

Tornado WebJet 128 External ISDN Terminal Adapter Users Manual



Tornado WebJet 128

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Table of Contents

Introduction	V
1. ISDN, Data Communication, the Internet	1
ISDN	1
Setting up a connection	2
The Function of the Tornado WebJet 128	2
Internet Access	2
Remote LAN Access	3
Data bits, control bit and speed	3
2. Getting started with the Tornado WebJet 128	5
Description of the Tornado WebJet 128 terminal adapter	5
The back of the Terminal Adapter	6
What else do you need	6
Connecting the Terminal Adapter	7
Protocols	7
Establishing a data connection	8
3. AT command set and S registers	11
3.1 The AT command set	11
3.1.1 Command mode and data mode	11
3.1.2 Building a command line	12
3.1.3 AT commands at a glance	13
3.2 S Registers	14
3.2.1 Bitmapped S registers	14
3.2.2 List of S registers	14
3.3 Description of AT commands and S registers	15
3.4 General settings	15
3.5 Dialing and Answering	16
3.5.1 Dialing an ISDN number	16
3.6 Serial port settings	17
3.6.1 Result codes	20
3.6.2 Other messages	21
3.7 Profiles and identification	22
3.8 Other commands	22
4. Sundries	24
4.1 Settings (profiles)	24
4.2 Nonvolatile memory settings	24
5. Special applications	25
5.1 Dial-in configuration	25
5.1.1 Subaddresses	25
5.1.2 MSN numbers	26
5.1.3 Setting protocol priorities	27
5.1.4 Remote Configuration	27
5.2 Firmware uploads	28
Appendix A: Technical Specifications	29
Appendix B: Allied Data Technologies Bulletin Board & Website	30
Appendix C: RS232C Connector	31
Appendix D: Call Clearing Causes	32
Appendix E: ASCII Table	35
Appendix F: Suggested further reading	37
Index	38
Figure 1:	Possible ISDN Configuration
Figure 2:	Access to an On-line Service
Figure 3:	Asynchronous Format
Figure 4:	Tornado WebJet 128: Top
Figure 5:	Tornado WebJet 128: Back
Figure 6:	Outline of Tornado WebJet 128 Protocols
Figure 7:	Set Protocol
Figure 8:	DB9F-RS232C connector

Introduction

The Tornado WebJet 128 (Terminal Adapter) connects two computers across more remote distances through ISDN, the digital telephone line. Data may be retrieved from or sent to the other computer. Connections to the Internet or to an external database are also possible this way. Internet or database information may be read and downloaded if necessary.

This manual doesn't describe all steps necessary in data communication. It so happens that a number of actions is dependent on the communication program used.

The manual is specifically meant to outline the use of the Tornado WebJet 128.

The Windows drivers installation procedure is described in the Installation Manual, which also covers the configuration program.

Who should read this manual?

Both starting and experienced users can find the information they need in this manual. First of all, chapter 1 should prove interesting to the former. It covers general information on data communication and the use of the Terminal Adapter. The alphabetical description of the commands and the S registers (Chapter: AT command set and S registers) can be used as reference by both types of users.

How is the manual set up?

The first chapter examines data communication in general. The second chapter describes the Tornado WebJet 128, the installation and bringing into use of the Terminal Adapter. Chapters 3 and 4 explain the commands and the S registers. Lastly, chapter 5 sums up the Tornado WebJet 128's specific possibilities.

The appendices contain background information on a number of aspects, such as technical specifications and the ASCII table.

We wish you good luck with your Tornado WebJet 128!

1. ISDN, Data Communication, the Internet

This chapter starts off with a brief explanation of ISDN and the function of the Tornado WebJet 128. After that, the concept of Data Communication is described.

ISDN

The introduction of ISDN (Integrated Services Digital Network) has made it possible to send information in a digital format. This helps improve speed and reliability. ISDN was set up to integrate the existing speech, data and telex telephone networks into one network. Apart from this integration, a separate signaling net was added to speed up connection. Establishing a connection through the PSTN network (telephone net) by modem took about 15 seconds; this has been reduced to just 2 or 3 seconds by using a terminal adapter through the ISDN network.

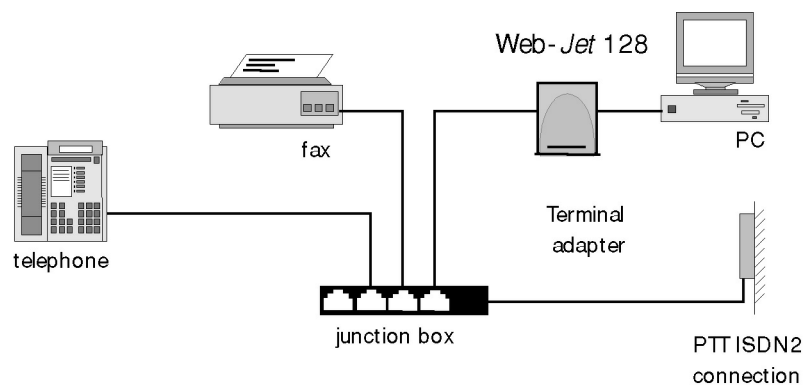


Figure 1: Possible ISDN Configuration

In ISDN, only one connection is needed for communication devices like faxes, telephones and terminal adapters. An ISDN device only responds to an incoming call if the call is actually destined for it. For instance, if a call is made by a terminal adapter, only a terminal adapter will respond; the fax and telephone will not. This is possible because information is sent along about the kind of telecommunication service. This means a beeping fax on the line is a thing of the past.

With an ISDN2 or BRI (Basic Rate Interface) connection, you have two so-called B channels (64 Kbps) and a D channel (16 Kbps) at your disposal. Both the B channels are data channels, whereas the D channel gives access to the signaling net and is used to make a connection. It is possible to connect eight ISDN devices to an ISDN2 connection, with a maximum total cable length of 200 meters between devices and ISDN2 connection.

Setting up a connection

Setting up a data connection through the ISDN network is almost the same as doing so by modem. Once a protocol has been selected, a number can be dialed using the ATD command. The Tornado WebJet 128 will now establish a connection through the D channel. If the same protocol is selected on both sides, a data connection is set up through one B or possibly both the B channels.

The Function of the Tornado WebJet 128

Computers can exchange information, for example by floppy disk, by connecting two RS232 ports or through a network. When the Tornado WebJet 128 is used, information is exchanged through the RS232 port and the ISDN network. In a direct connection between two serial ports, it is only possible to bridge a limited distance (approx. 15 meters). The ISDN network is used to cross greater distances. It is an existing infrastructure which can be used to establish worldwide connections. The ISDN network is digital which means data may be sent directly from the serial port by means of a protocol.

The Tornado WebJet 128 holds a number of standard protocols for exchanging data. In most cases, PPP (Point to Point Protocol) is used to gain Internet access through an Internet Provider. The V.110 or V.120 protocols are used to contact BBSs.

Internet Access

There are three common ways to gain Internet access through ISDN:

- *PPP or multilink PPP
- *V.120 with serial port speed adjustment
- *V.110 without serial port speed adjustment

The mode you use is dependent on the access facilities of the Internet Service Provider (ISP) or Point Of Presence (POP) (see Figure 2).

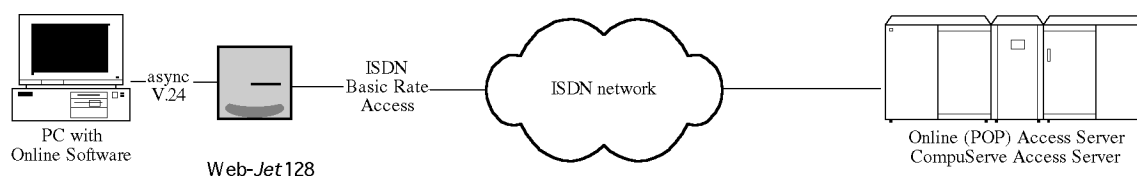


Figure 2: Access to an On-line Service

Internet Configuration

You can only gain ISDN access to the Internet if you have a contract with an Internet Service Provider (ISP) who works with ISDN access. You will need the following information from your ISP to configure the Tornado WebJet 128:

- *ISDN access number (to be entered into the PC program)
- *The protocol used, for instance PPP (command: AT&O7), which has to be configured in the Tornado WebJet 128
- *Access protocol (which has to be entered into the PC system software or the Internet software), usually PPP

You may need additional information to configure the Internet access software, like TCP/IP address, user name, password, etc. For more information, consult the software manual and contact your ISP.

Remote LAN Access

In order to gain remote access to a LAN through ISDN, it is necessary for you to apply the protocol used by the ISDN router on the LAN. Contact the system administrator.

Data bits, control bit and speed

The RS232 standard describes how serial information is processed (passed on). In a computer, bits are processed concurrently (parallel). These bits are passed on one by one through the serial port. In order to make sure the receiving end can interpret these data bits correctly, some extra bits are sent along.

These are: one start bit or control bit (parity bit for error detection) and one or two stop bits. Together they form a frame or character.

The most commonly used frame for standard asynchronous communication is 8N1:

(1 start bit + 8 data bits + 1 stop bit)

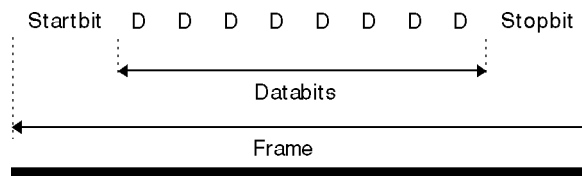


Figure 3: Asynchronous Format

Apart from the frame (character), the speed (baud rate) has to be set. Speed is expressed in terms of Bits per Second (bps) or baud.

Possible port speeds are: 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps

If data bits, control bits and speed are set at the computer end, the Tornado WebJet 128 will adapt automatically as soon as an AT command is sent.

Attention! Check whether the computer's serial port is fit for 115200 bps.

Getting started with the Tornado WebJet 128

In this chapter, a description of the terminal adapter is followed by a discussion of the installation procedure. Lastly, setting up a step-by-step connection is gone into by giving some examples.

Description of the Tornado WebJet 128 terminal adapter

The top of the terminal adapter shows four LEDs. Three of them reflect the status of the ISDN connection and the serial port. The fourth one indicates whether there is power on the Tornado WebJet 128.



Figure 4: Tornado WebJet 128: Top

Meaning of the LEDs from left to right:

DATA	B1	B2	PWR
Serial data transfer/ DTR status	Channel B1	Channel B2	Line power

The Data LED also reflects the DTR status. When DTR is active, the LED is on. When there is data transfer on the serial port, the LED will blink.

The back of the Terminal Adapter

The connections are found at the back of the terminal adapter.

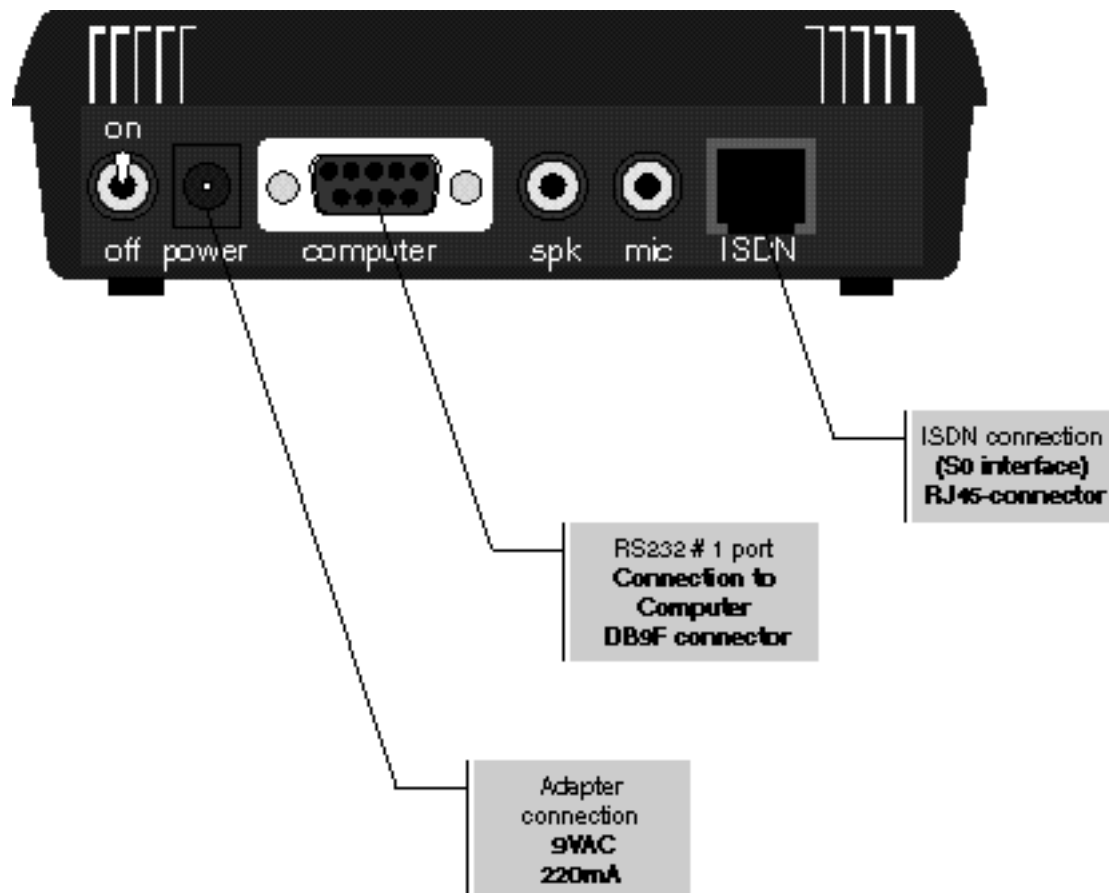


Figure 5: Tornado WebJet 128: Back

What else do you need

Apart from the terminal adapter, you need:

1. an ISDN connection
2. a computer or terminal with a serial port
3. a communication program
4. the ISDN number and other data (speed, parity, etc.) of the database you wish to contact
5. a serial cable and ISDN cable
6. an electrical outlet

Connecting the Terminal Adapter

1. Connect the serial ports of the terminal adapter and the computer.
2. Take the ISDN cable and click the RJ45 connector into the terminal adapter (S0 connection).
3. Plug the Tornado WebJet 128 Power adapter into the electrical outlet.
4. Plug the Power adapter connector into the power connection at the back of the Tornado WebJet 128. The green power LED is now on.
5. After it has been switched on, the terminal adapter will perform an extensive self-test. This will take a few seconds.

Protocols

The Tornado WebJet 128 can work with different protocols. A connection to another Terminal Adapter (TA) cannot be established unless both are set to use the same protocol. For this reason, it is important to verify which protocol is supported by the TA called to.

The ATi5 command is used to retrieve an outline of the protocols supported. The Tornado WebJet 128 will give the following response:

Figure 6: Outline of Tornado WebJet 128 Protocols

ati5				
Tornado WebJet 128 V0.7, September 1998				
Service	Channel	Bearer	Typ/max rate	Protocols
7 asyn PPP	B	data	115.2/230.4	PPP conversion asyn-sync
8 asyn transp	B	data	57.6/ 57.6	V.14
9 asyn transp	B	data	19.2/ 38.4	V.110 asyn
10 asyn transp	B	data	115.2/230.4	V.120 asyn
13 asyn transp	2B	data	230.4/230.4	V.120 asyn, MLP
16 GCI-speech	B1,B2	voice	230.4	
18 GCI-data	B1,B2	data	230.4	any
27 asyn transp	B1,B2	data	115.2/230.4	ML PPP RFC1990 asyn-sync
28 asyn transp	B1,B2	data	115.2/230.4	TRANSPARENT asyn-sync
Remote control.				
OK				

The above list is an example. It is possible that your Tornado WebJet 128 will produce another outline due to software changes.

A protocol is selected by using the **AT&O<n>** command. To select the corresponding protocol, the number found in the left column has to be entered for <n>. For example:

AT&O7 PPP is the protocol selected

The factory setting is V.120 (&O10).

The **AT&V** command is used to display current settings. It can be used to check if the correct protocol has been selected.

For example:

Set Protocol

```
at&v
DTE channel 10 (Asynchronous V.120) parameters:
E1 Q0 V1 W0 X4 \Q3 %C0
&C1 &D2 &K3 &M0 &O10 &Q0 &S0 &Y0
S000:000 S001:000 S002:043 S003:013 S004:010 S005:008 S007:060
S012:050 S025:000 S030:000 S039:003 S048:007 S095:000
S110:010 S111:008 S112:000 S113:025 S114:115 S116:000 S117:000
S119:000 S120:000 S121:253 S122:254 S123:000 S124:001 S126:000
S131:000 S133:080 S153:000 S154:000 S161:000
```

OK

When the Tornado WebJet 128 is used in Windows, it isn't necessary to select protocols by using the AT commands. Selecting the correct driver will do, the setting will be done automatically.

Establishing a data connection

In this section we shall discuss the actions needed to establish a data connection step by step. The communication software will be dealt with broadly. The fact of the matter is that each package has its own command structure.

1. Start the communication program.
 2. Make sure the software addresses the serial port to which the terminal adapter is connected.
 3. Select communication speed (baud rate), the number of data bits and parity. For example: 115200 bps, 8 bits, no parity.
 4. Make sure the program is in 'terminal mode', so that keyed-in characters are sent to the terminal adapter. The terminal adapter in its turn will echo the characters to screen.
 5. Then type: **AT** <Enter>
The screen will show: **AT**
 6. If the characters appear on screen twice, the echo in the communication program has to be switched off.
 7. Select the protocol to be used. For instance, select V.120 to connect to a BBS.
Type: **AT&O10**<Enter>
The screen will show: **OK**
 8. Select a telephone number by using the **ATD** command.
For instance, type: ATD0181 698399 (Allied Data BBS).
- a. If a connection has been established, the screen will show one or two of the following messages:
- | | |
|--------------------|---|
| CONNECT | : Connection |
| CONNECT/ARQ | : Error-correcting connection |
| CONNECT 2400 | : Connection, 2400 bps |
| CONNECT 2400/ARQ | : Error-correcting connection, 2400 bps |
| CONNECT 115200 | : Connection, 115200 bps |
| CONNECT 115200/ARQ | : Error-correcting connection, 115200 bps |
| CARRIER 64000 | : Line speed is 64000 bps |
| PROTOCOL: V120 | : V.120 protocol |
| PROTOCOL: PPP | : PPP protocol |

A B channel LED will be on to indicate that a data connection has been established.

b. If the connection fails, one of the following messages will appear:

ERROR	You have made a typing error.
NO DIALTONE	The terminal adapter is not -- or not properly -- connected to the ISDN connection (S0). For this reason, it isn't possible to call. Check to see if the modem is connected to the ISDN net.
BUSY	The number you have dialed is busy.
NO CARRIER	The number you have called doesn't support the selected protocol. Another explanation is that there is no terminal adapter present at the number you

9. Break the connection. There are three ways to do this:

- a. Order the BBS to break the connection.
- b. Use the command provided by your communication program.
- c. Order the modem to break the connection.

Here's how to do this:

Wait for 1 second

Type:

The screen shows:

Then type:

The screen shows:

+++

OK

ATH <Enter>

NO CARRIER

3. AT command set and S registers

3.1 The AT command set

This chapter discusses the terminal adapter commands. Most terminal adapters and communication programs use the AT command set. In order to support new equipment like terminal adapters with AT commands as well, manufacturers have added commands of their own to the AT command set. This means we can no longer speak of a standard. A distinction is drawn between the 'Standard AT' and the 'Extended AT' command set.

A number of reasons can be thought of to explain the command differences. Owing to deviating test requirements, some specific commands or settings are prohibited in some countries. There are also differences in American and European transmission standards (Bell as distinct from ITU, Euro-ISDN).

The terminal adapters understand both the Standard and the Extended AT command set. In addition, a number of separate commands have been included.

In the first section of this chapter, the command mode and data mode concepts are explained. Next, the command line structure is discussed. This is followed by a list of AT commands and S registers, after which each command and register is explained individually.

The description of the commands and register settings are grouped per subject:

- * General settings
- * Dialing and answering
- * Dialing an ISDN number
- * 3.6 Serial port settings
- * 3.7 Profiles and identification
- * Other commands

3.1.1 Command mode and data mode

The terminal adapter has two modes:

1. Command mode

In this mode the terminal adapter executes commands that are keyed in at the terminal. The terminal adapter is in command mode when it isn't on-line, or in a data connection, when it is set to command mode by way of the escape sequence.

2. Data mode

The terminal adapter is transparent, which means the information exchanged through both the terminal adapters remains unchanged. In a data connection, the terminal adapter normally is in data mode. If the terminal adapter is to execute a command, this can only be achieved from command mode. The terminal adapter can be switched to command mode during a connection by using the escape sequence.

Escape sequence: wait for 1 second
 type: +++
 'OK' appears after 1 second

The terminal adapter is now in command mode.

The terminal adapter can be switched back to data mode through ATO.

3.1.2 Building a command line

A command line opens with the letters AT, derived from the English word **AT**tention. The letters **AT** should both be either upper-case or lower-case. The command line is followed by <ENTER>. A command line may contain one or more commands. A command line has an 80-character limit.

NB The terminal adapter memorizes the last command line. It can be repeated by typing: **A** / (without <ENTER>). Commands may be space-separated for sake of clarity. Spaces are included in the command line character count.

Sometimes a command is followed by a parameter (number). If the number is 0, it may be left out. For example: **ATE0** corresponds to **ATE**.

The Terminal Adapter recognizes the terminal baud rate and parity from the initial letters AT in the command line. The Terminal Adapter gears itself to it. Automatically recognized speeds are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps.

The recognized data formats are: 7-bits or 8-bits characters with even, odd, or no parity bit and 1 stop bit.

3.1.3 AT commands at a glance

The Terminal Adapter responds to the commands listed below. After this, a detailed description stating the accompanying parameters is given.

A Answer an incoming call	16
D Dial a number..	16
E Echo.....	18
H Receiver on/off the hook	16
I Identification and internal test	22
O Data mode, or PAD.	15
P No function in ISDN	16
Q Result codes	18
T No function in ISDN	16
V Result code format	18
W Speed indication in CONNECT	19
X Dial and busy tone message and detection selection.	19
Z Software reset using stored settings.	22
&C Carrier Detect signal (CD, 109) behavior.	19
&D DTR (108) behavior.	19
&F Software reset using factory settings	22
&K Flow control	20
&M Communication mode	15
&O Select active protocol	15
&Q Communication mode	15
&S DSR (107) behavior during asynchronous mode	20
&V Show settings	22
&W Store current settings	22
&Y Select standard settings at startup	22
\S Show settings	22
Error! No index entries found.	
#CH Default DTE channel	22
#PASSRC Set Remote Control Password	28
#REMNBR Set Remote Control number	27
#RM Ring mode	23
#V Show list of available protocol names	22
#Z Software reset using stored settings	22

3.2 S Registers

A number of terminal adapter settings have to be done by means of S registers.

A number of registers have one meaning (function). Other registers have several functions and are called bitmapped registers. In these registers, settings or commands are done at bit level.

The following section explains what bitmapped means.

A detailed description of the commands including the accompanying parameters can be found from section 3.4 onward.

3.2.1 Bitmapped S registers

In bitmapped S registers, a function is switched on or off per bit. '1' means the bit is on or 'set' ; '0' means the bit is off or 'reset'..

These bits from the binary system represent a decimal value. Bit 7=128, 6=64, 5=32, 4=16, 3=8, 2=4, 1=2 en 0=1. If you add the decimal value of the bits that are '1' , the result is the value that has to be set in the register.

3.2.2 List of S registers

Register: Description:

<i>S000</i>	<i>Number of ringing signals for auto answer.</i>	<i>.16</i>
<i>S001</i>	<i>Number of non-replied ringing signals</i>	<i>.16</i>
<i>S002</i>	<i>Escape code character</i>	<i>.17</i>
<i>S003</i>	<i>Carriage return character <cr></i>	<i>.17</i>
<i>S004</i>	<i>Line feed character <lf></i>	<i>.17</i>
<i>S005</i>	<i>Backspace character <bs></i>	<i>.17</i>
<i>S006</i>	<i>No function in ISDN</i>	<i>.16</i>
<i>S007</i>	<i>Connection delay.</i>	<i>.16</i>
<i>S008</i>	<i>No function in ISDN</i>	<i>.16</i>
<i>S025</i>	<i>DTR hysteresis.</i>	<i>.17</i>
<i>S039</i>	<i>Flow control</i>	<i>.17</i>
<i>S095</i>	<i>Protocol and connection messages.</i>	<i>.17</i>
<i>S110</i>	<i>Active protocol</i>	<i>.15</i>
<i>S111</i>	<i>protocol service</i>	<i>.15</i>
<i>S112</i>	<i>Detailed call messages.</i>	<i>.17</i>
<i>S114</i>	<i>Serial asynchronous speed and asynchronous clock selection</i>	<i>.18</i>
<i>S117</i>	<i>Timer number of RING messages.</i>	<i>.18</i>
<i>S121</i>	<i>Action following &F command</i>	<i>.22</i>
<i>S122</i>	<i>Action following Z command</i>	<i>.22</i>
<i>S123</i>	<i>&D commando</i>	<i>.18</i>
<i>S124</i>	<i>Auto baud detection AT.</i>	<i>.18</i>

3.3 Description of AT commands and S registers

In the following sections, meaning and contents of AT commands and S registers are discussed. A great number of S registers have specific technical meanings. It is therefore not advisable to change an S register setting if you are not sure of the consequences.

The **Value** column indicates the values to be set.

The **Def.** column gives the default value for that command.

3.4 General settings

The commands listed below can be applied to change the Terminal Adapter general settings.

Syntax	Value	Def.	Meaning
S110	1..255	10	Active protocol
S111	1..255	cnf	Protocol service 1 : Voice service 2 : Data modem service 3 : Raw data service 4 : Group 3 fax service 5 : V.14 7 : PAD service 8 : V.120 service 10 : Synchronous relay service
O			Switch to Data mode
&M &M0 &M1 &M2	0..2	cnf	Communication mode Asynchronous Synchronous Synchronous, select DTR
&O &O7 &O8 &O9 &O10 &O13 &O16 &O18 &O27	1..255	10	Select active protocol PPP, 1 x B V.14, 1 x B V.110, 1 x B V.120, 1 x B Multi Link V.120, 2 x B GCI-speech, 2 x B GCI-data, 2 x B Multi Link PPP, 2 x B
&Q &Q0 &Q1, &Q4 &Q2 &Q5	0..6	cnf	Communication mode Asynchronous Synchronous Synchronous, select DTR Asynchronous, error-corrected

3.5 Dialing and Answering

Commands and settings to establish (or reply to) a connection, and break it.

Syntax	Value	Def.	Meaning	Type
S0	0..255	0 / 1	Nombre de sonneries avant réponse automatique 0: réponse automatique désactivée >0: réponse automatique activée	
S1	0..255		Nombre de sonneries avant décrochage	
S6			Sans fonction avec RNIS (composition aveugle)	
S7	0..255	60	Délai avant connexion (secondes)	
S8			Sans fonction avec RNIS (caractère pause)	
A			Répond à un appel entrant	
D	call string		Dial a number	
H	0..1	0	Receiver on/off the hook	
H0			Break connection	
H1			No function in ISDN	
P			No function in ISDN (choose pulse	
T			No function in ISDN (choose tone)	

Also refer to: &D (DTR behavior), X (show result of code selection and data detection), W (return messages), S95 (return messages), S112 (detailed indications).

3.5.1 Dialing an ISDN number

When dialing an ISDN number, the D command is followed by the number and, if necessary, a subaddress (preceded by an asterisk '*'). The dial command looks like this: **ATD**isdn_nb*sub_addr : : dte_channel_id
in which: **isdn_nb*sub_addr** is an ISDN number, followed, if necessary, by a subaddress.
dte_channel_id is the protocol number used. If this field is blank, the active protocol is used.

Examples:

ATD69855044	dials number 69855044
ATD69855044*5	dials number 69855044 and passes on subaddress 5
ATD69855044::10	dials number 69855044 and uses the V.120 protocol

3.6 Serial port settings

The commands listed below are used to set the serial port.

Syntax	Value	Def.	Meaning
S2	0..255	43	Escape code character '+' £ 127 : ASCII code of set value > 127 : +++ recognition disabled
S3	0..127	13	Line feed character <lf>
S4	0..127	10	Backspace character <bs>
S5	0..127	8	DTR hysteresis (in 1/100 seconds)
S25	0..255	0	Hystérésis DTR (en 1/100 secondes, ou en secondes si synchrone)
S39	0..4	3	Flow control 0 : No flow control 3 : RTS-CTS flow control (hardware) 4 : XON-XOFF flow control (software)
S95	0..255	0	Protocol and connection messages 1 : gives serial port speed, not line speed in CARRIER message 2 : add / ARQ in an error-correcting connection 4 : CARRIER message on 8 : PROTOCOL message on 16 : not in use 32 : not in use 64 : not in use
S112	0..255	0	Detailed call messages Bit-oriented command: 1 (bit 0) : RING message format 0 : standard AT format (RING) 1 : extended format (RING:) 2 (bit 1) : extended messages 0 : short 1 : long 8 (bit 3) : AT indications 0 : AT standard 1 : AT extended (RING message with number of caller, NO CARRIER with cause of message) 128 (bit 7) : additional services 0 : additional services message off 1 : additional services message (ALERT:) on Les autres bits sont réservés (val. par déf. 0)
S114	0..255	115	Serial asynchronous speed and asynchronous clock selection 75 : 75 bps 3 : 300 bps 12 of 1 : 1200 bps 24 of 2 : 2400 bps 48 of 4 : 4800 bps 72 of 7 : 7200 bps 96 of 9 : 9600 bps 14 of 144 : 14400 bps

Syntax	Value	Def.	Meaning
			19 of 192 : 19200 bps 28 : 28800 bps 38 : 38400 bps 57 : 57600 bps 115 : 115200 bps 255 : select internal clock (asynchronous clock information is derived from the S0 bus) 0 : select external clock (asynchronous clock information originates from serial port)
S117	0..255	4	Timer of number of RING messages (seconds) Time between two consecutive RING messages in incoming calls 0 : single RING message
S123	0..1	0	&D command 0 : use &D for DTR action 1 : ignore &D setting, force &D0
S124	0..255	1	Auto baud detection AT 0 : Auto baud off 1 : Autobaud on
E E0 E1	0..1	1	Echo Echo off Echo on
Q Q0 Q1	0..1	0	Result codes Result codes on Result codes off
V V0 V1	0..1	1	Result code format Numeric Verbal
W W0 W1 W2	0..2	2	Speed indication in CONNECT CONNECT with serial port speed No extended protocol messages when S95=0 CONNECT with serial port speed Also CARRIER and PROTOCOL messages when S95=0 CONNECT with line speed No extended protocol messages when S95=0
X X0 X1 X2 X3 X4	0..4	4	Dial and busy tone message and detection selection Busy tone and dial tone detection off, only CONNECT message Busy tone detection off, dial tone detection off CONNECT xxx message Busy tone detection off, dial tone detection on CONNECT xxx message Busy tone detection on, dial tone detection off CONNECT xxx message Busy tone detection on, dial tone detection on, CONNECT xxx message
&C &C0 &C1 &C2	0..2	1	Carrier Detect signal (CD, 109) behavior Synchronous mode: CD follows 'carrier' status Asynchronous mode: CD always on CD follows 'carrier' CD on when on-line, off when 'carrier' is gone, back on in rest
&D &D0 &D1	0..3	2	Comportement DTR (108) (voir aussi S123) &Q0, &Q5: DTR has no effect &Q1: DTR going off: break connection &Q2: DTR going off: break connection DTR off and on: start dialing &Q0, &Q1, &Q5: DTR going off: to command mode &Q2: DTR going off: break connection DTR off and on: start dialing

Syntax	Value	Def.	Meaning
&D2			&Q0, &Q5 : DTR going off: break connection &Q1: DTR going off: break connection, DTR has to be on within time in S25 for a CONNECT. No Auto Answer if DTR is not on. &Q2 : DTR going off: break connection DTR off and on: start dialing
&D3			No Auto Answer if DTR is not on. &Q0, &Q1, &Q5: DTR going off: reset the Terminal Adapter &Q2: DTR going off: reset the TTA DTR off and on: start dialing.
&K &K0 &K1, &K3 &K2, &K4	0..4	3	Flow control No flow control RTS-CTS flow control (hardware XON-XOFF flow control (software
&R &R0 &R1	0..1	0	VERTALING? VERTALING? VERTALING?
&S &S0 &S1, &S2	0..2	0	DSR (107) behavior during asynchronous mode (&Q0, &Q5 DSR is always on DSR is on when on-line, off in rest

See also: &Q (communication mode)

3.6.1 Result codes

Result codes are sent to the serial port by the Terminal Adapter once a command line has been processed. The codes may be given as text or as numbers. This is selected by using the ATV command.

Numeric	Text	Meaning	Type
0	OK	Command executed	
1	CONNECT	Connection established	
1	CONNECT/ARQ	Error-correcting connection	
2	RING	Incoming call	
3	NO CARRIER	Connection broken	
4	ERROR	Error message	
5	CONNECT 1200	Connected at 1200 bps	
5	CONNECT 1200/ARQ	Ditto, including error correction	
6	NO DIALTONE	ISDN network does not respond	
7	BUSY	The number dialed is busy	
10	CONNECT 2400	Connected at 2400 bps	
10	CONNECT 2400/ARQ	Ditto, including error correction	
11	CONNECT 4800	Connected at 4800 bps	
11	CONNECT 4800/ARQ	Ditto, including error correction	
12	CONNECT 9600	Connected at 9600 bps	
12	CONNECT 9600/ARQ	Ditto, including error correction	
14	CONNECT 19200	Connected at 19200 bps	
14	CONNECT 19200/ARQ	Ditto, including error correction	
18	CONNECT 57600	Connected at 57600 bps	
18	CONNECT 57600/ARQ	Ditto, including error correction	
28	CONNECT 38400	Connected at 38400 bps	
28	CONNECT 38400/ARQ	Ditto, including error correction	
99	CONNECT 115200	Connected at 115200 bps	
99	CONNECT 115200/ARQ	Ditto, including error correction	

3.6.2 Other messages

3.6.2.1 Extended (protocol) messages

The messages listed below are given at protocol negotiations. The messages are switched on through S95.

Chiffre	Texte	Signification
40	CARRIER 300	Line speed 300 bps
46	CARRIER 1200	Line speed 1200 bps
47	CARRIER 2400	Line speed 2400 bps
48	CARRIER 4800	Line speed 4800 bps
50	CARRIER 9600	Line speed 9600 bps
54	CARRIER 19200	Line speed 19200 bps
56	CARRIER 38400	Line speed 38400 bps
57	CARRIER 56000	Line speed 56000 bps
58	CARRIER 57600	Line speed 57600 bps
59	CARRIER 64000	Line speed 64000 bps
60	CARRIER 115200	Line speed 115200 bps
66	COMPRESSION: CLASS 5	MNP-5 data compression
67	COMPRESSION: V42BIS	V.42bis data compression
69	COMPRESSION: NONE	No data compression
70	PROTOCOL: NONE	No communication protocol
77	PROTOCOL: LAP-M	V.42 error correction
80	PROTOCOL: ALT	MNP-4 error correction
83	PROTOCOL: V120	V.120 protocol
87	PROTOCOL: V14	V.14 speed adjustment protocol

3.7 Profiles and identification

Syntax	Value	Def.	Meaning
S121	0..255	0	Action following &F command 0 : standard (retrieve factory settings and restart) 255 : do not undertake action other value: set the selected protocol
S122	0..255	254	Action following Z command 0 : standard (retrieve settings from memory and restart) 255 : do not undertake action other value: set the selected protocol
I I0 I1 I2 I3 I4 I5 I8	0..4		Identification and internal test Hardware Identification ROM checksum ROM checksum test Product name and software revision Manufacturer Outline of possible protocols Euro-ISDN software version
&V			Show settings
\S			Show settings
Z			Software reset using stored settings Caution! This command completely resets the Tornado WebJet 128, all possible connections will be broken See also S122
&F			Software reset using factory settings See also S121
&W			Store current settings (Stored Profile)
&Y	0, 255	0	Select standard settings at startup 255: use factory settings
#V			Show list of available parameters in sort form
#Z			Software reset using stored settings

3.8 0.0 Other commands

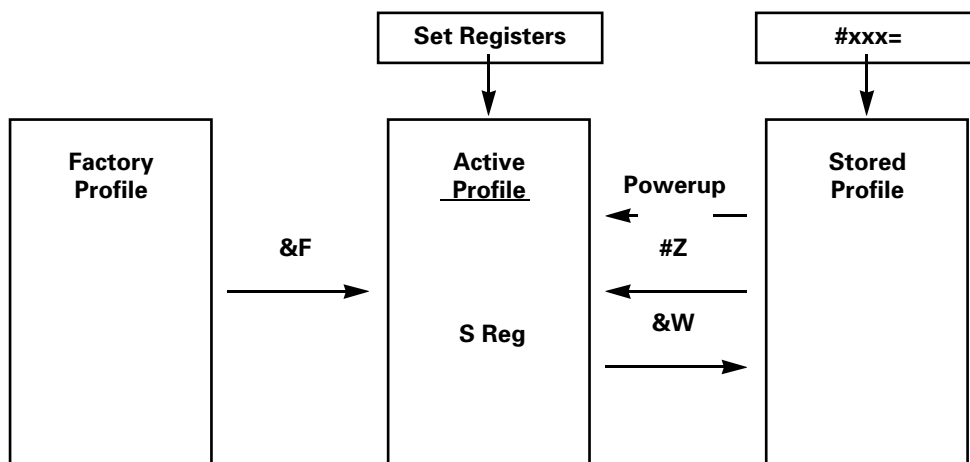
Syntax	Value	Def.	Meaning
#CH=	Refer to &O	10	Default protocol DTE channel port
#RM= #RM=0 #RM=1	0..1	1	Ring mode Selection by subnumber or MSN Pass on call to active protocol

4. Sundries

4.1 Settings (profiles)

The Tornado WebJet 128 has three settings:

1. Active Profile. Current settings used with the selected protocol.
2. Stored Profile. In this profile a number of settings (parameters and configurations) are stored in a nonvolatile memory (E2PROM). Changes with regard to the factory settings are often set and stored to memory with AT&W. The stored profile is loaded into the active profile on power-up and following the AT#Z command.
3. Factory Profile (Settings) is fixed in the terminal adapter memory (Flash EPROM). These settings are loaded into the active profile with the AT&F command.



4.2 Nonvolatile memory settings

The Terminal Adapter settings are stored in a nonvolatile memory (E2PROM). The commands used are:

- * Save register content with AT&W
- * Save automatic dial-up number (40 characters maximum) with AT&Z
- * MSN number function with AT#NBV120="<number> (always close with #Z).

The above commands store the settings in the nonvolatile memory, but do not become automatically active. They are activated by using the AT#Z command or by switching the Tornado WebJet 128 off and on again.

AT&F activates the factory settings.

5. Special applications

5.1 Dial-in configuration

The Tornado WebJet 128 can be set to link a telephone number to a protocol. When this number is called, the Tornado WebJet 128 will establish a connection according to the set protocol. When this number is called, this call is always passed on to the analog connection.

Subaddresses and Multiple Subscriber Numbers can be linked to protocols with special AT commands.

The general construction of AT commands is described in chapter 3.3.

5.1.1 Subaddresses

Subaddressing consists of adding an extra character (with a maximum of four characters) to the telephone number. These extra characters are passed on to the ISDN device that is called. When using the Tornado WebJet 128, a caller can, for instance, select a protocol (i.e. remote) by giving a subaddress. Conversely, the Tornado WebJet 128 can dial a number and add extra characters to the telephone number. This is limited to ISDN equipment.

The subaddress service is not a standard feature and needs to be applied for.

The table given below gives the AT commands for the various types needed to change the default link between protocol and subaddress. The link is switched off by not entering a value (empty string).

Syntax	Value	Def.	Meaning
#SAPPP	4 digits	7	PPP conv. asyn-sync
#SAV120	4 digits	10	V.120 asyn
#SA2B	4 digits	13	V.120 asyn, MLP (2B)
#SARTEL	4 digits	16	GCI-speech
#SARDATA	4 digits	18	GCI-data
#SAMPPP	4 digits	27	Multilink PPP RFC1990

Examples of subaddresses:

a. programming:

AT#SAPPP=28<ENTER>

AT#Z<ENTER>

Calling your own ISDN number and adding 28 as extra numbers will make the terminal adapter create a PPP connection.

b. switching off link:

AT#SAPPP=<ENTER>

AT#Z<ENTER>

The link between the PPP protocol and the subnumber is disconnected.

c. dialing:

A subaddress is added to the dial command as follows:

ATD010-1234567*28<ENTER>

Dial 010-1234567 and add subaddress 28.

5.1.2 MSN numbers

Having an ISDN connection, it is possible for you to apply to your provider (e.g. PTT Telecom) for more than one telephone number (with a maximum of eight). As a standard, you will be given one main number and an option on three extra numbers. Further numbers need to be applied for. This service is sometimes referred to as MSN (Multiple Subscriber Numbers). The AT commands given below can be used to link protocols to the last four digits of the MSN number. It is vital that the default link between the protocol in question and a subnumber is switched off.

Syntax	Value	Def.	Meaning	Port	Type
#NBPPP	4 digits	""	PPP conv. asyn-sync	Serial 1	
#NBV120	4 digits	""	V.120 asyn	Serial 1	
#NB2B	4 digits	""	V.120 asyn, MLP (2B)	Serial 1	
#NBRTTEL	4 digits	""	GCI-speech	Serial 1	
#NBRDATA	4 digits	""	GCI-data	Serial 1	
#INBMPPP	4 digits	""	Multilink PPP RFC1990	Serial 1	
#NBPTS1	4 digits	""	a/b - 1 (analog)	Analog 1	
#NBPTS2	4 digits	""	a/b - 2 (analog)	Analog 2	

Examples of MSN number programming:

1. **AT#NBV120=15<ENTER>**
AT#SAV120=<ENTER>
AT#Z<ENTER>

When calling the TTA 128, your own ISDN number ending in the numbers 15, the terminal adapter establishes a V.120 connection. It is vital that the default link between the V.120 protocol and the subnumber is switched off.

2. **AT#NBMPPP=1<ENTER>**
AT#Z<ENTER>

When calling the TTA128, your own ISDN number ending in the number 1, an ML-PPP connection is established. Make sure that the default link between the ML-PPP protocol and the subnumber is switched off.

5.1.3 Setting protocol priorities

The previous sections described how protocols can be linked to subaddresses and MSN numbers. It is possible to link different protocols to one and the same subaddress or MSN number. The terminal adapter will select the protocol with the highest priority. The following commands can be used to set the protocol priorities. Value 0 denotes the highest priority, value 254 denotes the lowest priority. Priority 255 means the protocol in question doesn't respond to an incoming call. If each protocol has a priority setting of 255, the caller will get a busy message because the TA doesn't respond.

Syntax	Value	Def.	Meaning	Port	Type
#IPPPP	4 digits	28	PPP conv. asyn-sync	Serial 1	
#IPV120	4 digits	16	V.120 asyn	Serial 1	
#IP2B	4 digits	40	V.120 asyn, MLP (2B)	Serial 1	
#IPRTTEL	4 digits	40	GCI-speech	Serial 1	
#IPDATA	4 digits	40	GCI-data	Serial 1	
#IPMPPP	4 digits	28	Multilink PPP RFC1990	Serial 1	
#IPPOTS1	4 digits	30	a/b - 1 (analog)	Analog 1	
#IPPOTS2	4 digits	30	a/b - 2 (analog)	Analog 2	

Example of setting the protocol priorities:

```
AT#IPV120=15<ENTER>
AT#IPPPP=18<ENTER>
AT#Z<ENTER>
```

The V.120 protocol is given a higher priority than the PPP protocol.

5.1.4 Remote Configuration

The Tornado WebJet 128 can be set remotely, through the ISDN network. An administrator with a Tornado WebJet 128 or a TTA128 and terminal software can configure a Tornado WebJet 128 located elsewhere remotely by calling the Tornado WebJet 128 using the V.120/RC protocol. In this protocol, the data path isn't passed on to the serial port but is sent back to the ISDN connection.

The remote Tornado WebJet 128 can be set in the same way as is done through the serial port by using « **AT** » commands.

In a receiving call, the Remote Control V.120 protocol is selected by an ISDN number and/or an ISDN subaddress (4 digits). This number and/or subaddress has to be set in advance.

The telephone number with the command:

AT#remnsrc=<telephone no. on which the settings are done>#Z <ENTER>

A remote configuration call can be secured in two ways:

- * Caller Number Identification (CLI). This is used to check whether the caller's telephone number matches the programmed telephone number
- * Password Check. This access code is sent through UUI (User to User Information) and compared to a set code. The code is programmed as follows:

AT#passrc="<password>#Z<ENTER>

CLI example:

In this example your own telephone number is: 010-1234567 and the number of the person allowed to do Remote Configuration is: 020-7654321.

Command's:

* AT#RM=0	;	Ring mode off
* AT#IPRC=254	;	Set priority
* AT#NBRC=0101234567	;	Program own number
* AT#SARC=	;	Switch off subaddress
* AT#REMNBR=0207654321	;	Number of Tornado WebJet 128 to be set
* AT#Z	;	Save settings

AT#REMNBR=remote msn no. of the person allowed to do Remote Configuration.

5.2 Firmware uploads

The Tornado WebJet 128 can be fitted with new software. This may be necessary occasionally when the protocols have been extended or supplemented.

The Tornado WebJet 128 is loaded with new software through the serial port. To be able to do this, the software wanted has to be collected first, for instance from a Bulletin Board or through the Internet. See Appendix B for more information. A configuration tool or DOS utilities are needed to load the new software. The necessary upload software and accompanying installation instructions will be sent along with future software.

Appendix A: Technical Specifications

General:

- * Protocols:
 - * V.110, 1 x B channel synchronous/asynchronous
 - * V.120, 1 x B channel, 64000 bps
 - * V.120, 2 x B channel, 128000 bps
 - * PPP, 1 x B channel, 64000 bps
 - * Multi Link PPP (ML-PPP), 2 x B channel, 128000 bps (BACP)
- * Data Compression: V.42bis, MNP5
- * Command sets:
 - * Extended 'AT' command set
- * Remote Control through ISDN for remote configuration and tests
- * Software upgrade through serial port (115.2 kbps).
- * V.25b signaling (HDLC)
- * ISDN-2 interface: S0 interface according to CCITT I.430 (1TR3)
- * S0 connection: RJ45 socket
- * Permanent memory for settings. Settings may differ per protocol!
- * Auto baud detection from 300 to 115200 bps
- * Full interspeeder with XON/XOFF and/or RTS/CTS flow control
- * Self-test after power-up
- * Data format:
 - * Data: 7 or 8 bits
 - * Parity: odd, even, space, mark or none
 - * Stop bits: 1 or 2

Connections:

- * Serial port:
 - * DB9F (V.24, RS232) connector
- * Supply by Power Adapter 9VAC, 220mA
- * LEDs for serial port and ISDN status indication

Environmental conditions:

* tension	:	9VAC, 220mA -15% / +10%
* temperature	use	-5• C to +60• C
	storage	-20• C to +70• C
* humidity	use	10% to 75%
	storage	5% to 95%
* dimensions	:	130x195x37. (w x l x h)
* weight	:	approx. 10.5 oz (adapter excluded)
* electrical safety	:	Class II

Appendix B: Allied Data Technologies Bulletin Board & Website

In order to support the users of its data communication equipment, Allied Data Technologies has set up a Bulletin Board System (BBS): the ALLIED DATA BBS. Here you can place and/or find messages, questions and other information.

Allied Data also provides an overview of special offers on communication programs, utilities, etc. Recent drivers for various software packages can also be found at Allied Data.

The Allied Data BBS can be accessed 24 hours a day at:

+31 (0)181 698 399

Line settings: 8 data bits, no parity and 1 stop bit with ASCII or ANSI screen emulation.

This number is accessible both through ISDN (V.120) and by modem (V.34).

Site Web de Allied Data Technologies :

<http://www.allieddata.nl>

Appendix C: RS232C Connector

CCITT	DBF9F Pin	Richting	Naam	Verkort
109	1	OUT	Data carrier detect	(CD)
104	2	OUT	Received Data	(RxD)
103	3	IN	Transmitted Data	(TxD)
108	4	IN	Data terminal ready	(DTR)
	5	-	Signal Ground	(GND)
107	6	OUT	Data set ready	(DSR)
105	7	IN	Request to send	(RTS)
106	8	OUT	Clear to send	(CTS)
125	9	OUT	Ring Indicator	(RI)

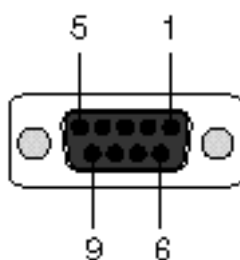


Figure 6: DB9F-RS232C connector

Appendix D: Call Clearing Causes

The table given below outlines the causes for connection failures. This information is given, for instance, by way of the CLEARED: message. The messages are given in hexadecimal and decimal values respectively. The below messages are for an ETSI ISDN network (Euro-ISDN).

Messages with a value larger than 80 hexadecimal are generated by the Tornado WebJet 128.

The messages are produced by the Tornado WebJet 128 by using the **AT*D/<number>** command at dial-up.

Hex	Decimal	Description
01	1	unallocated (unassigned) number
02	2	no route to specified transit network
03	3	no route to destination
06	6	channel unacceptable
07	7	call awarded and being delivered in an established channel
10	16	normal call clearing
11	17	user busy
12	18	no user responding
13	19	no answer from user (user alerted)
15	21	call rejected
16	22	number changed
1A	26	non-selected user clearing
1B	27	destination out of order
1C	28	invalid number format
1D	29	facility rejected
1E	30	response to STATUS ENQUIRY
1F	31	normal, unspecified
22	34	no circuit/channel available
26	38	network out of order
29	41	temporary failure
2A	42	switching equipment congestion
2B	43	access information discarded
2C	44	requested circuit/channel not available
2F	47	resources unavailable, unspecified
31	49	quality of service unavailable
32	50	requested facility not subscribed
39	57	bearer capability not authorised
3A	58	bearer capability not presently available
3F	63	service or option not available, unspecified
41	65	bearer capability not implemented
42	66	channel type not implemented
45	69	requested facility not implemented
46	70	only restricted digital information bearer capability is available
4F	79	service or option not implemented, unspecified
51	81	invalid call reference value
52	82	identified channel does not exist
53	83	a suspended call exists, but this call identity does not
54	84	call identity in use
55	85	no call suspended
56	86	call having the requested call identity has been cleared
58	88	incompatible destination
5B	91	invalid transit network selection
5F	95	invalid message, unspecified
60	96	mandatory information element is missing
61	97	message type non-existent or not implemented
62	98	message not compatible with call state or message type non-existent or not implemented
63	99	information element non-existent or not implemented
64	100	invalid information element contents

Hex	Decimal	Description
65	101	message not compatible with call state
66	102	recovery on timer expired
6F	111	protocol error, unspecified
7F	127	interworking, unspecified
91	145	no signalling data link establishment
A2	162	no line activation
FF	255	call clearing, unspecified

Exemples de messages détaillés.

Examples of extended messages.

We start from a Tornado WebJet 128 which has the following settings:

- * protocol 6 is for voice (S111 is 1).
- * Protocol 11 is for PAD (S111 is 7).
- * S112=35 (maximum information and automatic PAD VC).

AT&O6*D/11

OK:6,0,6

Select protocol 6, dial ISDN number 11.

Direct response that call number 6 on ISDN access number 0 is being established using protocol 6.

PROGRESS:6,0,0,6,1

Message for call no. 6 using protocol 6, channel B1, communication with analog network.

ALERT:6,0,6,1

The device called is ringing: ALERT message.

CONNECTED:6,,0,6,1

First call (6) has been established, channel B1 has been selected.

CLEARED:6,10

Call (6) has been broken off by normal cause (10).

AT*D/69855044*5/"Hello"

While the first connection is being established, a second command follows to dial ISDN number 69855044, subaddress 5 and User Information "Hello".

Note that it isn't necessary to give the &O6 command as this protocol is already active.

OK:6,0,6

Direct response that call number 6 on ISDN access number 0 is being established using protocol 6.

CONNECTED:6,"Welkom",0,1,2

Second call (6) has been established. Channel B2 has been selected. The recipient responded with "Welcome"

AT*H0/6

Break off call no. 6

Appendix E: ASCII Table

Meaning of ASCII codes

NUL	Null, or all zeros	DC1	Device Control 1	SI	Shift In
SOH	Start of Heading	DC2	Device Control 2	SO	Shift Out
STX	Start of Text	DC3	Device Control 3	SYN	Sync.
ETX	End of Text	DC4	Device Control 4	LF	Linefeed
EOT	End of Transm.	CAN	Cancel	FF	Formfeed
ACK	Acknowledge	EM	End of Medium	ENQ	Enquiry
BEL	Bell or Alarm	SUB	Substitute	ESC	Escape
BS	Backspace	FS	File Separator	DLE	Data Link
HT	Horizontal Tab	GS	Group Separator	ESC	Escape
VT	Vertical Tab	RS	Record Separator	S	P Space
CR	Carriage Return	US	Unit Separator	DEL	Delete
NAK	Negative Acknowl.	ETB	End Transm. Block		

CTRL	CODE	DEC	HEX	CODE	DEC	HEX	CODE	DEC	HEX
@	NUL	0	00	+	43	2B	V	86	56
A	SOH	1	01	,	44	2C	W	87	57
B	STX	2	02	-	45	2D	X	88	58
C	ETX	3	03	.	46	2E	Y	89	59
D	EOT	4	04	/	47	F	Z	90	5A
E	ENQ	5	05	0	8	30	[	91	5B
F	ACK	6	06	1	49	31	\	92	5C
G	BEL	7	07	2	50	32	]	93	5D
H	BS	8	08	3	51	33	^	94	5E
I	HT	9	09	4	52	4	_	95	5F
J	LF	10	0A	5	3	35	`	96	60
K	VT	11	0B	6	54	36	a	97	61
L	FF	12	0C	7	55	37	b	98	62
M	CR	13	0D	8	56	38	c	99	63
N	SO	14	0E	9	57	39	d	100	64
O	SI	15	0F	:	58	3A	e	101	65
P	DLE	16	10	;	59	3B	f	102	66
Q	DC1	17	11	<	60	3C	g	103	67
R	DC2	18	12	=	61	3D	h	104	68
S	DC3	19	13	>	62	3E	i	105	69
T	DC4	20	14	?	63	3F	j	106	6A
U	NAK	21	15	@	64	40	k	107	6B
V	SYN	22	16	A	65	41	l	108	6C
W	ETB	23	17	B	66	42	m	109	6D
X	CAN	24	18	C	67	43	n	110	6E
Y	EM	25	19	D	68	44	o	111	6F
Z	SUB	26	1A	E	69	45	p	112	70
[	ESC	27	1B	F	70	46	q	113	71
	FS	28	1C	G	71	47	r	114	72
]	GS	29	1D	H	72	48	s	115	73
	RS	30	1E	I	73	49	t	116	74
-	US	31	1F	J	74	4A	u	117	75
	SP	32	20	K	75	4B	v	118	76
	!	33	21	L	76	4C	w	119	77
	"	34	22	M	77	4D	x	120	78
	#	35	23	N	78	4E	y	121	79
	\$	36	24	O	79	4F	z	122	7A
	%	37	25	P	80	50	{	123	7B
	&	38	26	Q	81	51		124	7C
	'	39	27	R	82	52	}	125	7D
	(	40	28	S	83	53	~	126	7E
	)	41	29	T	84	54	DEL	127	7F
	*	42	2A	U	85	55			

Appendix F: Suggested further reading

A lot of literature has been published on the workings of the Terminal Adapter, ISDN, modems and other facets of data communication. Books, but also computer magazine articles appear on a regular basis. In addition, there are specific data communication magazines. Any good book store should be able to provide more information on the subject. We confine ourselves to mentioning a number of books in this field.

ISDN Implementor's Guide

by Charles K. Summers

ISBN 0-07-069416-8

Standards, protocols, & services

McGraw-Hill

Euro-ISDN

by J.J.C. Salemans

PTT Telecom BV

Necessary and valuable information on the PTT Telecom Euro-ISDN user-network interface

PTT-Telecom

Werken met ISDN

by Mike Sapien, Greg Piedno

ISBN 9051609213

Background information to apply ISDN in actual practice

Sybex

Het nieuwe handboek PC communication

by Henk van Ess

ISBN 90-5160-723-7

A crystal-clear clarification of the modem / Find your own fun databases / E-mail: information treasure trove / the Internet:

Minicruise through Cyberspace

TELEMATICA techniek en praktijk

by M.C. Silva dos Santos,

ISBN 90-72-98302-5

This book deals with a number of technical aspects, worked up for practical use, that come up when using data communication and telephone exchanges.

SCME

Index

A

ASCII Table, 35
asynchronous communication, 3
Asynchronous format, 3
AT command set, 11
AT commands outline, 13
Auto Answer indicator, 5

B

B channels, 1
baud rate, 4
BBS, 2
binary system, 14
bitmapped registers, 14
BRI, Basic Rate Interface, 1
Bulletin Board, 30

C

cable length, 1
Call Clearing Causes, 32
Caller Number Identification, 28
CLI, 28
Command mode, 11
commando mode, 11
configuration program, V
control bit, 3

D

D channel, 1
data mode, 12
Data mode, 12
DB25F connector, 6
DB9F connector, 6
Dial-in configuration, 25

E

E2PROM, 24
escape sequence, 12
Extended AT, 11

F

Firmware uploads, 28
Flash EPROM, 24

G

General settings, 15

I

indicators, 5
installation procedure, V

Internet, 3

Internet Configuration, 3

ISDN, 1

ISDN2, 1

ISP, 2

L

Led, 5

M

Manual

Installation, V

MSN numbers, 26

P

Password, 28

POP, 2

PPP, 2

profiles, 24

protocol priorities, 27

Protocols, 7, 29

provider, 26

PSTN, 1

R

remote access, 3

Remote Configuration, 27

RJ11 connector, 6

RJ45 connector, 7

S

S registers, 11

self-test, 7

Serial port, 7

Specifications, 29

Standard AT, 11

start bit, 3

stop bits, 3

Subaddresses, 25

Suggested further reading, 37

T

TCP/IP address, 3

terminal mode, 9

V

V.110, 2

V.120, 2

W

Website, 30



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