

# Manual

## AT-Modem-Emulator

**Release** 1.04, December 2015  
**Type** 58666  
Firmware 1.34 or higher

**W&T**

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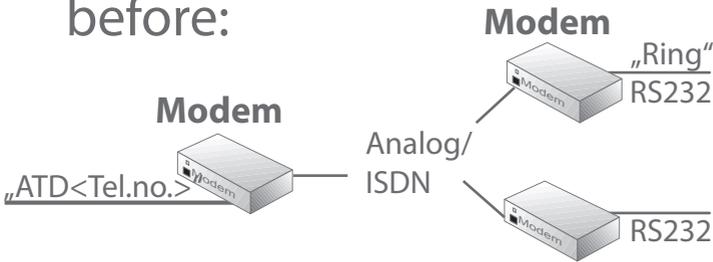
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**Introduction**

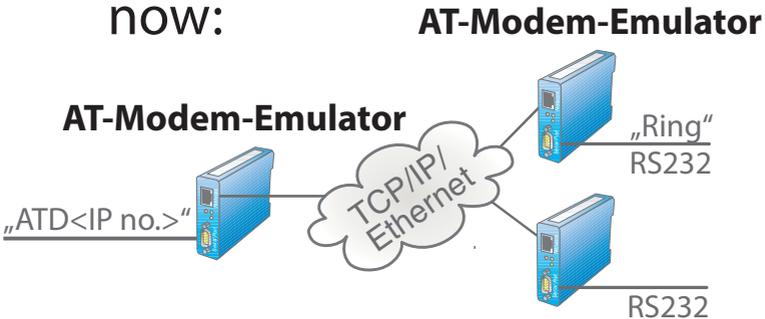
AT-Modem-Emulators are a seamless replacement for traditional analog and ISDN modems. Instead of the telephone network an AT-Modem-Emulator uses the TCP/IP/Ethernet network.

On the serial side AT-Modem-Emulators behave in a way compatible with a standard dial-up modem. Only the call number that was configured in the application or serial device needs to be replaced by the IP address.

before:



now:



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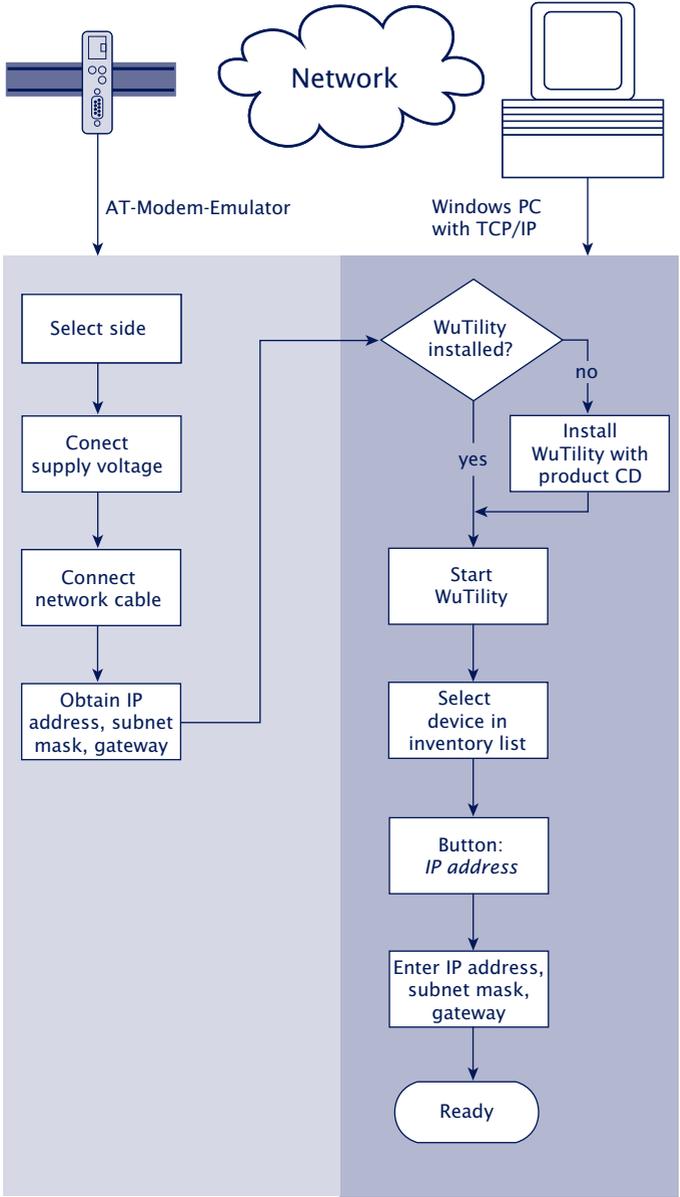
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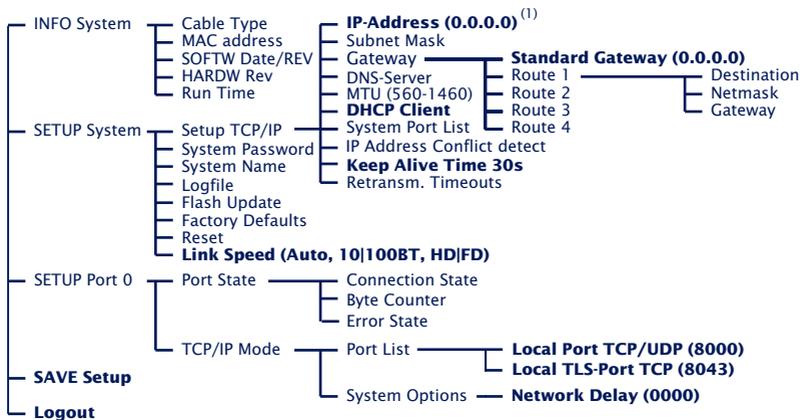
# **1 Quickstart**

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 Flow chart - Network installation using WuTility



## 1.2 Overview of configuration menu



To activate the new settings always save using *SAVE Setup* with Telnet or the *LOGOUT* link on the web pages. In WBM use the link *Logout* and click *Save!*

(1) Factory defaults are printed bold

Configuration of all other parameters, such as the serial transmission parameters, is done through the serial port on the AT-Modem-Emulator using AT commands.

## 1.3 Factory defaults settings

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



*To prevent unintended address assignments or changes, we recommend deactivating the DHCP protocol if it is not expressly used in the respective network environment.*

### Serial settings

Baud rate:	9600
Data bits:	8
Parity:	NO
Stop bits:	1
Handshake:	RTS/CTS (&k3)

### Configuration access

Per Telnet using TCP port 1111

### Network application/Operating mode

TCP server port for dial-in:	8000
TCP-Server Port for TLS-encrypted dial-in:	8043
Dial-out:	not encrypted (S13=0)

## **2 Assigning the IP address**

The AT-Modem-Emulator is factory set to IP address 0.0.0.0. Before you can make the entry in the Com-Server, you need to specify an IP address that is valid for your network. Your system administrator will provide you with this. The IP address must be unique within the network!

- ... using management tool *WuTility*
- ... using the ARP command
- ... using DHCP protokoll
- Assigning IP address, subnet mask and gateway address through the serial port
- IP Address Conflict Detect

## 2.1 Configuring network parameters with WuTility

*WuTility* is the central inventorying and management tool for all W&T network devices. In addition to convenient assigning of the IP parameters, *WuTility* also provides quick access to device configurations, the ability to perform firmware updates, managing configuration profiles, etc.

WuTility can be directly installed from the included product CD. Current versions are always available on our website at <http://www.wut.de>. From there you can navigate using the menu tree on the left side.

*Products & Downloads* → *Com-Server* → *Software-Tools*

After extracting the ZIP file you install *WuTility* by double-clicking on the file *wutility\_\*\*\*.msi*. Start WuTility using

*Start* → *All Programs* → *W&T Software Toolkit* → *WuTility*

### 2.2.1 Applications and prerequisites

IP assignment using WuTility works regardless of the current network parameters of the AT-Modem-Emulator and the computer used. This means that even if the AT-Modem-Emulator does not have IP parameters consistent with the respective network, WuTility can be used to overwrite them. Likewise, WuTility can be used to assign any values not consistent with the network the PC is located in.

- The PC and AT-Modem-Emulator must be located in the same physical network. This means you cannot assign values through a router.
- Any firewalls and network security packages installed on the PC must allow communication between WuTility and the Com-Server based on UDP broadcasts. If necessary these must be correspondingly configured or temporarily turned off.
- If the AT-Modem-Emulator does not have its factory default settings and there is a system password assigned,

this must be known in order to make changes using WuTility.

### Step 1: Start the assignment dialog

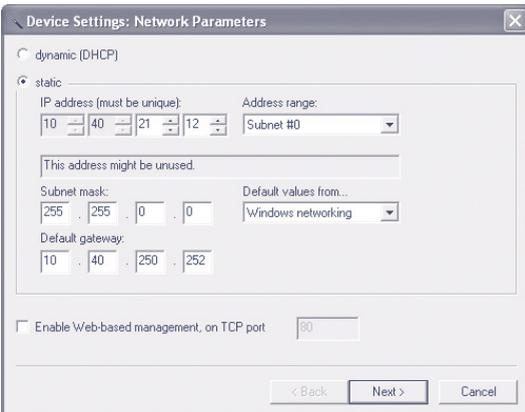
WuTility automatically searches the local network for connected W&T network devices and creates an inventory list. This search process can be repeated manually as often as desired by clicking on the Scan button:



Within the inventory list you can identify the desired AT-Modem-Emulator based on its MAC address. For initial installations its IP address is 0.0.0.0.



Select the AT-Modem-Emulator and click on the *IP address* button:



## Step 2: Assign the IP parameters

The *Static* option allows you to assign fixed basic parameters while simultaneously disabling *DHCP* and *BOOTP* protocols in the AT-Modem-Emulator. Enter the desired values for IP address, subnet mask and gateway address in the corresponding entry fields. The *DHCP* option enables DHCP protocol in the AT-Modem-Emulator, and operation with a static IP address is no longer possible (see *IP Assignment using DHCP Protocol* for detailed information)

If the remaining configuration of the AT-Modem-Emulator is done using a Web browser, activate the option Web-Based-Management (WBM). If you are not using the standard HTTP port 80, change the port number to the desired value.

Clicking on the *Next* button assigns the network parameters to the AT-Modem-Emulator. After acknowledging the resulting message, all the columns in the *WuTility* device list are filled in with information.

If necessary, the remaining configuration of the AT-Modem-Emulator is done using Telnet or Web-Based-Management. Click on the Telnet or Browser button.

Telnet:  Browser: 

Additional information can be found in the section *Configuration Accesses for the AT-Modem-Emulator*.

## 2.2 Assigning the IP using DHCP protocol

DHCP protocol is activated by the factory default settings, so that in network environments dynamic IP assignment is sufficient for connecting the AT-Modem-Emulator to the network. The following parameters can be assigned using DHCP:

- IP address
- Subnet mask
- Gateway address
- DNS server

### 2.2.1 Manual activation of DHCP

To prevent unintended address assignments or address changes, DHCP protocol is automatically deactivated when using all other methods for assigning the IP parameters. The following methods are then available for later activation of DHCP.

- **Management-Tool WuTility**

Select the desired AT-Modem-Emulator from the device list and click on the IP Address button. In the following dialog check the option DHCP and then click on Next.

- **Telnet-/WBM configuration**

In the menu branch *SETUP System* → *Setup TCP/IP* → *DHCP Client* you can activate DHCP protocol. For detailed information, see the section Menu: SETUP System.



*A set static IP address is deleted after DHCP is activated and the associated automatic reset. The AT-Modem-Emulator automatically sets this to 0.0.0.0 and starts sending DHCP requests.*

### 2.2.2 System name

To support any automatic updating of the DNS system by the DHCP server, the AT-Modem-Emulator identifies itself within the DHCP protocol with its system name. The factory default setting for this is ATMODEMEMULATOR followed by the last three places of the Ethernet address. For example the factory set system name of a AT-Modem-Emulator with the Ethernet address 00:c0:3d:01:02:03 is ATMODEMEMULATOR010203. The system name of the AT-Modem-Emulator can be changed in the configuration. For additional information refer to the section Menu: SETUP System → System Name.

### 2.2.3 Lease time

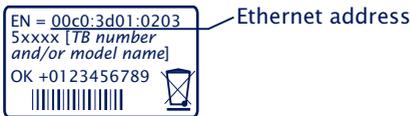
The lease time determined and transmitted by the DHCP server specifies the Time-To-Live of the assigned IP address. After half the lease time has expired, the AT-Modem-Emulator attempts to extend the time for the assigned DHCP server and up update the address. If this is not possible by the time the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

If DHCP is activated, the remaining lease time together with the current IP address is displayed in the menu item *SETUP System* → *Setup TCP/IP* → *IP-Address* using the format hh:mm:ss.

### 2.2.4 Reserved IP addresses

When selecting a different device the AT-Modem-Emulator is accessed on the network side as a TCP server. The dialing remote peer uses the IP address of the AT-Modem-Emulator to establish the connection, so that it makes sense to reserve a particular IP address for the AT-Modem-Emulator on the DHCP server. This is generally done by linking the IP address to the unique Ethernet address of the AT-Modem-Emulator, which can be found on the sticker attached to the housing.



### 2.2.5 Dynamic IP addresses

Fully dynamic address assignment, whereby the AT-Modem-Emulator gets a different IP address every time it is restarted or after the lease time has expired, only makes sense in network environments with automatic cross-connection between the DHCP and DNS services. This means when a new IP address is assigned to the AT-Modem-Emulator, the DHCP server then automatically updates the DNS system as well. The new address is associated with the respective domain name. If in doubt, consult your system administrator for detailed information about your network environment.

## 2.3 Assigning the IP using the ARP command

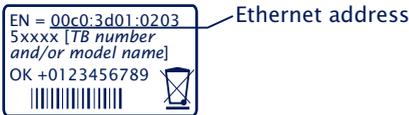
### Requirements

This method can only be used if the AT-Modem-Emulator does not already have an IP address, i.e. the 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 over Telnet. If the AT-Modem-Emulator has any other value, this access is disabled.

This method does *not* work across networks, e.g. through routers. This means the PC and AT-Modem-Emulator used for assigning must be connected to the same physical network segment. Only IP addresses whose Net-ID is identical to that of the assigning computer can be assigned.

### Step 1

Read off the Ethernet address of the AT-Modem-Emulator from the sticker on the side of the housing.



Insert a static entry into the ARP table of the computer using the following command line:

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

E.g. under Windows:

```
arp -s 172.16.231.10 00-C0-3D-00-12-FF
```

E.g. under UNIX/Linux:

```
arp -s 172.16.231.10 00:C0:3D:00:12:FF
```

 *The IP addresses must be without leading zeros in all Windows environments. Otherwise the entry is incorrectly interpreted by the system and an incorrect IP address is assigned to the AT-Modem-Emulator. In Windows Vista and newer the prompt cmd.exe necessary for invoking the ARP command must be started using Administrator rights.*

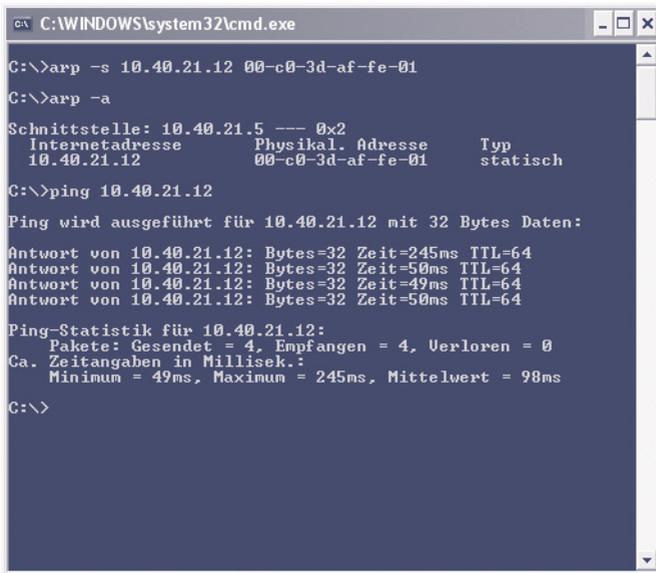


*Older Windows systems only accept a static entry if there is a dynamic one already present. Here you should first ping another network station.*

## Step 2

Use the following command line to *ping* the AT-Modem-Emulator with the desired IP address:

```
ping 10.40.21.12
```



```
cmd C:\WINDOWS\system32\cmd.exe
C:\>\arp -s 10.40.21.12 00-c0-3d-af-fe-01
C:\>\arp -a
Schnittstelle: 10.40.21.5 --- 0x2
  Internetadresse      Physikal. Adresse      Typ
  10.40.21.12          00-c0-3d-af-fe-01     statisch
C:\>\ping 10.40.21.12
Ping wird ausgeführt für 10.40.21.12 mit 32 Bytes Daten:

Antwort von 10.40.21.12: Bytes=32 Zeit=245ms TTL=64
Antwort von 10.40.21.12: Bytes=32 Zeit=50ms TTL=64
Antwort von 10.40.21.12: Bytes=32 Zeit=49ms TTL=64
Antwort von 10.40.21.12: Bytes=32 Zeit=50ms TTL=64

Ping-Statistik für 10.40.21.12:
  Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0
  Ca. Zeitangaben in Millisek.:
    Minimum = 49ms, Maximum = 245ms, Mittelwert = 98ms
C:\>
```

The AT-Modem-Emulator takes the IP address of the first network packet sent to it as its own and saves it in non-volatile memory. The ping requests of the PC are then replied.

It is not possible to configure the subnet mask and gateway address using a static ARP entry. These need to be set in a separate Telnet configuration session (see section *Basic Configuration of the Com-Server*).

 *To avoid unintended changes to the IP address, the DHCP client of the AT-Modem-Emulator is automatically deactivated when configuring using a static ARP entry.*

## 2.4 Assigning the IP using the serial port

After a AT-Modem-Emulator reset a time window of around 1-2 seconds is available, during which you can assign a new IP address, subnet mask and gateway address by entering at least 3 „x“.

In contrast to other methods described above, this serial method functions regardless of whether the AT-Modem-Emulator already has an IP address or not. The procedure can be repeated as often as desired. The appendix contains the detailed procedure under Windows.

### Preparations/requirements

First connect the serial port of the AT-Modem-Emulator to a computer. For a standard PC or laptop, you will need an *uncrossed* RS232 cable (=modem cable, see *RS232 mode*).

Any serial terminal program can be used for assigning. The following transmission parameters must be set regardless of any other settings in the AT-Modem-Emulator:

*9600 baud, no parity, 8 data bits, 1 Stop bit, no Handshake*

### Start the serial configuration mode

Reset the AT-Modem-Emulator by interrupting the power. While the AT-Modem-Emulator is starting up, use the terminal program to send the letter x at least three times. The AT-Modem-Emulator will then return the prompt *IPno.+<Enter>.*

### Assigning the IP settings

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.

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 AT-Modem-Emulator.

Example: Assigning the IP address:

```
IP no.+<ENTER>:          <-   AT-Modem-Emulator
172.17.231.99            ->   AT-Modem-Emulator
```

Example: Assigning IP address, subnet mask and gateway

```
IP no.+<ENTER>:          <-   AT-Modem-Emulator
172.17.231.99, 255.255.255.0,172.17.231.52 -> AT-Modem-Emulator
```



*To avoid unintended changes to the IP address, the DHCP client of the AT-Modem-Emulator is automatically deactivated when configuring using then serial port.*

### Option: Activating Web Based Management (WBM)

To further configure the *AT-Modem-Emulator* you can use either Telnet protocol or an Internet browser, although only Telnet is an option in the AT-Modem-Emulator as shipped from the factory. You can activate Web Based Management as part of the serial IP assignment. To do this, enter *+w[Portno.]* directly after the IP address or address string. Here *Portno.* is the desired TCP port in decimal format.

*Example 1:* Assigning the IP adress and WBM on Port 80.

```
xxx...                  -> AT-Modem-Emulator
IP no.+<ENTER>:        <-   AT-Modem-Emulator
172.17.231.99+w80      ->   AT-Modem-Emulator
172.17.231.99-1       <-   AT-Modem-Emulator
```

*Example 2:* Assigning IP address, subnet mask, gateway and activating WBM on port 8800.

```
xxx...                  -> AT-Modem-Emulator
IP no.+<ENTER>:        <-   AT-Modem-Emulator
172.17.231.99,255.255.0.0,172.17.231.1+w8800 -> AT-Modem-Emulator
172.17.231.99,255.255.0.0,172.17.231.1+w8800 <- AT-Modem-Emulator
```

## 2.5 Address Conflict Detect

The AT-Modem-Emulator is able to detect and display an IP address conflict. This function is deactivated by default and can be activated in the following menu branch:

```
SETUP System
  ↳ ...
    Setup TCP/IP
      ↳ ...
        IP Address Conflict Detect
```

When the AT-Modem-Emulator is restarted there is an active check for any address conflicts. During normal running the monitoring is passive. Details on this functionality can be found in RFC5227, *IPv4 Address Conflict Detection*.

### Indication of an address conflict

The AT-Modem-Emulator indicates a detected address conflict by rapid flashing (approx. 3x/s) of the Error LED. In addition a message including the competing MAC address is generated in the Error State (*Setup Port 0 → Port State → Error State*).

When using a static IP address the conflict is only indicated. The AT-Modem-Emulator continues to use this IP address. In a DHCP environment the AT-Modem-Emulator informs the responsible DHCP server, resets the IP address and waits for assignment of a corrected IP address.

 *IP address conflicts generally lead to communication problems which are difficult to diagnose. Please therefore inform the responsible administrator in such cases.*

## **3 Interfaces and LED displays**

- Supply voltage
- Ethernet/PoE
- RS232 interface
- LED displays

### 3.1 Supply voltage

The AT-Modem-Emulator 58666 can be operated either using PoE or from an external power supply.

The current draw can be found in the technical appendix.

#### 3.1.1 Power over Ethernet

In PoE environments (Power-over-Ethernet, IEEE802.3af) power is provided by the network infrastructure. The AT-Modem-Emulator supports both phantom power using data pairs 1/2 and 3/6 as well as power feed using the unused wire pairs 4/5 and 7/8.

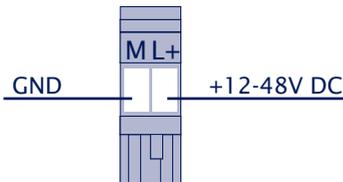
The model 58666 is a device in PoE Power Class 1 (power consumption 0.44 to 3.84W).

#### 3.1.2 External supply

As an alternative to PoE power supply the AT-Modem-Emulator can also be powered by an external power supply connected to the screw terminals on the underside of the housing. A half-wave rectifier makes the input reverse polarity protected. AC or DC power may be used, whereby the following limit values must be observed:

- AC: 18Vrms (- 10%) - 30Vrms (+10%)
- DC: 24V (-10%) - 48V (+10%)

When powering with DC voltage polarity must be observed:



### 3.2 Ethernet interface

The AT-Modem-Emulator incorporates an IEEE 802.3-compatible network interface.

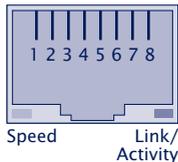
#### 3.2.1 Link status

The Link status is indicated on the two LEDs built into the RJ45 jack.

- **Link/Activity (green)**  
ON indicates a valid link to a hub or switch port. The LED flashes when there is data traffic.
- **Speed (yellow)**  
ON indicates a 100MBit/s-link (100BaseT). OFF indicates 10MBit/s (10BaseT)

#### 3.3.2 10/100BaseT on RJ45

The AT-Modem-Emulator 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	Devices w/o PoE	Devices with PoE
1	Out	Tx+	Tx+
2	Out	Tx-	Tx-
3	In	Rx+	Rx+
4	In	nc	Vcc positive
5	In	nc	Vcc positive
6	In	Rx-	Rx-
7	In	nc	Vcc negative
8	In	nc	Vcc negative

The network connection is galvanically isolated with respect

to the supply voltage as well as the serial interface(s) for at least  $1,5\text{kV}_{\text{rms}}$ .

### **Power-over-Ethernet - PoE**

The AT-Modem-Emulator can obtain power as defined in IEEE802.3af/Power-over-Ethernet. Either the data pairs or the unused wire pairs in 10/100BaseT may be used (see also the section *Supply Voltage*).

### **Auto Negotiation: 10/100BaseT, Full/Half Duplex**

The AT-Modem-Emulator is 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 AT-Modem-Emulator 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 AT-Modem-Emulator) are operated in Auto-Negotiation mode.
- *Both* parties are configured for the same (fixed) transmission speeds and duplex mode.

Use menu sequence *Setup System* → *Link Speed* to switch between Auto-Negotiation and fixed transmission speeds/duplex mode.

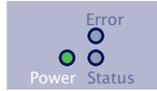
### 3.3 RS232 interface

The AT-Modem-Emulator has an RS232 port whose DCE configuration is identical with that of the traditional telephone modem. When these are replaced by the AT-Modem-Emulator, the RS232 cable used previously can be left in place.

#### Pin assignment and function RS232, D9 female

Pin	Direction	Signal	Description	AT command
1	OUT	DCD	Existing connection = active	AT&Cn
2	OUT	RxD	Data output	---
3	IN	TxD	Data input	---
4	IN	DTR	Edge change from active to deactive closes a connection	AT&Dn
5	---	GND	Signal Ground	---
6	OUT	DSR	always active	AT&Sn
7	IN	RTS	Flow control input: Data output only when active	AT&kn
8	OUT	CTS	Flow control output: active = ready to receive data deactive = not ready to receive data	AT&Kn
9	OUT	RI	For an incoming connection (dial-in) active pulses approx. 1 sec. Deactive after call is accepted	---

### 3.4 LED displays



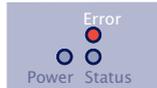
#### Power LED

**OFF:** There is no power present. Check the correct connection of the supply (PoE or the external power supply)  
**ON:** Power is present (PoE or the external power supply).



#### Status LED

**Rapid continuous flashing** = bootup, no IP  
 Rapid continuous flashing (approx. 3x/s) indicates that the AT-Modem-Emulator is in the bootup phase and/or has not yet been assigned an IP address. Please use WuTility for example to assign the AT-Modem-Emulator an IP address.  
**Slow continuous flashing** = connection  
 Periodic flashing indicates that the port has a valid connection to another network station. The status of the serial port can also be read out using WBM or the AT-Modem-Emulator's Telnet configuration tool.



#### Error LED

The Error LED uses various flashing patterns to indicate error conditions on the device or serial port. The error texts for the previous five serial faults and the associated system time (time between the last restart of the AT-Modem-Emulator and when the error occurred) can also be read out using the Telnet configuration tool.

**Rapid continuous flashing** = IP address conflict  
 The IP Address Conflict Detect function is activated and the AT-Modem-Emulator has detected an IP address conflict. This means the current IP address of the AT-Modem-Emulator is also used by other stations in the network. To prevent further problems, please contact the responsible network administrator and have the conflict resolved.

**2 x flashing** = Check serial data format

The serial port received at least one character with a parity or framing error (= parity error / framing error), or the data register of the serial receiver ship was written even though the previous character was not read out. Check the correctness of the serial parameters, the handshake procedure and the connection cable.

**3 x flashing** = Check serial handshake

The serial connected device is not responding to the handshake stop signal set by the AT-Modem-Emulator and continues to send data. The result can be that the serial ring memory is overwritten and data are lost. Check the handshake configuration of the device as well as the wiring of the connection cable.

**All LEDs on** = Self-test error

The self-test performed after each start or reset of the AT-Modem-Emulator could not be correctly finished. This error can occur when you have prematurely broken off a software update and the full operating software could not be transferred. The AT-Modem-Emulator is no longer capable of being operated in this condition. Repeat the software update over the network (see *Firmware update of the AT-Modem-Emulator*), and address the AT-Modem-Emulator using its assigned IP address. If this does not eliminate the error or should the error occur irrespective of any prior software update, please return the unit to W&T for service.

**Speed (yellow)**

**OFF:** Simultaneous illumination/flashing of the Link/Activity LED means there is a link to a device at a rate of 10 MBit/s (10BaseT).

**ON:** Simultaneous illumination/flashing of the Link/Activity LED means there is a link to a device at a rate of 100 MBit/s (100BaseT)

**Link/Activity (green)**

*OFF:* The AT-Modem-Emulator is not detecting a Link pulse from a hub or switch. Check the cable or the hub port.

*ON:* The AT-Modem-Emulator has a valid link to a hub or switch. The Speed LED indicates the data rate in this case.

*Flashing:* The AT-Modem-Emulator is receiving or sending network packets

## **4 The basic configuration**

Here follows the explanation of all the configuration possibilities related to the AT-Modem-Emulator operating system and which are not directly related to the serial ports.

- Telnet-Konfiguration unter Windows
- Konfiguration mit dem Internet-Browser
- Verwendung des Systempasswortes
- Menü: INFO System
- Menü: SETUP System
- Menü: Setup Port 0

## 4.1 Configuration menu

The setup of the AT-Modem-Emulator is treelike. An overview of all the levels can be found in the following illustration.

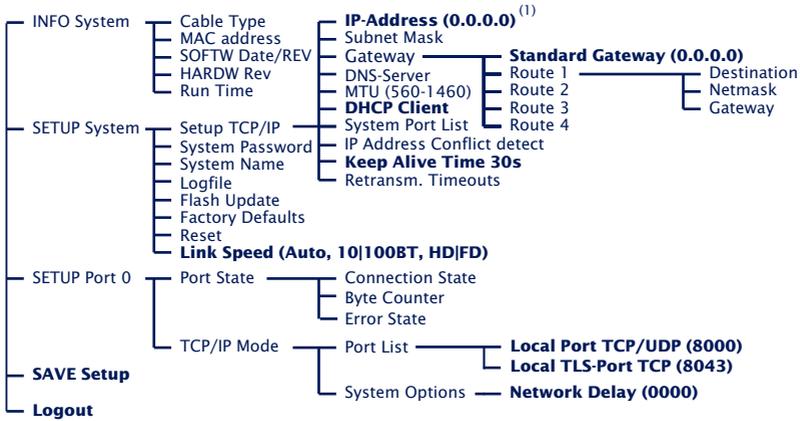
Prior to configuration a valid IP address must have been already assigned to the AT-Modem-Emulator (see “Assigning the IP Address”). Access is then possible from virtually any computer having network access and an installed TCP/IP protocol.

A detailed description of both configuration access types, their conditions as well as the respective navigation within the menu tree can be found in the following section.

 *HTTP protocol and its standard port 80 are frequent targets of Web attacks. In order not to impair data throughput of the applications and of the AT-Modem-Emulator, Web Based Management is therefore factory disabled. Ways of activating this as part of the startup process can be found in the section on Web Based Management.*



*If you exit the configuration menu by closing the Telnet connection without first invoking SAVE Setup, the original configuration is retained.*



To activate the new settings always save using *SAVE Setup* with Telnet or the *LOGOUT* link on the web pages. In WBM use the link *Logout* and click *Save!*

(1) Factory defaults are printed bold

## 4.2 Configuration via Telnet

To configure using Telnet a standard Telnet client is needed (e.g. Putty). The connection to the AT-Modem-Emulator is opened by default on TCP/1111. The port can be changed within the configuration.

If the connection could not be opened, and no system password has been assigned (= factory default setting), the following menu appears. If a system password has been configured, you will be prompted for it before the menu appears.

```
*****
*   AT-Modem-Emulator           *
*   "ATMODEMEMULATOR0A1B2C"   *
*****
1. INFO System
2. SETUP System
3. SETUP Port 0 (Serial)
4. SAVE Setup
```

### 4.2.1 Navigation within the Telnet menu

An overview of the entire AT-Modem-Emulator configuration menu is shown on the previous page. On the monitor you will see always just one level of the selected menu. Simply entering the number of the desired menu and pressing the *ENTER* key takes you to the next level. Entering a *q* or pressing the *ENTER* key takes you back to the previous menu level.

The last configured value of a menu item appears in parentheses. If you make changes, the new value will appear at this point the next time the menu is opened. It only becomes effective in the AT-Modem-Emulator itself however if you have saved it using SAVE Setup.

As long as you do not open this menu item, you can move around in the entire menu and change values without actually changing anything.

### 4.3 Configuration via Browser - Web Based Management

The AT-Modem-Emulator also allows configuration via a standard Internet browser. The menu structure of the WBM (**Web Based Management**) is compatible with the Telnet configuration.

#### 4.3.1 Activating WBM with the WuTility-Tool

The Web-Based-Management of the AT-Modem-Emulator can be activated at any time using WuTility as part of assigning the network parameters. Select the AT-Modem-Emulator in the device list and then click on the *IP address* button. In the first window of the dialog enter the desired values for IP address, subnet mask and gateway and then click on the *Continue* button. In the following window activate the *WBM option* and enter the desired TCP port number. As a rule HTTP standard port 80 should be used. If use of port 80 is not possible or desired, then the deviating port number must be explicitly specified in the address line of the browser when opening the AT-Modem-Emulator homepage

#### 4.3.2 Activating WBM via the serial interface

When serially assigning the IP parameters, you can optionally specify the TCP port number under which the WBM can be reached.

Additional information and details about serial configuration possibilities on the AT-Modem-Emulator can be found in the section on IP assignment using the serial interface.

#### 4.3.3 Activating WBM from the configuration menu

In the menu branch

*SETUP System → Setup TCP/IP → System Port List → WBM Port*

enter the decimal number of the desired TCP port under which you want to reach the WBM. Then press the Return key until you are back in the main menu and from there open the *SAVE Setup* item. After you have quit the Telnet session, you can now access the Com-Server using an Internet browser.

#### 4.3.4 WBM navigation

Since the WBM of the AT-Modem-Emulator is session-oriented, you must use *backlinks* and corresponding control buttons to navigate to the individual Web pages. Using the Back function in the browser can lead to problems in accepting the set parameters.

Entering the prompted password on the start page of the AT-Modem-Emulator is only necessary if a system password was previously configured.

You can make as many settings as desired during a configuration session. Pressing the Send button in the respective pages pastes them to a clipboard. Once all the settings have been made, always exit the configuration session using Link *Logout* and the *Save* button there. Only then are the settings you made copied into the non-volatile memory of the Com-Server and activated.



*The functions contained on the logout page of the AT-Modem-Emulator can also be found in the Telnet menu branch *SETUP System* → *Setup TCP/IP*.*

## 4.4 System password

Like all configuration and management accesses, Telnet and WBM are protected by the max. 31 character system password.

The password is prompted at a Telnet login only if a system password was configured in the AT-Modem-Emulator. Otherwise the configuration menu is immediately available.

When logging in through a web browser the start page of the AT-Modem-Emulator at first always appears after the password is prompted. If no system password has been configured, the entry field remains blank and the Login button takes you directly to the configuration menu.

The factory default setting is for no system password.

### 4.4.1 Resetting the system password

If a configured password is no longer known, you can reset the AT-Modem-Emulator to its factory default settings. All other settings you made including network parameters are also lost and will need to be reentered.

## 4.5 Menu: INFO System

This menu allows you to call up device-specific parameters such as the version number and creation date of the firmware, MAC address of the unit, etc.

### ↪ **Cable type**

Indicates whether the connection to the hub/switch is using 10BaseT or 100BaseTX. The duplex procedure is also indicated (Full- or Half-Duplex).

### ↪ **MAC address**

Shows the Ethernet address of the AT-Modem-Emulator. This number is factory set and registered. It cannot be changed.

### ↪ **SOFTW Date/Rev.**

Shows the creation date and version number of the operating software in flash.

### ↪ **HARDW Rev.**

Shows the version status of the AT-Modem-Emulator hardware.

### ↪ **Run Time**

Shows the time in hours and minutes since the last AT-Modem-Emulator restart.

## 4.6 Menu: SETUP System

This menu is for configuring all the parameters that pertain to the AT-Modem-Emulator operating system and are independent of the serial interface.

### 4.6.1 Menu: SETUP System → Setup TCP/IP

#### ↪ **IP-Address** (Default= 0.0.0.0)

Enter here the IP address if you want to change it. Please note that this number is not freely selectable, but rather needs to be specified based on the network address of the TCP/IP network. The format corresponds to the normal syntax (e.g. 172.16.231.5).

#### ↪ **Subnet Mask** (Default = 255.0.0.0)

The subnet mask only needs to be entered if the AT-Modem-Emulator will be making connections to another subnet. Enter the subnet mask of the subnet in which the AT-Modem-Emulator is located (e.g. 255.255.255.0).

#### ↪ **Gateways** (Default = 0.0.0.0)

In this menu branch the IP address of the standard gateway or router can be configured. If you have not configured fixed routes, the standard gateway is used for all network packets whose destination IP address is not in the local subnet.

#### ↪ **Route 1 - 4 (Destination, Netmask, Gateway)**

In addition to the standard gateway, up to four fixed routes can be defined. Packets whose destination addresses are in the networks configured here (=destination) are always sent through the gateway assigned to this route. A fixed route is only accepted and stored by the AT-Modem-Emulator if the following check is true:

*Destination AND Netmask == Destination*

 *Changes to the system parameters IP address, Subnet Mask, Gateway and Route 1-4 cannot be activated right after saving. The AT-Modem-Emulator will use these values only after closing the current Telnet connection using q.*

↪ **DNS server** (Default: 0.0.0.0)

The entry contains the IP address of the DNS server (Domain Name System). This is required if when instead of the IP address of the destination system a host name or URL is used when sending the dial command D. Name resolution on the AT-Modem-Emulator is via UDP through the DNS standard port 53.

The Time-To-Live of the IP address resolved for a host name is determined by the Time-To-Live parameter contained in the response from the DNS server. After the name has been successfully resolved this time is displayed in the menu item *SETUP Port 0 → Port State → Connection State*.

↪ **MTU – Maximum Transfer Unit** (Default: 560)

This value determines the maximum size of a TCP/IP packet. It refers to the number of bytes (excluding header) that can be sent in a packet. The smaller the MTU, the more network buffer overall is available in the AT-Modem-Emulator. The selectable range begins at 560 and ends at 1024 bytes. The values can be set in increments of 128 bytes (automatic correction).

↪ **DHCP Client** (Default: 1 = ON)

The DHCP protocol is activated with the factory settings (menu entry = 1). The AT-Modem-Emulator attempts to find a DHCP server and get an IP address from it. Entering 0 deactivates DHCP and the AT-Modem-Emulator works statically with the IP address assigned to it. More information on how DHCP works can be found in the section IP Assignment via DHCP Protocol.

 *To prevent unintended address assignments or changes, we recommend deactivating the DHCP protocol if it is not expressly used in the respective network environment.*

### ↳ **System Port List**

From the respective submenus you can configure and disable the TCP and UDP port numbers under which the following configuration and control accesses for the AT-Modem-Emulator are reached. Entries are made in decimal. The value 0 disables the service.

The TCP port under which the AT-Modem-Emulator can be dialed by a remote station is configurable in the submenu *Setup Port 0 → TCP/IP Mode → Port List*.

- WBM port (Default = TCP/0)  
*Chapter Configuration via browser*
- Telnet configuration port (Default = TCP/1111)  
*Chapter Configuration per Telnet*
- SNMP (Default = UDP/161)
- Device Reset port (Default = TCP/8888)  
*Chapter Reset AT-Modem-Emulator*
- Init Flash Update port (Default = TCP/8002)  
*Chapter Firmware Update of the AT-Modem-Emulator*
- Read Config port (Default = TCP/8003)
- Write Config port (Default = TCP/8004)
- Info port (Default = UDP/8513)



*Changes to the factory default port numbers as well as disabling services should be done with caution, since they can result in malfunction of configuration and management tools such as WuTility. If for example the telnet configuration and WBM are disabled, you can no longer configure the AT-Modem-Emulator. Restore the factory default values by performing a hardware reset of the AT-Modem-Emulator.*

### ↳ **Keep Alive Time (sec)** (Default: 30s)

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 AT-Modem-Emulator generates a keep-alive packet. If the partner does not answer this packet, the connection is reset in the AT-Modem-Emulator. This deletes any data still contained in the serial in- and

output buffers.

↪ **Retransmission Timeouts (ms)** (Default: 240)

This timeout determines what time must elapse before network packets are repeated if necessary. In most networks the default setting of 240ms can be used. Only when there are very long latency times between the AT-Modem-Emulator and its respective communications partner would you need to increase this value.

↪ **IP Address Conflict Detect** (Default: deaktiviert)

The AT-Modem-Emulator is able to detect and display an IP address conflict. An active check is performed each time the AT-Modem-Emulator is restarted. Only passive monitoring is performed during normal running. Details on this functionality can be found in RFC5227, IPv4 Address Conflict Detection.

If the AT-Modem-Emulator detects that its current IP address is also being used by another station in the local network, it indicates this conflict by rapid flashing of the Error LED. In addition a corresponding message including the competing MAC address is generated in the Error State (*Setup Port 0 → Port State → Error State*).

When using a static IP address the conflict is only indicated. The AT-Modem-Emulator continues to use this IP address. In a DHCP environment the AT-Modem-Emulator informs the responsible DHCP server, resets the IP address and waits for assignment of a corrected IP address.

 *IP address conflicts generally lead to communication problems which are difficult to diagnose. Please therefore inform the responsible administrator in such cases.*

### 4.6.2 Menu: SETUP System → System Password

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

- Telnet configuration menu (Default = 1111/TCP)
- WBM (Default = 0 = deactive)
- Init Firmware Update (Default = 8002/TCP)
- Read the configuration file (Default = 8003/TCP)
- Write the configuration file (Default = 8004/TCP)
- Reset (Default = 8888/TCP)
- SNMP (Default = 161/UDP)

On Telnet port 1111 and on WBM port 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 AT-Modem-Emulator no later than 2s after the TCP connection has been established. Queries from SNMP managers are only responded to by the AT-Modem-Emulator if the community corresponds to the system password.

### 4.6.3 Menu: SETUP System → System Name

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

If the tag `<wut1>` is used inside the system name, the AT-Modem-Emulator replaces it each time there is an output or communication with the last three places of its Ethernet address.

### 4.6.4 Menu: SETUP System → Logfile

The Logfile contains the last (max. 3000) connections and connection attempts for configuration accesses by the Com-Server with the associated time stamp and address parame-

ters.

Accesses to the following services are registered:

- Telnet configuration menu (Default = 1111/TCP)
- WBM (Default = 0 = deactivate)
- Init Firmware Update (Default = 8002/TCP)
- Read configuration file (Default = 8003/TCP)
- Write the configuration file (Default = 8004/TCP)
- Reset (Default = 8888/TCP)

↪ **Activate Logfile** (Default= 0 = OFF)

A 1 activates recording. In addition the Save Interval must be configured to a valid value.

↪ **Save Interval (min)** (Default= 0)

Configuration of the time interval in minutes at which the Logfile is written to the non-volatile memory of the AT-Modem-Emulator.



*Saving the Logfile has an influence on the latencies of the serial data transmission. We recommending configuring the Save Interval only as low as absolutely necessary. When timeouts occur in serial data exchange, logging should be disabled on a test basis.*

↪ **Delete Logfile**

Deletes the entire Logfile including the non-volatile stored entries.

### Reading/viewing the Logfile

The Logfile can be viewed using the Web Based Management of the AT-Modem-Emulator under Setup System → Logfile → Load. The Logfile can be downloaded via TFTP. The name to be specified in the TFTP client must be *wut\_cs\_logfile*. (Note period at the end!)

#### 4.6.5 Menu: SETUP System → Flash Update

Before you activate the update mode, make sure that you have quit any active network connections. Then confirm with `y`. The update mode is indicated by lighting of the Status LED on the AT-Modem-Emulator.

WuTility automatically enables update mode through TCP port 8002. Manual enabling is therefore only necessary if this port is blocked, such as by a firewall.



*You may quit the update mode only by either completely performing the update or by means of a reset, i.e. turning off the power!*

#### 4.6.6 Menu: SETUP System → Factory Defaults

Enter a `y` to restore the factory default settings.



*Resetting the non-volatile memory causes loss of all the settings which deviate from the default values, including the IP address.*

#### 4.6.7 Menu: SETUP System → Reset

Select this menu item to perform a software reset on the AT-Modem-Emulator. First your Telnet connection is properly closed.



*All data from any still open network connections are lost.*

#### 4.6.8 Menu: SETUP System → Link Speed

The AT-Modem-Emulator is 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 AT-Modem-Emulator 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 AT-Modem-Emulator) are operated in Auto-Negotiation mode (recommended).
- *Both* parties 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 AT-Modem-Emulator reset. Data from any open network connections is lost. If the newly selected setting is not supported by the port used on the switch or hub, the AT-Modem-Emulator may then not be accessible.*

## 4.7 Menu: Setup Port 0

This menu branch contains status and error information as well as the configuration options for the TCP port on which the AT-Modem-Emulator can be dialed.

### 4.7.1 Menu Setup Port 0 → Port State

#### ↪ Connection State

When a connection is open this menu branch contains the IP address and port number of the communication partner.

The display is updated by exiting and then reselecting the menu item *Connection State*.

#### ↪ Byte Counter

Counters for serial transmitted and received bytes since the last reset.

#### ↪ Error State

The list shows any errors which occur on the port. A maximum of the last 5 errors including the associated time stamp of the internal run time in hh:mm format are displayed. You can clear the error table in order to have all entries available. The following messages are displayed:

#### **No halt on XOFF/RTS**

The connected serial device does not respond to the stop signal set by the AT-Modem-Emulator and continues to send data. The result may be overwriting of the serial ring buffer and loss of data. Please check to be sure the handshake configurations for the devices agree and the connection cable is properly wired.

#### **Parity Error**

A character received on the serial port has an incorrect or missing parity bit. Please check that the transmis-

sion parameters for the AT-Modem-Emulator and the corresponding serial terminal device are the same. Parity errors can also be caused by use of excessively long cable.

### **Framing Error**

A character received on the serial port does not fit in the time frame that results from the configured transmission parameters (baud rate, start bit, data bits, parity bit, stop bits). Please check here also that the AT-Modem-Emulator and serial terminal device configurations are the same.

## **4.7.2 Menu Setup Port 0 → TCP/IP Mode**

### ↪ **Port List → Local Port** (Default = 8000)

This menu branch is where the TCP port is configured under which the AT-Modem-Emulator accepts incoming calls.

### ↪ **Port List → Local TLS-Port** (Default = 8043)

This menu branch is used to configure the TCP port under which the AT Modem Emulator accepts incoming, TSL encrypted calls.

### ↪ **System Options → Network Delay [10ms-Ticks]**

This value specifies the minimum delay time of the AT-Modem-Emulator after serial data have arrived. After this time has expired, it packs the data into a network packet and sends them to the respective communications partner. The default setting 0 means the attempt is made to send the data as quickly as possible. The resulting high time transparency does however bring with it the drawback of a higher number of network packets.

If the serial transmission takes place in predictable block sizes, this value can be adjusted to optimize the network load. There is also the advantage that the serial blocks are transmitted within a network packets, so that they arrive at the receiver bundled.

**Example:**

You are using serial data blocks of 25 bytes each and transmission parameters of 9600 baud, 8 data bits, no parity and 1 stop bit. Each block thus has a length of approx. 26ms ( $1/9600 * 10 \text{ bits} * 25 \text{ bytes}$ ). If the network delay is set here to a value of 3 (=30ms), each block is sent to the receiver with a network packet.



*The situation described here applies only to a non overloaded and error-free network. If there are interruptions in the data flow on the network side, any serially accumulated data are also sent in larger network packets.*



## **5 AT-Modem-Emulator modes**

In addition to the traditional paired operation of the AT-Modem-Emulators, Windows also makes it possible to use the option of a virtual modem port on the W&T COM Port Redirector.

- Standard mode - encrypted/unencrypted
- Downloading and installing the W&T COM Port Redirector
- Operation using virtual modem ports

## 5.1 AT-Modem-Emulator <> AT-Modem-Emulator

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

Starting with an AT dial-up command (*ATD...*) the calling AT-Modem-Emulator 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.

### 5.1.1 TLS encrypted connection

AT Modem Emulators as well as virtual LAN Modem Ports for the W&T COM-Port Redirector version 3.74 and higher support both unencrypted connections and TLS protected communication.

#### Outgoing connections

For outgoing connections to an AT Modem Emulator the content of S Register 13 determines whether the communication is encrypted.

##### ↔ **S13=0** (Default)

The connection to the dialed destination system is unencrypted. To dial-up an AT Modem Emulator its local port (factory setting = 8000) must be used as the destination port number.

##### ↔ **S13=1**

The connection to the dialed destination system is TLS encrypted. To dial-up an AT Modem Emulator its local port (factory setting = 8000) or the local TLS port (factory setting = 8043) can be used.

**Incoming connections**

When there are incoming connection requests from another AT Modem Emulator on the local port, the device automatically detects whether it is an unencrypted or TLS encrypted connection.

Connection requests on the local TLS port must however be encrypted. If the dialing system does not support TLS encryption, the network connection is rejected and the serial system receives the message *No carrier*.

Connections to the local port and local TLS port are possible only in alternation. If for example a connection to the local port is active, a parallel incoming connection on the local TLS port is automatically rejected.

 *Information on connections from or to a virtual LAN Modem Port on the W&T COM-Port Redirector is contained in the following section.*

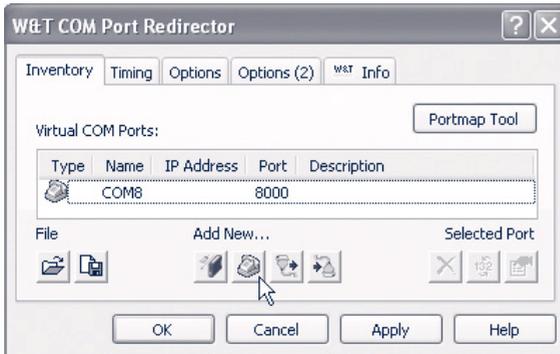
 *TLS encrypted connections require firmware version 1.35 or higher on both AT Modem Emulators. The W&T COM-Port Redirector supports incoming and outgoing TLS connections for version 3.74 and higher.*

**Overview of possible connections**

<b>To</b> <b>From</b>	58666: Local Port	58666: Local TLS-Port	Virt. Modem: Local Port	Virt. Modem: Local TLS-Port
58666 S13=0	<b>TCP</b>	--	<i>TCP</i>	--
58666 S13=1	<b>TCP/TLS</b>	<b>TCP/TLS</b>	--	<i>TCP/TLS</i>
Virt. Modem S13=0	<i>TCP</i>	--	<i>TCP</i>	--
Virt. Modem S13=1	--	<i>TCP/TLS</i>	--	<i>TCP/TLS</i>

## 5.2 AT-Modem-Emulator <> Virtual Modem Port

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 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 Legacy

The latest version 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 download link.

Use of the COM Port Redirector Legacy in connection with AT-Modem-Emulators from W&T is free.

## Installation/deinstallation of the COM port redirector

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

- Operating system Windows NT, 2000, XP, Vista, Windows 7, 8, 8.1 (incl. all server- and 64Bit editions)
- Login as administrator or with administrator rights



*The W&T COM-Port Redirector Legacy is installed as an update to any already existing older versions. All previous settings and connection parameters remain intact and available. To prevent a restart of the computer after the update, please quit all applications and services which access COM ports before starting the update.*

After downloading and unpacking the archive, start the exe 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 Legacy 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:

<input checked="" type="checkbox"/> handle incoming calls, on TCP port	8000
--	------

If this option is enabled, the virtual modem port on the specified TCP port also allows incoming calls, comparable to a hardware AT-Modem-Emulator, whereby the TCP port number used is functionally the same as the local port setting in the AT-Modem-Emulator.

### 5.2.1 TLS encrypted connection (in preparation)

AT Modem Emulators as well as virtual LAN Modem Ports for the W&T COM-Port Redirector version 3.74 and higher support both unencrypted connections and TLS protected communication.

#### Outgoing connections

For outgoing connections to an AT Modem Emulator the content of S Register 13 determines whether the communication is encrypted.

↪ **S13=0** (Default)

The connection to the dialed destination system is unencrypted. To dial-up an AT Modem Emulator its local port (factory setting = 8000) must be used as the destination port number.

↪ **S13=1**

The connection to the dialed destination system is TLS encrypted. To dial-up an AT Modem Emulator, its local TLS port (factory setting = 8043) must be specified as the destination port number.

#### Incoming connections

Virtual modem ports accept incoming connection on the TCP ports configured at the time of setup. The specified local port accepts only unencrypted connections. The local TLS port supports only TLS connections.

Connections to the local port and local TLS port are possible only in alternation. If for example a connection to the local port is active, a parallel incoming connection on the local TLS port is automatically rejected.

 *TLS encrypted connections require firmware version 1.35 or higher on both AT Modem Emulators. The W&T COM-Port Redirector supports incoming and outgoing TLS connections for version 3.74 and higher.*

**Overview of possible connections**

<b>To</b> <b>From</b>	58666: Local Port	58666: Local TLS-Port	Virt. Modem: Local Port	Virt. Modem: Local TLS-Port
58666 S13=0	<i>TCP</i>	--	<b>TCP</b>	--
58666 S13=1	<i>TCP/TLS</i>	<i>TCP/TLS</i>	--	<b>TCP/TLS</b>
Virt. Modem S13=0	<b>TCP</b>	--	<i>TCP</i>	--
Virt. Modem S13=1	--	<b>TCP/TLS</b>	--	<i>TCP/TLS</i>

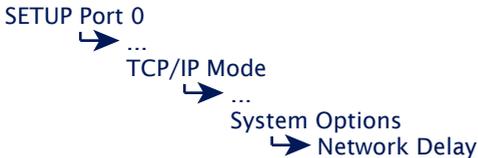
### 5.3 Optional settings of the AT-Modem-Emulators

#### Local Port



The port numbers configured here require other AT-Modem-Emulators or virtual modem ports in order to open a connection. The factory default is for unencrypted communication on local port 8000. Local TLS port 8043 is preconfigured for TLS encrypted connections.

#### Network Delay



In factory default setting the AT-Modem-Emulator attempts to send serially arriving data to the network side application with a little delay as possible. But especially when working with higher order serial protocols it may be necessary to send protocol blocks enclosed in a network packet. The option Network Delay in the menu branch mentioned above provides an artificial delay in transmission just for this purpose. For details see the section *The Menu ... Setup Port 0 → TCP/IP Mode*.

## **6 Controlling the AT-Modem-Emulator**

After finalizing the network configuration, the LAN modem behaves on the serial side like a standard dial-up modem, controllable using AT commands. From the point of view of the controlling application and controlling device only the previously used telephone number needs to be replaced by the IP address or the URL of the desired remote peer.

- 1:1 replacement of standard modems
- Serial parameters
- Command syntax
- All AT commands

## 6.1 Exchanging previous standard modems

The AT Modem Emulator is often used as a replacement for standard analog or ISDN modems. Please note the following especially in such application scenarios:

- Non-supported AT commands such as `%V` or `L2` are confirmed with `OK` but have no effect and are ignored. Invalid commands however result in an error message and notably terminate processing of the current command line.
- In contrast to standard modems automatic detection of the baud rate is not possible. This means that before starting up the application the baud rate used by the connected serial device must be set in the AT Modem Emulator using the command `AT%B` and saved in the desired configuration profile (`AT&W1/2`).
- Dialing serial devices and applications must have the previously used call number replaced by the target IP address or - together with DNS - the target URL. Details about the supported formats are contained in the description of the `ATD` dial command.



*The ability to automatically replace a call number received using the dial command with an IP address or URL stored in the setup of the AT Modem Emulator is not implemented in the current firmware. If such a function is needed please get in touch with W&T.*

## 6.2 Serial transmission parameters

Unlike modems for the telephone network, the AT-Modem-Emulator 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, 115200

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.

### 6.3 Command syntax

The AT-Modem-Emulator accepts all the AT commands described in the following sections. These commands correspond to one of the following samples and are terminated with a *CR* (0x0d) or the character configured in register S3.

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

In addition to a CR (0x0d) the sequences CRLF (0x0d 0x0a) and LFCR (0x0a 0x0d) are also accepted as a line termination. The preconfigured characters CR and LF can be modified with the registers S3 and S4.

Also, A/ (without a preceding AT and without a terminating CR) is interpreted as an entry and repeats the last command line in full.

Unsupported AT commands such as %V or L2 may be acknowledged with OK but have no effect and are ignored. Invalid commands on the other hand result in an error message and quit processing of the current command line.

Example:

Entering AT&C0\*H0Q1 would execute the command &C0, but not Q1, since the line is no longer processed starting at the invalid command \*H0.

## 6.4 Command- und Data mode

The LAN-Modem distinguishes on the serial side between two mode states:

### ■ **Command mode**

In this mode, which is activated after power-on, the AT-Modem-Emulator is 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 AT-Modem-Emulator 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 special cases, the S registers 2 and 12 can be used to modify the Escape characters as well as the pause time (see command  $S_n=x$ ). 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  $\&Dn$ .

## 6.5 All AT commands

The AT-Modem-Emulastor accepts all the commands in the following table.

Com- mand	Description	Parameter <sup>(*)</sup>
Dx	Dial IP address and go online	IP address
A	Accept incoming call	---
O	Change command to data mode	---
H	Close connection	---
Zn	Close connection and reset modem	n=0, 1
En	Local echo on/off	n=0, <b>1</b>
Qn	Result codes on/off	n= <b>0</b> , 1
Vn	Result codes as text instead of numeric	n=0, <b>1</b>
In	Firmware/device information	n=0-8
Sn?	Read S-register	n=0-40
Sn=x	Change S-register	n=0-40
&Cn	DCD only for connection active on/off	n=0, <b>1</b>
&Sn	DSR only for connection active on/off	n= <b>0</b> , 1
&Dn	Function of the DTR input	n=0,1, <b>2</b> ,3
&Kn	Flow control for the serial device	n=0, <b>3</b> ,4,5,6
&Fn	Restore factory default settings	n=0, 1
&Vn	Show configuration profiles/connection data	n=0,1,2
&Wn	Save configuration to non-volatile memory	n=0, 1
&Yn	Standard profile active at power-up	n= <b>0</b> , 1
&Zn=x	Save destination IP/URL	n=0,1,2,3
%Bn	Set baud rate	n=2-8 ( <b>5</b> )
%Dn	Number of data bits	n=7, <b>8</b>
%Pn	Parity	n= <b>0</b> ,1,2
%Sn	Stop bits	n= <b>1</b> ,2

<sup>(\*)</sup> Factory default

- 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*.

**6.5.1 A (ATA)****Accept incoming call**

When there is a call arriving from the network, the AT-Modem-Emulator sends the string RING approx. every 2 sec. At the same time the signal RI is generated approx. every 4 sec. with a duration of approx. 1 sec. The serially connected device can accept this call by sending an ATA.

### 6.5.2 D (ATD[IP address | /URL]:[Port number])

#### Dial command

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

```
D [Options]    IP address/URL  [:]
D [Options]    S=n            [:]
D              L              [:]
```

[Options] can be any number of letters and special characters except for colon, semicolon and slash. 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.

#### TLS encrypted connections

For an outgoing connection S Register 13 of the dialing AT Modem Emulator determines whether the connection is opened unencrypted or TLS encrypted (S13=0=unencrypted, S13=1=TLS).



*TLS secured connections are possible only between AT Modem Emulators and require firmware version 1.35 or higher on both ends. Implementation of TLS in the W&T COM-Port Redirector and its virtual modem ports is currently in development.*

#### IP address, URL & TCP-Port number

There are three ways to specify the destination system to be dialed:

**↪ [IP address Dot notation]:[Port number]**

When specifying the IP address in dot notation the port number must be specified separated by a colon. If no port number is specified, the factory default setting in the AT-Modem-Emulator is for Port 8000.

Example:

*atd10.40.21.5:8000* or *atdt10.40.21.5*

**↪ [Fixed length IP address][Portnumber]**

Alternately the IP address can also be specified having a fixed length and without delimiter. All four places in the IP are then filled with zeros, so that a length of 12 characters results. The port number can be specified flush and without any additional delimiter at the end of the IP address. If no port number is specified, the factory default setting in the AT-Modem-Emulator is for Port 8000.

Example:

*atd0100400210058000* or *atdt010040021005*

**↪/[URL]:[Port number]**

If the destination system is specified in the form of a host name or a URL, it must be separated from the command options by a slash (/). The port number must like the IP address in dot notation be separated from the URL with a colon. If no port number is specified, the factory default setting in the AT-Modem-Emulator is for Port 8000.

Example:

*atd/modem.xyz.de:8000 = atdt/modem.xyz.de*



*If a port number other than the factory default setting of 8000 is used, this must be configured for the dialing modem the same as the local port.*

**↪ S=0|1|2|3**

The AT-Modem-Emulator 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. 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.

**↪ ; (Semikolon)**

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 command****■ CONNECT**

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

**■ NO CARRIER**

The network connection either could not be opened or the serial application on the dialed side did not accept 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.

The reason for an unsuccessful network connection may be for example an IP address which cannot be reached or which is incorrect. With very slow network routes to the destination system the timeout stored in register S6 for opening the TCP connection (factory set to 3s) can be set to a higher value.

- **BUSY**

Opening of the network connection to the desired communication partner was rejected. The reason may be for example that the desired remote peer is already busy with another connection. Sometimes a firewall in the route blocks the selected TCP destination port.

### **6.5.3 E (ATE[0|1])**

#### **Local echo off/on**

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

**ATE0** = Echo off

**ATE1** = Echo on

**6.5.4 H (ATH)****Quit connection**

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

### 6.5.5 In (ATI[0-8])

#### Read out firmware information

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

- **AT10**  
Returns product code *58666* from the AT-Modem-Emulator
- **AT13**  
Returns the firmware version and date of the AT-Modem-Emulator
- **AT14**  
Returns product name *W&T-AT-Modem-Emulator*
- **AT18**  
Provides the run time of the AT-Modem-Emulator since power-up or since the last reset in hh:mm:ss format.  
hh:mm:ss

### **6.5.6 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*.

### 6.5.7 Q(ATQ0|1)

#### Modem replies on|off

#### Default setting: 0 = ON

Replies generated by the AT-Modem-Emulator 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.

**6.5.8  $S_n?$  (ATS[0-40])****Read S register**

This command is used to read the 41 S registers that determine the operating behavior of the AT-Modem-Emulator. Changing or writing to the S registers is done using the  $S_n=x$  command shown below.

### 6.5.9 $S_n=x$ (AT[0-40]=[0-255])

#### Set S register

The AT-Modem-Emulator has 41 S registers (S0 to S40) which determine its operating behavior. The command  $S_n=x$  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 AT-Modem-Emulator:

Register	Description	Default value
S0	Pick up after how many ring characters? (0=never)	0
S1	Ring counter	0
S2	Escape character	43 (= „+“)
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)	8
S10	Allowed carrier dropout (1/10 seconds)	20
S13	1=TLS encryption of outgoing calls 0=Unencrypted outgoing calls	0
S12	Isolation time for Escape sequence (1/50 seconds)	50
S14	Option bits for commands <i>E</i> , <i>Q</i> , <i>V</i>	138
S21	Option bits for commands <i>&amp;C</i> , <i>&amp;D</i> , <i>&amp;S</i>	52
S23	Option bits for commands <i>%B</i>	59
S25	Allowed DTR dropout (1/100 seconds)	5
S39	Handshake mode (command <i>&amp;K</i> )	3

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

- The command  $S_n=x$  has only a temporary effect. The changes can be loaded into the non-volatile memory of the AT-Modem-Emulator 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.

### 6.5.10 Vn (ATV[0|1])

#### Result codes in plain text

#### Default setting: 1 = ON

This command specifies whether result returns from the AT-Modem-Emulator 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.

### 6.5.11 Zn (ATZ[0|1])

#### Reset the AT-Modem-Emulator

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 AT-Modem-Emulator is turned on is defined by the *&Yn* command.

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

Additional information can be found in the following sections:

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

### 6.5.12 &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.

### 6.5.13 &D (AT&D[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 AT-Modem-Emulator. One of four functions may be selected:

- **&D0**  
The AT-Modem-Emulator ignores the signal.
- **&D1**  
If the AT-Modem-Emulator is in data mode, an ON → OFF change places the modem in command mode. The AT0 command can be used to return to data mode.
- **&D2**  
A change from ON → OFF breaks the existing connection.
- **&D3**  
Has the same function as &D2 but additionally it resets the AT-Modem-Emulator. If the AT-Modem-Emulator 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.

### 6.5.14 &Fn (AT&F[0|1])

#### Loading the factory defaults

The AT-Modem-Emulator has two factory settings which are invoked using the commands AT&F and AT&F1. Factory profile 2 differs from factory profile 0 only in the function of the DTR input (&D0 instead of &D2) as well as flow control (&K0 instead of &K3).

The serial transmission parameters stored in the factory profiles are ignored when invoking using &Fn.



*Loading of a factory profile does not result in simultaneous saving of the new settings in one of the non-volatile configuration profiles. This must be done separately using the command AT&Wn.*

### 6.5.15 &K (AT&K[0|3|4|5])

#### Flow control

#### Default setting: 3 = RTS/CTS

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

- **&K0 (no handshake)**

Flow control is turned off. The AT-Modem-Emulator 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 AT-Modem-Emulator 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 AT-Modem-Emulator receives an *Xoff*, no additional data are sent to the serial device until the latter has sent an *Xon*. The AT-Modem-Emulator 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.

### 6.5.16 &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 AT-Modem-Emulator has an active connection in data mode.

**6.5.17 &V (AT&V)****Calling configuration information**

The command provides information about the active configuration, the two saved configuration files as well as the saved destination addresses 0 to 3.

### 6.5.18 &Wn (AT&W[0|1])

#### Active Profile Write

This command is used to write the two non-volatile configuration profiles 0 and 1 which the AT-Modem-Emulator provides. The current settings are written to the memory location defined by „n“.

- **&W0**  
Send and save the current settings to configuration profile 0
- **&W1**  
Send and save the current settings to configuration profile 1

Additional information can be found in the following sections:

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

**6.5.19 &Yn (AT&Y[0|1])****Active Profile after reset**

This command specifies which of the two configurations stored in the profiles the AT-Modem-Emulator 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

### 6.5.20 &Zn=x (AT&Z[0|1|2|3]=[IP-Adresse])

#### Save destination IP address

The AT-Modem-Emulator 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.

### 6.5.21 %Bn (AT%B[2-8])

#### Modem Port Baud Rate

##### Default setting: 5 (9600 Baud)

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

Com- mand	Baud rate
%B2	1200
%B3	2400
%B4	4800
%B5	9600
%B6	19200
%B7	38400
%B8	57600
%B9	115200



*The command AT%Bn is delayed. The first OK reply takes place at the old baud rate, before then the new baud rate is used.*



*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 AT-Modem-Emulator.*

### 6.5.22 %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 command AT%Dn is delayed. The first OK reply takes place with the old format, before then the new format is used.*



*Successive commands in the same command line (such as &W for saving) are ignored. This ensures that any inadvertent change of the data format can be restored by resetting the AT-Modem-Emulator.*

### 6.5.23 %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 command AT%Pn is delayed. The first OK reply takes place with the old parity, before then the new parity is used.*



*Successive commands in the same command line (such as &W for saving) are ignored. This ensures that any inadvertent change of the data format can be restored by resetting the AT-Modem-Emulator.*

### 6.5.24 %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 command AT%Sn is delayed. The first OK reply takes place with the old format, before then the new format is used.*



*Successive commands in the same command line (such as &W for saving) are ignored. This ensures that any inadvertent change of the data format can be restored by resetting the AT-Modem-Emulator.*

## **Appendix**

- Firmware update of the AT-Modem-Emulator
- Resetting the AT-Modem-Emulator
- Factory default reset
- Used ports and network security
- Technical data

## A1 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.



This takes you directly to the page with the most up-to-date firmware for your Com-Server model.

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.

Model number



 *In particular if the sticker indicates an TB number as the part number, it is possible that the Com-Server has a special, customer-specific firmware or configuration. Please contact the responsible administrator in such cases before the update.*

## A1.1 Network firmware update under Windows

Required is a PC running Windows >NT 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 Com-Server.
- The file with the new firmware for transferring to the AT-Modem-Emulator.

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

 *The factory default port number under which the services required for firmware update can be reached are configured and deactivated in the menu branch SETUP System → Setup TCP/IP → System Port List*

Highlight the desired AT-Modem-Emulator 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 AT-Modem-Emulator, WuTility activates the *Next* button which starts the actual file upload.

Additional information can also be found in the WuTility online help.

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

## A1.2 Update in routed environments

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

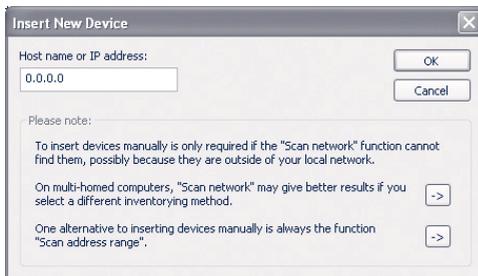
1. Identification/Inventory of the device  
Destination port Com-Server: UDP/8513
2. Initialization of the update process  
Destination port Com-Server: TCP/8002
3. Upload firmware  
Destination port Com-Server: UDP/69 (TFTP)

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

The TFTP port is required for actual sending of the firmware. Identification and initializing however can be done manually.

### Manual device entry in the inventory list

If UDP port 8513 for example is blocked by a firewall, automatic inventoring using *WuTility* is not possible. In this case the AT-Modem-Emulator can be manually entered in the inventory list using the menu item *Add device*.



Enter the IP address of the AT-Modem-Emulator in the corresponding entry field and click on *OK* to close the dialog box. The device is added to the inventory list.

Highlight the desired AT-Modem-Emulator in the WuTility

inventory list with the right mouse button and choose *Properties*.

Highlight the line *Component#0 → Platform Code* and enter the value 9.3 for the AT-Modem-Emulator, 58666 in the corresponding entry field

### **Manual initializing of the update process**

For security reasons the AT-Modem-Emulator must first be initialized for receiving new firmware. This initializing is done using Telnet or Web-Based-Management:

Telnet: *SETUP System → Flash update*

WBM: Logout page → Button *Firmware update*

 *Activating update mode closes all open TCP connections to the AT-Modem-Emulator. At the same time all network services (including PING) are stopped. A return to standard mode is only possible by sending firmware or performing a hardware reset of the AT-Modem-Emulator.*

### **A1.3 Incomplete and interrupted updates**

The AT-Modem-Emulator automatically detects an incomplete or interrupted firmware transmission – caused for example by a power or network failure – and after a restart automatically resumes update mode. The update can in this case be restarted under the previous IP address.

It may be that the AT-Modem-Emulator must be manually added to the WuTility inventory list for this purpose. For details, see the previous section.

## A2 Reset des AT-Modem-Emulators

Factory default: 8888/TCP

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



*The factory default port number under which this service can be reached is configured and deactivated in the menu branch SETUP System → Setup TCP/IP → System Port List*

### Use of the system password

If a system password has been configured (see section Basic Configuration of the AT-Modem-Emulator), this must be null-terminated (= [password] + 0x00) and sent to the AT-Modem-Emulator within 2s after a connection has been successfully opened. If the AT-Modem-Emulator 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 AT-Modem-Emulator 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 AT-Modem-Emulator is in its base state! This reset can be performed from any station and should be done only in extreme cases.*

### A3 Hardware reset to factory defaults

In addition to resetting the AT-Modem-Emulator to its factory defaults using the Telnet configuration (Port 1111), this can also be done via hardware. For this purpose the AT-Modem-Emulator has a jumper on the board. For normal operation this jumper must be out. To set the factory defaults, proceed as follows:

- Power off the AT-Modem-Emulator and open the enclosure
- Close the jumper and reconnect the supply voltage. An internal self-test will be performed during which messages will be issued on serial port A. The *Fail* messages in the lines *Port A:* and *TP Test:* can be ignored.
- The self-test will be finished in approx. 20s, at which point the factory defaults are active.
- Turn off the AT-Modem-Emulator, open the jumper and close up the housing again.

 *Resetting the non-volatile memory results in a loss of all the settings which are different from the factory defaults, including the IP address.*

## A4 Used ports and network security

The port numbers factory set in the AT-Modem-Emulator:

Port-/socket number	Application	Password-protection	Configurable?
8000 (TCP)	TCP server port for dial in	no	yes
8043 (TCP)	TCP server port for TLS dial-in	no	yes
1111 (TCP)	Telnet configuration	yes	yes
8888 (TCP)	Reset AT-Modem-Emulators	yes	yes
8002 (TCP)17	Initialize firmware update	yes	yes
8003 (TCP)	Read configuration data	yes	yes
8004 (TCP)	Write configuration data	yes	yes
8513 (UDP)	Inventory	no	yes
161 (UDP)	SNMP	yes	yes

The following port numbers are deactivated with the factory defaults. They will be used if Web Based Management is activated or in case of a firmware update.

Port-/socket number	Application	Password protection	Configurable?
80 (TCP)	Web-Based-Management	yes	yes
69 (UDP)	Firmware update	yes	no

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

### The AT-Modem-Emulator 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 AT-Modem-Emulator. 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 Com-Server**

Control and configuration access to the AT-Modem-Emulator 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 AT-Modem-Emulator 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 or Web Based Management, 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 AT-Modem-Emulator into an SNMP-based network management, basic configuration settings are accessible via SNMP. This access is protected in that the system password must be used as a community string.

### ■ **Inventorytool**

Like all intelligent components from W&T, the AT-Modem-Emulator can be accessed through the *WuTility* tool. Information is read from UDP port 8513. No writing can be done over this path.

### ■ **Firmware-Update**

(see section on *Firmware-Update*)

Initialization of a firmware update takes place on the system password-protected TCP port 8002. Only the operating system of the AT-Modem-Emulator is updated after a firmware update. The configuration data (IP address, gateway, serial parameters, modes, etc.) are retained.

### ■ **Reading/writing the configuration data**

The *WuTility* tool or your own applications can be used to read out and write the configuration profiles from AT-Modem-Emulators with the basic parameters. Not contained in these profiles are serial and modem-specific settings, since these are generally controlled by the serially connected device using AT commands. Both TCP ports used here (8003 and 8004) are protected by the system password.

- **AT-Modem-Emulator Reset**

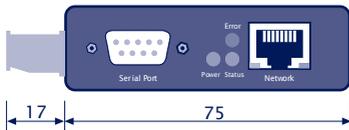
(see section *Reset of the AT-Modem-Emulator*)

TCP port 8888 enables a complete reset of the AT-Modem-Emulator. The port is protected by the system password.

**Technical data and formfactor 58666**

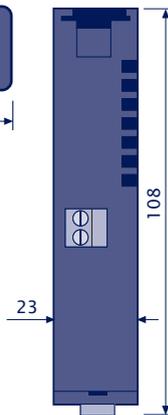
<b>Supply voltage ...</b>	
Power-over-Ethernet	37 - 57V DC from PSE
External supply...	
... DC	24 - 48V DC (+/- 10%)
... AC	18 - 30Vrms +/- 10%
<b>Current draw</b>	typ. 55mA @ 24VDC PoE Class 1 (0,44 - 3,84W)
<b>Permissible ambient temperatur ...</b>	
... storage	-40 ... +70°C
... operation	0 ... +60°C
<b>Permissible relative humidity</b>	0 ... 95% (not condensing)
<b>Network</b>	10/100BaseT, RJ45 for STP cables
<b>Galvanic Isolation</b>	Network: 1,5kV rms
<b>Dimensions</b>	approx. 105 x 75 x 22mm,
<b>Weight</b>	approx. 150g
<b>Serial ports</b>	1 x RS232 DCE, DB9/Female
<b>Baud rates</b>	1200 bis 115.200 kBit/s
<b>Data formats</b>	7, 8 daten bits, 1, 2 stop bits NO, EVEN, ODD Parity
<b>Flow control</b>	Hardware handshake or Xon/Xoff protocol

Front view 58666



Measure in mm, +/-1 mm

Bottom side 58666



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