Manual
LAN-Modem

W&T

W&T

Introduction

The LAN-Modem permits devices that require dial-up modems for communicating to use the Intranet or Internet instead of the telephone system. On a serial interface, the LAN-Modem behaves in a way this is compatible with standard modems for the telephone system; the only difference is that the dial-up number is replaced by an IP address.

before:

now:

Inhalt

1   Quickstart

Already experienced users of LAN-Modems will find on the two following pages a flow chart with the essential steps for start-up as well as the configuration. Detailed information can be found then in the following sections.
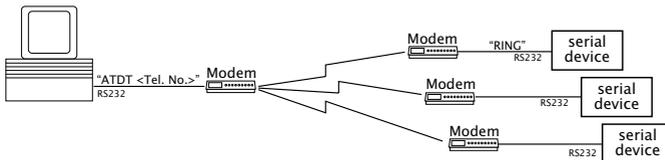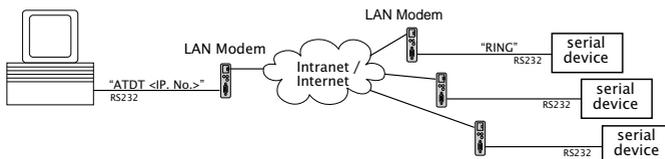
1.1   Installation in flow chart form

Network

LAN-Modem

Windows PC
with TCP/IP

Select site

WuTility
installed?

no

Install
WuTility with
product CD

yes

Connect
supply voltage

Start
WuTility

Connect
network cable

Select
LAN-Modem in
inventory list

Optain IP
address, subnet
mask, gateway
address

Button:
IP address

Enter IP address,
subnet mask,
gateway

Finish
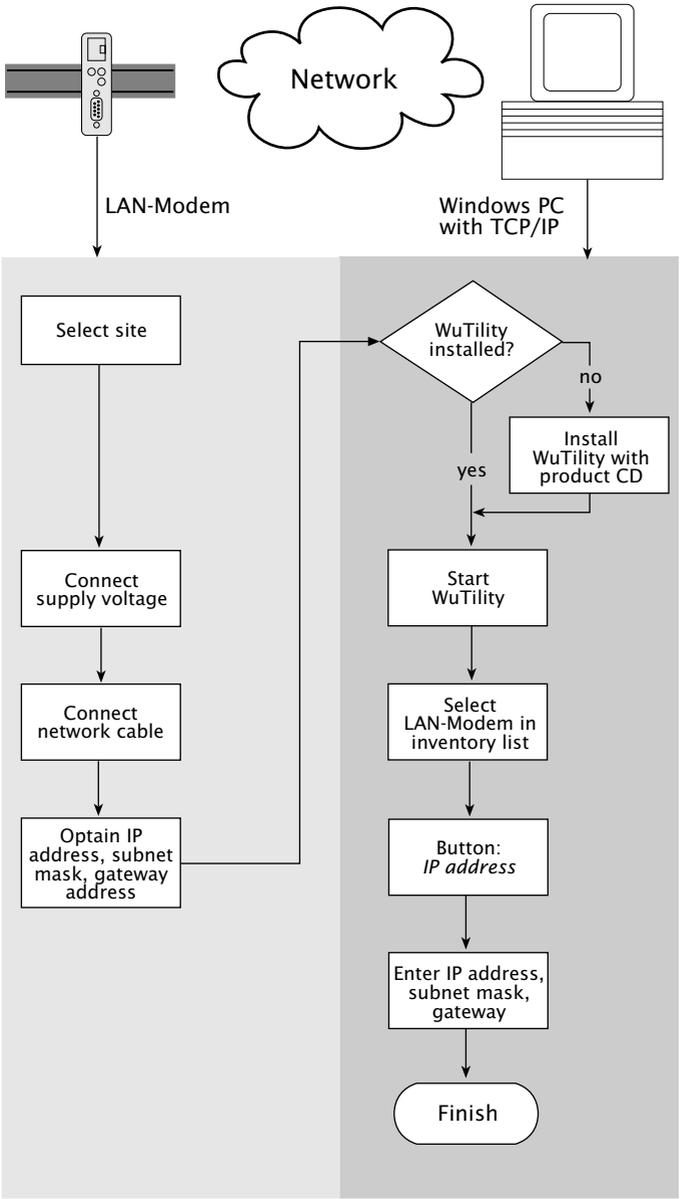
1.2 Factory Default setting

The list contains an overview of the most important settings. Detailed information on the respective parameters can be found in later sections of this manual.

Network settings

Hardware connection:	Auto negotiating
IP address:	0.0.0.0
Gateway address:	0.0.0.0
Subnet mask:	255.0.0.0
DHCP:	Active
TCP port for incoming calls:	8000

⚠️ *To prevent unintended address assignments or changes, we recommend deactivating the DHCP, BOOTP and RARP protocols if they are not expressly used in the respective network environment.*

Serial settings

Baud rate:	9600
Data bits:	8
Parity:	NO
Stop bits:	1
Handshake:	Hardware (RTS/CTS)

2   Assigning the IP address

The LAN-Modem is factory set to IP address 0.0.0.0. Before you can make the entry in the LAN-Modem, you need to specify an IP address that is valid for your network. You system administrator will provide you with this. If you have only a small network with no routing, use the IP address of your PC and simply change the last digit. The IP address must be unique within the network!

■ Assigning IP address, subnet mask and gateway address
   using *WuTility* management tool

■ Assigning IP address, subnet mask and gateway address
   through the serial port

■ Assigning IP address, subnet mask and gateway using
   DHCP/BOOTP protocol

■ Using the ARP command

2.1   Configuring network parameters with *WuTility*

The Windows tool WuTility version 3.0 and higher allows not only inventorying of LAN-Modem, Com-Server and Web-IO installations, but also convenient assignment of the following network-side basic parameters:

- IP address
- Subnet mask, gateway address
- Activating/deactivating BOOTP/DHCP

Assigning requires that the PC and LAN-Modem be in the same subnet. In firmware revisions 1.45/1.14 and higher the function is independent of the current address settings in the LAN-Modem, i.e. even changes to parameters not matching the network are easily made. Any system password which has been set must however in this case be known.

Downloading and installing *WuTility*
The most current version can always be found at our Web site under the following address:

http://www.wut.de

From there use the menu tree on the left side to navigate:

Downloads → Serial Com-Servers

After unzipping the ZIP file, begin installation by double-clicking on the file *wutility_xxxus.msi. WuTility* is started from

Start → Programs → W&T Software Toolkit → WuTility

Starting the assignment dialog
First be sure that both the LAN-Modem and the computer you are using are connected to the same network and are in the

same subnet. When started, *WuTility* automatically searches the local network for connected W&T network devices and creates an inventory list. This search process can be repeated manually as often as desired by clicking on the *Scan* button:

Within the inventory list you can identify the desired LAN-Modem based on its MAC address. For initial installations its IP address is 0.0.0.0.
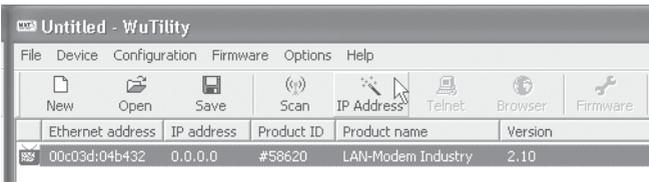
Select the LAN-Modem and click on the *IP address* button:

To use the LAN-Modem with dynamic IP parameters, select in the following dialog box the corresponding option *DHCP* or *BOOTP* and then click on the *Next* button. Detailed information about these modes can be found in the section *IP Assignment using DHCP protocol* and *IP Assignment using BOOTP protocol.*

The *Static* option allows you to assign fixed basic parameters while simultaneously disabling *DHCP* and *BOOTP* protocols in the LAN-Modem. Enter the desired values for IP address, subnet mask and gateway address in the corresponding entry fields.
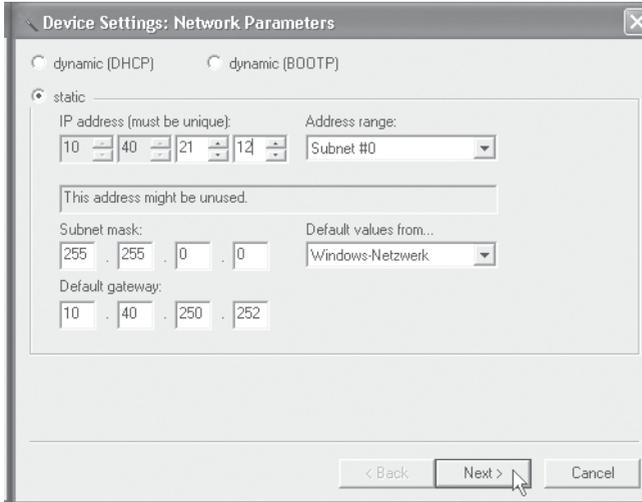
Clicking on the *Next* button assigns the network parameters to the LAN-Modem. After acknowledging the resulting message, all the columns in the *WuTility* device list are filled in with information.

This concludes the network-side startup of the LAN-Modem. With the exception of a few special settings, the rest of the configuration is done as for a standard dial-up modem using the serial port and AT commands.

⚠ *Changing network parameters is protected by the system password. To prevent improper access, we recommend assigning a system password for any LAN-Modems in use. Additional information can be found in the section* Extended configuration of the LAN-Modem.

2.2   Serial assigning of IP, subnet mask and gateway

After a LAN-Modem reset a time window of around 2 seconds is available, during which you can assign a new IP address, subnet mask and gateway address by entering at least 3 „x".

⚠️ *This serial method functions regardless of whether the LAN-Modem already has an IP address or not. The procedure can be repeated as often as desired. Therefore use this method if you don't know the IP address or have forgotten it.*

First connect the serial port of the LAN-Modem to a computer. For a standard PC or laptop, you will need a *1:1* wired RS232 cable (=modem cable, see *section RS232 interface*).

The serial transmission parameters of the terminal program you use should be set to *9600 baud, no parity, 8 bits, 1 stop bit*, no handshake. Reset the LAN-Modem by interrupting the power. When the green status LED lights up, enter the letter „x" at least three times on the terminal, until the LAN-Modem returns the prompt *IPno.+<Enter>*.

Use the usual format (xxx.xxx.xxx.xxx) to enter the IP address, and end the entry by pressing *<Enter>*. If the entry was accepted, the acknowledgement is the assigned IP address. Otherwise you will get a *FAIL* message followed by the last current IP address.

2.2.1 Assigning of subnet mask and gateway address

Together with the IP address, the subnet mask and gateway address can also be assigned serially. The entry is separated by commas and follows the IP address. Entering as shown in

the following example will assign IP address 172.17.231.99, subnet mask 255.255.255.0 and gateway 172.17.231.52 to the LAN-Modem.

```
xxx                                              ->  LAN-Modem
IP no.+<ENTER>:                                  <-  LAN-Modem
172.17.231.99,255.255.255.0,172.17.231.52        ->  LAN-Modem
172.17.231.99,255.255.255.0,172.17.231.52-1      <-  LAN-Modem
```

2.2.2 Activating/Deactivating DHCP, BOOTP/RARP

The DHCP and BOOTP/RARP function of the LAN-Modem can be turned off as part of assigning the IP address serially. To activate/deactivate the DHCP or BOOTP/RARP client enter one of the following options directly appended (no space!) to the IP address and confirm with *<Enter>*.

- **-0**
  DHCP and BOOTP/RARP = OFF
- **-1**
  DHCP = OFF,
  BOOTP/RARP = ON
- **-2**
  DHCP = ON
  BOOTP/RARP = OFF

Example: Deactivation of DHCP and BOOTP/RARP

```
xxx                  ->  LAN-Modem
IP no.+<ENTER>:      <-  LAN-Modem
172.17.231.99-0      ->  LAN-Modem
172.17.231.99        <-  LAN-Modem
```

⚠ *To prevent unintended address assignments or changes, we recommend deactivating the DHCP and BOOTP/RARP protocols if they are not expressly used in the respective network environment. LAN-Modems with incorrectly assigned IP addresses can be easily found after the fact using the scan function of the WuTility management tool and reconfigured.*

2.3   Assigning the IP using DHCP protocol

Many networks use DHCP (**D**ynamic **H**ost **C**onfiguration **P**rotocol) or its predecessor BOOTP described in the following section for centralized and dynamic assignment of the network parameters. DHCP protocol is activated by the factory default settings, so that in network environments dynamic IP assignment is sufficient for connecting the LAN-Modem to the network. The following parameters can be assigned using DHCP:

· IP address
· Subnet mask
· Gateway address
· Lease time

⚠ *To prevent unintended address assignments or changes, we recommend deactivating the DHCP and BOOTP/RARP protocols if they are not expressly used in the respective network environment. LAN-Modems with incorrectly assigned IP addresses can be easily found after the fact using the scan function of the WuTility management tool and reconfigured.*

2.3.1 Activating/Deactivating DHCP

The factory default setting is for DHCP protocol active. To deactivate it or to enable it again later, use one of the following options.

- **Management-Tool WuTility**
  Select the desired LAN-Modem in the device list and click on the *IP Address* button. In the following dialog box enter the desired option *DHCP*, *BOOTP* or *Static.* Clicking on *Continue* then sends the new configuration data to the LAN-Modem.

- **Serial port**
  As part of serial IP assignment, the following options for deactivating/activating DHCP and BOOTP can be selected directly following the address string:

  -0 → Deactivates DHCP and BOOTP/RARP
  -1 → Activates BOOTP/RARP
  -2 → Activates DHCP

  A detailed description of the procedure can be found in the section on *Serial assignment of IP, subnet mask and gateway*.

2.3.2 System Name

To support any automatic updating of the DNS system by the DHCP server, the LAN-Modem identifies itself within the DHCP protocol with its system name. The factory default setting for this is *LanModem-* followed by the last three places of the Ethernet address. For example the factory set system name of a LAN-Modem with the Ethernet address 00:c0:3d:01:02:03 is *LanModem_010203*. The system name of the LAN-Modem can be changed in the configuration. For additional information refer to the section *Extended configuration of the Lan-Modem.*

2.3.3 Lease-Time

The lease time determined and transmitted by the DHCP server specifies the Time-To-Live of the assigned IP address. After half the lease time has expired, the LAN-Modem attempts to extend the time for the assigned DHCP server and up update the address. If this is not possible by the time the lease time expires, for example because the DHCP server can no longer be reached, the LAN-Modem deletes the IP address and starts a new cyclical search for alternate DHCP servers for the purpose of assigning a new IP address.

Because of the absent clock, the lease time associated with the current IP address is no longer available after a reset. After the

restart therefore a corresponding update request is issued with the original DHCP server. If the latter is not resolvable at this point in time, the LAN-Modem deletes the IP address and starts a new cyclical search for alternate DHCP servers.

⚠️ *If after the assigned lease time has expired the DHCP server is not reachable, the LAN-Modem deletes its IP address. All existing network connections with other network clients are thereby closed. To prevent such events, we recommend configuring the assigned lease time in the DHCP server to infinite if possible.*

2.3.4 Reserved IP addresses

A LAN-Modem provides services which other clients in the network can make use of as needed. To open a connection, they of course need the current IP address for the LAN-Modem, so that in such situations it makes sense to reserve a particular IP address for the LAN-Modem on the DHCP server. This is generally done by linking the IP address to the unique Ethernet address of the LAN-Modem, which can be found on the sticker attached to the housing.

```
58xxx      [Model]
EN=00c03d004a05 ——— Ethernet address
OK xxxxxx
```
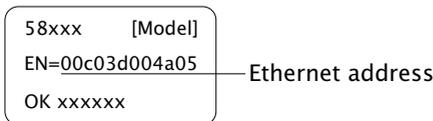
2.3.5 Dynamic IP addresses

Operation with dynamic address assignment, whereby the LAN modem receives a different IP address after each restart of after the lease time has expired, is not recommended, since the AT dial-up command can be used only with numeric IP addresses.

2.4   Assigning the IP using BOOTP protocol

Many networks use BOOTP as predecessor of DHCP protocol for centralized and dynamic assignment of IP addresses. The factory default setting is for BOOTP turned off. You can activate it e.g. by using WuTility The following parameters can be assigned:

- IP address
- Subnet mask
- Gateway address

⚠ *To prevent unintended address assignments or changes, we recommend deactivating the DHCP and BOOTP/RARP protocols if they are not expressly used in the respective network environment. LAN-Modem with incorrectly assigned IP addresses can be easily found after the fact using the scan function of the WuTility management tool and reconfigured.*

2.4.1 Address reservation

BOOTP protocol is based on fixed reservations of fixed IP addresses for particular Ethernet addresses. This means a LAN-Modem connected to the network only gets an IP address if the latter was previously stored in the BOOTP server. Check with your system administrator for creating this reservation. The Ethernet address of the LAN-Modem can be found on the housing sticker.

```
58xxx      [Model]
EN=00c03d004a05 ——— Ethernet address
OK xxxxxx
```

Once the administrator has made the necessary entries, the LAN-Modem obtains the desired IP address automatically after each reset. To ensure accessibility of the LAN-Modem even should the BOOTP server go down, the previous IP address is retained should there be no reply.

3　Interfaces and displays

■ Ethernet interface

■ Serial interface

■ Supply voltage

■ LED displays

3.1   Ethernet connection

The LAN-Modem incorporates an IEEE 802.3-compatible network interface.

Link-Status
The current link status of all models is indicated by the Error LED on the device front panel. Flashing at a rate of approx. 1 second indicates that there is no connection to the hub or that the connection is faulted.

3.1.1 10/100BaseT on RJ45

The LAN-Modem has a 10/100BaseT network interface on a shielded RJ45 connector. The pin assignments shown below correspond to an MDI interface, so that the connection to the hub or switch is made using a max. 100m long 1:1 shielded patch cable.
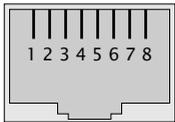
Pin	Direction	Signal
1	Out	Tx+
2	Out	Tx-
3	In	Rx+
4	In	nc
5	In	nc
6	In	Rx-
7	In	nc
8	In	nv

The network connection is galvanically isolated with respect to the supply voltage as well as the serial interface(s) for at least $500V_{rms}$.

Auto Negotiation: 10/100BaseT, Full/Half Duplex
LAN-Modems are factory set to operate in Auto-Negotiation mode on the network side. The data transmission speed and duplex are automatically negotiated with the connected switch/hub and set accordingly.

In addition to the Auto-Negotiation mode, both the LAN-Modems as well as many switches can be configured for fixed transmission parameters with respect to speed and duplex. To prevent communications problems (duplex mismatch), only the following two combinations are permissible:

- *Both* parties (switch and LAN-Modem) are operated in Auto-Negotiation mode.

- *Both* parties (switch and LAN-Modem) are configured for the same (fixed) transmission speeds and duplex mode.

Information on toggling between Auto Negotiation and fixed transmission speeds can be found in the section *Expanded LAN Modem Settings*.

⚠ *Managable switches often have special protocols (spanning tree, port trunking, ...) as required for example for uplinks to other switches or broad-band connection of servers. These protocols are not generally required for connecting a normal terminal device such as the LAN-Modem, and they do under some circumstances significantly delay opening of communication after a new start. We recommend deactivating these protocols and functions on the port used for the LAN-Modem. Please consult here with the responsible network administrator.*

3.2 RS232 interface

The pin assignments for the RS232 port are identical with that of a dialup modem, which means that standard cable can be used. Make sure that the ports for the LAN-Modem and the serial terminal device are configured for identical transmission parameters and handshake procedures.

The following table shows the factory configured functions for the individual signals. These can be modified using the respective AT commands.

Pin	Direction	Factory setting	AT command
1	Output	Active for existing connection	AT&Cn
2	Output	Data output	---
3	Input	Data input	---
4	Input	If deactive, break connection and do not accept new connection until active again	AT&Dn
5	GND	---	
6	Output	Always active	AT&Sn
7	Input	Hardware handshake input Data output only when active	AT&Kn
8	Output	Hardware handshake output active = ready to receive data deactive = not ready to receive data	AT&Kn
9	Output	For incoming connection alternately 1s active, 4s deactive until connection is established; then deactive	---

3.3 Supply voltage

The supply voltage for the LAN-Modem can be brought in on the adjacent screw terminals on the underside of the housing. DC voltage of any polarity or AC voltage may be used. The reverse polarity protection results in the following various maximum and minimum values for the supply voltage:

- AC: 9Vrms (- 10%) - 30Vrms (+10%)
- DC: 12V (-10%) - 48V (+10%)

The current draw is indicated in the technical appendix.

3.4 LED displays

Status and error information is indicated by the LAN-Modem using three LEDs having various blink codes.

- **Power-LED**
  Indicates the presence of supply voltage. If the LED is not full on, please check your power supply connections.

- **Status-LED**
  Flashes when there is network activity with the LAN-Modem. Periodic flashing indicates that the port has a connection to another station.

- **Error-LED**
  The error LED uses various blink codes to indicate error states on the device or serial port:
  1 x flashing = *Check network connection*
  The LAN-Modem is not receiving a link pulse from a hub. Check the cable and hub.
  2 x flashing/3 x flashing
  There is an internal communication problem. Connections to other LAN-Modems are no longer possible or are defective. The problem may be correctable by resetting to the factory default settings.
  All LEDs on = *Self-test error*
  The self-test performed after each start or reset of the LAN-Modem could not be correctly finished due for example to an incomplete update of the firmware. In this state the LAN-Modem is no longer operational. Please return the unit for repair.

4 LAN-Modem operation settings

In addition to the traditional paired operation of the W&T LAN-Modem it is also possible to communicate on a Windows computer using virtual modem ports.

■ Standard mode

■ Download and installation of the W&T COM redirector

■ Communication with virtual modem ports

4.1 Standard mode *LAN-Modem <> LAN-Modem*

Like standard modems in a land line network, the devices are connected in pairs, i.e. there is a LAN-Modem on both the calling and receiving side.

Starting with an AT dial-up command (*ATD*...) the calling LAN-Modem opens a TCP connection to the destination system. In response to this incoming call, the character sequence *RING* and the hardware signaling are generated on the serial side on the RI line. After the call is answered with the *ATA* command there exists then a character-transparent data connection.

4.2 Mode *LAN-Modem <> Virtueller Modemport*

If one side of the connection is a Windows application, then on this side it is possible to use a virtual modem port of the W&T COM Port Redirector. This emulates a local COM port including a connected LAN-Modem. In other words, just as with a hardware LAN-Modem the AT command set described in the following section can be used for control and monitoring the connection.
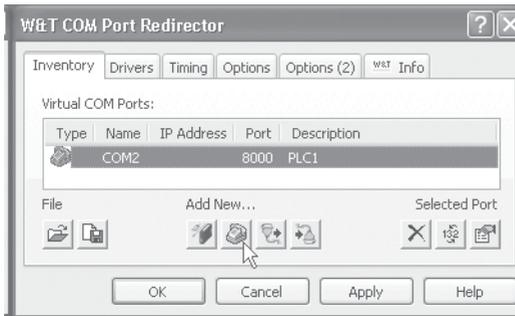
⚠️ *The following sections contain only a brief guide to the function of the W&T COM Port Redirector and modem ports. Additional information on all configuration options for the W&T COM Port Redirector can be found in the online help.*

Download of the W&T COM redirector
The latest version of the COM Port Redirector can always be downloaded from our Web site.

http://www.wut.de

The simplest way to navigate from there is by using the menu tree on the left side of the page. Follow the

Downloads → Com-Servers

path to get to the website containing a direct link to the COM Port Redirector.

Use of the COM Port Redirector in connection with W&T LAN-Modems is free and not subject to any licensing requirements.

Installation/deinstallation of the COM port redirector

System requirements for installing the W&T Com Port Redirector:

· Operating system Windows NT, 2000, XP, Vista, Windows7
· Login as administrator or with administrator rights

⚠️ *Installation of the W&T Com Port Redirector is done as an update to any already existing older versions. All settings and connection parameters are saved and remain available unchanged. To prevent restarting of the computer when your are finished, quit all applications and services which are actively accessing COM ports before performing the update.*

After downloading and unpacking the archive, start the MSI file to start installation. In addition to setting up the core driver, a link to the configuration tool in the Windows Start menu under *W&T COM Port Redirector* is created.

The W&T COM Port Redirector is uninstalled using Windows software administration. Start the Software applet in the control panel and there select the entry *W&T COM Port Redirector*. Clicking on the *Remove* button removes the COM Port Redirector from the system.

Setting up virtual modem ports
To set up a new virtual modem port, start the COM Port Redirector configuration tool from the Windows *Start* menu and click there on the *LAN-Modem* button. The resulting dialog window provides only the two following configuration options:

If this option is enabled, the virtual modem port on the specified TCP port also allows incoming calls, comparable to a hardware LAN-Modem, whereby the TCP port number used is functionally the same as the local port setting in the LAN-Modem. Additional information can be found in the section *Expanded Configuration of the LAN-Modem*.

Description (optional):

The optional name entered here is used only for identifying the port within the inventory list of the W&T COM Port Redirector. It has no effect on the actual operation or communication.

5   Modem Operation

After the network configuration is complete, the LAN-Modem behaves on the serial side just like a dial-up modem with an AT command set, except that the TCP/IP LAN takes the place of the telephone line. As far as the controlling application or controlling device is concerned, all that needs to happen is that the previously used telephone number is replaced by the IP address of the distant terminal.

■ Serial transmission parameters

■ Command syntax

■ List and explanation of all AT commands

5.1 Serial transmission parameters

Unlike modems for the telephone network, the LAN-Modem is not able to automatically detect the baud rate of the terminal. The following transmission format is factory set:

Baud: 9600
Data bits: 8
Parity: none
Stop bits: 1
Flow control: RTS/CTS

The AT commands *AT%Bn*, *AT%Dn*, *AT%Pn* and *AT%Sn* can be used to select the following alternate transmission speeds and character formats:

Baud:
1200, 2400, 4800, 9600, 19200, 38400, 57600

Data bits:
7, 8

Parity:
none, even, odd

Stop bits:
1, 2

For additional information, refer to the detailed description of the respective AT command.

5.2 Command syntax

The LAN-Modem accepts all the AT described in the following sections as long as they corresponding to one of the following patterns and are finished with a CR:

	letter	[number]
&	letter	[number]
%	letter	[number]
\	letter	[number]

Non-supported AT commands, such as *%V* or *L2* have no effect and are simply ignored. Invalid commands on the other hand generate an error message and in particular end processing of the current command line. Example: „AT&C0*H0Q1" would run command *&C0* , but not *Q1*, since the line is no longer considered starting with the invalid command *H0*.

5.3 Command and data mode

The LAN-Modem distinguishes on the serial side between two mode states: command and data mode.

- **Command mode**
  In this mode, which is activated after power-on, the AT command interpreter operates on the serial interface. The LAN-Modem is in this state ready to receive and process AT commands. All data not corresponding to AT syntax is ignored or acknowledged with an error message. Nothing is passed on to any communications partner in the network. The command ATO can be used to switch from command to data mode during any existing network connection.

- **Data mode (Online mode)**
  This mode is only available while there is a connection to a communications partner. The AT command interpreter is now deactivated and all incoming serial data are passed into the network without any further processing. To switch back into command mode, use the escape sequence „+++“. To retain the binary transparency of data mode inspite of the processing of this character string, the LAN-Modem only carries out the change if the following times are observed:
  minimum 1s no data received →
  Escape sequence →
  1s no data received
  If this procedure should be unusable in sepcial cases, the S registers 2 and 12 can be used to modify the Escape characters as well as the pause time (see command *Sn=x*). As an alternative to use of the Escape sequence, the RS232 input DTR can be configured for switching into command mode. FOr details, see the description of the AT command *&Dn*.

5.4 All AT commands

The LAN-Modem accepts all the commands in the table whose processing is done according to the following rules:

Command	Description	Parameter
Dx	Dial IP address and go online	IP-Adresse
A	Pick up incoming call	---
O	Return to an existing connection	---
H	Close connection	---
Zn	Close connection and reset modem	n=0, 1
En	local echo on|off	n=0, **1**
Qn	Suppress result codes on|off	n=**0**, 1
Vn	Result codes as text instead of number	n=0, **1**
In	Firmware information	n=0 - 8
Sn?	Read S register	n=0 - 40
Sn=x	Modify S register	n=0 - 255
&Cn	DCD option	n=0, **1**
&Sn	DSR option selection	n=**0**, 1
&Dn	Modem response to DTR option	n=0, 1, **2**, 3
&Kn	Flow control between modem and terminal	n=0, **3**, 4, 5, 6
&Fn	Restore	n=0, 1
&Vn	Display configuration profiles/connection data	n=0, 1, 2
&Wn	Active profile write	n=0, 1
&Yn	Active profile read	n=**0**, 1
&Zn=x	Destination IP address write	n=0, 1, 2, 3
%Bn	Baudrate between modem and terminal	n=2 - 8 (**5**)
%Dn	Number of data bits beween modem and terminal	n=7, **8**
%Pn	Parity bit between modem und terminal	n=**0**, 1, 2
%Sn	Number of stop bits between modem and terminal	n=**1**, 2
%Nn	Allow remote maintenance over network	n=0, **1**
**n	Start firmware update	n=0, 1

·   No other command may follow *A*, *D*, *O*, *Z* and *&Z* in the same command line. In the case of *A*, *O* and *Z* they are ignored, and in the case of *D* and *&Z* they are considered as part of the dialed number.

- Omitting a numerical parameter has the same effect as indicating a *0*.
- The boldface parameters are the standard values that are created by *AT&F.*

In addition to these commands, *A/* (without a preceding AT or concluding *<cr>*) is accepted as an entry to completely repeat the last command line again.

5.4.1 A (ATA)

Accept incoming call

If the serial application detects an incoming call by means of the RING sequences send by the LAN-Modem, the call can be picked up by sending this command. After the network connection with the communication partner has been established, the LAN-Modem sends the message *CONNECT* over the serial interface and automatically switches to data mode.

Along with each serial output of the *RING* character string, an incoming connection request causes the interface signal RI (=Pin 9) to be set high for approx. 1s.

5.4.2   D (ATD[IP address])

Dial command

The dial command is required for establishing a connection with another LAN-Modem. Taking the place of the dial-up number used in telephone networks is the IP address of the desired LAN-Modem. To maintain compatibility with existing modem applications, the LAN-Modem accepts here the following formats:

D [*Options*] *IP address*   [;]
D [*Options*] **S**=n   [;]
D   **L**   [;]

- **Options**
  Options may consist of any number of letters and special characters; these characters have no effect on the connection set-up. By this means it is possible to continue using an application that employs at this point for example a *T* for using tone dialing.
- **IP address**
  The IP address consists of four numbers between 0 and 255 in decimal format. These can be separated by special characters (e.g. decimal point or comma). Without separators it is assumed that each number consists of exactly three digits. If additional digits follow behind the last number, these are intered as TCP port numbers. If no port number is specified, port number 8000 is implied. Valid entries would include for example.:

  atd172016232073
  atd1720162320738000
  atd172.16.232.73
  atdt172.16.232.73:8000

All three commands have the same effect: An attempt is made to set up a call to the LAN-Modem having IP address 172.16.232.73 to TCP port 8000.

⚠️ *If the preset TCP port number 8000 for the LAN-Modem is not usable in special network environments, this value can be changed using the Telnet configuration. Additional information can be found in the section* Expanded Configuration of the LAN-Modem*.*

- **S=0|1|2|3**
  The LAN-Modem has a non-volatile memory for up to four destination IP addresses. By specifying a value between 0 and 3, the IP addresses stored here is used for the call set-up. If only *S* is entered without a numerical value, the addresses stored in position 0 is used. The command *&Zn* is used to write to the non-volatile address memory.
- **L**
  When using L instead of the IP address, the dial-up is repeated using the last used values. If no address has been dialed since the last reset of the LAN-Modem, the message *ERROR* is returned.
- **;   (Semicolon)**
  Entering a semicolon to terminate the dial-up command causes the LAN-Modem not to automatically return to data mode after a successful call set-up, but rather to remain in command mode.

Replies for the dial-up command

- **CONNECT**
  The network connection with the desired destination system was successfully made, and the serial application connected therre accepted the call. If the dial-up command was not terminated with a semicolon, the LAN-Modem is now in data mode, i.e. all entries are sent transparently to the communication partner

- **NO CARRIER**

  The network connection to the desired communication partner was able to be established, but the serial application there did not pick up the call. The time for which the LAN-Modem waits for the counterpart to pick up the call is stored in Register S7 and is factory set to 50s.

- **BUSY**

  No network connection to the desired communication partner could be established. The cause of this may be a station that is already busy with another connection. In this case the attempt to establish a connection is rejected. Another reason may be an unreachable or incorrect IP address. For very slow network routs to the destination system, the timeout stored in Register S6 for the TCP connection set-up can be set to a higher value. The factory setting is for 3s

5.4.3   E (ATE[0|1])

Local echo off|on

This command determines whether the data received on the RS232 interface in command mode should lbe returned. The factory setting is for echo on.

ATE0 = Echo off
ATE1 = Echo on

!

5.4.4   H (ATH)

Quit connection

This command quits the connection. Both serial communication partners receive the reply *NO CARRIER*.

5.4.5　In (ATI[0–8])

Read out firmware information

The I command is used to read out system information for the LAN-Modem. Of a possible 0-8, only the following parameters are presently used.

- **ATI0**
  Returns product code *58210* from the LAN-Modem
- **ATI3**
  Returns the firmware version and date of the AT command interpreter
- **ATI4**
  Returns product name *W&T-LANMODEM*.
- **ATI8**
  Liefert die Laufzeit des LAN-Modems seit dem Einschalten bzw. seit dem letzten Reset im Format *hh:mm:ss*

5.4.6   O (ATO)

Switch to data mode

This command switches (when there is an existing connection) from command to data mode. If you need for example to change LAN-Modem parameters during a connection, you must first use the Escape sequence to switch to command mode. After the desired reconfiguration you can then use the ATO command to reactivate data mode.

For additional information see Section *Command and Data Mode.*

5.4.7   Q (ATQ0|1)

Modem replies on|off

Default setting: 0 = ON

Replies generated by the LAN-Modem such as *OK* or *CONNECT* can be turned off by using the *Q* command:

- **ATQ0**
  The LAN-Modem sends replies
- **ATQ1**
  Reply messages are turned off.

5.4.8   Sn? (ATS[0-40]?)

Read S register

This command is used to read the 41 S registers that determine the operating behavior of the LAN-Modem. Changing or writing to the S registers is done using the *Sn=x* command shown below.

5.4.9 Sn=x (AT[0–40]=[0–255])

Set S register

The LAN-Modem has 41 S registers (S0 to S40) which determine its operating behavior. The command *Sn=x* is used to overwrite the current contents, whereby *n* specifies the desired register and *x* the value to write in decimal format. Only the following registers presently have meaning for the operation of the LAN-Modem:

Register	Description	Default value
S0	Pick up after how many ring characters ? (0=never)	0
S1	Ring counter	
S2	ESC character	43 (=ASCII "+")
S3	Code for CR (Carriage Return)	13
S4	Code for LF (Linefeed)	10
S5	Code for BS (Backspace)	8
S6	Wait time for TCP-connection set-up (seconds)	3
S7	Waits until other party picks up (seconds)	50
S9	Time base for carrier generation (1/10 seconds)	
S10	Allowed Carrier dropout (1/10 seconds)	20
S12	Isolation time for ESC sequence (1/50 seconds)	50
S14	Option bits from commands E, Q, V	
S21	Option bits from commands &C, &D, &S	
S23	Option bits from commands %B, %N	
S25	Allowed DTR-Dropout (1/100 seconds)	5
S39	Handshake mode (command &K)	

Note the following when writing to the S registers of the LAN-Modem:

· The command *Sn=x* has only a temporary effect. The changes can be loaded into the non-volatile memory of the LAN-Modem by using the *&W* command. The only exceptions are registers *S3, S4 and S5*. These cannot be permanently stored.

· Registers *S14*, *S21*, *S23* and *S39* should not be accessed by direct writing, but rather via the corresponding AT commands.

· The value of register *S9* is adjusted to the value of *S10* each time a connection is set up.

5.4.10 Vn (ATV[0|1])

Result codes in plain text

Default setting: 1 = ON

This command specifies whether result returns from the LAN-
Modem are to be numerical or in plain text. The following
messages and result codes are possible:

0 = OK
1 = CONNECT
2 = RING
3 = NO CARRIER
4 = ERROR
7 = BUSY

- **V0**
  Replies will be numerical in decimal format.
- **V1**
  Replies will be in plain text.

5.4.11 Zn (ATZ[0|1])

Reset the LAN-Modem

The *Zn* command quits any active connection and resets the firmware of the LAN-Modem to the parameters stored in the non-volatile memory. By specifying *0* or *1* you can select one of the two available reset profiles (see also *&Wn* command). Which profile is loaded after the LAN-Modem is turned on is defined by the *&Yn* command.

-
  Load stored reset profile 0.
- **Z1**
  Load stored reset profile 1.

Additional information can be found in the following sections:

&V1:   Read the configuration profiles
&Wn: Store the current settings in the specified profile
&Yn   Specifying the configuration profile after a reset.

5.4.12 &C (AT&C[0|1])

DCD Option

Default setting: 1 = ON

This command defines the behavior of the DCD interface output:

- **&C0**
  DCD is always active regardless of the network-side connection status.
- **&C1**
  DCD is only active if there is a connection to a communication partner.

5.4.13 &D (AT&C[0|1|2|3])

Modem response to DTR option

Default setting: 2

Defines the effect of a level change on the DTR input on the LAN-Modem. One of four functions may be selected:

- **&D0**
  The LAN-Modem ignores the signal.
- **&D1**
  If the LAN-Modem is in data mode,k an ON → OFF change places the modem in command mode. The ATO command can be used to return to data mode.
- **&D2**
  A change from ON → OFF breaks the existing connection. A new connection can only be established when an enable level is present on DTR.
- **&D3**
  Has the same function as *&D2* but additionally it resets the LAN-Modem. If the LAN-Modem is on data mode, a level change on the DTR input is only recognized if it is present for the time defined in S-register *25*.

5.4.14 &Fn (AT&F[0|1])

Restore

The LAN-Modem has two factory settings which can be invoked using the commands *AT&F* and *AT&F1*. The defaults specified by the individual commands refers basically to the factory profile 0. Factory profile 1 differs here in the function of the DTR input (*&D0* instead of *&D2*) and in the flow control (*&K0* instead of *&K3*).

5.4.15 &K (AT&K[0|3|4|5|6])

Flow control

Default setting: 3 = RTS/CTS

This command determines the flow control between the LAN-Modem and the connected serial device:

- **&K0**   **(no handshake)**
  Flow control is turned off. The LAN-Modem sends all data to the serial device regardless of the status of the handshake input RTS. In the opposite direction the LAN-Modem has no way to report an impending overflow of its input buffer through the CTS output, so that in this case the serial applications are responsible for ensuring data integrity.
- **&K3**   **(RTS/CTS)**
  Flow control is handled by the port signals RTS and CTS. The LAN-Modem sends serial data only when there is an enable level on its RTS input. An impending overflow of the serial input buffer is signaled by the CTS output.
- **&K4**   **(Xon/Xoff)**
  Flow control is handled by the control characters *Xon* (hex 11) and *Xoff* (hex 13), whereby these characters are filtered out from the user data stream. If the LAN-Modem receives an *Xoff*, no additional data are sent to the serial device until the latter has sent an *Xon*. The LAN-Modem indicates its ready or not-ready status likewise using an *Xoff* or *Xon*.
- **&K5**   **(transparent Xon/Xoff)**
  As in the case of *&K4* the flow control is handled by *Xon/Xoff*. The control characters are now however not filtered out, but rather sent transparent to the communication partner.
- **&K6**   **(RTS/CTS + Xon/Xoff)**
  Flow control is handled by *RTS/CTS* and *Xon/Xoff*. The modem generates signals for both handshake procedures and allows itself to be prevented from continuing to send by means of *Xoff* or a returned RTS.

5.4.16 &Sn (AT&S[0|1])

DSR Option Selection

Default setting: 0

This command defines the behavior of the DSR output:

- **&S0**
  The DSR output is always enabled regardless of the connection status and regardless of the mode (command or data).
- **&S1**
  DSR is only enabled if the LAN-Modem has an active connection in data mode.

5.4.17 &Vn (AT&V[0|1|2])

Display configuration information

This command causes the LAN-Modem to output its configuration and connection data:

- **&V0**
  Provides the current configuration data as well as the data stored in non-volatile profiles 0 and 1. In addition, the stored destination addresses are output.

- **&V1**
  The LAN-Modem returns statistics for the last TCP/IP connection.
- **&V2**
  The LAN-Modem sends as a reply its complete configuration coded in S record format. By sending this data record to another modem, it is possible for example to copy configurations over the network.

For additional information, see section *Reading/sending Configuration profiles*.

5.4.18 &Wn (AT&W[0|1])

Active Profile Write

This command is used to write the two non -volatile conofiguration profiles 0 and 1 which the LAN-Modem provides. The current settings are written to the memory location defined by „n". The configuration profiles are specified by the command *Zn*. Which of the two profiles is active after the LAN-Modem is turned on is defined by the command *&Yn*.

Additional information can be found in the following sections:

Zn: Reset modem to Profile 0 or 1
&V1:   Read the configuration profiles
&Yn   Specifying the configuration profile after a reset.

- **&W0**
  Specifying the configuration profile 0 after a reset.

- **&W1**
  Specifying the configuration profile 1 after a reset.

5.4.19 &Yn (AT&Y[0|1])

Active Profile Read

This command specifies which of the two configurations stored in the profiles the LAN-Modem uses after being turned on or after a reset.

- **&Y0**
  Specifying the configuration profile 0 after a reset.
- **&Y1**
  Specifying the configuration profile 1 after a reset.

Additional information can be found in the following sections:

Zn: Reset modem to Profile 0 or 1
&V1:   Read the configuration profiles
&Wn: Store the current settings in the specified profile

5.4.20 &Zn=x (AT&Z[0|1|2|3]=[IP address])

Save destination IP address

The LAN-Modem can save up to 4 destination IP addresses in its non-volatile memory, which can later be recalled using the fast dial function (*Sn=x*) of the dial command.

Example: AT&Z1=172.16.2.2
IP address 172.16.2.2 is stored in memory location 1. *ATDS=1* can now be used to establish a connection with this address.

5.4.21 %Bn (AT%B[2-8])

Modem Port Bps Rate

Default setting: 5 (9600 Baud)

This command is used to set the baud rate. The following speeds are available:

Command	Baudrate
%B2	1200
%B3	2400
%B4	4800
%B5	9600
%B6	19200
%B7	38400
%B8	57600

⚠️ *The %B command has a delayed effect. The first* OK *reply is still with the old baud rate.*

⚠️ *Successive commands in the same command line (such as &W for saving) are ignored. This ensures that any inadvertent change in the baud rate can be restored by resetting the LAN-Modem.*

5.4.22 %Dn (AT%D[7|8])

Number of data bits per character

Default setting: 8

This command determines whether the serial character format works with 7 or 8 data bits.

⚠️ *The %D command has a delayed effect. The first* OK *reply is still with the old data format.*

⚠️ *Successive commands in the same command line (such as &W for saving) are ignored. This ensures that any inadvertent change in the baud rate can be restored by resetting the LAN-Modem.*

5.4.23 %Pn (AT%P[0|1|2])

Specifying the parity bit

Default setting: 0 = no parity

This command determines if and, if yes, what parity is used for the serial data format.

- **%P0** = no parity
- **%P1** = odd parity
- **%P2** = even parity

⚠️ *The %P command has a delayed effect. The first* OK *reply is still with the old data format.*

⚠️ *Successive commands in the same command line (such as &W for saving) are ignored. This ensures that any inadvertent change in the baud rate can be restored by resetting the LAN-Modem.*

5.4.24 %Sn (AT%S[1|2])

Minimum number of stop bits between 2 characters

Default setting: 1= 1 stop bit

This command determines how many stop bits (minimum) appear between 2 serial characters.

⚠️ *The %S command has a delayed effect. The first OK reply is still with the old data format.*

⚠️ *Successive commands in the same command line (such as &W for saving) are ignored. This ensures that any inadvertent change in the baud rate can be restored by resetting the LAN-Modem.*

5.4.25 %Nn (AT%N[0|1])

Remote maintenance over the network allowed

Default setting: 1 = allowed

Loading firmware updates and copying configuration data is possible either through the serial port or over the network. To protect against misuse of network-side remote maintenance, the *&N* command makes it possible to suppress this functionality.

- **%N0**
  Remote maintanance will be deactivated.
- **%N1**
  Remote maintanance will be activated.

Additional information: Section *Firmware-Update* and Section *Reading/sending Configuration profiles.*

5.4.26 ** (AT)**

Start flash update

Updating the firmware or sending a configuration file must be introduced with the ** command. The LAN-Modem generates the following message and then expects the update data in Motorola S Record format. If no data are sent within 30s, the mode is automatically quit.

```
MB90F562 bootloader v1.x W&T xx/xxxx
Invoked by software, ESC to cancel
Waiting (Port 0)...
```

Additional information: Section *Firmware-Update* and Section *Reading/sending Configuration profiles*.

Appendix

■ Extended configuration of the LAN-Modem

■ Firmware update of the LAN-Modem

■ Reading and sending configuration profiles

■ Resetting the LAN-Modem

■ The modem protocol on the TCP level

■ Used ports and network security

■ Technical   Data

A1 Extended configuration of the LAN-Modem

The LAN-Modem consists of two essentially independent function modules which communicate with each other over an internal high-speed port.

The AT command interpreter assumes all the modem-specific tasks. This includes for example serial transmission, receiving and executing the AT commands and monitoring the resulting modem connections.

The network stack assumes all the network-side tasks, including on the TCP level for example the opening and closing of connections. The operating behavior of the network stack is factory optimized for modem operation and does not generally need to be changed. In some special applications and system environments it may however be necessary or practical to adjust the settings described below. Telnet serves as the configuration interface.

⚠️ *Only the parameters described below can be changed using the Telnet configuration. Any changes to settings not described here may result in failure of the LAN-Modem.*

A1.1 Starting the Telnet session

A Telnet client comes standard with nearly all operating systems that support TCP/IP protocol. Under Windows 9x/NT/2000/XP this is normally found in the Windows system directory.

Verwenden Sie beim Öffnen der Telnet-Verbindung zu der IP-Adresse des LAN-Modems die Portnummer *1111*.
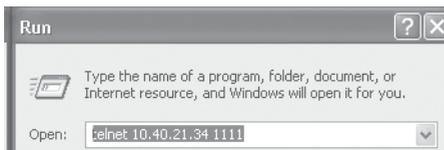
After successful opening of a connection and entering the system password (if configured) you are taken to the main menu of the LAN-Modem network stack.

```
**************************************
*    Com-Server Highspeed            *
* "LanModem-04B432"                  *
**************************************
1.  INFO  System
2.  SETUP System
3.  SETUP Port 0 (High-Speed Serial)
4.  SAVE Setup

Press <No.+ ENTER> (q=quit): _
```

To navigate enter the number of the desired submenu followed by *<Enter>*. Entering *<Enter>* without preceding it by an identifier returns you to the previous menu level.

All settings are first stored only temporarily. To save all settings in non-volatile memory run *4. Save Setup* in the main menu.

A1.2 Configuration of the TCP server port (Local Port)

Menu:
3. SETUP Port 0 -> 3. TCP/IP Mode -> Local Port

Default: 8000

This setting specifies under which TCP port number the LAN-Modem can receive calls from a different LAN-Modem or virtual modem port. If the value set here is other than 8000, the corresponding target port number must be specified explicitly along with the dial-up command (e.g. ATD192.168.0.10,44555). For additional information about specifying the port number in the AT dial-up command see the section *All AT Commands -> D(ATD)*.

A1.3 Configuration of the System Name

Menu:
2. SETUP System -> 4. System Name -> Type System Name

The freely configurable system name consisting of max. 31 characters is used to identify the LAN-Modem. This name is displayed as an opening message in the client for all Telnet sessions.

The factory default setting for the system name is *LanModem-<wut1>*, whereby the LAN-Modem replaces the keyword *<wut1>* within communication with the last three places of the device-specific Ethernet address. For example the factory set system name of a LAN-Modem with Ethernet address 00:c0:3d:01:02:03 is *LanModem-010203*. When using DHCP protocol the system name is also used for identification with respect to the DHCP server.

A1.4 Configuration of the System Password

Menu:
2. SETUP System -> 3. System Password -> Type new password

The system password, which consists of any 31 (max.) characters, protects against any subsequent configuration and control access to the LAN-Modem.

- · 1111: Telnet configuration menu
- · 8888: Reset Com-Server
- · IP assignment with *WuTility*

On Telnet port 1111 the system password is prompted as soon as the connection is opened. For all other associated TCP ports the password must be null-terminated (=[*password*] + 0x00) and sent to the LAN-Modem no later than 2s after the TCP connection has been established.

A1.5 Configuration of Keep Alive Check

Menu:
2. SETUP System -> 1. Setup TCP/IP -> 9. Keep Alive Time (s)

Default: 5s

If the keep-alive check is activated by entering and saving a value in second ticks, all TCP connections are monitored for network-side data traffic. If there is no network traffic within the set time, the LAN-Modem generates a keep-alive packet. If the partner does not answer this packet, the connection is reset in the LAN-Modem. This deletes any data still contained in the serial in- and output buffers.

Example: During an existing connection over the internet the DSL router drops out. After the set keep-alive time plus 2s for two repetitions has elapsed, the LAN-Modem closes the connection and is again ready for any other clients.

A1.6 Configuration of Link Speed

Menu:
2. SETUP System -> 8. Link Speed

Default: Autonegotiating

LAN-Modems are factory set for *autonegotiation*. Data transmission speed and duplex procedure are automatically negotiated with the connected switch/hub and set correspondingly.

In addition to *autonegotiation*, the LAN-MOdem as well as many manageable switches can be configured for fixed transmission parameters with respect to speed and duplex procedure. To prevent communications problems (duplex mismatch), only the following two combinations are permitted:

- *Both* parties (switch and LAN-Modem) are operated in Auto-Negotiation mode.

- *Both* parties (switch and LAN-Modem) are configured for the same (fixed) transmission speeds and duplex mode.

Changing the link speed is activated only after saving and exiting the telnet or WBM session by means of an automatic Com-Server reset. Data from any open network connections is lost. If the newly selected setting is not supported by the port used on the switch ort hub, the Com-Server may then not be accessible.

A2 Firmware update of the LAN-Modem

The LAN-Modem is divided into two function modules each with their own update methods.

The AT command interpreter assumes all modem-specific tasks. This include for example serial transmission, receiving and executing the AT commands and monitoring the modem connections opened thereby.

The network stack is responsible for handling all network-side tasks, including the Ethernet level along with TCP and IP protocols.

The two firmware components are in separate files and are sent to the LAN-Modem independently of each other as described in the following sections.

Firmware file extension AT command interpreter: *.mhx*

Firmware file extension TCP/IP-Stack: *.uhd*

A2.1 Where do I get the current firmware?

The most current firmware including update tools and a revision list is published on our Web site at the following address:

 http://www.wut.de

From there it is easiest to navigate using the Search function located on the left side. In the entry field first enter the model number of your device. Select *Firmware* in the associated selection box and click on the *Go* button.

Search Firmware ▼
     for **Prod. no.**: 58...   go

This takes you directly to the page with the most up-to-date firmware for your the LAN-Modem.

If you do not know the model number, you can find it on the sticker located on the narrow side of the enclosure, likewise the Ethernet address.

Type no.   Description, e.g. TB-number
                            for special versions

58xxx   [description]
EN=00c03d004a05
OK xxxxxx
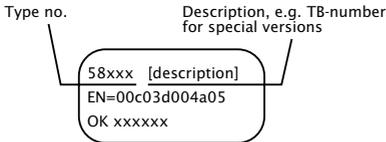
⚠️ *In particular if the sticker indicates an TB number as the part number, it is possible that the LAN-Modem has a special, customer-specific firmware or configuration. This would be overwritten by uploading the standard firmware. Please contact the responsible administrator in such cases before the update.*

A2.2 Update des AT-Kommando-Interpreters

The update of the command interpreter can be done through the serial port or over the network.

A2.2.1 ... via the serial interface
For this the LAN-Modem must have a serial connection to a terminal program whose transmission parameters are configured as follows:

Baud rate:	same as the LAN-Modem
Data format:	8 data bits, no parity, 1 stop bit
Handshake:	RTS/CTS (required)

The command *AT*** is used to place the LAN-Modem in serial update mode, which is acknowledged with the following message:

```
MB90F562 bootloader v1.x W&T xx/xxxx
Invoked by software, ESC to cancel
Waiting (Port 0)...
```

⚠️ *The update mode is protected with a timeout of 30s. If no data are transmitted within this time, the LAN-Modem automatically resumes normal operating mode.*

The function *Send text file* of the terminal program can now be used to sent the *mhx*-file with the current firmware. The LAN-Modem sends a continuous byte counter during the transmission and returns the message *OK* after successful completion of the update. The new firmware version can now be checked using the command *AT13*.

⚠️ *You cannot use the binary data transmission function offered by terminal programs, since this uses additional protocols such as* ZModem *or* Kermit.

A2.2.2 ... via the network

Updating the firmware over the network offers the advantage of a higher speed compared with the serial method. The prerequisite however is that network-side remote maintenance be enabled by the command *%N1*.

After establishing a TCP socket connection to Port 8000 on the LAN-Modem, the latter returns a short identifier. If this is replied to within three seconds with the character „U", update mode is started with the following message.

```
MB90F562 bootloader v1.x W&T xx/xxxx
Invoked by software, ESC to cancel
Waiting (Port 1)...
```

As in the case of a serial update, the LAN-Modem now expects the update data in S record format. Under Windows the following method using a Telnet client and pasting from the clipboard has proven useful.

Example with Telnet client under Windows

1. Open the *mhx* file with the LAN-Modem firmware in an editor and copy the entire contents to the clipboard.

2. From *Start → Run → telnet [IP address] 8000* on a Windows machine having a TCP/IP stack, the network connection to the LAN-Modem is established and the message *Wxxxx* appears.

3. Entering a *U* within the first three seconds activates update mode, and the LAN-Modem sends the corresponding reply. The serially connected device is informed of the access with a short message.

⚠ *The update mode is protected with a timeout of 30s. If no data are transmitted within this time, the LAN-Modem automatically resumes normal operating mode.*

4. Use *Edit → Paste* to copy the firmware from the clipboard to the LAN-Modem.

5. After a successful update the LAN-Modem breaks the TCP connection. Any transmission errors are reported with referenced to a checksum error.

A2.3 Update of the TCP/IP-Stack

Required is a PC running Windows 9x/NT/2000/XP with a network connection and activated TCP/IP stack. For the update process you need two files which, as already mentioned, are available for download from our Web site at *http://www.wut.de.*

• The executable update tool for transferring the firmware to the LAN-Modem.
• The file with the new firmware for transferring to the LAN-Modem.

It is not necessary to do any special preparation in the LAN-Modem for a firmware update. You only need to close all data, control and configuration connections.

Highlight the desired LAN-Modem in the *WuTility* inventory list. The *Firmware* button starts the Update dialog box in which you must specify the file name of the new firmware (*.uhd). After checking the compatibility of the specified firmware for the selected LAN-Modem, WuTility activates the *Next* button which starts the actual file upload.

⚠ *Never interrupt the update process by pulling the power plug or pressing the reset button. The LAN-Modem will be non-operational after an incomplete update.*

A2.3.1 Update in routed/protected environments

The WuTility Update Wizard divides itself on the network side into three steps, whereby the specified TCP and UDP services are used:

1. Identification/Inventory of the device
    Destination port LAN-Modem: UDP/8513
2. Initialization of the update process
    Destination port LAN-Modem: TCP/ 8002
3. Upload firmware
    Destination port LAN-Modem: UDP/69 (TFTP)

The previously described automatic processing of the update requires that any security components (firewalls, routers ...) used between *WuTility* and the LAN-Modem allow transparent communication via these services.

⚠ *When enabling the listed services in firewalls, routers etc. various aspects of network security need to be taken into consideration. These should therefore be run only after consulting with the responsible network administrator. Increasing complexity of the network structure brings with it the risk of transmission problems, so that we recommend only performing firmware updates from the computer located in the same subnet as the LAN-Modem.*

A3 Reading/Sending Configuration Profiles

To simplify the configuration of the LAN-Modem when using a greater number of devices, it is possible to copy the configuration data. To do this, you must first configure a LAN-Modem for the desired operating mode using the AT commands. In the ext step you use *&Wn* to save these configuration data in one of the two non-volatile profiles. Then use the command *&V2* to read the entire conofiguration in S record format and store it in a file.

The upload of the configuration data to other LAN-Modems can be done either over the serial interface or over the network. The procedure is then identical to the update of the the AT command interpreter.

A4 Software reset of the LAN-Modem

Socket 8888 has been implemented in case the LAN-Modem
ever needs to be completely reset. If a connection is opened on
this port, the LAN-Modem immediately closes it again and then
performs a software reset.

Use of the system password
If a system password has been configured (see section
Extended configuration of the LAN-Modem), this must be null-
terminated (=[password] + 0x00) and sent to the LAN-Modem
2s after a connection has been successfully opened. If the LAN-
Modem does not receive a correct or even any password within
this time, it sends the message *PASSWD?* followed by a null byte
(0x00) to the client and closes the TCP connection.

If no system password is configured, then as the example
shows the LAN-Modem immediately closes the TCP connection
as soon as it has been established and performs a port reset.

⚠️ *Following this reset all the buffer contents are deleted
and any still active connections are closed - the LAN-Mo-
dem is in its base state! This reset can be performed from any
station and should be done only in extreme cases!*

A5 The Modem Protocol on the TCP Level

Normally LAN-Modems will be used only to connect to each other. It is however conceivable that an application program uses TCP/IP programming to direct dial an individual LAN-Modem or to be called by the LAN-Modem. The information required for doing this can be obtained on request.

A6 Used ports and network security

The port numbers factory set in the LAN-Modem:

Port number	Application	Password protection	Configurable?
8000 (TCP)	Port for incoming calls		yes
1111 (TCP)	TELNET Configuration port		no
9084 (TCP)	Reset Port Status		no
8888 (TCP)	Reset LAN-Modem		no
8002 (TCP)	Initialize firmware upate TCP/IP stack		no
8003 (TCP)	Read Configuration data		no
8004 (TCP)	Write configuration data		no
8512 (UDP)	Inventory (replaces through port 8513)		no
8513 (UDP)	Inventory		no
161 (UDP)	SNMP		no

The following port numbers are deactivated with the factory defaults. They will be used in case of a firmware update.

Port number	Application	Password protection	Configurable?
69 (UDP)	Update TCP/IP stack	yes	no

⚠️ *Each port number may be used for just one service in the Com-Server. If differing numbers are used for changeable ports, be sure that these are not assigned in duplicate.*

The LAN-Modem and network security

Network security has rightly taken on added significance in recent times. All the experts are in agreement that there can be no such thing as absolute security given today's level of technology. Every customer must decide for himself what the appropriate balance is between security, functionality and cost for his specific circumstances.

In order to provide the customer with the greatest possible flexibility which is oriented towards changing security requirements from a pure testing and installation environment to critical production applications, the safety measures have been made highly customer-configurable. The present document provides an overview of the safety measures which have been implemented and can be used on the LAN-Modems. It is presumed here that the original W&T firmware (without any customer modifications) is being used. Additional details can be found in the respective sections of this manual.

The authorization concept of the LAN-Modem
Control and configuration access to the LAN-Modems is protected by the system password. The factory default setting is for no system password, so that anyone logging in has full access to the corresponding settings and functions. To prevent unauthorized access, it is therefore recommended that a system password be used. Additional measures in this regard, such as the composition and regular changing of this password, should be taken by the customer in an organizational way.

The system password is transmitted to the LAN-Modem without encoding. It must therefore be ensured if necessary that password-protected access can be gained only over an Intranet which the customer deems to be safe. For access over the public Internet, additional measures such as the addition of a VPN tunnel (Virtual Private Network) should be taken. This is however a general issue for network security for which each customer must find the appropriate solutions.

Ports with special functions
In addition to access over Telnet, there are a variety of functions which can be activated over various TCP or UDP ports. These are shown in the previous table. Details can be found in the indicated sections of this manual.

- **SNMP**

In order to be able to incorporate the LAN-Modems into an SNMP-based network management, all the essential configuration settings are also accessible via SNMP. This access is protected in that the system password must be used as a community string.

- **Inventarisierungstool**

Like all intelligent components from W&T, the LAN-Modems can be accessed through the WuTility tool. Information is read from UDP ports 8512 and 8513. The ports cannot be turned off. No writing can be done over this path.

- **Firmware update of the TCP/IP stack**

(see section on *Firmware-Update of the LAN-Modem*)
Initialization of a firmware update takes place on the system password-protected TCP port 8002. Only the TCP/IP stack of the LAN-Modem is updated after an initialization on port 8002. The configuration data (IP address, gateway, serial parameters, modes, etc.) are retained.

- **Reading/writing the configuration data**

The WuTility tool as well as a customer's own applications can be used to read and write the TCP/IP stack's configuration profile. Both of the TCP ports 8003 and 8004 used for this are protected by the system password.

- **LAN-Modem Reset**

(see section on *Reset the LAN-Modem*)
The TCP port 8888 allows a reset of the LAN-Modem. The port is not configurable and is protected by the system password.

A7 Technical Data

Supply voltage ...	
... DC	12V - 48V (+/-10%)
... AC	9Vrms - 30Vrms (+/-10%)
Current draw	typ. 190mA @12VDC
Permissible ambient temperatur ...	
... storage	-40 ... +70°C
... operation, non-cascaded	0 ... +60°C
... operation, cascaded	0 ... +50°C
Permissible relative humidity	0 - 95% (not condensing)
Network	10/100BaseT, RJ45 for STP cables
Galvanic isolation	min. 500Vrms
Dimensions	105 x 75 x 22mm
Weight	approx. 150g
Serial port	1 x RS232 DCE on DB9/Female
Baud rates	1200 to 57.600 kBit/s
Data formats	7, 8 Data bits, 1, 2 Stop bits, NO, EVEN, ODD parity
Flow control	Hardware handshake or Xon/Xoff protocol