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:

W&T

Contents

1 Quick Installation

■ LAN-Modem installation in flow chart form

1.1   Installation in flow chart form

The following diagram shows the essential installation
steps for any LAN-Modem installation.
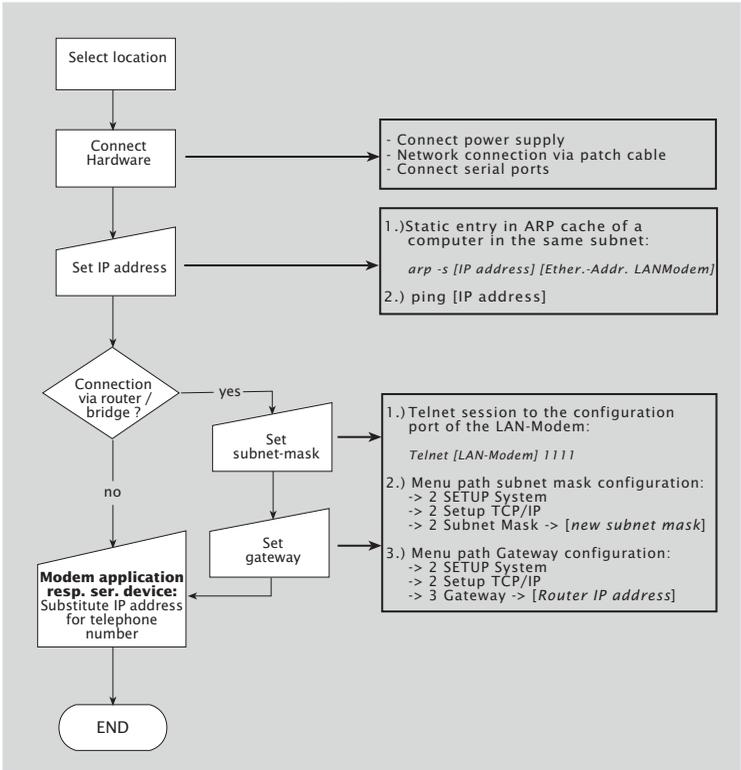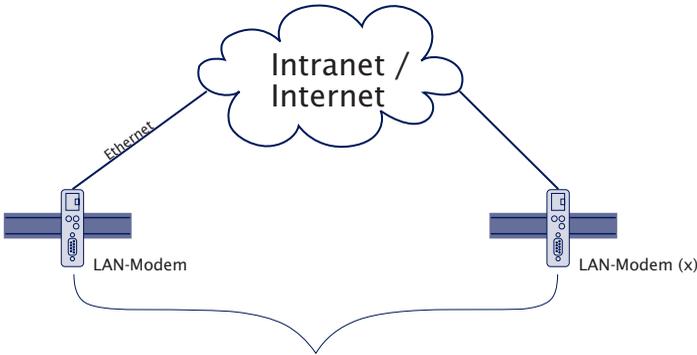
2   Connections and Displays

■ Pin   Assignments

■ Supply   Voltage

■ LED   displays

2.1 Ethernet connection

The location of the LAN-Modem must be selected such that on the network side a maximum cable length of 100 meters is not exceeded.

For the network connection, an IEEE 802.3 compatible terminal on a shielded RJ45 plug is provided on the front panel. With a shielded patchcable the LAN-Modem can be connected through here to a hub or switch. Pin assignments conform to a standard MDI interface (AT&T258), so that you can use here a 1:1 cable with a length of max. 100 meters.

1 = Tx+   8 = nc
 2 = Tx-   7 = nc
  3 = Rx+   **6 = Rx-**
      4 = nc 5 = nc
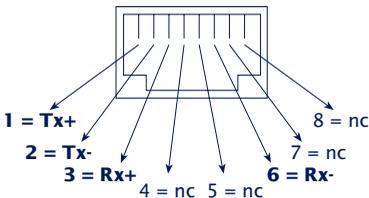
RJ45 female (AT&T256 standard)

Depending on the LAN-Modem model, the following standards are supported:

10BaseT (Typ 58210, 58610)
These devices operate conformal with the 10BaseT standard at 10MBit/s. It is also possible however to link into a 100BaseTx network using an autosensing hub or switch. Such an autosensing component automatically adjusts to the transmission rates supported by the terminal device.

10/100BaseT autosensing (Models 58220, 58620)
These devices support both 10BaseT as well as the 100BaseTx standrad at a bit rate of 100Mbit/s and offer full-duplex transmission. Switching between the two network speeds is done using the autosensing function of the LAN-Modem according to the capabilities of the hub or switch used. The prerequisite for operating at

100MBit/s is appropriate cabling (Cat 5/ISO Class D or better).

The current link status is indicated by the Error LED on the front panel: If it blinks at 1-2 second intervals, there is no connection to the hub, or the connection is faulty.

2.2 The RS232 connection

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 prots for the LAN-Modem and the serial terminal device are configured for identical transmission parameters and handshake procedures.

RS232 Pin assignment and function, DB9 female

```
3 = RxD
4 = DSR                    2 = TxD
5 = GND                    1 = NC


        ▢ ▢ ▢ ▢ ▢

         ▢ ▢ ▢ ▢


    NC                      6 = DTR
8 = RTS                     7 = CTS
```
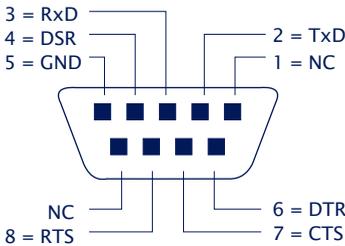
RS232, DB9 female

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	---	---	
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	---

2.3 Supply voltage

Depending on the hardware version, the LAN-Modems are supplied either with a regulated +5V or with an AC/DC voltage of between 12V and 24V.

2.3.1 5V supply voltage (58210, 58220)

The supply voltage for models 58210 and 58220 is brought in through the power terminal located on the underside of the housing. The supply voltage is 5V +/- 5%. The current consumption of the various models can be found in the technical appendix.

2.3.2 12–24V supply voltage (58611, 58620)

The supply voltage for models 58610 and 58620 can also be brought in through the power terminal for jack plugs located on the housing underside. Both DC voltage of any polarity as well as AC voltage may be used. Polarity versal protection results in the following maximum and minimum values for the supply voltage:

- AC: $9V_{eff}$ (-5%) – $24V_{eff}$ (+5%)
- DC: 12V (-5%) – 34V (+5%)

The current consumption of the various models can be found in the technical appendix.

2.4 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 xflashing = *Check network connection*
    The LAN-Modem is not receiving a link pulse from a hub. Check the cable and hub.
    2 x fhashing = *Check serial basic configuration*
    Use the Telnet configuration to check the basic settings of the LAN-Modem for Port 0:
    SETUP Port 0 (serial) → UART Setup → Baud   = *57600*
    SETUP Port 0 (serial) → UART Setup → Parity   = *NONE*
    SETUP Port 0 (serial) → UART Setup → Data Bits   = *8*
    3 x flashing = *Check serial basic configuration*
    Use the Telnet configuration to check the basic settings of the LAN-Modem for Port 0:
    SETUP Port 0 (serial) → UART Setup → Handshake = **HARDWARE**
    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.

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For additional informatio on the settings, please refer to section 4 „Modem Operation"

3 TCP/IP Configuration

Following the hardware installation, this section describes the logical integration of the LAN-Modem into the TCP/IP network.

■ Assigning the IP address

■ Setting the Subnet-Mask and Gateway

You can obtain all the parameters from the system administrator of your network. In contrast to the IP address, which is always required, you may skip the setting of the subnet mask and gateway if the communications partner for the LAN-Modem is located in the same network.

3.1 Assigning the IP using the „ARP" command

⚠️ *This method can only be used if the LAN-Modem does not yet have an IP address, i.e. the current entry is 0.0.0.0. To change an IP address, use one of the other methods described in this section or use the configuration menu via TELNET.*

The prerequisite is a computer located in the network segment of the LAN-Modem and which has TCP/IP protocol installed. Read the Ethernet address of the LAN-Modem off from the sticker on the side of the housing:

```
58xxx      [Model]
EN=00c03d004a05 ——— Ethernet address
OK xxxxxx
```
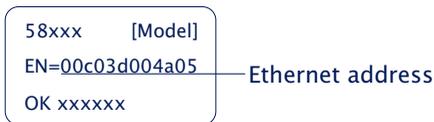
Now use the following command line of the ARP table in your computer to add a static entry:

```
arp -s [IP address] [MAC address]
```

Example under Windows:
```
arp -s 172.16.231.10 00-C0-3D-00-12-FF
```
Example under SCO UNIX:
```
arp -s 172.16.231.10 00:C0:3D:00:12:FF
```

Then use the following command line under *Start → Run* to start a Telnet session to the configuration port of the LAN-Modem with the desired IP address:

```
telnet 172.16.232.10 1111 [Return]
```

ⓘ *Older Windows systems will only accept a static entry if a dynamic entry was already present. First send a PING to another network station.*

⚠️ *In Windows environments you must enter the IP address* without leading zeros. *Otherwise the entry will be improperly interpreted by the system and the LAN-Modem will assign an incorrect IP address.*

The LAN-Modem accepts the IP address of the first network packet sent to it as its own and saves it in non-volatile RAM. Only now is the Telnet connection established and the configuration menu shown in the Telnet window. Now you may sete the subnet mask and gateway (see section 3.5 *Configuring the subnet mask and gateway*).

Every IP address must be used only once in the network.

3.2 Assigning the IP through the serial port

After the LAN-Modem has been reset, a time window of approx. 1-2 seconds is provided during which you can assign a new IP address by entering at least three „x".

⚠️ *In contrast to the previously described using ARP, this serial path works regardless of whether the LAN-Modem already has an IP address or not. The procedure can be repeated as often as desired. This method is therefore recommended if you do not 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 a laptop, you will require a 1:1 modem cable (see section *2.2 The RS232 connection*).

The serial transmission parameters of the terminal program used are configured for *9600 Baud, no Parity, 8 bits, 1 stop bit, no handshake*. Interrupt the supply voltage to the LAN-Modem to perform a reset. If the green Status LED comes on, enter the letter „x" at least three times on the terminal until the LAN-Modem has returned the prompt „IPno.+<Enter>:".

Use the usual format (xxx.xxx.xxx.xxx) to enter the IP address and finish your entry by pressing *<Enter>*. If the entry was accepted, this is acknowledged with the assigned IP address. Otherwise a „*FAIL*" message is returned with the last current IP address.

All other settings such as the gateway address, subnet mask, etc. are made using the Telnet configuration menu (see section 3.5 *Configuring the subnet mask and gateway*).

3.2.1 Serially deactivating the DHCP-/BOOTP-Client

The DHCP-/BOOTP function of the LAN-Modem can be turned off when serially assigning the IP address. We recommend doing this in all cases where it is not absolutely necessary to use DHCP/BOOTP to assign the IP.

To deactivate the DHCP-/BOOTP client, attach the option „-0" directly after the IP address (no spaces) and confirm your entry with *<Enter>*.

Example:

```
xxx                -> Com-Server
IP no.+<ENTER>:    <- Com-Server
172.17.231.99-0    -> Com-Server
172.17.231.99      <- Com-Server
```

You can always reactivate the function later using the Telnet configuration under *SETUP System → SETUP TCP/IP → BOOTP Client.*

3.3 Assigning the IP using an RARP server

UNIX environments in particular often use the RARP protocol for centralized assignment of IP addresses. This means that TCP/IP devices that want to obtain an IP address send RARP requests with their Ethernet address as a broadcast over the network.

Activate the RARP server on the UNIX system and enter in the file */etc/ethers* the Ethernet address of the LAN-Modem, and in the file */etc/hosts* enter the IP address.

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

The LAN-Modem must be located in the same subnet as the RARP server.

Example:
Your LAN-Modem has MAC address EN= 00C03D0012FF (sticker on the unit). You want to give it IP address 172.16.231.10 and the alias name WT_1:

- Entry in the file */etc/hosts*:
  `172.16.231.10 WT_1`
- Entry in the file */etc/ethers*:
  `00:C0:3D:00:12:FF  WT_1`

If the IP address for the LAN-Modem is 0.0.0.0 (=Factory Defaults), RARP broadcasts are cyclically generated in order to obtain a valid address from any existing RARP-Daemon.

If the Com-Server already has a valid IP address, an RARP broadcase is generated after every reset. If a reply comes within 500ms, the IP addressed contained in it is accepted. As in the case of assigning through the serial port, this method also makes it possible to overwrite a current IP address.

3.4 Assigning the IP using DHCP-/BOOTP protocol

Many network use DHCP (**D**ynamic **H**ost **C**onfiguration **P**rotocol) or BOOTP for centralized and dynamic assignment of IP addresses. As far as the LAN-Modem is concerned, it makes no difference which of the two protocols is used, since DHCP is only a downward-compatible expansion of BOOTP. DHCP servers thus also use requests from BOOTP clients. The following parameters can be assigned to the LAN-Modem using these protocols

· IP address
· Subnet mask
· Gateway address

It is not possible to transfer other parameters or lease time.

Function
To obtain an IP address, the LAN-Modem sends a corresponding BOOTP request as a broadcast over the network after each new start. The resulting reply from the DHCP/BOOTP server contains in addition to the IP address also the subnet mask and gateway address. The LAN-Modem immediately loads this information into its non-volatile memory.

To start up the LAN-Modem in DHCP/BOOTP networks, consult with your systems administrator. If you are assigning the address using DHCP, please indicate that a reserved IP address is needed. For the purpose of maintaining the respective address database, the administrator will need the Ethernet address of the LAN-Modem, which can be found on the sticker located on the housing:

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

After the administrator has made the necessary entries, the LAN-Modem will automatically obtain the desired IP address after each reset. To ensure the availability of the LAN-Modem even should the DHCP/BOOTP server fail, the previous IP address is kept if no reply comes.

*In DHCP environments the IP address to be assigned **must** be reserved by means of a fixed link to the Ethernet address of the LAN-Modem. Under Windows NT this is done in the DHCP manager under the menu item Reservations. Linux provides the file* dhcpd.conf *for this purpose, in which a corresponding entry must be added.*

3.4.1 Deactivating the DHCP-/BOOTP protocol

A DHCP server assigns IP addresses dynamically from an address pool provided by the administrator. This means that DHCP-compatible devices usually receive another IP address after starting. Since a constantly changing IP address is not something you want to have with the LAN-Modem, the latter uses BOOTP protocol, which is based on fixed Ethernet-to-IP address assignments. DHCP servers should reply to BOOTP requests only if they have an explicit IP reservation for the Ethernet address of the sender.

Some DHCP servers (e.g. Windows 2000 servers) however use both DHCP and BOOTP requests from their dynamic address pool. To prevent the LAN-Modem from being assigned unknown IP addresses in such environments, the following options are available:

·   A reservation must be made in the respective DHCP server before connecting the LAN-Modem to the network.

· The serial port is used to assign the IP address for the LAN-Modem. By sending „xxx" to the LAN-Modem during a restart, you arrive at the input mode for a new IP address. If you enter this followed by the string „-0", the BOOTP client of the LAN-Modem will be deactivated (see section 3.2 *Assigning the IP through the serial port*).

In existing systems the BOOTP client of the LAN-Modem can also be deactivated and activated whenever desired using the Telnet configuration under „*SETUP System → SETUP TCP/IP → BOOTP Client*.

For an explanation of the basic terms and concepts for addressing in the Internet, as well as information about DHCP and BOOTP, please see our manual „TCP/IP-Ethernet and WEB-IO".

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Older Windows systems will only accept a static entry if a dynamic entry was already present. First send a PING to another network station.

3.5 Configuring the subnet mask and gateway

When working in routed environments, the LAN-Modem must be told the responsible router in addition to the subnet mask which is valid for the respective network segment. Valid values for both parameters can be obtained from your systems administrator. The LAN-Modem provides a Telnet configuration menu under port number 1111 for entering this.

Under Windows 95/98/NT the Telnet client is started under *Start → Run ...* using the following command line:

telnet [IP address LAN-Modem] 1111

If the Telnet client is already active, you can establish a connection under *Connect → Remote-System... .* In the field *Host-Name* enter the IP address and next to *Port* enter 1111.
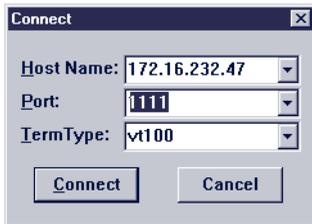
If a connection could be established, the LAN-Modem will display the following menu on your monitor:

```
***************************
* MINI Com-Server         *
***************************
1. INFO System
2. SETUP System
3. SETUP Port 0 (Serial)
4. SAVE Setup
```

The entry fields for the subnet mask and the gateway address are reached through the following menu path:

```
1. INFO Com Server

2. SETUP System    1. Setup TCP/IP        1. IP-Address
                   2. Set Password        2. Subnet Mask
3. SETUP Port 0    3. Flash Update        3. Gateway
                   4. Factory Defaults    4. MTU (512-1024)
                   5. Reset
                                    Always save using
                                      "SAVE Setup"
                                   in order to activate
                                    the new settings!

4. SAVE Setup   Takes the selected parameters and saves all
                settings in non-volatile memory (EEPROM)
                of the LAN-Modem
```
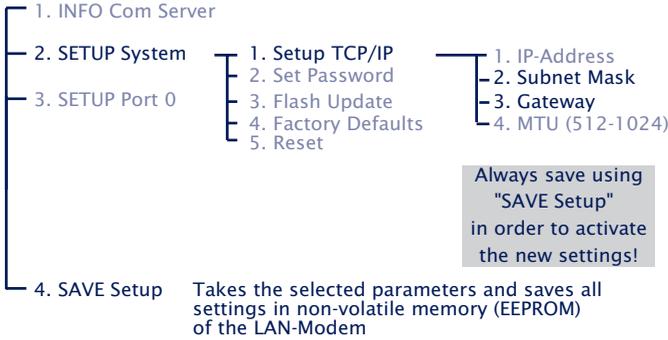
Once the settings have been made, they must be loaded into the non-volatile memory of the LAN-Modem by selecing 4. SAVE Setup. Then you may close the Telnet session.

The network-side configuration of the LAN-Modem is now complete. You can PING to check whether all the settings have been correctly made. In routed environments, the LAN-Modems must also be reachable by other IP networks that are incorporated into the infrastructure.

4 Modem Operation

After the netework 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

4.1 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 bit:s	1, 2

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

4.2 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*.

4.3 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 onlyh 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.*

4.4 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.

4.4.1   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.

4.4.2   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 intereted as TCP port numbers. If no port number is specified, port number 8000 is implied. Valid entries would include for example.:

  172016232073
  1720162320738000
  172.16.232.73
  172.16.232.73:8000

· **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.

Example of dial-up command:

    ATD172.16.1.1
    ATD172016001001
    ATDT172.16.001.001

All three commands have the same effect: An attempt is made to set up a call to the LAN-Modem having IP address 172.16.1.1.

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

4.4.3   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

4.4.4   H (ATH)

= Quit connection

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

4.4.5   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 parameters 0 and 3 are presently used. The remaining even options are reserved for later enhancements.

- **ATI0**
  Returns product code „58210" from the LAN-Modem
- **ATI8**
  Returns the firmware version of the AT command interpreter

!

4.4.6   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: Section 4.3 „Command and Data Mode"

4.4.7   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.

4.4.8   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.

4.4.9   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.

4.4.10 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	4 = BUSY

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

4.4.11 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.

·   **Z0**
    Load stored reset profile 0.
·   **Z1**
    Load stored reset profile 1.

4.4.12 &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.

4.4.13 &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*.

4.4.14 &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*).

4.4.15 &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.

4.4.16 &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.

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

= Display system 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 6 „Copying the configuration data").

4.4.18 &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*.

4.4.19 &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. 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

4.4.20 &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.

4.4.21 %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.

4.4.22 %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.

4.4.23 %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.

4.4.24 %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.

4.4.25 %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.

Additional information: Section 5 „Firmware-Update" and Section 6 „Copying Configuration Data"

4.4.26 ** (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 5 „Firmware-Update" and Section 6 „Copying Configuration Data".

5   Firmware-Update

The firmware for the LAN-Modem is divided into two function modules whoses update methods differ.

■ Update the AT command interpreter serially or over the network

■ Update the TCP/IP-Stack over the network

5.1 Where do I get the latest firmware?

The current firmware including the update tool and a revision list is published on our Web site at the following address: **http://www.wut.de**.

Before proceeding with the update, please write down the 5-digit model number located on the LAN-Modem. From our homepage you can now find the product overview sorted by article numbers, from which you arrive directly at the Web data sheet for the respective LAN-Modem model. Then follow the link to the current version of the firmware.

⚠️ *Never interrupt the update process by pulling the power plug or pressing the reset key. The Com-Server will be made inoperable following an incomplete update.*

Never mix files having different version numbers in the file name. This will make the device inoperable.

Transmit all the files in order. The Com-Server automatically detects when all the files have been sent and the new operating software is complete. It will then automatically perform a reset.

5.2 Serial update of the AT command interpreter

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 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.*

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.

5.3 Network update of the AT command interpreter

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 95/98/NT

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.

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.

⚠️ *When starting update mode over the network, 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.

If updating over the network is automated in any way, you must ensure a pause of at least 0.5 seconds between sending of othe „U" and the start of firmware transmission. The LAN-Modem needs this time to delete the internal serial receive buffer when switching over to update mode.

5.4 Updating the TCP/IP-Stack

Prerequisite is a PC running under Windows 9x/NT/2000 with a network connection and an installed TCP/IP stack. You need two files for the update process:

1. The Update-Tool (32-bit application for Windows9x/ NT/2000), used to perform the update, and

2. the file with the extension *.bin (e.g. *C4r1_0.bin*), which contains the new operating software for the LAN-Modem. This file is sent to the LAN-Modem.

The update process is described in steps below. Please follow these instructions exactly. After an incomplete update the device will no longer be operable!

1. Close all connections that may still be active on the LAN-Modem. Before the update process all buffers and their contents are deleted!

2. Start the remote configuration tool of the LAN-Modem via Telnet

   telnet [IP address] 1111

   Select the following in the SETUP menu*: System → Flash Update → Net Update* and confirm with *y.* The LAN-Modem closes the Telnet connection, and the green status LED indicates that it is now in update mode.

3. Now start the update tool. The menu path *CS programming → Flash* takes you to the input screen for uploading the new firmware.

4. Enter the IP address for the LAN-Modem as well s the name of the firmware file in the corresponding fields.

IN the option field „*Output*" please select only the item „*Firmware*".

5. Click on the *Start* button. The update will take several secnds. It is only finished when a message window reports the end of the update process.

6. Check in the configuration menu of the LAN-Modem to verify that the new operating software was loaded. The menu *INFO System → SOFTW Date/Rev* must now show the new version number of the firmware.

If the old version is still displayed, the file with the new operating software is corrupted. Please contact your dealer for assistance.

⚠ *The procedure described here for the update only applies to version 1.14 and higher of the TCP/IP stack. LAN-Modems with a lower version of othe TCP/IP stack must first be upgraded to 1.14 or higher. Note here that only the destination IP address and the name of the new firmware may be entered in the input screen for the update. In the option field, however, both firmware and configuration must be activated.*

Appendix

■ Reading and sending complete configuration profiles

■ The modem protocol on the TCP level

■ Using with W&T COM Port Redirector and virtual modem ports

■ Technical Data

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 that described in Section 5 for updating the AT command interpreter.

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.

Virtual Modem Ports under Windows NT/2000/XP

As is the case with standard dial-up modems, the LAN-Modems are generally used in pairs, with one LAN-Modem used to dial-up another. If in a serial application this involves an application running under Windows NTW, 2000 or XP, a LAN-Modem is not required on this side.

The COM Port Redirector for WIndows NTW/2000/XP allows you to create virtual COM ports with an integrated AT command interpreter. Whenever an application opens such a virtual modem port, the latter behaves just like a local COM port with an externally connected hardware LAN-Modem. Both incoming and outgoing connectrions are possible.

Where do I get the COM Port Redirector
The latest version can always be downloaded at no charge from our Web site under the following address:

http://www.wut.de

Before proceeding with the update, please write down the 5-digit model number located on the LAN-Modem. From our homepage you can now find the product overview sorted by article numbers, from which you arrive directly at the Web data sheet for the respective LAN-Modem model. Then follow the link to the current version of the COM Port Redirector for Windows NT/2000/XP.

Technical Data

Supply voltage		
Model 58210:	typ. 270mA	max. 330mA
Model 58220:	typ. 455mA	max. 575mA
Model 58610@24V/DC:	typ. 80mA	max. 110mA
Model 58620@24V/DC:	typ. 175mA	max. 225mA
Permissible ambient temperature with free air circulation, not cascaded:		
Model 58210, 58220, 58610, 58620:	0 - 60°C	
Permissible ambient temperature for cascaded mounting on hat rail:		
Model 58210, 58610:	0 - 60°C	
Model 58220, 58620:	0 - 60°C	
Permissible relative humidity, non-condensing:	0% - 95%	
Dimensions 58210, 58220, 58610, 58620:	105 x 75 x 22mm	
Weight 58210, 58220, 58610, 58620:	approx. 110g	

Declaration of conformity

W&T
www.wut.de

Declaration of conformity
according to paragraph 10.1 of directive 89/336/EWG

Wiesemann & Theis GmbH hereby confirms that the products

LAN-Modem Mini, 10BaseT	**Type 58210**
LAN-Modem Industry, 10BaseT	**Type 58610**
LAN-Modem Mini, 100BaseT	**Type 58220**
LAN-Modem Industry, 10BaseT	**Type 58620**

fulfill the requirements of the directives / regulations specified below:

1. Emission according to

    1.1. EN 55022-B (1997)
    1.2. EN 61000-3-2 (1996)
    1.3. EN 61000-3-3 (1996)

2. Noise Immunity according to EN 61000-6-2 (1999):

    2.1. EN 61000-4-2   ESD
    2.2. EN 61000-4-3   Radiated Immunity
    2.3. EN 61000-4-4   Burst
    2.4. EN 61000-4-5   Surge
    2.5. EN 61000-4-6   Conducted Immunity
    2.6. EN 61000-4-8   H-Field
    2.7. EN 61000-4-11   Supply Voltage Dips and Interruptions

3. Product-specific Low-Voltage Directive for communications technology

    3.1. EN 60950 (1997)

Wuppertal, 04/26/2002

Klaus Meyer

Dipl.-Ing. Rüdiger Theis, Managing Director

Interfaces
für
Netzwerke,

serielle
Schnitt-
stellen

und
Drucker-
schnitt-
stellen