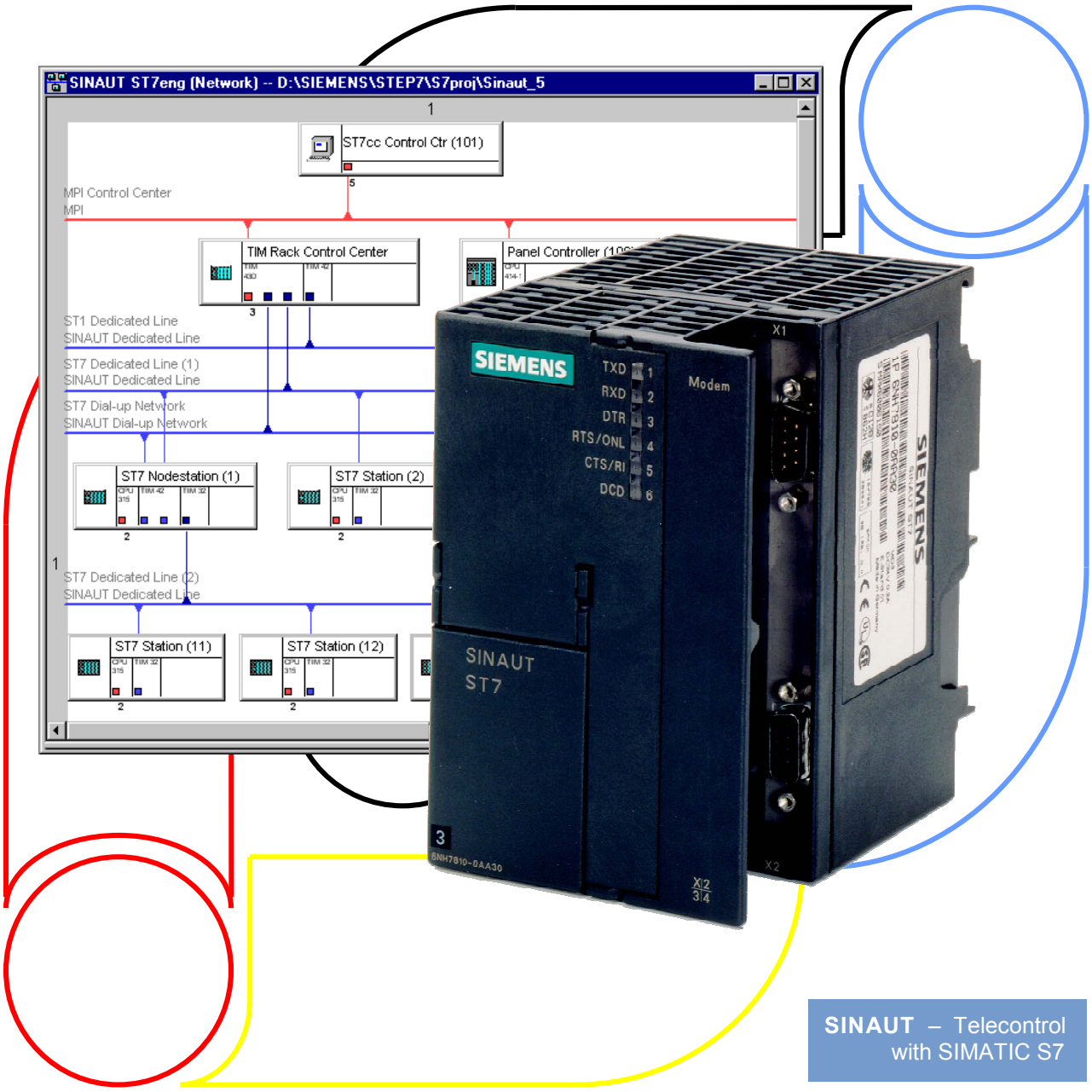
SIEMENS

SINAUT ST7
Digital ISDN Modem MD4

Operating Instructions Edition 07/2002



SINAUT – Telecontrol with SIMATIC S7

SIEMENS

SINAUT ST7

Digital ISDN Modem MD4

Operating Instructions

Edition 07/2002

SINAUT® Documentation

Certified Siemens Quality for Software and Training according to DIN ISO 9001, Reg. No. 2160-01

This documentation was creared with Microsoft Word97 and the documentation utility AutWinDoc.

It is possible that there are operable functions in the device that are not described in this documentation. However, no claims can be made for these functions for new delivery or in cases of servicing.

We have checked the contents of this manual for agreement with the hardware and software described. Deviations, however, cannot be entirely precluded. The information in this manual is reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcome.

Technical data subject to change.

Order No. 6NH7811-0AA42
Printed in the Federal Republic of Germany

Siemens-Aktiengesellschaft.

Preface

Note

This documentation uses the following conventions for pointing out information of special importance:

Note

This symbol draws your attention to information on the product, handling the product, or to a particular part of the documentation.

Important

This symbol draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Notes of Warning

The following notes are used in the documentation for various levels of warning:

Danger

This symbol indicates that death, severe personal injury or substantial property damage **will** result if proper precautions are not taken.

Warning

This symbol indicates that death, severe personal injury or substantial property damage **can** result if proper precautions are not taken.

Caution

This symbol indicates that minor personal injury or property damage **can** result if proper precautions are not taken.

Contents

To
Siemens AG

I&S OCW TI

D-76181 Karlsruhe, Germany

Suggestions

Corrections

Correspondence to:

SINAUT ST7
Digital ISDN Modem MD4
Operating Instructions

Order no.: 6NH7811-0AA42

Edition: 07/2002

If you notice typographical errors in this document please use this form to inform us. We would also be grateful for your suggestions and criticisms.

Sender

Name:

Address of your company/office

Street: _____

ZIP: _____ City: _____

Telephone:
_____ / _____

Fax: _____ / _____

E-mail: _____

Suggestions and/or corrections

Overview

1

1.1 Areas of Application

The MD4 modem (see Fig. 1-1) is a dial-up modem for data transmission via the digital ISDN network. It can also be used as a modem for duplex point-to-point data transmission via an ISDN dedicated line.

It was developed as a component of the SINAUT ST7 station control system but can also be used as a normal ISDN modem independent from this system. Due to its design and its electrical properties the MD4 is suited for use in industrial applications.

Fig. 1-1 SINAUT MD4 Modem

1.2 Main Features

The MD4 modem has the following features:

- SIMATIC S7-300 construction design (see Fig. 1-1)
- Can be mounted on a S7-300 mounting rail or a 35 mm standard rail (using the optional adapter 6NH7760-0AA)
- DC 24V power supply connection, power consumption 100 mA
- RS232 port (9-pin sub-D plug) and RS485 port (9-pin sub-D socket)
- Potential insulation between power supply and RS232/RS485 interface
- Modem can be controlled by AT or V.25bis commands
- Available standard transmission modes (used by SINAUT ST):
  - V.110 1200 bps, duplex
  - V.110 2400 bps, duplex
  - V.110 9600 bps, duplex
  - V.110 19200 bps, duplex
  - X.75 1200 bps, duplex
  - X.75 2400 bps, duplex
  - X.75 9600 bps, duplex
  - X.75 19200 bps, duplex
  - X.75 38400 bps, duplex
- Other transmission modes
  - V.110, duplex - baud rate depends on the connected data terminal (DTE)
  - V.120
  - X.75, duplex - baud rate depends on the connected data terminal (DTE)
  - T.70NL (e.g. T-Online)
- Remote configuration & security callback
- On an ISDN dedicated line the MD4 provides a duplex transmission channel which can be used for a point-to-point connection between two data terminals (DTE).
- Certification for Europe (see section 1.6)

1.3 Compatibility to SINAUT ST1 Modems

In certain operating modes the MD4 modem is compatible to the ISDN modems that are used for SINAUT ST1. This compatibility is ensured in two ways:

1. You can build a new SINAUT ST1 station into an existing network and use the MD4 modem to exchange data with an existing ST1 ISDN modem at the partner.
2. You can use the MD4 modem as a replacement for a defective ST1 ISDN modem.

The following table provides the compatibility matrix of the MD4 modem in connection with the ISDN modems used in the SINAUT ST1 system.

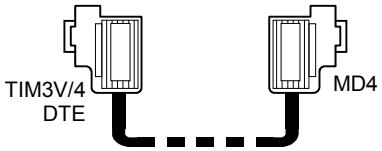
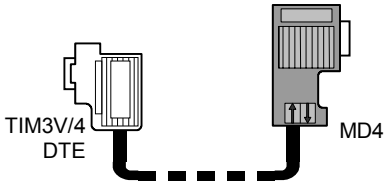
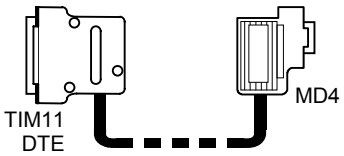
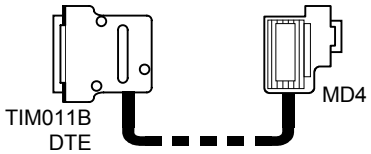
Table 1-1 Compatibility matrix of the MD4 modem and SINAUT ST1 ISDN modems

Operating Modes of the MD4	**SINAUT ST1 ISDN Modem**
	LGM64K
V.110 / 9600 bps	x

1.4 Standard Cables

The following standard cables are available for the RS232 and RS485 interfaces.

Table 1-2 Standard cables for the MD4 modem

Order no.	Description	Diagram
6NH7701-4AL	Cable for connecting the MD4 modem (RS232) with a TIM3V/TIM4 (RS232) or an other terminal (DTE) with an identically configured 9-pin RS232 interface. Cable length 1.5 m	
6NH7701-4DL	Cable for connecting the MD4 modem (RS485) with a TIM3V/TIM4 (RS485) or an other terminal (DTE) with an identically configured 9-pin RS485 interface. Cable length 1.5 m	
6NH1701-7AN	Cable for connecting the MD4 modem (RS232) with a TIM11 (RS232) or an other terminal (DTE) with an identically configured 25-pin RS232 interface (socket) and slide lock. Cable length 2.5 m	
6NH1701-7BK	Cable for connecting the MD4 modem (RS232) with a TIM011B (RS232) or an other terminal (DTE) with an identically configured 25-pin RS232 interface (socket) and screw lock. Cable length 1.0 m	

Tables 2-6 to 2-9 in Chapter 2, *Mounting and Installation*, shows the configuration of the cables listed above.

1.5 Dedicated Line Operation

On an ISDN dedicated line the MD4 provides a duplex transmission channel which can be used for a point-to-point connection between two data terminal devices (DTE).

An ISDN dedicated line is a standard fixed connection of the Deutsche Telekom or other providers which provides a 64 Kbps B channel and features an S_0 interface conforming to the ITU-T recommendation I.430.

To configure a point-to-point connection, note that the two MD4 modems being used for the connection must be set differently. To simplify matters, the differently set modems will be referred to as "Modem A" and "Modem B" in the following. In this scenario "Modem A" (originate) is the active modem which attempts to establish a connection to the other party via the dedicated line. "Modem B" (answer) is the passive, responding modem in this process of establishing a connection.

During the connecting process the modems try to get synchronized to each other using the S_0 protocol. After this has been executed a duplex connection for data transmission is available.

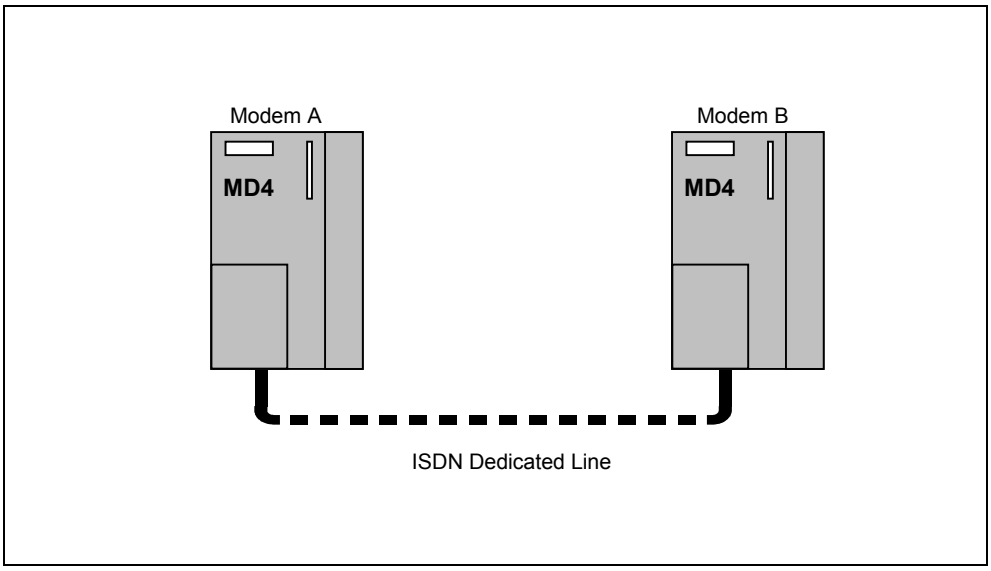


Fig. 1-2 Point-to-point connection between two MD4 modems via an ISDN dedicated line

Details about the settings for "Modem A" or "Modem B" are available in section 2.1.7, *Settings Made on the DIL Switch Accessible from Above*, under the heading *Settings for Dedicated Line Mode*. Additional important information about dedicated line operation is available in section 2.5, *Modem Configuration for Dedicated Line Mode* and section 2.6, *Notes about ISDN Dedicated Lines*.

1.6 Certification and CE Labeling

1.6.1 Certification for Europe

The MD4 is certified throughout Europe for connection to the digital, public ISDN network.

BUNDESAMT FÜR POST UND TELEKOMMUNIKATION
Federal Office For Posts And Telecommunications

EG–BAUMUSTERPRÜFBESCHEINIGUNG
EC TYPE–EXAMINATION CERTIFICATE

Registriernummer (Registration no.): D130324H — **Anzahl der Anlagen: 1** (Number of annexes: 1)

Benannte Stelle (Notified body): Bundesamt für Post und Telekommunikation

Bescheinigungsinhaber (Certificate holder): Blatzheim – Datensysteme
und Kommunikationstechnik
Moltkeplatz 3
D-53173 Bonn

Produktbezeichnung (Designation of product): BM-4/MD4

Produktbeschreibung (Product description): ISDN-Terminaladapter zum Einbau in einen Kommunikationskontroller zur Verwendung an ISDN-Basisanschlüsse S0.

Produkthersteller (Product manufacturer): Blatzheim – Datensysteme
und Kommunikationstechnik
Molteplatz 3
D-53173 Bonn

EG-Vorschriften (EC spezifications): Commision Decision of 18. November 1994 on a Common Technical Regulation for the pan-European Integrated Services Digital Network (ISDN) (94/797/EEC).
(I-CTR 3)

Prüfergebnis (Statement): Das geprüfte Baumuster erfüllt die Anforderungen der oben genannten EG-Vorschriften.
The examinded type meets the requirements of the above mentioned EC spezifications

Hinweis: (Note:) Diese Bescheinigung gilt nur in Verbindung mit den o.g. Anlagen.
This certificate is only applicable in conjunction with the above mentioned annex(es).

Diese Bescheinigung ist erstellt in Übereinstimmung mit der Richtlinie 91/263/EWG des Rates
This certificate is issued in accordance with the Council Directive 91/263/EEC

Saarbrücken, den 18.12.1996
Ort, Ausstellungsdatum: Place, issue Date:

gezeichnet: Heinz Günter Becker
Signed:
(Verantwortlicher der benannten Stelle)
(Manager of notified body)

Bundesamt für Post und Telekommunikation, Talstraße 34–42, D–66119 Saarbrücken, Tel.: +49 6 81 5 98–0, Fax: +49 6 81 5 98–16 00

1.6.2 Notes about CE Labeling

Product Description

Description	Order no.	EMC
MD4	6NH7810-0AA40	**

EC Guidelines EMC 89/336/EEC

The product described above complies with the requirements of the EC Directive 89/336/EEC "Electromagnetic Compatibility" and the Harmonized European Standards (EN) published in this connection.

EC Guidelines TCE 1999/5/EEC

The product described above complies with the requirements of the EC Directive 1999/5/EC "Directive of the European Parliament and Council Governing Radio and Telecommunication Terminal Equipment and the Mutual Recognition of their Conformity".

In accordance with the EC directive described above, the EC conformity declarations are kept available at the following address:

Siemens Aktiengesellschaft
Industrial Solutions and Services
I&S IS 6 E D
P.O. Box 3249
D-91050 Erlangen, Germany

Operating Areas

The product fulfills the following requirements:

Operating environment	Requirement	
	Interference emission	Interference immunity
Equipment in non-protected environment	-	EN 60870-2-1 : 1996
Industry	* EN 55022 (A) : 1998	-
Residential	** EN 55022 (B) : 1998	-

Observe Installation Guidelines

The products comply with the requirements when the product information and the installation guidelines described in the product documentation are observed during installation and operation.

Mounting and Installation

2

2.1 Design of the MD4 Modem

Introduction

This section provides a description of the design of the MD4 modem with its connections, display elements and switches.

2.1.1 Front View of an MD4 with Closed Front Doors

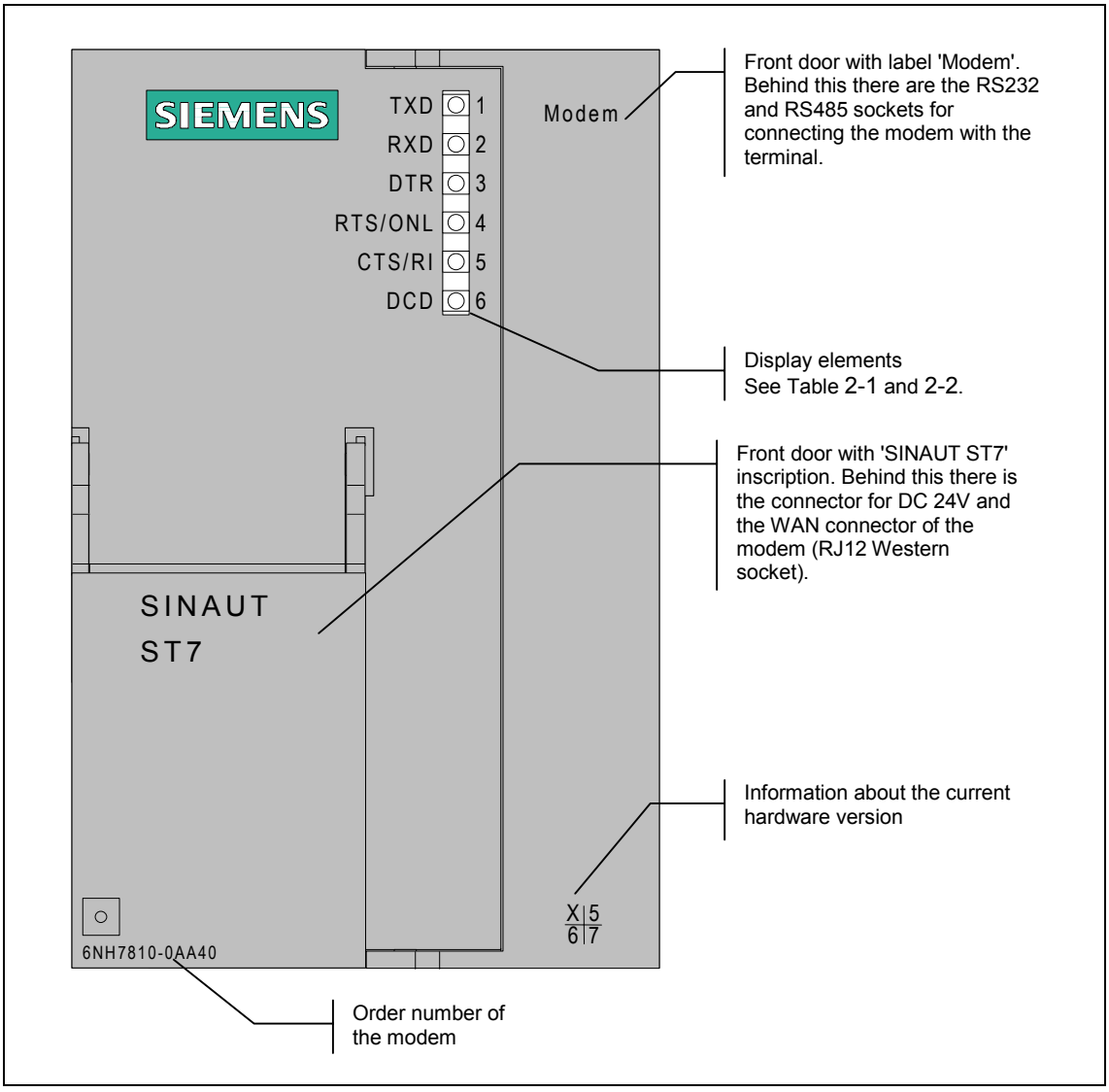


Fig. 2-1 Front view of the MD4 modem with closed front doors

2.1.2 LED Display of the MD4

The following table is a summary of the meaning and the activity of the six LEDs on the front of the modem in the dial-up mode.

Table 2-1 Meaning and activity of the six LEDs on the MD4 front in dial-up mode

LED No.	Inscription	Description
1	TXD	Transmit Data The LED blinks in rhythm with the data flow that is sent to the modem by the terminal via the RS232 or RS485 interface.
2	RXD	Receive Data The LED blinks in rhythm with the data flow that is sent from the modem to the terminal via the RS232 or RS485 interface. The data flow is indicated in the data phase as well as the command phase.
3	DTR	Data Terminal Ready Outgoing call: The LED lights up when the terminal requests a connection to be established and goes out as soon as the terminal wants to disconnect the established connection. If connection is not made, is ended by the other side or disrupted by interference, the terminal recalls the DTR signal as soon as it receives an appropriate message from the modem. Incoming call: The LED lights up when the terminal wants to accept an incoming call. The LED goes out under the same circumstances as for an outgoing call.
4	RTS / ONL	Modem online (ONL) Outgoing call: The LED lights up as soon as the ISDN modem receives the dialing command from the terminal and begins to establish the connection. The LED goes out when the connection is ended (by its own terminal or by the other party) or when interference disrupts the connection. Incoming call: The LED lights up when the terminal signals with DTR that it wants to accept an incoming call. The LED goes out under the same circumstances as for an outgoing call.
5	CTS / RI	Incoming call (RI) The LED lights up with an incoming call.
6	DCD	Connection established The LED lights up as soon as the participating modems have synchronized their connection (reported to terminal with CONNECT). The LED goes out when the connection is ended or disrupted by interference.

The RTS and CTS inscriptions are irrelevant for the MD4.

The following table is a summary of the meaning and the activity of the six LEDs on the front of the modem in the dedicated line mode.

Table 2-2 Meaning and activity of the LEDs on the MD4 front in dedicated line mode

LED No.	Inscription	Description
1	TXD	Transmit Data The LED blinks in rhythm with the data flow that is sent to the modem by the terminal via the RS232 or RS485 interface.
2	RXD	Receive Data The LED blinks in rhythm with the data flow that is sent from the modem to the terminal via the RS232 or RS485 interface.
3	DTR	Data Terminal Ready This LED indicates the signal state of the DTR channel of the data terminal. Due to the factory setting of the MD4, the signal state of the DTR channel in the dedicated line mode has no effect on the modem.
4	RTS / ONL	Modem online (ONL) The modem attempts to establish a connection to the partner modem after power ON, i.e., the two modems attempt to synchronize themselves. As soon as they are synchronized the ONL LED continues to light but the also DCD LED goes on (see below). If there is no synchronization within 15 seconds, the ONL LED goes out briefly and then lights up again to indicate that the modems are attempting to synchronize once again.
5	CTS / RI	-
6	DCD	The LED goes on as soon as the participating modems have synchronized their connection (see also ONL). The LED goes out when the connection has been disrupted by interference.

The RTS, CTS and RI inscriptions are irrelevant for the MD4.

2.1.3 Front View of an MD4 with Removed Front Doors

The following illustration shows a front view of the MD4 modem with the doors removed so that the connectors inside are visible.

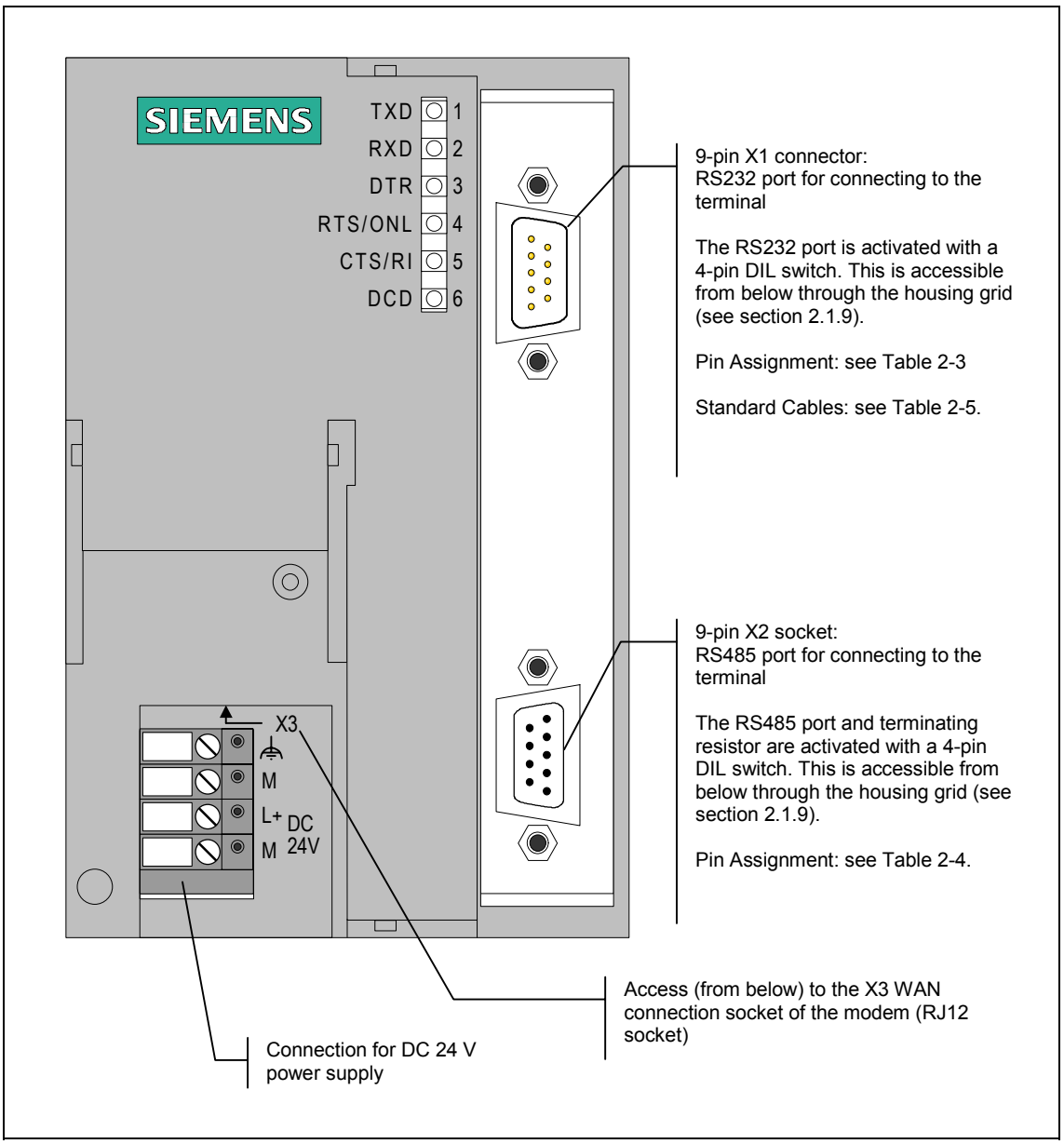


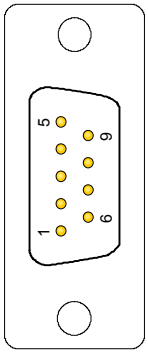
Fig. 2-2 Front view of the MD4 modem with removed front doors

2.1.4 Pin Assignments for the RS232 and RS485 Ports

The X1 connector is a 9-pin Sub-D miniature socket (male). The following table lists the pin assignments. Used as an RS232 interface the pin assignment corresponds to a standard PC port.

The RS232 port is activated with the 4-pin DIL switch which can be accessed from below through the housing grid. The corresponding settings on the DIL switch are described in section 2.1.9.

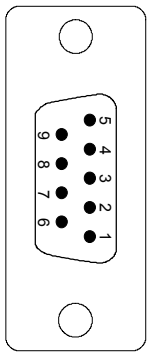
Table 2-3 Pin assignments on X1 RS232 socket

Diagram	Pin No.	Signal name	Signal direction	Comments
	1	DCD	Output	
	2	RXD	Output	
	3	TXD	Input	
	4	DTR	Input	
	5	GND		
	6	DSR	Output	
	7	RTS	Input	
	8	CTS	Output	
	9	RI / T	Output	

The RS485 port is a 9-pin Sub-D miniature socket (female). The following table lists the pin assignments.

The RS485 port and terminating resistor can be activated with a 4-pin DIL switch which can be accessed from below through the housing grid. The corresponding settings on the DIL switch are described in section 2.1.9.

Table 2-4 Pin assignments on the X2 RS485 socket

Diagram	Pin No.	Signal name	Signal direction	Comments
	1			
	2			
	3	Data B	bi-directional	
	4			
	5	M5	-	0 V for bus termination in the plug *)
	6	P5	-	5 V for bus termination in the plug *)
	7			
	8	Data A	bi-directional	
	9			

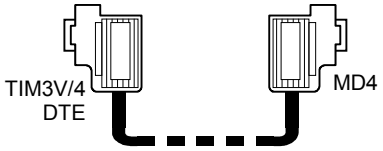
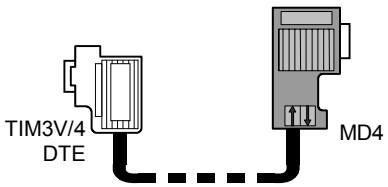
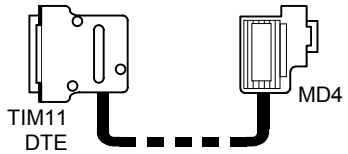
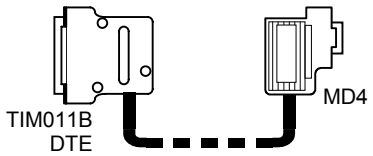
*) It is not recommended to activate the terminating resistor for the RS485 bus in the plug. Use the bus terminating resistor in the modem instead. This can be activated with the 4-pin DIL switch which can be accessed from below. See section 2.1.9.

2.1.5 Standard Cables for the RS232 and RS485 Ports

The X1 9-pin RS232 connector or the X2 9-pin RS485 socket is used to connect a terminal with an appropriate interface, for example, a PC or a TIM transmission module of the SINAUT ST1 or ST7 system.

The following standard cables are available for the X1 or X2 socket.

Table 2-5 Standard cables for the RS232 and RS485 interface

Order no.	Description	Diagram
6NH7701-4AL	Cable for connecting the MD4 modem (RS232) with a TIM3V/TIM4 (RS232) or an other terminal (DTE) with an identically configured 9-pin RS232 interface. Cable length 1.5 m	
6NH7701-4DL	Cable for connecting the MD4 modem (RS485) with a TIM3V/TIM4 (RS485) or an other terminal (DTE) with an identically configured 9-pin RS485 interface. Cable length 1.5 m	
6NH1701-7AN	Cable for connecting the MD4 modem (RS232) with a TIM11 (RS232) or an other terminal (DTE) with an identically configured 25-pin RS232 interface (socket) and slide lock. Cable length 2.5 m	
6NH1701-7BK	Cable for connecting the MD4 modem (RS232) with a TIM011B (RS232) or an other terminal (DTE) with an identically configured 25-pin RS232 interface (socket) and screw lock. Cable length 1.0 m	

The following tables shows you how the cables listed above are configured.

Table 2-6 Configuration of standard cable 6NH7701-4AL

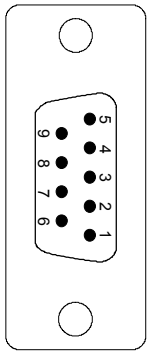
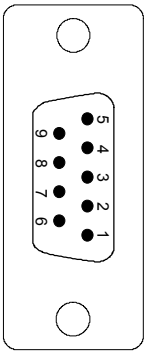
DTE/TIM3V/TIM4 (RS232)	Pin No.	Connection	Pin No.	MD4 Modem, (RS232)
 **Sub-D socket 9-pin**	Housing shell		Housing shell	 **Sub-D socket 9-pin**
	1	DCD	1	
	2	RXD	2	
	3	TXD	3	
	4	DTR	4	
	5	GND	5	
	6	DSR	6	
	7	RTS	7	
	8	CTS	8	
	9	RI / T	9	

Table 2-7 Configuration of standard cable 6NH7701-4DL

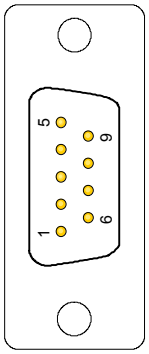
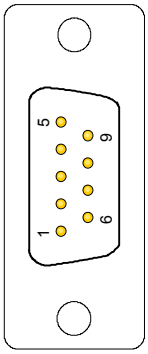
DTE/TIM3V/4TIM (RS485)	Pin No.	Connection	Pin No.	MD4 Modem, (RS485)
 **Sub-D plug 9-pin**	Housing shell		Housing shell	 **Sub-D plug 9-pin**
	1			
	2	Data B	A1 (8)	
	3	Data A	B1 (3)	
	4			
	5			
	6			
	7			
	8			
	9			

Table 2-8 Configuration of standard cable 6NH1701-7AN

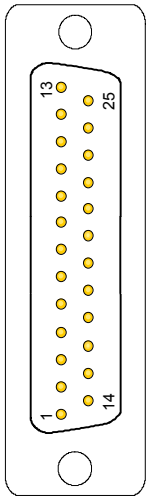
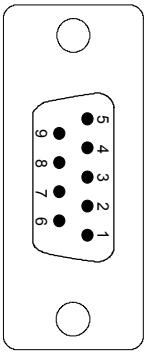
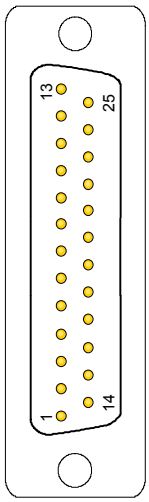
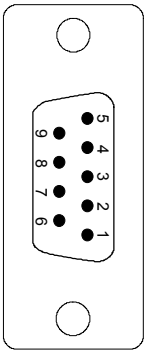
DTE/TIM11 (RS232)	Pin No.	Connection	Pin No.	MD4 Modem, (RS232)
	1	RXD	1	
	3	TXD	2	
	2	DTR	3	
	18	GND	4	
	7	DSR	5	
	6	RTS	6	
	4	CTS	7	
	8	RI / T	8	
	22		9	
Sub-D plug 25-pin				**Sub-D socket 9-pin**

Table 2-9 Configuration of standard cable 6NH1701-7BK

DTE/TIM011B (RS232)	Pin No.	Connection	Pin No.	MD4 Modem, (RS232)
	1	RXD	1	
	3	TXD	2	
	2	DTR	3	
	20	GND	4	
	7	DSR	5	
	6	RTS	6	
	4	CTS	7	
	5	RI / T	8	
	22		9	
Sub-D plug 25-pin				**Sub-D socket 9-pin**

2.1.6 View of the MD4 from Above

The following illustration is the MD4 modem viewed from above. It shows the position of the 4-pin DIL switch accessible from above.

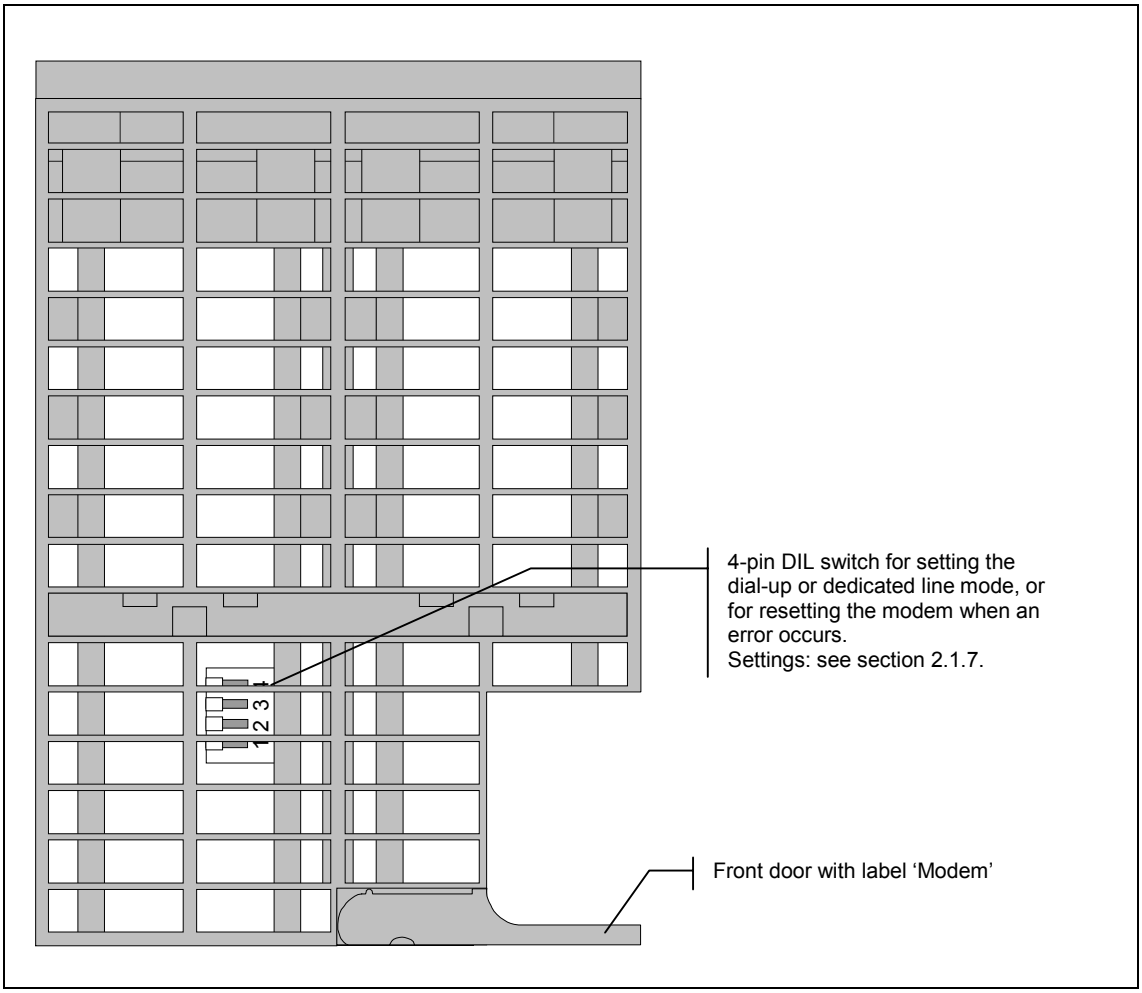


Fig. 2-3 View of the MD4 modem from above

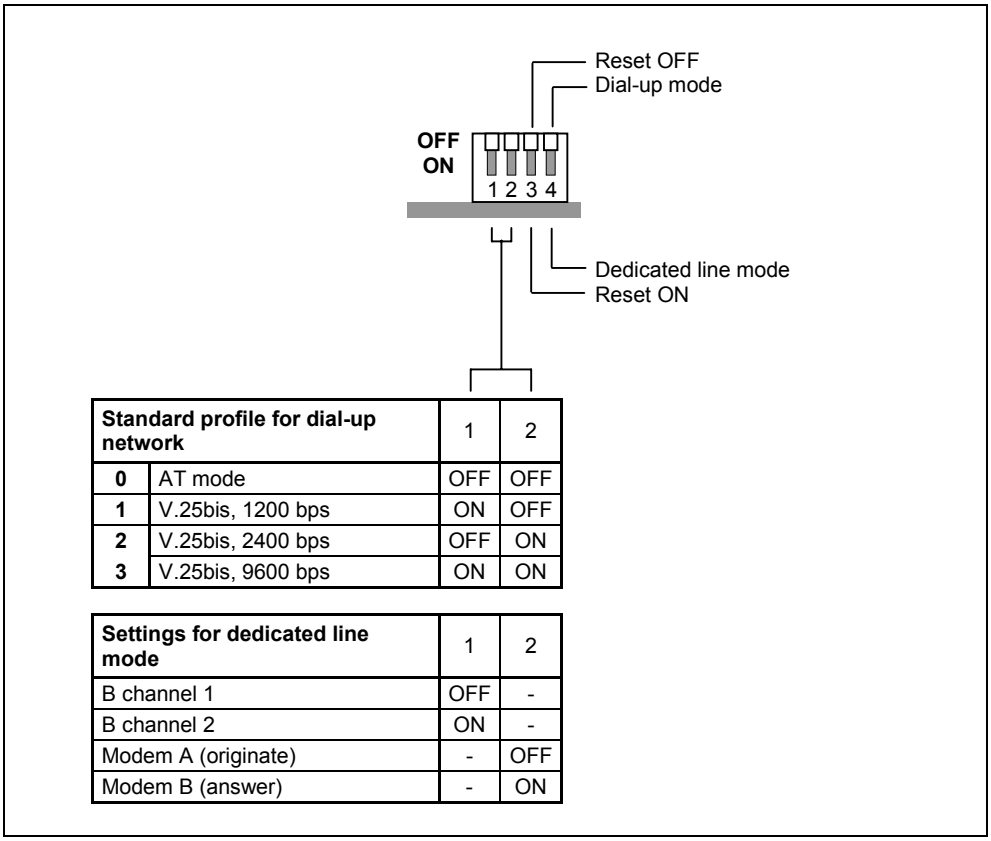
2.1.7 Settings for the DIL Switches Accessible from Above

The MD4 modem features a 4-pin DIL switch located directly on top of the housing grid (see Fig. 2-3).

The DIL switch has the following functions:

- Setting the operating mode
- Setting one of 4 standard profiles for the dial-up mode
- Setting the B channel for dedicated line mode
- Modem type A (originate) or B (answer) for dedicated line mode
- Reset function

The following illustration is a summary of the settings possible.



Standard profile for dial-up network		1	2
0	AT mode	OFF	OFF
1	V.25bis, 1200 bps	ON	OFF
2	V.25bis, 2400 bps	OFF	ON
3	V.25bis, 9600 bps	ON	ON

Settings for dedicated line mode	1	2
B channel 1	OFF	-
B channel 2	ON	-
Modem A (originate)	-	OFF
Modem B (answer)	-	ON

Fig. 2-4 Various settings on the DIL switch accessible from above

! **Important**

The MD4 modem loads the settings on the DIL switch only on switching on the DC 24V power supply! While the MD4 reads the settings the lower 4 LED's display a cascading light. When the lights go out the settings have been loaded.

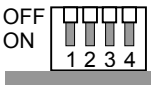
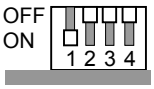
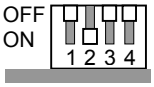
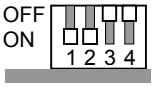
Settings for Dial-up Mode

A standard profile needs to be set for the dial-up mode. The setting is made on the 4-pin DIL switch. Standard dialing profiles 0 to 3 are factory settings that enable the MD4 modem to be put into operation without any programming by a terminal program if one of these profiles fits the intended application. However, each of these standard profiles can also be freely configured which then requires programming through the terminal program before the MD4 can be put into operation.

The procedure is as follows:
Switch off the power supply and set the position for the four switches as desired. At power ON the modem then reads the selected setting.

The following table lists the properties of the individual dialing profiles and how they can be set using the mentioned switches.

Table 2-10 Overview of the standard profile settings for dial-up mode

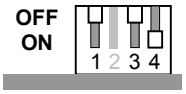
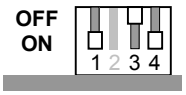
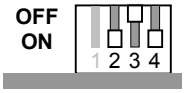
Profile no.	Meaning	DIL Switch Setting
0	AT command set Data format: - in the command phase: self adapting - in the data phase: 10-bit (8N1) (factory default)	
1	V.25bis, 1200 bps V.23 hx Data format: - in the command phase: 10 bit (7E1) - in the data phase: 11-bit (8E1)	
2	V.25bis, 2400 bps V.22bis Data format: - in the command phase: 10 bit (7E1) - in the data phase: 11-bit (8E1)	
3	V.25bis, 9600 bps V.32 Data format: - in the command phase: 10 bit (7E1) - in the data phase: 11-bit (8E1)	

Settings for Dedicated Line Mode

Basic settings need to be made for the dedicated line mode. These settings are the selection of the B channel of the S_0 interface to be used and the modem type. The basic settings are made on the 4-pin DIL switch. There are no standard profiles with factory settings for dedicated line mode. You are therefore required to configure the modem using a terminal program before beginning operation (for more details about this see section 2.4, *Modem Configuration for Dedicated Line Mode*).

The procedure is as follows:
Switch off the power supply and set the position the four switches as desired. At power ON the modem then reads the selected setting.

Table 2-11 Overview of the settings for dedicated line mode

Meaning	DIL Switch Setting
B channel 1 [1])	
B channel 2 [1])	
Modem A (originate) [2])	
Modem B (answer) [2])	

1) Details are available in section 2.5 *Notes about ISDN Dedicated Lines.*

2) See next page for details.

Modem A and Modem B for Dedicated Line Mode

To configure a point-to-point connection, note that the two MD4 modems being used for the connection must be set differently. To simplify matters, the differently set modems will be referred to as "Modem A" and "Modem B" in the following. In this scenario "Modem A" (originate) is the active modem which attempts to establish a connection to the other party via the dedicated line. "Modem B" (answer) is the passive, responding modem in this process of establishing a connection.

During the connecting process the modems try to get synchronized to each other using the S_0 protocol. After this has been executed a duplex connection for data transmission is available.

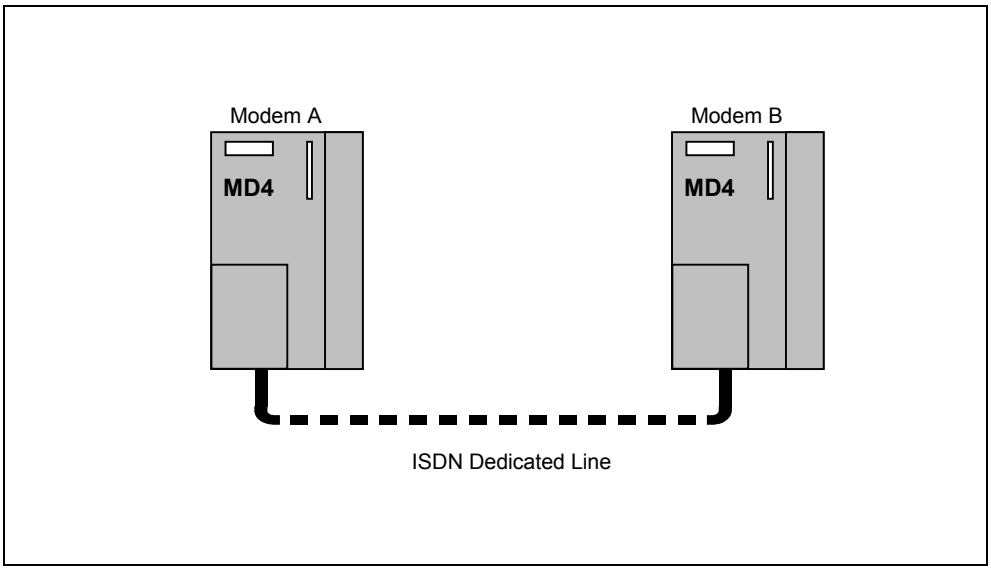


Fig. 2-5 Point-to-point connection between two MD4 modems via an ISDN dedicated line

Resetting the Modem

If you have lost oversight of the modem's configuration, the default factory settings can be restored. All 4 standard profiles for dial-up mode are returned to their original factory settings when the modem is reset.

Procedure:

1. Switch the power supply OFF.
2. Set switch 3 to ON and switch 1, 2 and 4 to OFF.
3. Switch the power supply ON, then wait for the cascading lights on the lower 4 LED's to go out.
4. Switch the power supply OFF, set switch 3 to OFF.
5. Select the setting for dedicated line mode or a standard profile for dial-up mode and then switch the power supply ON.

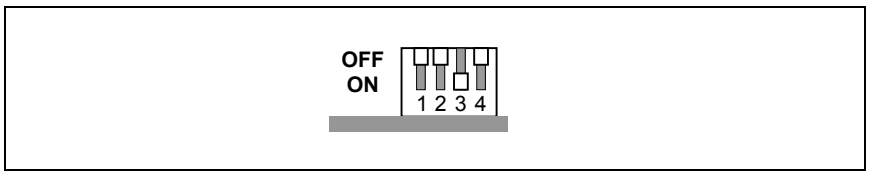


Fig. 2-6 Setting the DIL switch for modem reset

Note

Any settings made for the dedicated line mode using a terminal program are deleted when the modem is reset. You need to enter these settings again in the modem with the terminal program before resuming operation (see section 2.4).

Factory Default Settings of the DIL Switch

The factory default settings for the modem are as follows:

- Dial-up mode
- Standard profile 0: AT mode
- Reset OFF

With the factory default settings the switches appear as shown in the following illustration.

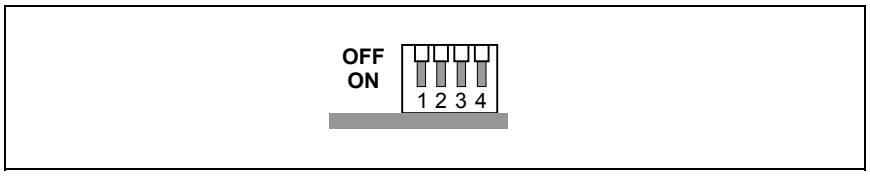


Fig. 2-7 Factory default settings of the DIL switch

2.1.8 View of the MD4 from Below

The following illustration shows the MD4 modem from below with the X3 RJ12 Western socket and the DIL switch for activating the RS232 or RS485 interface.

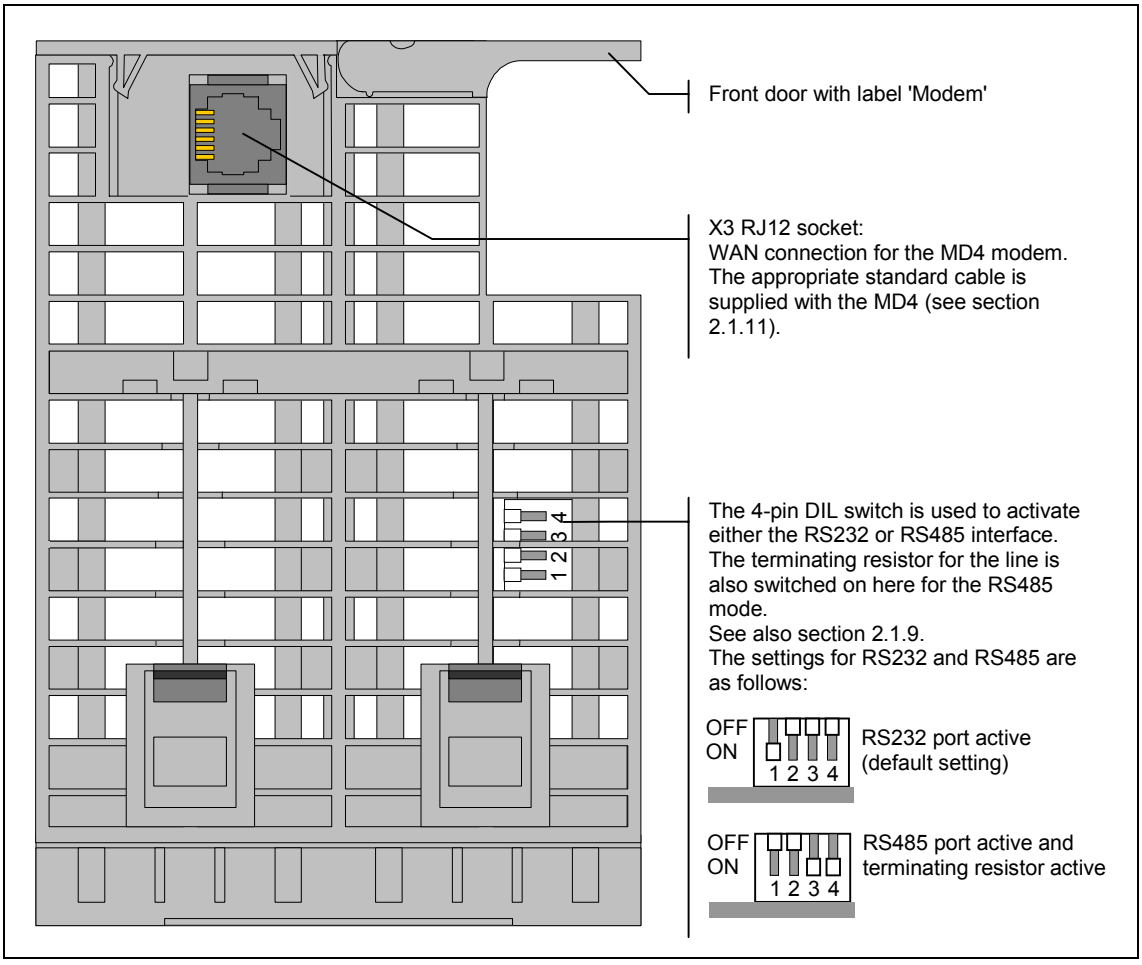


Fig. 2-8 View of the MD4 modem from below

2.1.9 Settings for the DIL switches accessible from below

Another 4-pin DIL switch can be accessed from the bottom of the modem housing (see Fig. 2-8). The DIL switch is used to activate either the RS232 or RS485 interface. The terminating resistor for the line is also switched on here for the RS485 mode. The following illustration shows a summary of the settings possible, Fig. 2-8 shows the default settings.

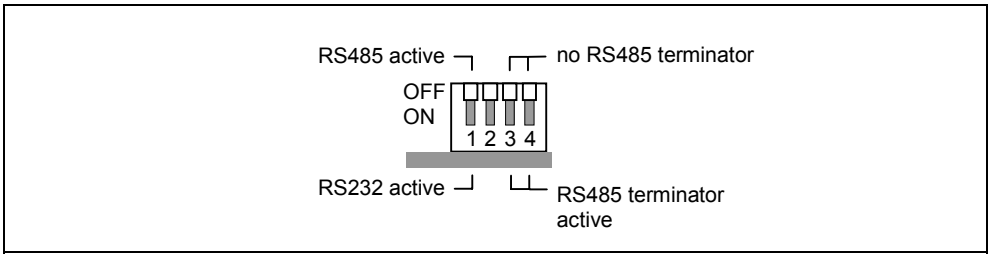


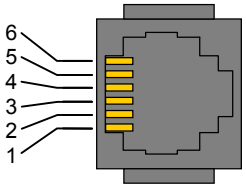
Fig. 2-9 Various settings for the 4-pin DIL switch accessible from below

2.1.10 Pin Assignments on the RJ12 Socket

Pin Assignments on the X3 RJ12 Socket for the MD4 Modem

The X3 connector on the MD4 modem is a 6-pin RJ12 Western socket. The following table lists the pin assignments.

Table 2-12 Pin Assignments on the X3 RJ12 socket for the MD4 modem

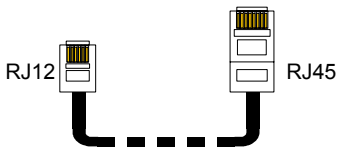
Diagram	Pin No.	Signal name	Signal direction	Comments
	1			
	2	TX-		
	3	RX-		
	4	RX+		
	5	TX+		
	6			

2.1.11 Standard Cable for the RJ12 Port

A 6NH7700-4AR60 cable is delivered with each MD4 modem. It enables the modem to be connected to an ISDN S_0 outlet for dial-up or dedicated line mode.

A replacement connection cable can be ordered by specifying the part number listed below.

Table 2-13 Standard cable for the RJ12 port of the MD4 modem

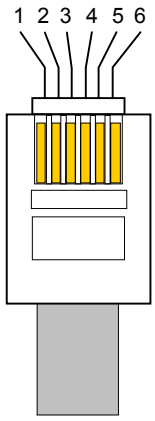
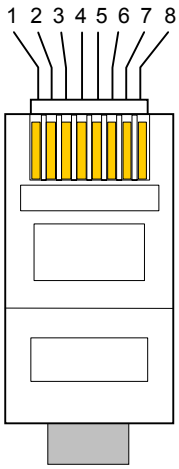
Order no.	Description	Diagram
6NH7700-4AR60	Cable with a RJ12 and RJ45 Western plug for connecting a MD4 modem (RJ12) to an ISDN S_0 outlet (RJ45). The cable can also be used for an MD4 that is integrated in a TIM. Cable length 6 m	

Note

When inserting the cable in the RJ12 socket of the modem, it is best to hold it directly below the RJ12 plug. The insertion is then considerably easier than when holding the cable by the RJ12 plug. Make sure that the RJ12 plug clearly clicks when it is inserted!

The following table shows the signal assignments for both plugs on the standard cable.

Table 2-14 Signal assignments on the RJ12 and RJ45 Western plugs

RJ12 Western Plug			RJ45 Western Plug	
Diagram	**Pin No.**	**Signal name**	**Pin No.**	**Diagram**
		-	1	
	1	-	2	
	2	TX-	3	
	3	RX-	4	
	4	RX+	5	
	5	TX+	6	
	6	-	7	
		-	8	

2.2 Connecting the MD4 with a DTE and ISDN Socket (S_0) in Dial-up Mode

The following diagram provides an overview of how to connect an MD4 modem in dial-up mode to a DTE (e.g. a TIM via RS232) and to the ISDN outlet (S_0) using the specified standard cables.

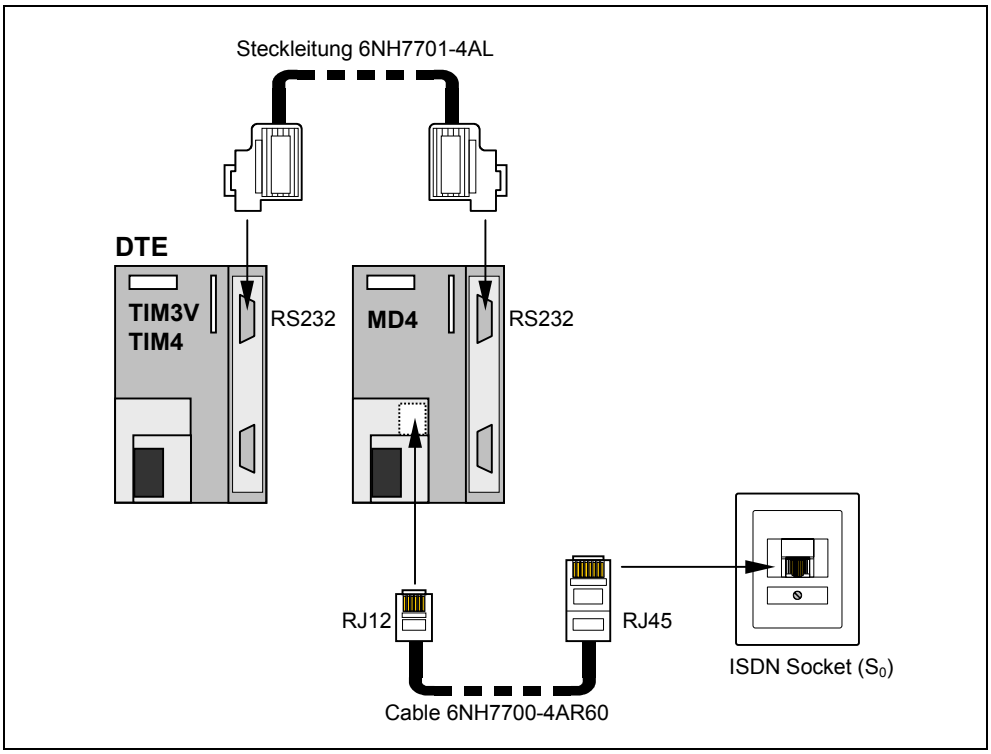


Fig. 2-10 Connecting the MD4 to a DTE (e.g. TIM) and ISDN outlet (S_0)

2.3 Connecting the MD4 with a DTE and ISDN Outlet (S_0) in Dedicated Line Mode

Introduction

The following diagrams show various possibilities for connecting the MD4 modem in dedicated line mode to a DTE (e.g. TIM) or other MD4 modems to an ISDN dedicated line.

Connecting an MD4 with a DTE (e.g. TIM) via the RS232 Port

Through the RS232 interface only one MD4 modem can be connected to a data terminal equipment DTE (e.g. TIM). This results in the following configuration:

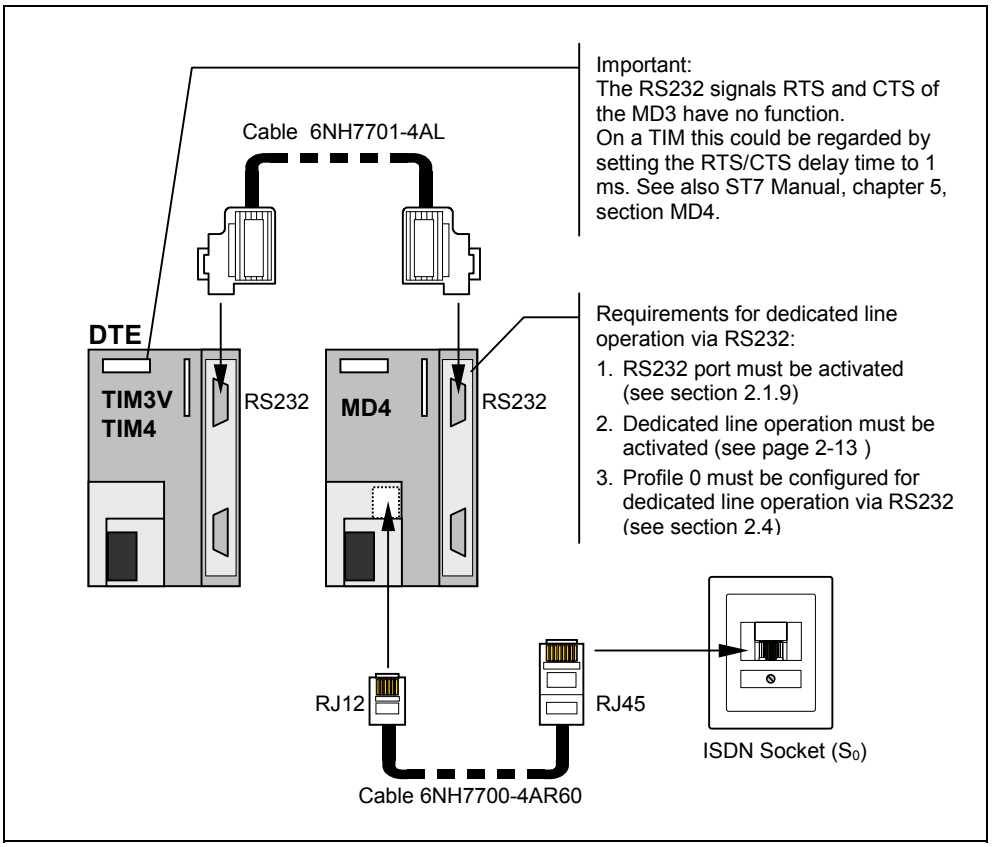


Fig. 2-11 Connecting an MD4 with a DTE (e.g. TIM) via the RS232 port

Make sure that the MD4 is configured for dedicated line operation via its RS232 interface:

- Notes about the required switch settings can be found in section *Settings for Dedicated Line Mode* on page 2-13.
- Take care that the selected Profile 0 is loaded with a suitable RS232 dedicated line profile. How to do this can be looked up in section 2.4 *Modem Configuration for Dedicated Line Mode*.
- Please pay also attention to the other notes in the above picture to ensure a trouble-free commissioning.

Connecting Several MD4 with a DTE (e.g. TIM) via the RS485 Interface

Through the RS485 interface several MD4 modems can be connected to a data terminal equipment (e.g. TIM). This type of connection is needed when several ISDN dedicated lines come together on one DTE, in other words, when the connection involves a star-shaped network. The following diagram shows an example of such a configuration using standard components.

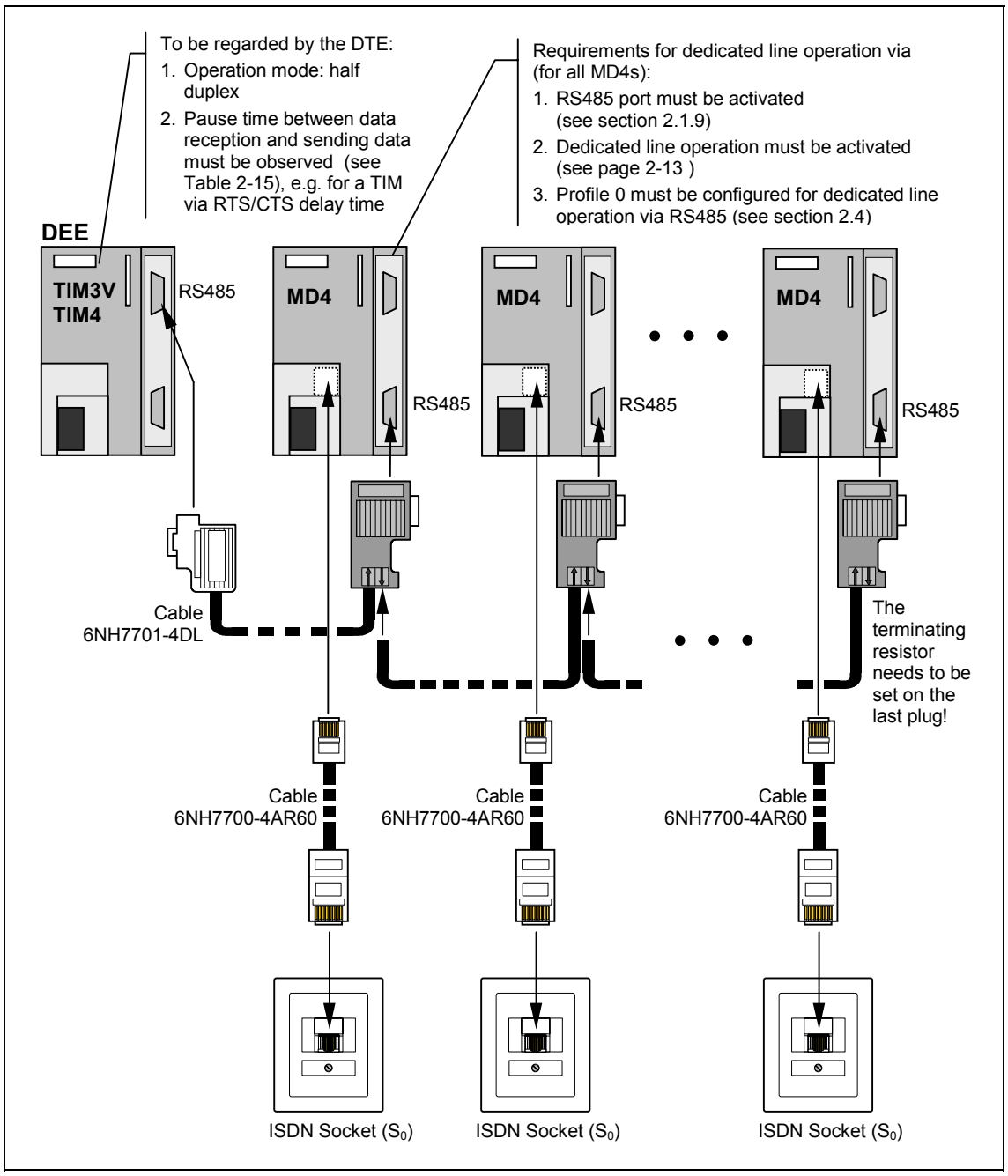


Fig.2-12 Connecting several MD4s with a DTE (e.g. TIM) via RS485, star-shaped junction of several ISDN dedicated lines

The standard 6NH7701-4DL cable is used for connecting the DTE to the first MD4. There is no prefabricated cable for the connection to the next modems. However, one can be built using standard components from the SIMATIC S7 product catalog. The same components can be used as those for making an MPI connection. 6XV1830-0AH10 is recommended for the cable, and 6ES7972-0BA12-0XA0 for the plug. The RS485 terminating resistor for the line can be switched on this plug if required.

The table on the next page shows how several MD4s can be connected in parallel using various cable sections.

! **Important**

Do not forget to activate the terminating resistor for the RS485 bus with the slide-switch on the last plug (see Fig. 2-12)!

RS485 Operation of the MD4

When connecting several MD4s in parallel through the RS485 interface, several factors should be taken into consideration when setting the modem.

1) The RS485 interface of the MD4 modem must be activated with the 4-pin DIL switch accessible from below (see Fig. 2-8).
2) The MD4 modem needs to be configured for dedicated line mode via the RS485 interface (for more details see section 2.4, *Modem Configuration for Dedicated Line Mode*).
3) As data exchange via RS485 is only possible in a halfduplex mode the operation mode of the connected DTE must be set to halfduplex.
4) After the MD4 has received data and has passed them to the DTE the MD4 needs a pause of several ms until it is able to send data. The DTE must observe this time delay, i.e. after data has been received sending data is only allowed after expiration of the pause time. The length of the pause depends on the transmission speed that is run on the dedicated line (see following table).

Tabelle 2-15 Pause time between data reception and sending data for RS485

Speed on dedicated line	Required pause time	Speed on dedicated line	Required pause time
1200 bps	100 ms	19200 bps	10 ms
2400 bps	50 ms	38400 bps	10 ms
9600 bps	30 ms		

If the DTE connected to the MD4 modem is a TIM from the SINAUT catalog, this pause time can be considered by the TIM by setting an appropriate RTS/CTS delay time. This and other notes concerning the RS485 mode with a TIM can be found in the SINAUT ST7 Manual, chapter 5, section MD4.

! **Important**

Follow the instructions in section 2.5 *Notes about ISDN Dedicated Lines* when connecting the ISDN dedicated line to the MD4 modem.

Table 2-16 Configuration of standard cable 6NH7701-4DL from the DTE (e.g. TIM) to first MD4 modem

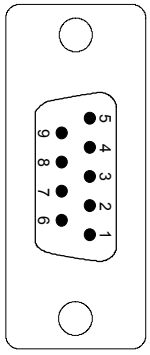
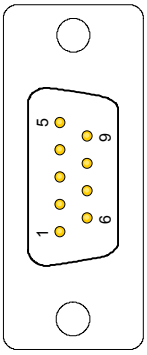
DTE (TIM3V/4) (RS485)	Pin No.	Connection	Pin No.	MD4 Modem, (RS485)
	Housing shell		Housing shell	
	1			
	2	Data B	A1 (8)	
	3	Data A	B1 (3)	
	4	Data A	A2	
	5	Data B	b2	
	6			
	7			
	8			
	9			
Sub-D socket 9-pin				**Sub-D plug 9-pin**

Table 2-17 Connection to the second MD4 modem

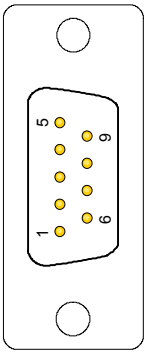
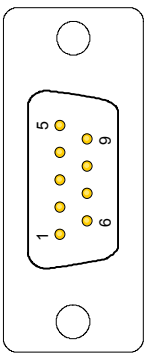
		Connection	Pin No.	MD4 Modem, (RS485)
			Housing shell	
		Data A	A1 (8)	
		Data B	B1 (3)	
			A2	
			b2	
				Sub-D plug 9-pin

Table 2-18 Connection to the third MD4 modem, etc.

		Connection	Pin No.	MD4 Modem, (RS485)
			Housing shell	
		Data A	A1 (8)	
		Data B	B1 (3)	
			A2	
			b2	
				Sub-D plug 9-pin

2.4 Modem Configuration for Dedicated Line Mode

Introduction

The basic settings for dedicated line mode are made on the 4-pin DIL switch which can be accessed from above (see section 2.1.7). The MD4 requires additional parameters which, however, cannot be selected in the form of a standard profile. It is therefore necessary to give the missing parameters to the MD4 using a PC before beginning operation of the modem. The parameters can them be saved in profile 0 of the MD4 to keep them non-volatile available.

Note

After resetting the MD4 (see section *Resetting the Modem* on page 2-15) the dedicated line settings saved in profile 0 are lost. You therefore have to enter them again in the modem using a PC.

The modem can be configured using AT commands sent from a PC (see Chapter 5 *AT Commands*). The PC and modem must be connected with a cable to do this (see Fig. 2-13). The cable connects to COM1 or COM2 port on the PC and the RS232 interface on the modem.

The AT commands are entered with a terminal program. Hyper Terminal from WINDOWS 95/98/NT can be used for this purpose.

Connection between the PC and Modem

For sending AT commands the SINAUT ST7 standard cable 6NH7701-4AL is used to connect the modem with the PC. If the standard cable is not available, use any cable with two 9-pin Sub-D sockets and the following pin assignments.

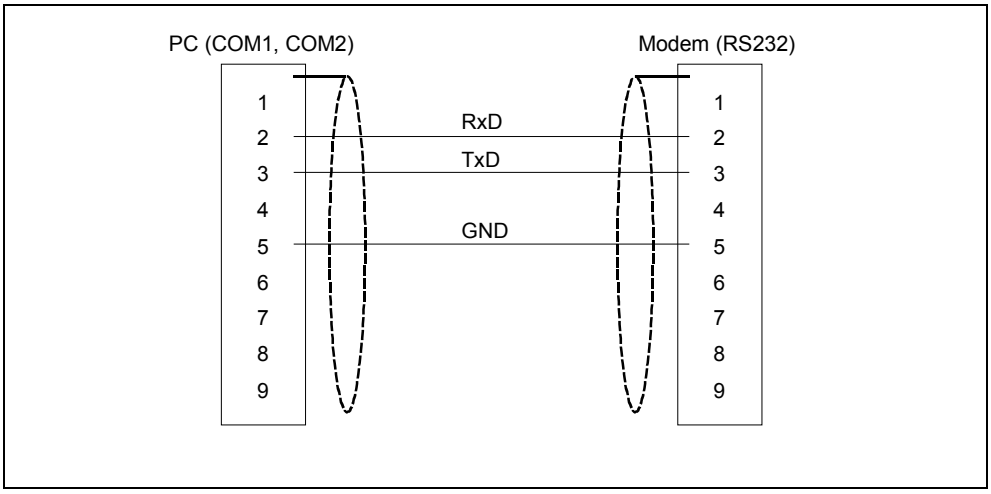


Fig. 2-13 Basic wiring diagram of a PC modem cable

AT Commands for Dedicated Line Mode

The combination of the AT commands depends on the interface type (RS232 or RS485) used between the DTE and the modem and the data format with which the data will be transmitted over the ISDN dedicated line. The following tables are a summary of the AT commands.

Table 2-19 AT Command strings if the RS232 interface is to be used

Data Format	AT Commands
11 bit	**ATS45=83&D0\Q0&W**
10 bit	**ATS45=85&D0\Q0&W**

Table 2-20 AT Command strings if the RS485 interface is to be used

Data Format	AT Commands
11 bit	**ATS45=83&D0\Q0&C2&W**
10 bit	**ATS45=85&D0\Q0&C2&W**

Configuration of Profile 0 for Dedicated Line Mode

Carry out the following steps to configure profile 0 for dedicated line mode:

1) Switch the modem power supply OFF.
2) Set all switches on the 4 -pin DIL switch accessible from above to OFF (dial-up mode and standard profile 0).
3) Connect the modem via its RS232 interface to the PC (cable: see previous page)
4) Switch the modem power supply ON.
5) Send the desired AT command string to the MD4 using the terminal program. The modem confirms the transfer of the string and that it is saved in profile 0 by reporting OK.
6) Switch the modem power supply OFF.
7) Make the necessary basic settings for dedicated line mode on the 4-pin DIL switch accessible from above (see section *Settings for Dedicated Line Mode* on page 2-13).

Each time the power is switched on for the modem the basic settings and the parameters saved in profile 0 are activated for the dedicated line mode.

Note

When the MD4 is reset (see section *Resetting the Modem* on page 2-15) the settings for dedicated line mode saved in profile 0 are lost. These settings must be entered again in the modem as previously described.

2.5 Notes about ISDN Dedicated Lines

Characteristics of an ISDN Dedicated Line

An ISDN dedicated line to which the MD4 modem is connected in dedicated line mode must fulfill certain requirements to ensure correct, continual operation of the modem over such a line. Since there are currently a variety of ISDN dedicated line types offered, the following lists the most important characteristics of an ISDN dedicated line to which an MD4 can be connected.

- S_0 Interface Conforming to ITU-T Recommendation I.430

  The ISDN dedicated line features an S_0 interface. The S_0 interface is defined by ITU-T recommendation I.430. The ITU-T recommendation I.430 describs the physical, electronic and functional characteristics and defines the performance features of the S_0 interface.

- Provision of a 64 Kbps B channel

  The S_0 interface of the ISDN dedicated line must provide at least one switched 64 Kbps B channel. The B channel of an S_0 interface is also defined by the ITU-T recommendation I.430.

  The S_0 interface of the ISDN dedicated line can provided a maximum of two 64 Kbps B channels (B channels 1 and 2) as well as a 16 Kbps D channel. The MD4 always uses only one 64 Kbps B channel. The other channels, a maximum of one 64 Kbps B channel and one 16 Kbps D channel per S_0 interface, are freely available for other dedicated line applications. The second 64 Kbps B channel can be used by an additional dedicated line MD4 if desired. The MD4 does not use the 16 Kbps D channel.

Note

The S_0 interface of the ISDN dedicated line cannot be used for simultaneous dial-up mode.

Selecting the Correct B Channel

Depending on the type of the ISDN dedicated line, the S_0 interface features one or two B channels. When one B channel is available, either B channel 1 or B channel 2 is switched; when two B channels are available, both B channel 1 and B channel 2 are switched. Therefore, when connecting the MD4 to the ISDN dedicated line it is required to select the correct B channel on the MD4 by making the appropriate setting on the 4-pin DIL switch accessible from above. The provider of the ISDN dedicated line usually provides information about which B channel is switched when the line is installed and this information should be used to select the correct channel for the MD4.

Important

When selecting the B channel be aware that on both terminal points of an ISDN dedicated line different B channels can be switched to the respective S_0 interfaces. It is possible that B channel 1 needs to be activated on one terminal point and B channel 2 on the other terminal point.

ISDN Dedicated Line Products from the Deutsche Telekom

The Deutsche Telekom offers ISDN dedicated lines with a variety of product features. The MD4 modems can be operated on three of these ISDN dedicated line products which are offered by the Deutsche Telekom under the name of "LeasedLink SFV Digital". The following table provides an overview of the ISDN dedicated lines that can be used together with the MD4.

Table 2-21 ISDN dedicated line products of the Deutsche Telekom

Description	**Available Channels**	**Comments**
LeasedLink SFV Digital **64S**	1 x 64 Kbps B channel	Suitable for one MD4 dedicated line connection
LeasedLink SFV Digital **64S2**	2 x 64 Kbps B channels	Suitable for two parallel MD4 dedicated line connections
LeasedLink SFV Digital **TS02**	2 x 64 Kbps B channels 1 x 16 Kbps D channel	Suitable for two parallel MD4 dedicated line connections. The D channel cannot be used for an MD4 dedicated line connection.

2.6 Mounting the MD4 Modem

Introduction

The MD4 modem can be mounted on a SIMATIC S7-300 mounting rail or on a standard 35 mm mounting rail using a 6NH7760-0AA adapter (must be ordered separately).

You can mount and operate the modem horizontally or vertically

Important

Before the MD4 modem is mounted on the S7-300 or standard mounting rail, all of the DIL switches on the MD4 modem should be set to the positions required for operation. These switches are usually not easy to access when mounted.

2.6.1 Mounting on an S7-300 Mounting Rail

Important

If the MD4 modem is mounted together with other S7-300 modules, please note the fact that this modem does not have an S7-300 backplane bus! For this reason an S7-300 SM, FM or CP module that communicates with the S7-CPU via this backplane bus may not be placed to the right of the modem.

Procedural Steps for Installation

To mount the modem on a S7-300 mounting rail, carry out the steps listed below:

1. Switch off the power supply to which the modem is to be connected.
2. Hang the modem on the mounting rail and swing it down.
3. Screw the modem tight.
4. Connect the modem to the power supply (see also section 2.6.4).
5. Insert the supplied cable for the modem into the X3 RJ12 socket. This is located above the power supply screw terminal on the modem (see Fig. 2-2 and Fig. 2-8). The release clip of the RJ12 Western plug must be on the right side when inserted.

Note

When inserting the cable it is best to hold it directly below the RJ12 plug. The insertion is then considerably easier than when holding the cable by the RJ12 plug. Make sure that the RJ12 plug clearly clicks when it is inserted!

6. To connect the modem to a terminal (a TIM, for example), insert the 9-pin sub-D plug of the modem cable (see section 2.1.5 *Standard Cables*) into the X1 socket (RS232 port) of the modem and screw it tight. Connection to the optional RS485 X2 port is carried out in the same way. For this port, however, a standard cable is not available.

Note

Standard cable 6NH7701-4AL for connecting the modem with a TIM3 or TIM4 module is inserted 'upside down', in other words, the cable leads upward. The cable is also inserted from above on the TIM3/TIM4.

7. If other modems are to mounted into the rack, follow the procedures described above for each one.
8. When all of the modems are mounted the power supply can be switched on. The modem starts up but will only show activity on its LED's when the terminal addresses it.

2.6.2 Mounting on a 35 mm Mounting Rail

Mounting the modem on a standard 35 mm mounting rail requires the optional 6NH7760-0AA adapter (see illustration below).

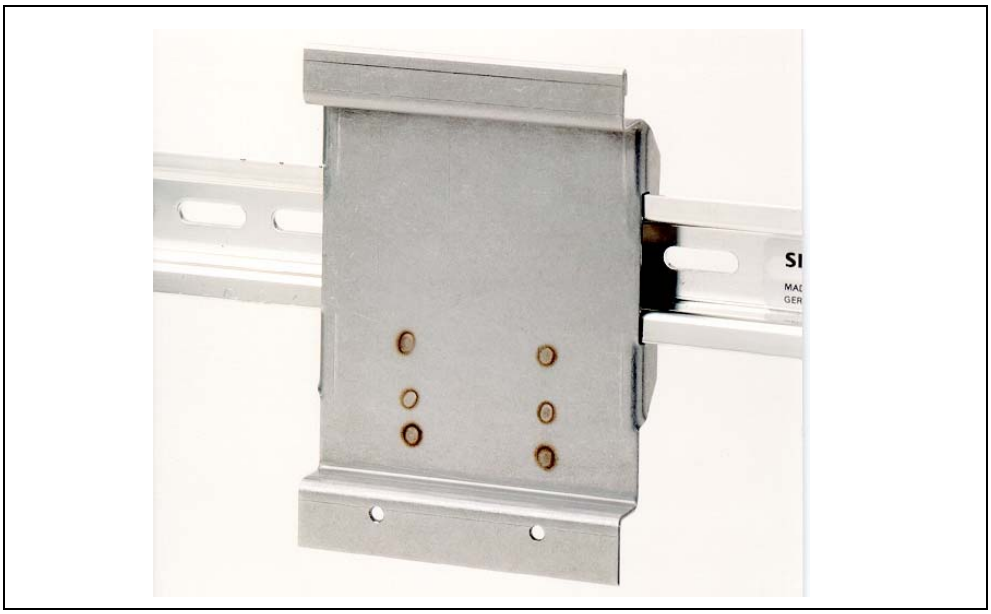


Fig. 2-14 Adapter for mounting on a standard 35 mm mounting rail

Hang the modem on the adapter, similar to the way it is mounted on an S7-300 rail Screw the modem tight on the adapter. Now the modem is ready for mounting on the standard rail and can clipped into place.

The remaining steps for mounting are similar to those described in section 2.6.1 *Mounting on an S7-300 Mounting Rail.*

2.6.3 Horizontal and Vertical Mounting

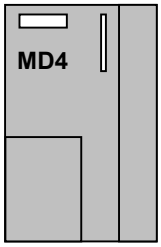
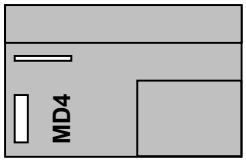
Horizontal and Vertical Assembly

You can mount and operate the MD4 modem horizontally or vertically.

Permissible Ambient Temperature

The MD4 modem does not deviate from the temperature range specified for other S7-300 components:

Table 2-22 Permissible ambient temperature for the MD4 modem

Installation Position	Permissible Ambient Temperature
 Horizontal	0 to 60 °C
 Vertical	0 to 40 °C

Assembly Dimensions of the MD4 Modem

Table 2-23 Assembly dimensions of the MD4 modem

Module	Module width	Module height	Max. depth req.
Modem Module MD4	80 mm	125 mm	120 mm or 180 mm with open front plate

2.6.4 Connecting to the Power Supply

Warning

Connecting the modem module to live current can cause damage to it. Connect the modem to the power supply only when it is not under current.

Warning

The power for the device (DC 24 V) must be generated as safe, electrically isolated low voltage. This means that the power must be SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) in conformity with DIN VDE 0100 Part 410 (IEC 60364-4-41).

Cabling

Use flexible cables with a cross section of 0.25 to 0.75 mm^2 for wiring the power supply. An additional core sleeve is necessary if you are wiring more than one cable per connection.

Wiring

To wire the power supply module to an MD4 modem, carry out the following steps:

1. Open the front door of the power supply and the MD4 modem.
2. Connect the power supply cables to the MD4 modem: M and L+
3. Close the front doors.

Important

To avoid ground loops you should not connect the shielding of the modem.

Connection Diagram

Use the following diagram for connecting one or more modems. Other SINAUT ST7 modems or a SINAUT ST7 TIM may also be mounted in place of an MD4 modem. The same connection scheme applies for these modules.

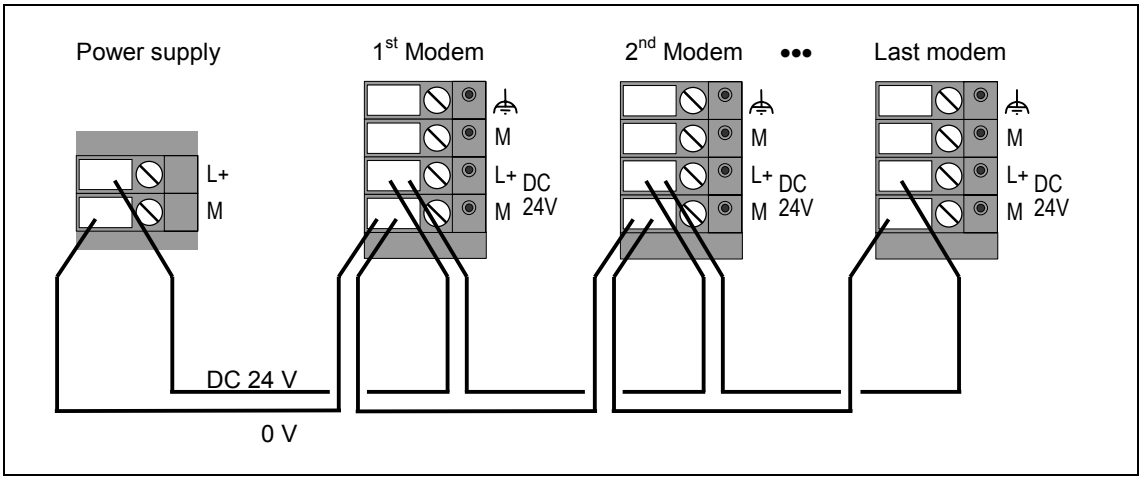


Fig. 2-15 Connecting to the power supply

Instructions for Operation with SINAUT ST1

3

3.1 Compatibility to SINAUT ST1 Modem LGM64K

Introduction

In certain dial-up modes the MD4 modem is compatible to the ISDN LGM64K modem that is used for SINAUT ST1. This compatibility is ensured in two ways:

1. You can build a new SINAUT ST1 station into an existing network and use the MD4 modem to exchange data with an existing ST1 ISDN modem at the partner.
2. You can use the MD4 modem as a replacement for a defective ISDN LGM64K modem.

Note

A new SINAUT ST1 station might also be a SINAUT ST7 device with an MD4 operating as an ST1 station.

In the following you will find detailed information about connecting the MD4 to a SINAUT ST1 device.

Compatibility Matrix

The following table provides a compatibility matrix of the MD4 modem in connection with the ISDN LGM64K dial-up modem used in the SINAUT ST1 system.

Table 3-1 Compatibility matrix of the MD4 modem and ISDN LGM64K modem

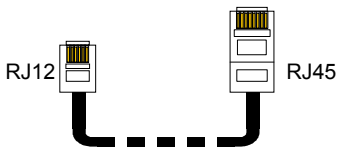
Operating Modes of the MD4	SINAUT ST1 ISDN Modem
	LGM64K
V.110 / 9600 bps	x

3.2 Connecting the MD4 to a TIM11 and TIM011B

Standard Cables

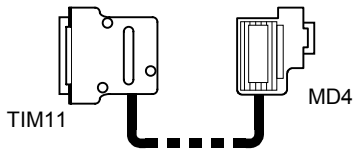
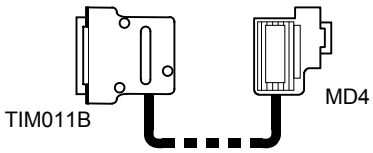
Cable 6NH7700-4AR60 is delivered with the MD4 modem (see following table). This enables the modem to be connected with an ISDN S_0 outlet.

Table 3-2 Standard cable for the RJ12 port of the MD4 modem

Order no.	Description	Diagram
6NH7700-4AR60	Cable with a RJ12 and RJ45 Western plug for connecting a MD4 modem (RJ12) to an ISDN S_0 outlet (RJ45). Cable length 6 m	

There are two standard cables for connecting the the MD4 to SINAUT ST1 modules TIM11 and TIM011B (see following table). These are not included with the MD4; both must be ordered separately.

Table 3-3 Standard cables for SINAUT ST1 modules TIM11 and TIM011B

Order no.	Description	Diagram
6NH1701-7AN	Cable for connecting the MD4 modem (RS232) with a TIM11 (RS232) or an other terminal with an identically configured 25-pin RS232 interface (socket) and slide lock. Cable length 2.5 m	
6NH1701-7BK	Cable for connecting the MD4 modem (RS232) with a TIM011B (RS232) or an other terminal with an identically configured 25-pin RS232 interface (socket) and screw lock. Cable length 1.0 m	

The section *'Standard Cables for the RS232 and RS485 Ports*' in Chapter 2 provides a description of these cables' configuration.

3.2.1 Controlling the Modem with V.25bis Commands

In most cases you will probably want to operate the MD4 using the V.25bis mode which is normal for SINAUT ST1. The following provides a description of the necessary configuration and settings for this mode. The following requirements must also be fulfilled:

- TIM11 Version ≥ 12
- TIM011B Version ≥ 5

If you wish to control the MD4 using the AT command set, refer to the notes in section 3.2.2.

Required Configuration for V.25bis

If the MD4 is to be connected to a TIM11 or TIM011B the following standard profile must be selected on the 4-pin DIL switch accessible from above. It is also necessary to enter the listed parameters for the TIM module in the SINAUT ST1 startup program.

Table 3-4 Required configuration for modem and TIM (modem control with V.25bis commands)

Operating Mode of the MD4	Standard Profile on the MD4	Basic Parameters for TIM11 or TIM011B							
		MTYP	BAUD	DUPL	SINT	SZEI	UZEI [1]	WAHL [2]	FORM [2]
9600 bps dx	3	1	9600	1	0	0	0	0	0,0

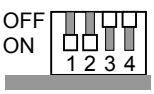
1) Answer delay for incoming calls is only available for the MD4 when used together with a TIM11 version ≥ 15 or a TIM011B version ≥ 8. Answer delay does not function with older versions. The parameter UZEI therefore needs to be set to 0 for these TIMs.

2) The WAHL and FORM parameters are only available with the newest version 7.0 of the TD1 software.

Setting the Required V.25bis Profile on the DIL Switch of the MD4

The selection of the V.25bis profile 3 which can be used for SINAUT ST1 is made on the 4-pin DIL switch that can be accessed from above through the grid (see also Chapter 2, section 2.1.7). The following table shows how to set the switches for profile 3.

Table 3-5 Setting for V.25bis profile 3

Profile no.	Profile description	Setting on DIL switch
3	V.25bis, 9600 bps Data format: - in the command phase: 10 bit (7E1) - in the data phase: 11-bit (8E1)	

3.2.2 Controlling the Modem with AT Commands

When the MD4 modem is connected to a TIM11 or TIM011B it can be control with AT commands instead of V.25bis. The following requirements are necessary when using it with SINAUT ST1:

- Software package SINAUT TD1, version 7.0
- TIM11 Version ≥ 12
- TIM011B Version ≥ 5

Required Configuration for AT Commands

Standard dialing profile 0 needs to be set on the modem's 4-pin DIL switch accessible from above if the MD4 is to be connected to a TIM11 or TIM011B. It is also necessary to enter the listed parameters for the TIM module in the SINAUT ST1 startup program.

Table 3-6 Required configuration for modem and TIM (modem control with AT commands)

Operating Mode of the ST1 TIM	Operating Mode of the MD4	Standard Profile on the MD4	Basic Parameters for TIM11 or TIM011B							
			MTYP	BAUD	DUPL	SINT	SZEI	UZEI [1]	WAHL	FORM
9600 Baud 10 Bit (FT2)	AT mode	0	1	9600	1	0	0	0	1	1,0
9600 Baud 11 Bit (FT1.2)	AT mode	0	1	9600	1	0	0	0	1	0,0

1) Answer delay for incoming calls is only available for the MD4 when used together with a TIM11 version ≥ 15 or a TIM011B version ≥ 8. Answer delay does not function with older versions. The parameter UZEI therefore needs to be set to 0 for these TIMs.

Along with these basic parameters for the TIM module, the TIM also needs information about how the MD4 modem should be preset during startup. An initialization string is required for this. FB99, SREGP, is used in the SINAUT startup program for configuring this initialization string. The call for this FB must directly follow the FB for the TIM basic parameters.

If you are editing an existing SINAUT program that has already been setup for the use of AT commands, an FB99 will be available there. If an initialization string was configured for a previously used LGM64K, this configuration must be changed because most of the default settings are different for the MD4.

A different initialization string is required for each of the operating modes used by the modem. The following table lists the details of these variations. It also includes the corresponding parameters for FB99.

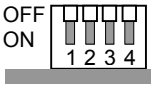
Table 3-7 Initialization strings for the MD4 using AT commands for modem control

Operating Mode	Initialization String	Parameters for FB99 , SREGP
9600 bps 10 bit (FT2)	AT$V3$P1S45=85$M=n	: JU FB99 NAME : SREGP: SSNR : KF+.. AT1 : KH4154 (AT) AT2 : KH2456 ($V) AT3 : KH3324 (3$) AT4 : KH5031 (P1) AT5 : KH5334 (S4) AT6 : KH353D (5=) AT7 : KH3835 (85) AT8 : KH244D ($M) AT9 : KH3Dxx (=n) AT10 : KH0D0A (Cr;Lf) AT11 : KHFF00 (End code FF) : AT20 : KH0000
9600 bps 11 bit (FT1.2)	AT$V3$P1S45=83$M=n	: JU FB99 NAME : SREGP: SSNR : KF+.. AT1 : KH4154 (AT) AT2 : KH2456 ($V) AT3 : KH3324 (3$) AT4 : KH5031 (P1) AT5 : KH5334 (S4) AT6 : KH353D (5=) AT7 : KH3833 (83) AT8 : KH244D ($M) AT9 : KH3Dxx (=n) AT10 : KH0D0A (Cr;Lf) AT11 : KHFF00 (End code FF) : AT20 : KH0000

Setting the Required AT Standard Profile on the MD4 DIL Switch

Set standard profile 0 to control the modem using AT commands (see following table). The setting is made on the 4-pin DIL switch that can be accessed from above through the grid (see also Chapter 2, section 2.1.7).

Table 3-8 Setting standard profile 0

Profile no.	Profile description	Setting on DIL switch
0	AT command set Data format: - in the command phase: self-adapting - in the data phase: 10-bit (8N1) (factory default)	

3.2.3 Avoiding Problems When Exchanging Modems

Note the following points when using the MD4 to replace a defective SINAUT ST1 ISDN modem:

- Set the required basic setting and the correct standard profile on 4-pin DIL switch before operating the modem. The factory setting for the ISDN modem is profile 0, i.e., AT mode.
- Use the cable supplied with the MD4 for connecting the modem to the ISDN S_0 outlet.
- Ensure that the TIMs to which you wish to connect the MD4 modems have the following versions:
  TIM11 Version ≥ 12
  TIM011B Version ≥ 5
- If the LGM64K ISDN modem being replaced was controlled with AT commands instead of the usual V.25bis set, the initialization string (configured with FB99, SREGP) in the startup program must be changed. The required initialization strings can be found in Table 3-7.

Controlling the MD4

4

Introduction

This chapter provides basic information about controlling the MD4 modem. Two command languages are available:

- The extended Hayes® AT command set
- V.25bis command set

While V.25bis only provides a basic range of commands for dialing and controlling connections, the AT command set enables full control of the modem. The MD4 modem, however, uses a special extension of the V.25bis syntax that allows almost all AT commands to be passed through V.25bis! For more information about this topic refer to Chapter 6 *V.25bis Operation*.

4.1 Using the AT Commands

All commands to Hayes compatible modems must begin with the sequence **AT** and end with ↵ (RETURN). (**A/** and **a/** are exceptions as will be explained later!)

AT stands for *Attention*. Through the use of this character string the modem can automatically detect the bit rate and data format of the connected terminal. The "A" is used to detect the data transmission speed and the "T" the data format.

4.2 Permissible Data Formats and Speeds

The following is a list of permissible data formats over the serial interface of the MD4 modem:

Number of data bits	Parity	Number of stop bits
7 or 8	Even	1 or 2
7	Odd	1 or 2
7	Mark	1 or 2
7	Space	1 or 2
7 or 8	None	1 or 2

All of the above formats can be used with the following speeds:

1200, 2400, 4800, 7200, 9600, 12000, 14400, 19200, 38400, 57600, 115200 bps

If you unintentionally use an invalid format or a speed which is not allowed it will be rejected or you will receive an **ERROR** as a response.

4.3 Command Syntax

As already mentioned, each command line must begin with **AT** and end with ↵. The characters can be written either capitalized (AT...) or small (at...). Several commands can be entered in sequence in a command line and spaces can be used to make the line easier to read. You can correct a mistaken entry at any time by using the "backspace" key (←) before entering the command with a return (↵). However, once **AT** has been entered it can no longer be deleted! If necessary the ASCII-Codes for ↵, ← can be changed.

Note

The commands **AT Z** and **AT &W** require a certain time to take effect and should therefore be entered at the end of the command line! In general, however, it is best not to use these commands in combination with other commands.

Certain other commands, such as AT$M=n, AT$R=n and AT&Z=n, must also be entered at the end of the command string.

4.4 Maximum Length of the Command Buffer

The maximum allowed length of a command line is limited to 40 characters in correspondence to the size of the command buffer! This limit does not include the characters **AT**, ↵ and the line feed (LF). If more than 40 characters are entered the modem signals an **ERROR.**

4.5 Command Parameters

If no parameter is entered for a selection command the value is automatically assumed to be zero.

Example: **AT X** corresponds to **AT X0**

4.6 Command Mode and Data Mode

Modems use two different operating modes:

- Command mode
- Data mode

In the command mode the modem interprets the characters coming from the PC as control signals. These are not passed on to the opposite party!

In the data mode, on the other hand, the modem is ready for data exchange with the opposite party. All of the characters arriving from the PC are passed on without hindrance and without evaluation. This direct forwarding makes sense since the data being transmitted is not necessarily normal text and therefore may contain character strings that could be mistakenly interpreted as control commands. This is referred to as transparent data transmission. Of course, there is a way to change from the data mode back into the command mode: the ESCAPE sequence.

ESCAPE • Changing from the Data Mode to the Command Mode

Carry out the following standard procedure to change from the data mode back into the command mode:

1 second pause · +++ · 1 second pause

(No transmission 1 second long from the terminal (PC) to the modem, three plus signs, 1 second pause as before).

The MD4 then reports with **OK**.

Important

Please note that changing to the command mode does not cancel the connection to the opposite party! Connection charges will still continue. Another command is necessary to end the connection.

The procedure for exiting the data mode can be changed within certain limits, although the standard method should be sufficient for practically every situation. For one, the pause time can be changed. This parameter is stored in register S12 and applies to the pause time before and after the character string. In addition, another character can be substituted for the plus character. The ASCII character code in register S2 must be correspondingly changed (see Chapter 7, *S Registers*).

In addition to the escape sequence, many programs also support cancellation of a connection and return to the command mode at the same time by turning off the DTR signal on the serial RS232 interface. The AT command **&Dn** is used to have the MD4 react this way.

4.7 Note about the V.25bis Modem Control Protocol

Due to the limited range of functions in comparison to the AT command set, a few special notes need to be made about operation with the V.25bis protocol implemented in the MD4. Especially lacking is the automatic detection of the port speed and format.

The registers **S44** and **S45** enable direct access to the internal modem variables which are normally set by an AT command but can also used to directly set the configuration of the V.25bis operating parameters. In addition, the contents of the registers can be saved in the modem profiles. A few V.25bis standard profiles are available for selection per DIL switch as well.

4.8 Notes about RS485 Mode

The modem can be switched to RS485 with the command **AT&C2**. In this mode the DCD signal is active during the time the modem transmits characters. There is no command line echo.

In RS485 mode 8-N-1 or 8-E-1 are permitted as character formats in the data phase (online). With 8-E-1 the parity check throws out all incorrect characters regardless of the data direction.

Since no message and control signals are used in the RS485 mode, the DTR monitoring and the handshake (data flow control) should be switched off:

AT &D0 \Q0 ↵

4.9 Modem Responses

Commands to the modem generally result in a response. In addition to **OK** and **ERROR** as mentioned above, there are a number of other messages that are described in tables **Fehler! Verweisquelle konnte nicht gefunden werden.** and **Fehler! Verweisquelle konnte nicht gefunden werden.** below.

Basically, you can select an English text message (long form) or a number code (short form). The form of the responses depends on the setting in the modem (see **Vn**, **\Vn, $Vn** and **Xn** in the Chapter 5, *AT Commands***).**

Messages in number code primarily serve to enable further processing in automatic computer programs.

The modem responses in long and short form are summarized in the tables on the next page.

Table 4-1 Standard Messages

Short form	Long form	Meaning / Notes
0	OK	Command fully executed
1	CONNECT	Connection established to opposite party
2	RING	Incoming call (ringing) detected
	RING FM: 1234 TO: 9876	The entry can be extended with $Vn (bit 0) to cause the number of the caller to also be displayed.
3	NO CARRIER	No carrier frequency can be detected or the carrier frequency has gone out in the meantime.
	NO CARRIER: Normal Call Clearing	The entry can be extended with $Vn (bit 1) to cause the reason to also be displayed.
4	ERROR	Error Message caused by: • Non-allowed entry in the command line or • More than 40 characters in the command line or • Internal memory error
6	NO dial tone	No dial tone • The **W** command was contained in the dialing command but a dial tone was not detected within the time specified in register S7. • While using the extended response codes **X2** or **X4** no dial tone was detected within 5 seconds after the "receiver was off the hook".
7	BUSY	Telephone line is occupied! (This response only occurs when the extended response code **X3** or **X4** is enabled!)
8	NO ANSWER	Call not accepted or the opposite modem does not answer the call
14	ALERTING	The opposite modem signals that it has detected an incoming call and is ringing. This information is only displayed when $Vn (bit 2) is activated.
15	TEI REMOVED	The MD4 has been assigned a new TEI. (see Chapter 5, AT Commandos, $T Command).

Table 4-2 CONNECT Messages

Short form	Long form	Speed [bps]	Protocol
1	CONNECT	Connection established to opposite party	
120	Connect 9 600 (V.110)	9 600	V.110
121	Connect 19 200 (V.110)	19 200	V.110
122	Connect 2 400 (V.110)	38 400	V.110
123	Connect 64 000 (X.75)	64 000	X.75
124	Connect 64 000 (V.120)	64 000	V.120
125	Connect 64 000 (TRANS)	64 000	TRANS
126	Connect 64 000 (FLAGS)	64 000	FLAGS

AT Commands

5

Introduction

This chapter describes the standard AT commands and their effects. In the place of the variable "n", a selected value needs to entered as explained by the respective description. Several "nnn" represents a sequence of characters.

5.1 General AT Commands

AT Attention

A command to the modem must always begin with **AT**. These two characters are used to measure the transmission format and speed between the PC and modem. At the same time the string prepares the modem for the series of commands that will soon follow. Note that a command line can have a maximum of 40 characters! This limit does not include the characters **AT**, ↵ and the line feed (LF).

Enter the character string **AT** ↵ once the modem is switched on. This allows the modem to adjust itself to the transfer format and transmission speed of your PC and immediately enables stable communication. Otherwise the modem starts operation with the default speed stored in its non-volatile memory.

Example:
Input: **AT** ¿
Modem: **OK**

A/ Repeat Previous Command Line

or
a/

The command caused the previous command line to be repeated. It must be entered without the **AT** prefix and closing ¿ and may not be combined with other commands. The **A/** command is especially useful for redialing. It is the only exception to the rule that every command must begin with the prefix **AT** and close with ¿.

A Answer

This command causes the modem to "pick up the receiver" and to immediately begin sending the answer signal (manual answer mode). If a connection is not established within the time specified in register S7, the modem hangs up and reports: "**NO CARRIER"**. You can also cancel ongoing answering by sending a character of any kind to the modem. The possibility to cancel the answering, however, lasts only until a connection has been established. When the connection is established ("DCD" LED is lit), the modem goes immediately into the data mode.

Example:
Input: **AT A** ¿
Modem: The Modem "picks up the receiver" and sends an answer signal (answer mode)

Dnnn Dialing

Along with the actual data connection, the dialing of a telephone number represents one of the central tasks of a modem. For this reason the Hayes "AT" command set provides convenient commands for all aspects of dialing.

A **D** is always prefixed to the beginning of a dialing command. The desired telephone number follows. A "-" (hyphen) or "/" (backslash") can be inserted in the dial command to improve the legibility. The following characters originating from analog modem are ignored:

- P
- T
- , (comma)
- @
- ! (flash)
- W (wait)
- ; (semicolon)

If a telephone number has already been dialed after the modem was switched on, the "**DL**" sequence enables a redial of the number. The modem reports an **ERROR** when no number has been dialed.

Example:
Input: **AT D 0041 56 1234567** ¿
Modem: **OK**
The modem dials the country code (0041), the area code (56 without 0) and finally the telephone number (1234567).

You can find more detailed information in section 5.5 *Detailed Dialing Instructions*.

En Echo ON/OFF

This command determines whether the modem should send characters received from the PC back to the PC when the modem is in the command mode (=Echo). No echo can be returned when the MD4 is in RS485 mode (AT &C2).

E0 — Echo - OFF (default)
E1 — Echo - ON

Example:
Input: **AT E1** ¿
Modem: Characters are sent back to the PC.

H Hook (hang up)

The command closes an existing connection.

H — Close connection

In Identification / Check

The modem responds to this command with various messages for purposes of identification and checks.

I0 — Indicates modem type "210"
I1 — The EPROM checksum is calculated and reported.
The modem description and version number are also displayed.
I2 — A test of the modem memory is carried out. If no error occurs, **OK** is reported, otherwise **ERROR** is reported.
I3 — Returns the internal version number.
I4 — Displays the modem description, version number and the manufacturer.
I20 — Displays all commands allowed for remote configuration.
I21 — Displays the date when the firmware was compiled.
I69 — Shows DIP switch positions.

Examples:
Input: **AT I2**¿
Modem: **OK**

Input: **AT I69**¿
Modem: **DIP Sw 1 2 3 4**
OFF OFF OFF OFF

O Online

This command enables you to change from the command mode back to the data mode during an ongoing modem connection. For example, if you wish to change a modem parameter during a data connection, you first change from the data to the command mode using the ESCAPE sequence. As mentioned above, this does not end the modem connection! You can then enter the desired control commands to the modem. Finally, you change back to the data mode using **O** and continue the data transmission.

Example: (In this example ~ stands for: 1 second pause)

Input: **AT DP 0041 056 1234567** ¿ (dial)
Modem: Dials the other party and establishes a connection.
CONNECT 64000
(connection established; data mode)

Input: ~ **+++** ~ (ESCAPE: data → command mode)
Modem: **OK**

Input: **AT $T** ¿ (Command: display TEI value)
Modem: **75**

Input: **AT O** ¿ (Switch: command → data mode)
Modem: **CONNECT 64000**
(connection in data mode)
The data transmission can be continued.

Qn Quiet (no modem messages)

You can use this command to determine whether the modem messages such as **OK** or **ERROR** should be displayed. This command, however, only relates to the messages described under section 4.9 *Modem Responses*.

Q0 — Modem displays responses. (default)
Q1 — Modem displays no responses.

Example:
Input: **AT Q0** ¿
Modem: **OK**
Input: **AT Q1** ¿
Modem: (no response)

Note

Turning off the modem response messages does not mean that the commands are no longer executed! Only the messages of the modem are suppressed!

Sr? Read S-Register Indicated by r

This command is used to read a modem register, whereby **r** specifies the desired register. The returned display is always in the form of a three-digit decimal number. You can find a detailed description about the meaning of the individual registers in Chapter 7 *S-Registers*.

Example:
Input: **AT S0?** ¿
Modem: **003**
OK
The modem answers an incoming call after the third ring.

Note

The Sr? Command can be supplemented by another letter to determine the output format of the requested register content.

Sr? B — Displays the register content in binary format.

Sr? H — Displays the register content in hexadecimal format.

Sr=x Write to S-Register Indicated by r

This command is used to write the value **x** in register **r**. Note that some registers are "BIT mapped registers" which have values that need to be converted from binary into decimal numbers. Some registers are "read-only", in other words, the modem will report an **ERROR** when you attempt to write to them.

Example:
Input: **AT S0=2** ¿
Modem: **OK**
The modem now answers an incoming call after the second ring.

Note

The write command should be used very carefully as its misuse may lead to chaos in the modem control. Please use this command only after you are sure exactly what its effect will be!

Sr.b? Read Bit from S-Register Indicated by r

This command returns the value of an individual bit in the S-register specified by **r** as a three-digit decimal number. The value may be 0 or 1. The number of bit **b** can have the value 0 - 7, whereby 7 is the most significant bit.

Example:
Input: **AT S21.2?** ¿
Modem: **001**
OK

Sr.b=x Write Bit to S-Register Indicated by r

This command sets the value of an individual bit in the S-register specified by **r**. The **x** value may be 0 or 1. The number of bit **b** can have the value 0 - 7, whereby 7 is the most significant bit.

Example:
Input: **AT S80.6=1** ¿
Modem: **OK**

Vn Form of the Modem Response Messages

This command is used to determine the form of the modem responses, either in English text or as decimal code. See also Chapter 4.9.

V0 — Code messages
V1 — Text messages (default)

Note

Text responses are closed with a carriage return and line feed (CR/LF). Decimal responses have only a carriage return (CR)!

Xn Result Code (extended modem messages)

This command for monitoring the establishment of a connection has, for technical reasons, no effect in ISDN systems. Similar to analog systems and together with the **\V** command it can only be used to control modem messages.

Whereas **X0** results in a simple "CONNECT" message, with **X1...X4** together with **\V** the modem displays messages such as "CONNECT 64000".

Z RESET

Entering a **Z** command resets the modem's internal register to the settings in the EPROM. The conclusion of the RESET is confirmed by the modem with the message: **OK.** Commands following a **Z** command in the same line are ignored. The numbers following the ATZ command determine the profile to be loaded.

Example:
Input: **AT Z1** ¿
Modem: **OK**
The modem is reset to the settings from profile 1 saved in the EPROM.

&Cn Data Carrier Detect (DCD)

This command enables you to control the response of the DCD output. The DCD output is used to signal the connected terminal (PC) that the data carrier signal has been detected.

&C0— The DCD output is always ON regardless whether a carrier has been detected or not.

&C1— The DCD output corresponds to the status of the data carrier. ON status means: data carrier detected! (default)

&C2— Switch to RS485. DCD is active while the modem is sending characters to the RS485 port. There is no command line echo in this operating mode !

&Dn Data Terminal Ready (DTR)

Using the DTR signal the modem can determine if the connected terminal is ready for operation. At the same time DTR can also be used for various control tasks (for example with RS485). The "**DTR**" LED reflects the current status. The DTR signal criteria are the two signal edge transitions:

- ON to OFF: signals a change from the On status to the OFF status.
- OFF to ON: signals a change from the OFF status to the ON status.

&D0— The modem ignores the operating status of the terminal (= DTR signal). The LED "**DTR**" is always on.

&D1— The modem goes to the command mode as soon as it detects an ON to OFF edge transition from the DTR signal. The "**DTR**"LED reflects the current signal status.

&D2— The modem hangs up the receiver, goes to the command mode and switches Auto Answer off when an ON to OFF edge transition is detected. Auto Answer can be activated by an ON status from the DTR signal. The "**DTR**" LED reflects the current signal status. (default)

&D3— When an ON to OFF edge transition is detected the modem is reinitialized, that is, the configuration is reset to the setting in the non-volatile memory.

Note

In the ONLINE status the changes of the DTR signal are only detected when they last longer than the time specified in register **S25**!

&Fn Factory Settings

With this command the modem configures itself to the factory settings saved in the EPROM. There are 4 factory settings.

&F0 — Factory setting as configured on the DIL switch
&F1..4 — Load profiles 0..3
&F5..98 — Same as &F0
&F99 — Delete EEPROM

Note

The factory settings are not saved in non-volatile memory at this time! To do this the command **&Wn** must be entered.

&Rn Clear To Send (CTS) Behavior

This command enables you to control the response of the CTS signal.

&R0— CTS signal follows DTR or indicates readiness to send. This setting is used with V.25bis.
&R1— The CTS is always ON or follows the \Q setting in data mode (default).

&Sn Data Set Ready (DSR)

This command enables you to control the response of the DSR signal.

&S0— DSR signal always ON.
&S1— DSR signal is activated if a connection exists (default).

&Vn Display Configuration

This displays an overview of the configuration including the content of the S registers.

&V0 — Display current profile as set by DIL switches SW1.1 to SW1.4
&V1 — Display saved profile 0 (AT commands)
&V2 — Display saved profile 1 (AT commands)
&V3 — Display saved profile 2 (AT commands)
&V4 — Display saved profile 3 (AT commands**)**
&V5 — Display current S-registers (S0 – S99)
&V6 — Display saved profile 0 (S-registers)
&V7 — Display saved profile 1 (S-registers)
&V8 — Display saved profile 2 (S-registers)
&V9 — Display saved profile 3 (S-registers)
&V51 — Display current S-registers (S100 – S199)
&V52 — Display current S-registers (S200 – S255)

&Wn Write Configuration (save the current settings)

The **&W** command enables you to save "configuration profiles" in the non-volatile memory (EEPROM) of the MD4. These settings are loaded when the unit is switched on (based on the DIL switch settings) or after the command **ATZ** is entered.
When numbers follow the AT&W command they determine the area where the values are saved in the non-volatile memory. Otherwise DIL switches SW2.1 to SW2.4 determine the area.

&W — Save the profile in the area determined by the DIL switches
&W0..4 — Save the profile in the area 0..4

Example:
Input: **AT &W1** ¿
Modem: **OK**
Input: **ATZ** ¿
Modem: **OK**

The current modem configuration is saved in the profile area "1" of the non-volatile memory and then a RESET is carried out whereby the profile specified by the DIL switches is reloaded.

&Xn Ring Signal (RI) Behavior

This command affects the RING signal behavior. In addition to the signaling of incoming calls the clock pulse can be output in synchronous mode.

&X0 — Normal RI signal behavior
&X1 — Normal response to the ring signal for incoming calls and output of the synchronous clock pulse during an established connection.
&X2 — In contrast to &X1 no ring is reported, only the synchronous clock pulse will be output during an established connection.

&Zn=xxx Telephone Number Memory for Quick Dialing

This command enables you to save up to twenty often-used telephone numbers (**n** = 0..19) in the non-volatile memory, which can then later be selected by the short string **AT DS=n↵. xxx** represents the dialing sequence (telephone number + control characters) to insert.

Note

The maximum length for an entry in the quick dialing memory is 30 characters (not including spaces). Longer dialing strings are cut off after the 30th character!

Example:
Input: **AT &Z0=0221 1234567** ¿
Modem: **OK**

The telephone number is saved in the quick dialing memory "0". This information (telephone number) will not be lost when the modem is switched off. To dial the saved telephone number enter:

Input: **AT DS=0** ¿
Modem: **ATD02211234567**
Dial telephone number 0221/1234567.

Note

The quick dialing numbers can be displayed with the command AT \F!

%Pn Power-Up Dialing

This command causes the MD4 to dial a number from the quick dialing memory when the power supply is switched on.
The default entry %P0 switches the function off, %P1 activates the power-up dialing. The number of the quick dialing memory (0 – 19) is saved in register 41.

Example:
Input: **AT &Z5=12345** ¿ (Enter number 12345 in quick dialing register 5)
Modem: **OK**

Input: **AT S 41=5** ¿ (Select number saved in quick dialing register 5)
Modem: **OK**

Input: **AT %P1** ¿ (Activate power-up dialing)
Modem: **OK**

Input: **AT &W** ¿ (Save)
Modem: **OK**

Switch the MD4 off and then on again. The MD4 dials the number 12345.

*D? Display the date

The ISDN network supplies date and time information. In Germany this information is transmitted each time a connection is established. The information is not processed in the device itself! The date is displayed as "DD.MM.YY" (DD=day, MM=month, YY=year). For time display: refer to ***T?** command.

Example:

Input:	**AT *D?** ¿	(display the date)
Modem:	**02.02.01**	(2nd of February 2001)

*In Switching between AT and V.25bis Command Modes

The command interpreter of the MD4 can switch back and forth between AT commands and V.25bis commands.
The **AT *I1** command switches from the AT mode to the V.25bis mode.
The **CNL *I0** switches from the V.25bis mode to the AT mode (for more information refer to Chapter 6, *V.25bis Mode*).

*T? Display the time

The ISDN network supplies date and time information. In Germany this information is transmitted each time a connection is established. The information is not processed in the device itself! The time is displayed as "HH:MM:SS" (HH=hour, MM=minute, SS=second). For date display: refer to ***D?** command.

Example:

Input:	**AT *T?** ¿	(display the time)
Modem:	**12:30:25**	(12 o'clock, 30 minutes, 25 seconds)

Note

The exactness of the time of day cannot be guaranteed since it is supplied through the ISDN network by the individual provider.

\F Display Quick Dialing Numbers

The AT \F command provides a list of the 20 quick dialing numbers.

Example:

Input: **AT \F** ¿
Modem: **0 = 123456**
1 = 234567
2 = 345678
:
19 = 987654

\Tn Timeout" ("Inactive" Time Limit)

n may be between 0 and 90 and specifies the time in increments of 10s after which a connection is automatically disconnected if no more data traffic occurs within the specified time period. Entering zero deactivates the function. It is not available in the DIRECT mode. The default is "0".

\Vn Extended Connection Response Messages

This command can be used to extend the CONNECT messages of the modem with the baud rate and the protocol.
The following table lists the possibilities.
"DCE" = modem
"DTE" = local terminal, for example a PC
"Bit rate" = one of the possible DCE or DTE speeds
"Protocol" = the transmission protocol of the B cahnnel

\V0 — Standard CONNECT message with DCE bit rate
Format:"CONNECT bit rate"
Example: CONNECT 64000

\V1 — Extended CONNECT message with DCE bit rate and protocol
Format:"CONNECT bit rate / protocol"
Example: CONNECT 64000/X.75

\V2 — Standard CONNECT message with DTE bit rate
Format:"CONNECT bit rate"
Example: CONNECT 115200

\V3 — Extended CONNECT message with DTE bit rate and protocol
Format:"CONNECT bit rate / protocol"
Example: CONNECT 115200/V.110

The DCE bit rates may be:
2400, 9600, 19200 and 64000

The DTE bit rates may be:
300, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 19200, 38400, 57600 and 115200

Note

Normally the "extended CONNECT messages" should be activated to provide exact information about the type of connection. However, CONNECT messages are often evaluated by the communication programs and there may be circumstances in which a communication program being used cannot evaluate the extended CONNECT messages.

5.2 Speed Adjustment and Data Flow Control

\Qn Data Flow Control of the RS232/RS485 Interface

There are often differing transmission speeds between the modem and PC or between the modem and opposite modem. The data is therefore buffered in modem. The task of the data flow control is to prevent an overflow in the internal modem buffer. This is accomplished by instructing the PC to hold the transmission of data when the modem's buffer is full until the modem is ready to accept more characters. There are several methods for controlling this:

\Q0 — Data flow control OFF
If your PC or communication program does not have data flow control features, the control must be switched off using this command. The transmission of characters between the modem and the PC should then be less than or the same as the speed of the transmission line to the opposite party.

\Q1 — XON/XOFF data flow control
Using this type of data flow control, certain characters, namely XON (= Control Q) and XOFF (= Control S) are inserted to control the data flow. This is used to control the data flow not only between the modem and PC but also between two modems in certain circumstances. In this case both parties must have XON/XOFF control activated. In the opposite direction the PC can report to the modem that it presently cannot process any more characters.

> **Note**
>
> See also AT \X
>
> This type of data flow control is suitable for both RS232 and RS485 interface!

\Q2 — Unidirectional CTS data flow control
With this method the modem uses the CTS signal (Clear to Send) of the RS232 interface for controlling the data flow. By switching the CTS signal off the modem informs the terminal to stop sending data. This is referred to as unidirectional because the control only occurs in the direction "terminal sending data to modem".

> **Note**
>
> This type of data flow control is only suitable for the RS232 interface!

\Q3 — RTS/CTS data flow control
The CTS signal is used to control the data flow from the PC to the modem (see **Q2**), and in the other direction the RTS signal (Request to Send) is used to control the flow from the modem to the PC.

Note

This type of data flow control is only suitable for the RS232 interface!

\Q4 — Unidirectional XON/XOFF data flow control
In this mode the modem sends XON/XOFF characters to the connected PC. XON/XOFF characters arriving from the PC are ignored.

Note

This type of data flow control is suitable for both RS232 and RS485 interfaces!

\Xn XON/XOFF Forwarding

This command determines whether the modem should forward or filter out the XON/XOFF control characters. If "forwarding" is activated, XON/XOFF characters from your PC are sent to the opposite party, and, in the other direction, XON/XOFF characters from the opposite party are passed to your PC.

\X0 — XON/XOFF control characters are evaluated by the modem but not forwarded (default)

\X1 — XON/XOFF control characters are evaluated by the modem and forwarded.

$R DTR Command

The **$R** command enables you to save a command in the modem and have it carried out each time there is a positive edge transition in the DTR signal. Initialization or dialing commands can be saved here as commands. You can also save several commands in sequence. The character string limits for the command line still apply, however.

$R=AT . . . — Enter command
$R? — Display command

Note

The command line has to end after this command!

Example:
Input: **AT $R=ATD12345** ¿
Modem: **OK**
The modem dials the number 12345 as soon as it detects an ON to OFF edge transition from the DTR signal.

Note

This function enables you to establish a dial-up connection using a transition of the DTR signal but use a dedicated line protocol in the data phase.

5.3 Special ISDN Commands

This section lists all commands especially used for ISDN.

$M=s MSN (Multiple Subscriber Number)

One of the most important settings that need to made in order for the device to operate correctly is the entry of the MSN. In Germany a Euro ISDN connection is assigned 3 MSN by the Telekom. The MD4 is only suitable for the multiple-device connection! The "s" telephone number entered here specifies the connection number to which the modem responds and the telephone number to be used for outgoing calls. When this information is missing or incorrect the device may not operate properly or there will be problems in establishing connections. This especially affects extension systems which may not operate at all without the MSN information. What is more, many extension systems can only handle the extension number and not the full telephone number. For more information refer to the documentation of your telephone extension system.

The command **$M?** displays the currently entered MSN of the MD4.

$M=s — Enter the MSN
$M? — Display the MSN

Note

The command line has to end after this command!

Example:
Input: **AT $M=456789** ¿
Modem: **OK**

The modem now responds to incoming digital calls with the MSN 456789. Outgoing call attempts are also registered with this "caller number".

Note

When no MSN number is specified or the MSN=0, the MD4 responds to all incoming calls.

$Pn B Channel Protocol

The $P command specifies the transmission standard used for the B channel (transmission channel).

$P0 — V.110, depending on the DTE rate
$P1 — V.110, 9600 bps
$P2 — V.110, 19200 bps
$P3 — RESERVED
$P4 — V.120
$P5 — X.75 (default)
$P6 — transparent, synchronous
$P7 — transparent, flag stuff
$P8 — T.70NL (e.g. T-Online)
$P9 — RESERVED
$P10 — RESERVED

$T TEI Value

The TEI value (Terminal Endpoint Identifier) is used to identify the terminal device to the switching center in a multiple device system . The default is "Aut.TEI" should be maintained because it enables the modem on power up to automatically negotiate the TEI value with the switching center or extension system. You can query the value to determine if a valid value could be negotiated. The TEI value should only be manually specified in exceptional circumstances.

$T=n — "n" **=** 1..63 manual TEI value
= 0, 64-254 automatic TEI value
= 255 no TEI value
$T? — display TEI value

$Vn Extended ISDN Messages

$V enables configuration of the basic format for all modem messages especially the amount of information. In contrast to \V, which only extends the CONNECT messages, $V affects all messages even including RING messages, for example. The allowed value range is between 0 and 15, whereby "0" is the default. $V operates on bits. The value for $V is calculated from the sum of the bits set.

$V0 — No extended messages
$V1 — Display the caller number with the RING message
$V2 — Display the cause with the NO CARRIER message (see register S53 for the cause values)
$V4 — Display ALERTING during calling (signal of the opposite party that the call there is being reported, e.g. with RING)
$V8 — Display SIGNALING LINK NOT ESTABLISH (signaling in the D channel, level 1 and 2 is not functioning, ISDN connection defective, or no EURO ISDN)

Example:
Input: **AT $V15** ¿
Modem: **OK**
All modem messages are displayed with extended information.

$Xn X.75 Window Size

The window size determines the maximum number of frames (blocks) to be sent in the X.75 protocol without requiring the block to be confirmed. The allowed value range is between 1 and 7, whereby "1" is the default. This value was selected for reasons of compatibility since not all manufacturers can work with a larger window size. Larger values, however, reduce the protocol overhead which, in turn, increases the data throughput.

5.4 Call Protection, Remote Configuration and Security Callback

$Nxyz Call Protection

The modem can be instructed to only respond to specific telephone numbers by using caller identification. Calls made from telephone numbers not entered in the "Allowed callers list" are automatically rejected. It is therefore important to enter the telephone numbers exactly as they will be received, for example, including the area code although the caller is within the same telephone network area.

The extended RING message can be used to determine the exact form of the displayed telephone number. Refer to the $Vn command for more information.

$N0 — Caller identification deactivated
$N1 — Caller identification activated
$NCLR — Delete caller list
$NNL — Display caller list
$NNx=s — Enter telephone number "s" in caller list slot "x" (x=0..19)
$NNx? — Display list slot number "x" (x=0..19)

Note

This list also applies to remote configuration when caller identification is activated.

Example:

Input: **AT NN0=12345** ¿ (listed number 0: 12345)
Modem: **OK**
Input: **AT NN1=045678901** ¿ (listed number 1: 045678901)
Modem: **OK**
Input: **AT NNL** ¿ (display caller list)
Modem: **0=‘12345‘**
1=‘045678901‘
2=‘‘
:
19=‘‘
Input: **AT N1** ¿ (activate caller identification)
Modem: **OK**
The MD4 now only responds to calls which are forwarded to the MD4 by the ISDN exchange with either of the "caller numbers".

$Fxyz Remote Configuration

Remote configuration in the MD4 enables the password protected activation of up to 20 remote configuration access authorizations with 3 different levels. These levels are:

0 - "read-only access"

1 - "read and write access, no access to the password tables"

2 - "full access (supervisor)"

After CONNECT the "ESCAPE sequence" for remote configuration must be entered within the time specified in register S43. This is done by entering the character saved in register S42 4 times. The default for S43 is 10 seconds, the "#" (rhomb) is default for S42.

Following the remote configuration "ESCAPE sequence" the MD4 responds with:

"REMOTE CONFIC"
"ENTER PASSWORD:"

Once the correct password is entered you will find yourself in the command mode level of the remote modem.

$F0	**—**	Deactivate remote configuration
$F1	**—**	Activate remote configuration for the next call
$F2	**—**	Remote configuration always activated
$FCLR	**—**	Delete authorization table for remote configuration
$FPL	**—**	Display authorization table for remote configuration
$FPx=p:l	**—**	Remote configuration table line "x" (x=0..19) gets password "p" with level "l".
$FPx?	**—**	Display entry on table line "x" (x=0..19)

Example:

Modem (1) is the MD4 which will be enabled for remote configuration.

Preparatory configuration for modem (1):

Input (1):	**AT $FP0=word0:2** ¿	(authorization 0, password: word0,
Modem (1):	**OK**	level 2)
Input (1):	**AT $F2** ¿	(remote configuration always
Modem (1):	**OK**	activated)
Input (1):	**AT &W** ¿	(save)
Modem (1):	**OK**	

Remote access from modem (2) to modem (1):

Input (2):	**AT Dxyz** ¿	(call modem 1, number xyz)
Modem (2):	**CONNECT 64000/X.75**	
Input (2):	**# # # #**	(switch to remote configuration
Modem (2):	**REMOTE CONFIG**	mode)
	ENTER PASSWORD	
Input (2):	**word0**	(password entry)
Modem (2):	**PASSWORD ACCEPTED LVL2**	
Modem (1):	**REMOTE CONFIG DETECTED**	

Modem (1) can now be remotely configured through modem (2).

Input (2): **+ + +** (switch to command mode)
Modem (2): **OK**

Input (2): **AT H** (close connection)
Modem (2): **NO CARRIER**
Modem (1): **NO CARRIER**

$Cxyz Security Callback (Password and Callback)

The security callback feature gives the user control over the access established through an MD4. Five different levels are available:
0 - "Password check without callback"
1 - "Password check, callback to the listed number after 5 seconds"
2 - "Password check, callback to the listed number after 45 seconds"
3 - "Password check, query a callback number and callback after 5 seconds"
4 - "Password check, query a callback number and callback after 45 seconds"

Up to 20 different remote configuration access authorizations can be enabled.

$C0 — Deactivate security callback
$C1 — Activate security callback
$CCLR — Delete security callback authorization table
$CPL — Display security callback authorization table
$CPx=p:l:n — Security callback table line "x" (x=0..19) gets password "p" with level "l" and – depending on the level – possibly callback number "n".
$CPx? — Display entry on table line "x" (x=0..19)

Note

In addition to security callback, the security can be tightened using $N (authorized caller list).

Example:

You wish to protect the access to the PC to which the modem (1) is connected by assigning various passwords with different levels.

Preparatory configuration for modem (1):

Input (1): **AT $CP0=pass00:0** ¿ (password control only, no callback)
Modem (1): **OK**

Input (1): **AT $CP1=pass11:1:1111** ¿ (callback number 1111 after 5 seconds)
Modem (1): **OK**

Input (1): **AT $CP2=pass22:2:2222** ¿ (callback number 2222 after 45 seconds)
Modem (1): **OK**

Input (1): **AT $CP3=pass33:3** ¿ (query the callback number and callback after 5 seconds)
Modem (1): **OK**

Input (1): **AT $CP4=pass44:4** ¿ (query the callback number and callback after 45 seconds)
Modem (1): **OK**

Input (1): **AT $C1** ¿ (activate security callback)
Modem (1): **OK**

Input (1): **AT &W** ¿ (save)
Modem (1): **OK**

Query the list for security callback:

Input (1): **AT $CPL** (display the password table)
Modem (1): **0= 'PASS00': 0**
1='PASS11': 1 : '1111'
2='PASS22': 2 : '2222'
3='PASS33': 3
4='PASS44': 4
5=' ' : 0

Call modem (1) from modem (2):

Input (2): **AT Dxyz** ¿ (call modem 1, number xyz)
Modem (1): **INCOMING CALL FOR CALLBACK . . .**
Modem (2): **CONNECT 64000/X.75**
CALLBACK PROCEDURE
ENTER PASSWORD:

The called MD4 reacts differently depending on the various passwords used:

Input (2): **PASS00** ¿ (enter password 0, for level 0)
Modem (2): **PASSWORD ACCEPTED**
CONNECTED TO DTE

Input (2): **PASS11** ¿ (enter password 1, for level 1)
Modem (2): **PASSWORD ACCEPTED**
CALLING BACK NOW
Modem (2): **NO CARRIER**
Modem (1): **CALLBACK IN PROGRESS**
Modem (2): **RING** (callback after 5 seconds)
CONNECT 64000/X.75

Input (2): **PASS22** ¿ (enter password 2, for level 2)
Modem (2): **PASSWORD ACCEPTED**
CALLING BACK SOON
Modem (2): **NO CARRIER**
Modem (1): **CALLBACK IN PROGRESS**
Modem (2): **RING** (callback after 45 seconds)
CONNECT 64000/X.75

Input (2): **PASS33** ¿ (enter password 3, for level 3)
Modem (2): **PASSWORD ACCEPTED**
ENTER CALLBACK NUMBER

Input (2): **9876** ¿ (enter the callback number)
Modem (2): **NO CARRIER**
Modem (1): **CALLBACK IN PROGRESS**
Modem (2): **RING** (callback after 5 seconds)
CONNECT 64000/X.75

Input (2): **PASS44** ¿ (enter password 4, for level 4)
Modem (2): **PASSWORD ACCEPTED**
ENTER CALLBACK NUMBER

Input (2): **9876** ¿ (enter the callback number)
Modem (2): **NO CARRIER**
Modem (1): **CALLBACK IN PROGRESS**
Modem (2): **RING** (callback after 45 seconds)
CONNECT 64000/X.75

5.5 Detailed Dialing Instructions

Introduction

Along with the actual data transmission, establishing a connection between two modems is one of the most important tasks in modem control. For this reason this chapter provides special details about dialing.

5.5.1 Command Combinations for Dialing

Each dialing sequence starts with the **D** command which, together with the numbers **0** to **9**, forms the dialing command. One other character is available to make dialing more convenient.

S ¾ Stored:
S=n causes a telephone number previously saved with the command **&Zn** to be dialed.

Example:
Input: **AT &Z2= 0123 987654** ¿
Modem : **OK**

Input: **AT DS=2** ¿
Modem: **AT D 0123 987654**
Dials telephone number 0123 / 987654.

5.5.2 Dialing a Telephone Number

The following are examples of typical dialing commands:

Input: **AT D 0123 98765** ¿

As you see, this "normal" dial command contains nothing special. The space between the area code "0123" and the telephone number "98765"is ignored. It is only inserted to make the telephone number easier to read.

Input: **AT DP 001 808 123456** ¿

This is an example of dialing a telephone number in the USA (from Germany). First the modem dials "001", the country code for the USA, then the area code "808" and finally the telephone number "123456”.

5.5.3 Dialing through a Telephone Extension System

In telephone extension systems you are usually required to dial an access number for an external line. "0" or "9" are usually used for this. At the same time and especially in large telephone extension systems, there are often comparably few external lines available for the many internal extension users. It is therefore very possible that an attempt to get an external line will fail.

Input: **AT D 0 01234 987654** ¿

After the external access number is dialed, "0" in this example, the telephone number is dialed.

5.5.4 Repeat Dialing

The MD4 modem always saves the most recent dial command in its memory. You can redial using the command **AT DL**.

Example:

Input:	**AT D 01234 987654** ¿	
Modem:	**BUSY**	(opposite party is busy)
Input:	**AT DL**	(repeat dialing)
Modem:	**CONNECT**	(connection established)

5.5.5 Canceling Dialing

Dialing can be canceled at any time by sending any character to the modem before a data connection has been established. The modem then "hangs up the receiver" and, if it was still in the process of dialing, reports: **OK**. If the modem has finished dialing the telephone number and is waiting for a data carrier from the opposite party, it reports: **NO CARRIER**.

6 V.25bis Operation

Introduction

In addition to the Hayes® or AT command set, the MD4 modem can also be controlled using V.25bis. V.25bis is a command set defined by CCITT/ITU for modem control and signaling via the RS232 interface. Commands are only accepted in the offline mode.

As V.25bis only covers a small selection from the wide range of Hayes commands, its practical application is limited. However, the **CNL** command has been implement in the MD4 as a device-specific enhancement. This enables you to use almost all of the AT commands even in V.25bis.

Note

If the MD4 is connected to the terminal (PC) via the RS485 interface, it cannot be controlled with V.25bis!

Important

V.25bis is not capable of automatic speed or data format detection (autobaud)! It therefore uses:

- the last speed and data format valid on switching back from AT to V.25bis

or

- the default speed and format upon power-up

6.1 Switching from V.25bis « to the AT Command Set

AT Command Set ® V.25bis Command Set

In the AT command mode enter the following command to switch to the V.25bis mode:

AT *I1 &W Z ¿

The modem reports **VAL** (valid) and is now in the V.25bis command mode. Commands smaller than 3 or greater than 60 characters are recognized as errors and canceled with **INV** (invalid). The commands described in section 6.2 *V.25bis Commands* are now activated.

V.25bis Command Set ® AT Command Set

In the V.25bis mode enter the following command to switch back to the AT mode:

CNL *I0 &W Z ¿

Any commands you now enter will be interpreted as AT commands and the modem will respond accordingly.

6.2 V.25bis Commands

The following is a list of the V.25bis commands implemented in the MD4.

CIC Connect Incoming Call

The modem goes online and answers an incoming call in the answer mode. Any previous **DIC** is canceled at this time. Without an incoming call the modem responds with an **INV** message.

CNL Local Configuration

This command enables AT commands to be processed with V.25bis. Complete command lines can be entered.

Example: **CNLS0=2**
this corresponds to **AT S0=2**

CRIn Call Request With Number And Identification

In addition to its dialing function (similar to the CRN command), the **CRI** command also has the task of saving the MSN (the modem's own telephone number).
Following the **CRI** command there is the dial command with up to 40 characters which may contain the characters 0-9 and ; (semicolon). The semicolon serves as a separator between the telephone number and the identification number (MSN or the modem's own telephone number).

Example: **CRI 026448995;368765**
Dials 02644 / 8995 and
saves 368765 as the MSN.

Note

The CRI command also saves the MSN (the modem's own telephone number).

CRNn Call Request with Number

The modem connects to the line, begins the dialing sequence and establishes a connection.
Following the **CRN** command there is the dial command with up to 40 characters which may contain the characters 0-9.

Example: **CRN 026448996**

CRSn Call Request with Memory Address

The modem connects to the line and executes the saved dialing string (**n** = quick dialing memory 0 to 19) and establishes the connection.

Example: **CRS0**
this selects the telephone number saved in quick dialing memory 0

DIC Disregard Incoming Call

Configured for auto-answer, the modem disregards any current incoming call. INV is displayed when there is no incoming call or auto-answer is not activated. The command can be canceled with **CIC**.

PRNn;m Program Number

This command is used to store dialing strings in one of the 20 quick dialing memory slots numbered 0 to 19.

The following are included in the command:
n Memory slot 0 to 19
; Separator between the memory slot number and the dialing string
m Dialing string. The same numbers and characters are allowed as for **CRI** and **CRN** with up to 40 characters in length.

Example: **PRN14;0022123456**

RLNn List Request Of Stored Telephone Numbers

The modem displays the dialing string from the memory slot **n** in the quick dialing memory (0 to 19). If **n** is not specified, the modem displays the complete list. It first shows the number of the memory slot and then, separated by a semicolon, the stored number.

Example:
Input: **RLN** ¿
Modem: **0;019834**
1;026448996
etc.
VAL

6.3 V.25bis Response Messages

VAL Valid

A command was accepted and successfully executed.

INV Invalid

The command entered contains an error and cannot be executed.

CNX Connect

A connection was established. The connection speed is also displayed. The CNX message can be changed like the CONNECT message by setting X and \V.
The default setting for V.25bis is X3 \V1, in other words the DCE bit rate and possibly the protocol are shown.

Example: **CNX64000** or **CNX64000/X.75**

CFIxx Call Failure Indication

An attempt to call has not resulted in a connection. In addition, the cause is indicated by the parameter **xx**:

CFI AB No dial tone or canceled by the DTE (terminal)
CFI CB Reserved
CFI ET Busy signal detected
CFI NS Selected memory slot is empty.
CFI NT No answer tone / time limit exceeded

INC Incoming Call

An incoming call is detected.

S-Registers

7

Introduction

The MD4 features numerous registers which are referred to as S-registers. They are used to store modem settings. Some of the registers are temporary and are lost when the modem is switched off; others can be permanently saved in the EEPROM. AT commands can be used to read out and write to S-registers. The descriptions of the AT commands contain explicit information about the syntax for accessing the S-registers.

7.1 List of S-Registers

Register	#	Function
S0	EW	Number of rings for auto-answer
S1		Ring signal counter
S2	EW	ASCII: ESCAPE character [+]
S3	W	ASCII: Carriage Return [↵]
S4	W	ASCII: Line feed [↓]
S5	W	ASCII: Backspace [←]
S6	EW	Wait time for "dial tone " [sec.]
S7	EW	Wait time for data carrier [sec.]
S8	EW	Pause at comma in the dial command [sec.]
S9	EW	Min. detect time for data carrier [1/10 sec.]
S10	EW	max. carrier down time [1/10 sec.]
S11	EW	Tone dialing: Duration of tones [msec.]
S12	EW	Wait time before and after ESCAPE character [1/50 sec.]
S13		RESERVED
S14	E	Options register
S15		RESERVED
S16		RESERVED
S17		RESERVED
S18		RESERVED
S19		RESERVED
S20		RESERVED
S21	EW	Options register
S22	EW	Options register
S23	EW	Options register
S24	EW	DTE rate
S25	EW	DTR delay
S26		RESERVED
S27	EW	Options register
S30	EW	Inactivity timer
S31	E	RESERVED
S32	W	XON character
S33	W	XOFF character
S34		RESERVED
S35		RESERVED

Register	#	Function
S36		RESERVED
S37		RESERVED
S38	EW	Options register
S39	EW	Options register
S40	EW	Options register
S41	EW	Power-up dialing vector
S42	EW	Remote configuration ESCAPE character
S43	EW	Remote configuration ESCAPE time
S44	EW	Data format command line
S45	EW	Data format online
S46	EW	Time between RING + M3
S48	EW	M3 duty cycle
Results register		
S50		RESERVED
S51		RESERVED
S52		Result connection establishment protocol
S53		Most recent reason for hang-up
ISDN register		
S70		RESERVED
S71		RESERVED
S72		RESERVED
S73	EW	Options register
S74	EW	Options register
S75	EW	Options register
S76		RESERVED
S77	EW	Protocol in B channel
S78	EW	TEI value
S79	EW	RESERVED
S90		ISDN Results Register

E = can be saved in EEPROM
W = writable

7.2 Descriptions of the S-Registers

Register 0 —— Rings until answering

Default value: 1
Value range: 0 - 10
Meaning: Register **S0** is used to set the desired number of ring signals until the modem should automatically answers an incoming call (= auto-answer). When **S0** is "0"calls are not automatically answered. A value greater than "0" determines the number of ring signals until the "receiver is picked up". For example, a value of "3" means the modem answers the call after the third ring.

Register 1 —— Ring signal counter

Default value: 0
Value range: 0 - 20
Meaning: This register is used to count the number of ring signals for an incoming call. Every ring signal increments the contents of the register by one. Register **S1** only functions when register **S0** is set to a value greater than "0". When register **S0** and register **S1** match, the incoming call is answered.

Register 2 —— Definition: ESCAPE character

Default value: 43 (ASCII: +)
Value range: 0 – 127, 128 – 255
Meaning: This register is used to specify the ESCAPE character which is required for switching between the data and command modes. An entry of 128 – 255 deactivates this feature.
Alternatively, with the commands **&D1**, **&D2** or **&D3** an ON-to-OFF edge in the DTR signal can be used to change to the command mode.

Note

Entries greater than 127 deactivate this feature!

It is then no longer possible to exit the data mode using the ESCAPE sequence!

Register 3 —— Definition: RETURN character

Default value: 13 (ASCII: ↵)
Value range: 0 - 127
Meaning: The character defined here is used to close a command line. At the same time it appears at the beginning and the end of a modem response message. This only applies to asynchronous operation.

Note

Entries greater than 127 are not allowed and switch the function off! The default value should not be changed!

Register 4 —— Definition: Line feed

Default value: 10 (ASCII: ↓)
Value range: 0 - 127
Meaning: This character is inserted after the RETURN character (register 3) and only applies to asynchronous operation.

Note

Entries greater than 127 are not allowed and switch the function off! The default value should not be changed!

Register 5 —— Definition: Backspace

Default value: 8 (ASCII: ← [Backspace])
Value range: 0 - 32 or 127
Meaning: This register specifies the character for deleting data in the command line.

Note

The **AT** at the beginning of a command line cannot be deleted! The default value should not be changed!

Register 6 —— Wait time for dial tone

Default value: 2
Value range: 2 – 10 [seconds]
Meaning: Not applicable for the MD4.

Register 7 —— Wait time for data carrier of the opposite party

Default value: 30
Value range: 1 - 90 [seconds]
Meaning: Not applicable for the MD4.

Register 8 —— Pause in the dial command :"," (comma)

Default value: 2
Value range: 2 - 10 [seconds]
Meaning: Not applicable for the MD4.

Register 9 —— Time: Stable data carrier detected

Default value: 6
Value range: 1 - 100 [1/10 seconds]
Meaning: Not applicable for the MD4.

Register 10 — Time: max. allowed carrier down time

Default value: 7
Value range: 1 - 100 [1/10 seconds]
Meaning: Not applicable for the MD4.

Register 11 — Duration of tones for tone dialing

Default value: 95
Value range: 60 - 100 [1/100 seconds]
Meaning: Not applicable for the MD4.

Register 12 — Wait time before and after ESCAPE character

Default value: 50
Value range: 0 – 255 [1/50 seconds]
Meaning: This register determines the pause before and after the ESCAPE characters. The pauses between the three ESCAPE characters must also be less than the time specified here.

Note

If this register is set to zero, there is no pause before and after the ESCAPE character. The three ESCAPE characters must then be entered in immediate sequence!

Register 13 — RESERVED

Register 14 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0		-
1	0	**E0** Echo in the command line OFF
	1	**E1** Echo in the command line ON
2	0	**Q0** Modem response messages OFF
	1	**Q1** Modem response messages ON
3	0	**V0** Modem response messages as numbers
	1	**V1** Modem response messages as text
4		-
5		-
6		-
7		-

Register 15 — RESERVED
: :
: :
Register 20 — RESERVED

Register 21 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0		**&Cx** DCD control, see table for bit 5
1		-
2	0	**&R0** Wait for CTS
	1	**&R1** Ignore CTS
3 - 4	0	**&D0** DTR always ON
	1	**&D1** At negative DTR edge: Change to command mode:
	2	**&D2** At negative DTR edge: Break connection and change to command mode At positive DTR edge: Activate auto-answer
	3	**&D3** At negative DTR edge: Reinitialize modem
0 + 5	0	**&C0** DCD always ON
	1	**&C1** The DCD output corresponds to the status of the data carrier
	2	**&C2** Switch to RS485. DCD is active while the modem is sending characters to the RS485 port.
	3	**-**
6	0	**&S0** DSR always ON
	1	**&S1** DSR corresponds to V.22/V.22bis recommendation
7		-

Register 22 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0 - 3		-
4-6	0	**X0** No extended CONNECT
	4	**X1** Extended CONNECT
	5	**X2** Extended CONNECT
	6	**X3** Extended CONNECT
	7	**X4** Extended CONNECT
7		-

Register 23 — RESERVED

Register 24 — DTE bit rate

The current DTE speed is entered in this register. It can be read and written.

Bit	Value	Meaning
0 - 7	0	300 bps
	1	600 bps
	2	1200 bps
	3	2400 bps
	4	4800 bps
	5	7200 bps
	6	9600 bps
	7	12000 bps
	8	14400 bps
	9	16800 bps
	10	19200 bps
	11	21600 bps
	12	24000 bps
	13	25600 bps
	14	26400 bps
	15	28800 bps
	16	38400 bps
	17	57600 bps
	18	64000 bps
	19	76800 bps
	20	115200 bps

Register 25 — Delay of the DTR Signal

Default value: 2
Value range: 0 255 [0.0125 seconds]
Meaning: A shorter change in the status of the DTR signal than that specified here is ignored.

Register 26 — RESERVED

Register 27 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0		-
1		-
2		-
3 - 4	0	**&X0** Normal RI signal behavior
	1	**&X1** Normal response to the ring signal for incoming calls and output of the synchronous clock pulse during an established connection.
	2	**&X2** In contrast to &X1 no ring is reported, only the synchronous clock pulse will be output during an established connection.
	3	-
5		-
6		-
7		-

Register 28 — RESERVED

Register 29 — RESERVED

Register 30 — Inactivity Timer

Default value: 0
Value range: 0 - 255 [10 seconds]
Meaning: If no data is exchanged with the modem for the period of time specified here, it hangs up. The value "0" switches the function off.

Register 31 — RESERVED

Register 32 — XON character

Default value: 17
Value range: 0 - 127
Meaning: Contains the decimal value for the "XON" character.

Register 33 — XOFF character

Default value: 19
Value range: 0 - 127
Meaning: Contains the decimal value for the "XOFF" character.

Register 34 — RESERVED
: :
: :
Register 37 — RESERVED

Register 38 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0		-
1		-
2	0	**%P0** Power-up dialing deactivated
	1	**%P1** Power-up dialing activated
3		-
4	0	Unknown commands are ignored.
	1	Unknown commands return an ERROR.
5	0	***I0** Command language: AT commands
	1	***I1** Command language: V.25bis Commands
6		-
7	0	**$C0** Security callback deactivated
	1	**$C1** Security callback activated

Register 39 — Data flow control modem / terminal

Bit	Value	AT Command / Meaning
0-2	0	**\Q0** Data flow control OFF
	1	**\Q1** Data flow control bidirectional via XON/XOFF
	2	**\Q2** Data flow control unidirectional via CTS
	3	**\Q3** Data flow control bidirectional via CTS and RTS
	4	**\Q4** Data flow control unidirectional via XON/XOFF
3	0	Xon/Xoff disabled
	1	Xon/Xoff pass thru
4		-
5		-
6		-
7		-

Register 40 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0 - 1	0	**\V0** Display DCE speed, without extended messages
	1	**\V1** Display DCE speed, with extended messages
	2	**\V2** Display DTE speed, without extended messages
	3	**\V3** Display DTE speed, with extended messages
2		-
3		-
4	0	Normal call answering
	1	Quick call answering
5	0	Cancel with key
	1	No cancel with key
6		-
7		-

Register 41 — Power-up call vector

Default value: 0
Value range: 0 - 19
Meaning: This register contains a reference to the telephone number to use for power-up calling (**%P**).

Register 43 — Remote configuration: ESCAPE character

Default value: 35 (ASCII: #)
Value range: 0 - 255
Meaning: ASCII value of the remote configuration ESCAPE character. Values greater than 127 deactivate the feature.

Register 44 — Data format command mode

Bit	Value	AT Command / Meaning
0	0	7 data bits per character
	1	8 data bits per character
1 - 2	0	Parity: Zero (space)
	1	Parity: None
	2	Parity: Even
	3	Parity: Odd
3	0	1 Stop bit
	1	2 Stop bits
4	0	Register 44 determines the data format in the command mode.
	1	The AT command code determines the data format in the command mode.
5 - 7		-

Note

The data format is also dependent on the setting of the 4-pin DIL switch. This is only loaded at reset or at power ON.

Register 45 — Data format online / AT detection

Bit	Value	AT Command / Meaning	
0	0	7 data bits per character (online)	
	1	8 data bits per character (online)	
1 - 2	0	Parity: Odd	(online)
	1	Parity: Even	(online)
	2	Parity: None	(online)
	3	Parity: Zero (space)	(online)
3	0	1 Stop bit	(online)
	1	2 Stop bits	(online)
4	0	7 data bits per character	(AT detection)
	1	8 data bits per character	(AT detection)
5 – 6	0	Parity: Odd	(AT detection)
	1	Parity: Even	(AT detection)
	2	Parity: None	(AT detection)
	3	Parity: Zero (space)	(AT detection)
7	0	1 stop bit	(AT detection)
	1	2 stop bits	(AT detection)

Note

The data format is also dependent on the setting of the 4-pin DIL switch. This is only loaded at reset or at power ON.

Register 46 — Time between ring and RI signaling

Default value: 20
Value range: 1 – 60 [100 ms]
Meaning: Time span between RING message and triggering of the "RI" signal

Register 47 — Time between RI signaling

Default value: 3
Value range: 1 - 60 [100 ms]
Meaning: Time span between RING message and triggering of the "RI" signal

Register 48 — RESERVED

Register 49 — RESERVED

Register 50 — RESERVED

Register 51 — RESERVED

Register 52 — Results register connection establishment protocol

Bit	Value	AT Command / Meaning
0 - 4	0 – 7	RESERVED
	8	ISDN X.75
	9	ISDN V.110
	10	ISDN V.120
	11	ISDN 64 Kbps synchronous transparent
	12	ISDN 64 Kbps synchronous flag stuff
	13–15	RESERVED
5 - 7		-

Register 53 — Most recent reason for hang-up

Default value: 0
Value range: 0 - 127
Meaning: This register enables you to determine the most recent reason why a connection was disconnected. Possible entries are:

1: Unallocated number
2: No route to specified transit network
3: No route to destination
6: Channel unacceptable
7: Call awarded and being delivered in an established channel
16: Normal Call Clearing
17: User busy
18: No user responding
19: No answer from user (user alerted)
21: Call rejected
22: Number changed
26: Non-selected user clearing
27: Destination out of order
28: Invalid number format
29: Facility rejected
30: Response to STATUS REQUIRY
31: Normal, unspecified
34: No circuit/channel available
38: Network out of order
41: Temporary failure
42: Switching equipment congestion
43: Access information discarded
44: Requested circuit/channel not available
47: Resources unavailable, unspecified
49: Quality of service unavailable
50: Requested facility not subscribed
57: Bearer capability not authorized
58: Bearer capability not presently available
63: Service or option not available, unspecified
65: Bearer capability not implemented
66: Channel type not implemented
69: Requested facility not implemented
70: Only restricted digital information bearer capability is available
79: Service or option not implemented, unspecified
81: Invalid call reference value
82: Identified channel does not exist
83: A suspended call exists, but this call identity does not
84: Call identity in use
85: No call suspended
86: Call having the requested call identity has been cleared
88: Incompatible destination
91: Invalid transit network selection
95: Invalid message, unspecified
96: Mandatory information element is missing
97: Message type non-existent or not implemented
98: Message not compatible with call state
99: Information element non-existent or not implemented

100: Invalid information element contents
101: Message not compatible with call state
102: Recovery on timer expiry
111: Protocol error, unspecified
127: Interworking, unspecified

(Some messages may not be available in certain ISDN networks!)

Register 73 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0 - 2		-
3	0	**$N0** Caller identification ON
	1	**$N1** Caller identification OFF
4 - 7	0	**$V0** no extended ISDN messages.
	1	**$V1** caller identified at ring
	2	**$V2** reason displayed at NO CARRIER, see S92
	4	**$V4** Alerting also displayed
	8	**$V8** "Signaling link not established" displayed

See also Chapter AT Commands, **$Vn** command, Extended ISDN Messages.

Register 74 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0 - 2		-
3	0	**$R0** DTR command ON
	1	**$R1** DTR command OFF
4 – 7		-

Register 75 — Modem control register (bit mapped)

Bit	Value	AT Command / Meaning
0 - 1	0	**$F0** remote configuration deactivated
	1	**$F1** activate remote configuration for the next call
	2	**$F2** remote configuration always activated
	3	**$F3**
2 - 3		-
4	0	**$H0** for flag stuff: activate higher levels
	1	**$H1** for flag stuff: deactivate higher levels
5-7	0-7	**$Xn** X.75 window size

Register 76 — RESERVED

Register 77 — Protocol in B Channel

Default value: 5
Value range: 0 - 10
Meaning: The contents of this register corresponds to the protocol in the B channel specified by **$P**. The register contains the value passed by **$P**. The protocol can also be selected by writing to this register.

Register 78 — TEI Value

Default value: 0
Value range: 0 - 255
Meaning: The current TEI value is located in this register. The register contains the value passed by **$T**.

Register 90 — ISDN Results Register

Default value: 0
Value range: 0 - 7
Meaning: This read-only register enables you to query the current ISDN speed.

0: V.110 9600bps
1: V.110 19200bps
2: V.110 38400bps
3: 64 kbps
4: -
5: -
6: -
7: -

Problem Report

SINAUT ST1 / ST7 / ST7*cc*

K _ _ _ _ **(Servicenumber** given by I&S OCW TI Hotline)

E _ _ _ _ **(Servicenumber** given by I&S IS6 ECS)

To	From	Entry remark
SIEMENS AG I&S OCW TI Attn. Ms. Ksiondz Siemensallee 84 76181 Karlsruhe Germany		
Tel. +49 (0)721 / 595 - 5204 Fax. +49 (0)721 / 595 - 5244 E-mail: **Hotline.ST@khe.siemens.de**	Tel. Fax. E-mail:	Response: ..... Done: .....

When hardware is clearly at fault, please send the device to:

Siemens AG, I&S IS6-ECS, Retourenstelle, Attn. Ms. Stenzel,
Frauenauracher Str. 98, 91056 Erlangen, Germany

Forwarded on	for information	for processing
☐ to Karlsruhe I&S OCW TI, Mr./Ms.:	☐	☐
☐ to Erlangen I&S IS6 ECS, Mr./Ms.:	☐	☐

1. **Keyword :** .....
2. **Project :** .....
3. **Contact at Siemens AG (Sales):**

   Name: ..... Dept.: ..... City: .....
4. **Contact at customer**

   Company: ..... Dept.: .....

   Name: ..... Tel.: ..... Fax: .....

   Street: ..... ZIP: ..... City: .....

   E-mail: .....
5. **Brief description of plant** (for example: Dial-up network with 10 stations)

   .....

   .....
6. **Description of problem:**

   Occurs : ☐ always ☐ sporadically ☐ reproducible

   The error has occured since: ..... observed by: .....

   Problem already discussed with: ..... on:.....
7. **Attachments:**

   ☐ Network configuration ..... ☐ Archived project ..... ☐ other attachments

.....

Dept., City, Date Processed by

To be completed by the person who processes the problem report:

Keyword 1: .....

Keyword 2: .....

8. Description of problem: (Description, what are the expected / observed results, error log, messages, . . .)

If the problem described relates to several stations / components, please list each of the components affected

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

9. Information about versions: (TIM software version available in STEP7 dialog: 'Module Information', 'General' tab)

ST1 / ST7 Components:

SW Components	*Version*	*SW Components*	*Version*
☐ **Configuration Tool**		☐ **Routing Server**	
☐ **TD7 Library**		☐ **Diagnostics Server**	
☐ **Firmware**		☐ **Time-of-day Server**	
☐ **RMOS for TIM ST7**		☐ **SDB Server**	
☐ **Installation**		☐ **WAN Dial-up Driver**	
☐		☐ **WAN Dedicated Line Driver**	

HW Components	*Order Number*	*Version*
☐ **TIM**	6NH7 800-	
☐ **Modem**	6NH7 810-	
☐ **CPU**		

ST7*cc* Components:

SW Components	*Version*	*SW Components*	*Version*
☐ **ST7 Server**		☐	
☐ **ST7*cc* Config**		☐	
☐ **ST7 Channel DLL**		☐	
☐ **Softnet S7**		☐	
☐ **S7 542**		☐	
☐ **WinCC**		☐	

Published by
Siemens AG
Industrial Solutions & Services
I&S OCW TI
Sales SINAUT ST
Siemensallee 84
D-76181 Karlsruhe, Germany

Tel: ++49 / 721 / 595-4466
Fax: ++49 / 721 / 595-5244

www.sinautst.com

subject to change
without notice (07/2002)