook
Term used to describe when the modem is using the telephone line.

OSI
Open System Interconnection.

Parity
A mathematically-derived bit which is added by the transmitter. The receiver checks the sum of the parity bit to detect any error in transmission.

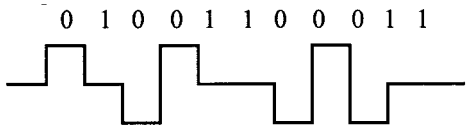
PBX
Private Branch Exchange.

PPP
Point-to-point protocol.
The Point-to-Point Protocol (PPP) provides a standard method for transporting multi-protocol datagrams over point-to-point links. using a HDLC-like framing for PPP encapsulated packets.

PRI/PRA
Primary Rate Interface / Primary Rate Access; the interface configuration with thirty 64 kbit/s information channels and one 64 kbit/s signalling channel.

Primary Acces
30B +1D.

Pseudo ternary code
Coding is performed in such a way that a binary ONE is represented by no line signal, whereas a binary ZERO is represented by a positive or negative pulse. The first binary ZERO following the frame bit-balance bit is of the same polarity as the framing bit-balance bit. Subsequent binary ZEROs must alternate in polarity.
A balance bit is a binary ZERO if the number of binary ZEROs following the previous balance bit is odd. A balance bit is a binary ONE if the number of binary ZEROs following the previous balance bit is even.



PSTN
Public Switched Telephone Network.

QAM
Quadrature Amplitude Modulation. A technique used for data rates up to 9 600.

Rate Adaptation
Also Rate Adaption. The process of converting a user's actual bit rate, which may be 56 Kb/s synchronous or 9.6 Kb/s asynchronous, to the 64 Kb/s speed of the B-channel.

R,S,T,U
Reference points according to the ISDN user-network interface reference configuration model.

RD
Received Data. The Data going from DCE to DTE.

R-Interface
Interface between the TA and TE2.

RJ-45
8-pole modular jack according to ISO Standard 8877.

RTS
Request to Send. Hardware handshake generated by the DTE to determine if the DCE is ready to receive data. Expected response is from the CTS line.

SAPI
Service Access Point Identifier.

Simplex
Unidirectional communication.

S-Interface
2B+D 192kbit/s 4-wire full duplex. The S-interface is capable of handling 8 TE connections to the NT with three concurrent open channels. An “common telephone” uses one channel alone while other packet switched equipment could share channels.
Max wire length 1 km at one TE and max 200 m with 8 TE.

SLIP
Serial line IP, Layer 1 protocol specialized to carry IP-frames.

SPB
Short Passive Bus.

Start bit
Marks the start of a transmission. In asynchronous transmission each character is preceded by a start bit.

Stop bit
One or more stop bits mean that the character has been transmitted. Systems that use two stop bits can cause problems with some modems as the modem will remove the second stop bit to gain better data throughput and then not put it back.

SUB
Subaddressing.

Subaddress
Additional addressing information appended to the ISDN number. ISDN subaddresses are not needed by the network to route the call; instead, they are used by the called terminal equipment (such as a PBX) to direct the call to a specific device (such as an ISDN telephone).

synchronous access mode
Mode of data transmission whereby start-stop framed data octets from V.24 circuit 103 are stripped of the start and stop bits and concatenated for transmission to the remote DCE. The synchronous bitstream from the remote DCE is divided into octets and transmitted to the local DTE on V.24 circuit 104 with start and stop bits inserted. Flow control is available to allow the DTE-DCE octet transfer rate to be matched to that of the line without buffer underrun or overrun. While in this mode, operation may be alternated between a Transparent sub-Mode where no additional bit processing is done by the DCE, and Framed sub-Mode where bit-oriented synchronous protocol framing is performed by the DCE.

synchronous mode
Mode of data transmission whereby the V.24 circuits 103 (TD) and 104 (RD) transfer data synchronously at the modem-to-line interface rate, using V.24 circuits 113 or 114 for transmitter bit timing, and circuit 115 for receiver bit timing. The modem does not buffer data in either, nor does it implement flow control.

T_Interface
Interface between NT1 and NT2.

TA
Terminal adaptor (TA), function that allow a TE2 terminal to be served by an ISDN user-network interface. Adaptors between physical interfaces at reference points R and S or R and T are examples of equipment or combinations of equipment that provide TA functions.

TCM
Trellis Coded Modulation. Used in the highest speed modulations.

TD
Transmitted Data. Data going from DTE to DCE.

TE
Terminal Equipment

TE1
Terminal equipment type 1 (TE1),function with an interface that complies with the ISDN user-network interface Recommendations.

TE2
Terminal equipment type 2 (TE2), function with an interface that complies with interface Recommendations other than the ISDN interface Recommendation (e.g. the X-Series interface Recommendations) or interfaces not included in CCITT Recommendations.

TEI
Terminal Endpoint Identifier, a unique identifier associated with each ISDN device in operation. The TEI is used to differentiate between devices whose control signals are being multiplexed onto the same D-channel. Some devices request a TEI from the network switch upon being connected, while others request permission to use a specific TEI assigned when the ISDN subscription was negotiated.

U-Interface
Two wire interface between the subscriber and the telephone company. The most common transmission technique is Echo Cancellation at 160 kbit/s. The maximum wire length is 6 km.

V110
Support by an ISDN of data terminal equipments with V-Series type interface
Bit rate conversion and control signal handling.

V120
Support by an ISDN of data terminal equipment with V-Series type interface with provision for statistical multiplexing.

V.17
Modulation standard for facsimile applications with rates up to 14 400 bit/s.

V.21
300 bit/s, similar to Bell 103.

V.22
1 200 bit/s full duplex.

V.22bis
2 400 bit/s full duplex.

V.23
1 200/75 bit/s Split speed line.

V.23hdx
1 200 multidrop lease line standard.

V.32
9 600 bit/s full duplex.

V.32bis
14 400 bit/s full duplex.

V34
A modem operating at data signalling rates of up to 33 600 bit/s.

V.42
CCITT's error correction protocol incorporating LAPM. If the V.42 connection fails then MNP will be tried.

V.42bis.
Data Compression technique used by modems rather than MNP5, because it offers better compression on already compressed data.

V42bis
Standard for data compression.

V90

X.25
A packet-switching protocol defined by the CCITT, X.25 is designed to carry high volumes of data with no errors. More specifically, X.25 defines the interface between user data terminal equipment and the packet-switching network equipment.

X.75
Packet-switched signaling systems between public networks providing data transmission services.

FAQ/Hints

Q: I entered DTR- or TX- Hotline mode and now I can't get contact with the unit anymore. What is wrong?

A: *If the settings not are saved its only to set all switches to off (use settings saved in database) and restart the unit. If settings are saved, switch in "AT command mode" or if the remote msn "RMSN" is known then enter the unit remotely and set the configurator to default values with "defa=0" and "defa=1" and "save"*

Q: I set the "PRTY" command to even but the unit does not accept 8E1 (or any other format with parity)?

A: *When setting a another format than 8N1 its important to set all parameters related to the speed and format.*

Example of setting the speed and format 9600 8E1:

- Set the baudrate "AT**BR=4"
- Set the Databits "AT**DBITS=8"
- Set the Parity "AT**PRTY=1"

When using switches its also important to set all parameters related to format and speed.

Q: The format 7N1 doesn't work.

A: *True, using 7 databits without parity is not supported.*

Q: Why is there a problem to communicate with the unit, either directly when in configurator mode or when in configurator mode via a remote connection, when using a different data format than 8N1?

A: *The configurator only supports 8N1.*

OWN COMMENTS

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