

Manual

Com-Server LC

Release 2.01, July 2010
Typ 58661
Firmware 2.10 or higher

W&T

W&T

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Introduction

The Com-Server model 58661 represents a uniform platform for linking serial a interface such as RS232, RS422/485 to TCP/IP networks. The standard modes for transparent tunneling of serial data are implemented. The expanded model 58665 Com-Server Highspeed2.0 ++ includes additional protocols and modes (e.g. UDP, TCP client, FTP client/server, etc.) as well as expanded functions for structuring the data interchange.

In addition to all the standard applications implemented in the firmware, this reference manual also describes the integration possibilities for your own applications.

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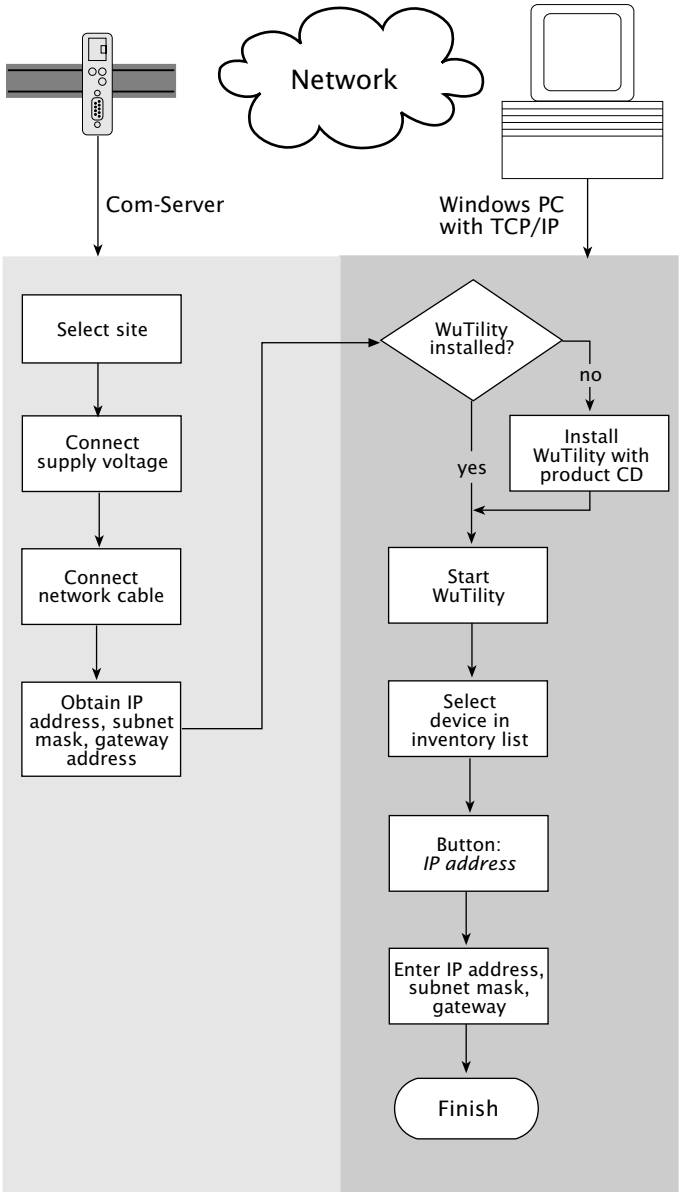
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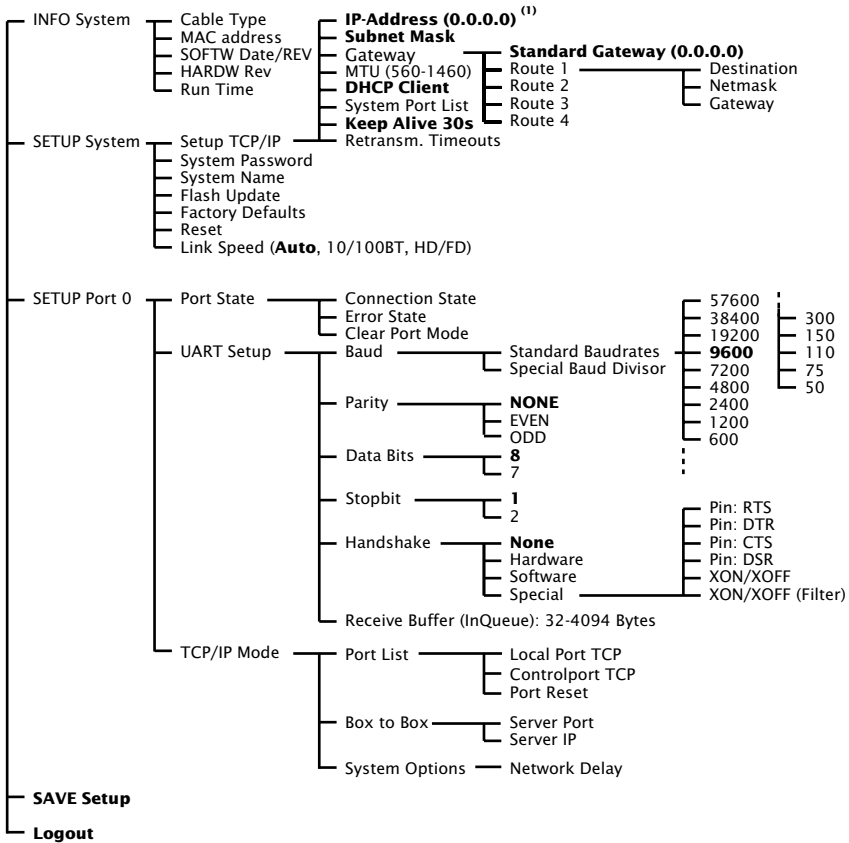
1 Quickstart

Already experienced users of Com-Servers will find on the two following pages a flow chart with the essential steps for start-up as well as a complete overview of the configuration menu. Detailed information can be found then in the following sections.

1.1 Flow chart - Network installation using WuTility



1.2 Overview of configuration menu



(1) Factory defaults are printed bold.

To activate the new settings always save using **SAVE Setup** with Telnet or the **LOGOUT** link on the webpages

1.3 Factory defaults settings

The list contains an overview of the most important settings. For many applications, such as the W&T COM Port Redirector, no additional configurations need to be made besides assigning the network base parameters. 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

Hardware connection:	RS232
Baud rate:	9600
Data bits:	8
Parity:	NO
Stop bits:	1
Handshake:	None

Configuration access

Per Telnet using TCP port 1111

Network applications / Operating mode

TCP port data:	8000
Control port TCP:	9094

2 Assigning the IP address

The Com-Server 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

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 Com-Server and the computer used. This means that even if the Com-Server 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 Com-Server 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 Com-Server 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

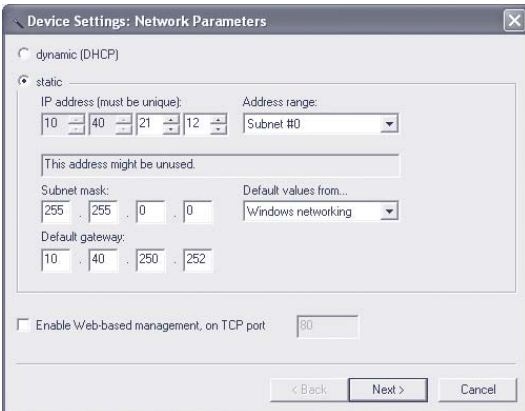
WuTility automatically searches the local network for connected W&T network devices and creates an inventory list. This search process can be repeated manually as often as desired by clicking on the Scan button:



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



Select the Com-Server and click on the *IP address* button:



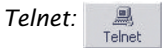
Step 2: Assign the IP parameters

The *Static* option allows you to assign fixed basic parameters while simultaneously disabling *DHCP* and *BOOTP* protocols in the Com-Server. 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 Com-Server, 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 Com-Server 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 Com-Server. 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 Com-Server is done using Telnet or Web-Based-Management. Click on the Telnet or Browser button.



Additional information can be found in the section *Configuration Accesses for the Com-Server*.

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 Com-Server to the network. The following parameters can be assigned using DHCP:

- IP address
- Subnet mask
- Gateway address

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 Com-Server 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 Com-Server 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 Com-Server identifies itself within the DHCP protocol with its system name. The factory default setting for

this is *COMSERVER_* followed by the last three places of the Ethernet address. For example the factory set system name of a Com-Server with the Ethernet address 00:c0:3d:01:02:03 is *COMSERVER_010203*. The system name of the Com-Server can be changed in the configuration. For additional information refer to the section *Menu: SETUP System → System Name*.

2.2.3 Lease time

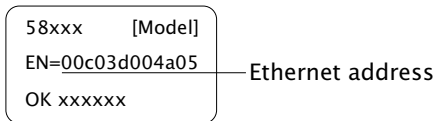
The lease time determined and transmitted by the DHCP server specifies the Time-To-Live of the assigned IP address. After half the lease time has expired, the Com-Server attempts to extend the time for the assigned DHCP server and up update the address. If this is not possible by the time the lease time expires, for example because the DHCP server can no longer be reached, the Com-Server 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 Com-Server 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

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



2.4.5 Dynamic IP addresses

Fully dynamic address assignment, whereby the Com-Server 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 Com-Server, 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

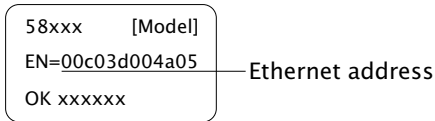
Requirements

This method can only be used if the Com-Server 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 Com-Server has any other value, this access is disabled.

This method does *not* work across networks, e.g. through routers. This means the PC and Com-Server 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 Com-Server 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
```



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

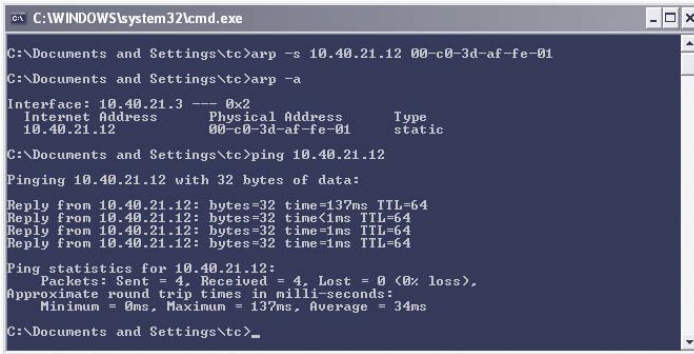


The IP addresses must be without leading zeros in all Windows environments. Otherwise the entry is incorrectly interpreted by the system and an incorrect IP address is assigned to the Com-Server. In Windows Vista and newer the prompt cmd.exe necessary for invoking the ARP command must be started using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

Step 2

Use the following command line to *ping* the Com-Server with the desired IP address:

```
ping 172.16.231.10
```



```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\etc>arp -s 10.40.21.12 00-c0-3d-af-fe-01
C:\Documents and Settings\etc>arp -a
Interface: 10.40.21.3 --- 0x2
   Internet Address      Physical Address      Type
   10.40.21.12           00-c0-3d-af-fe-01    static
C:\Documents and Settings\etc>ping 10.40.21.12
Pinging 10.40.21.12 with 32 bytes of data:
Reply from 10.40.21.12: bytes=32 time=137ms TTL=64
Reply from 10.40.21.12: bytes=32 time<1ms TTL=64
Reply from 10.40.21.12: bytes=32 time=1ms TTL=64
Reply from 10.40.21.12: bytes=32 time=1ms TTL=64
Ping statistics for 10.40.21.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 137ms, Average = 34ms
C:\Documents and Settings\etc>
```

The Com-Server 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 Com-Server is automatically deactivated when configuring using a static ARP entry.

2.4 Assigning the IP using the serial port

After a Com-Server 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 Com-Server 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 A of the Com-Server to a computer. For a standard PC or laptop, you will need a *crossed* RS232 cable (=Null 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 Com-Server:

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

Start the serial configuration mode

Reset the Com-Server by interrupting the power. While the Com-Server is starting up, use the terminal program to send the letter x at least three times. The COM-Server 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 Com-Server

Exampel: Assigning the IP address:

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

Example: Assigning IP address, Subnet mask and gateway

```
IP no. +<ENTER>:                <- Com-Server
172.17.231.99, 255.255.255.0,172.17.231.1  -> Com-Server
```



To avoid unintended changes to the IP address, the DHCP client of the Com-Server is automatically deactivated when configuring using then serial port.

Option: Activating Web Based Management (WBM)

To further configure the Com-Server you can use either Telnet protocol or an Internet browser, although only Telnet is an option in the Com-Server 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.

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

```
xxx...                            ->Com-Server
IP no. +<ENTER>:                  <-Com-Server
172.17.231.99+w80                  ->Com-Server
172.17.231.99-1   <- Com-Server
```

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

```
xxx...                            ->Com-Server
IP no. +<ENTER>:                  <-Com-Server
172.17.231.99,255.255.0.0,172.17.231.1+w8800  ->Com-Server
172.17.231.99,255.255.0.0,172.17.231.1+w8800  <-Com-Server
```


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3 Supply voltage

- Com-Server LC

3.1 Supply voltage

The model 58661 can also 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 Com-Server 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.

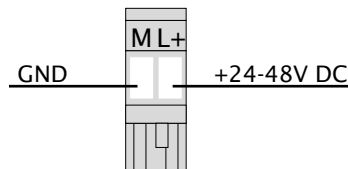
The model 58661 is a device in PoE Power Class 1 (power consumption 0.44 to 3.84W).

3.1.2 External supply

As an alternative to PoE power supply the Com-Server 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:



4 Network interface

- Ethernet interface
- 10/100BaseT autonegotiating
- Power-over-Ethernet

4.1 Ethernet interface

The Com-Server LC incorporates an IEEE 802.3-compatible network interface.

4.1.1 Link status

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

- **Link/Activity (green)**

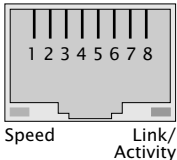
ON indicates a valid link to a hub or switch port. The LED flashes when there is data traffic.

- **Speed (yellow)**

ON indicates a 100MBit/s-link (100BaseT). OFF indicates 10MBit/s (10BaseT)

4.1.2 10/100BaseT on RJ45

The Com-Server LC 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	Richtung	Geräte <i>ohne</i> PoE	Geräte <i>mit</i> 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	ncv	Vcc negative

The network connection is galvanically isolated with respect to the supply voltage as well as the serial interface(s) for at least $1,5kV_{rms}$.

Power-over-Ethernet - PoE

The model 58641 Com-Server 58641 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 Com-Server LC 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 Com-Servers 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 Com-Server) 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.

5 The serial combi-port

- Mode selection
- RS232 mode
- RS422/485 mode

5.1 Overview

Com-Server LC comes standard with an RS232/422/485 combi-port whose modes are described below.

All external signal lines use ESD-immune interface components to provide protection against static discharges of up to 15kV per IEC 801-2, Level 4.

5.1.1 Opening the Com-Server

To open the Com-Server, plug the DB9 connector into the serial port. After tightening the two mounting screws, pull on the DB9 plug to remove the circuit board from the housing..

5.1.2 Mode selection

Switching between the modes is accomplished using the internal DIL switches located on the respective interface module. The following table shows an overview of all modes:

Mode	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
RS232 ⁽¹⁾	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
RS422, RS485 4-wire bus master	OFF	OFF	OFF	OFF	ON	x	x	OFF
RS485 4-wire automatic control	OFF	ON	OFF	OFF	ON	x	x	OFF
RS485 2-wire automatic control	ON	ON	OFF	OFF	ON	x	x	OFF

(1) Factory default

5.2 RS232 mode (factory default)

The pin configuration of the RS232 port is identical to that of a PC, which allows you to use standard cables.

DIP switch setting RS232

Betriebsart	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
RS232	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON



The terminating DIL switches SW6 and SW7 must never be in the ON position when using the module in RS232 mode. This will result in a significant increase in the current draw and may cause the RS232 driver to fail.

Pin assignment and function RS232, DB9 male

Pin	Direction	Signal	Description	Default Function (1)
1	IN	DCD	Data Carrier Detect	ignored
2	IN	RxD	Receive Data	Data in
3	OUT	TxD	Transmit Data	Data out
4	OUT	DTR	Data Terminal Ready	12V for existing TCP connection to a client or server
5	---	GND	Signal Ground	---
6	IN	DSR	Data Set Ready	ignored
7	OUT	RTS	Ready To Send	Handshake-Ausgang +12V = ready to receive data - 12V = not ready to receive data
8	IN	CTS	Clear To Send	Send data only at +3...12V
9	IN	RI	Ring indicator	ignored

(1) Applies only the the hardware handshake setting

5.3 RS422/485 mode

As opposed to RS232, an RS422 interface allows transmission distances of up to 1000 meters. The RS485 mode allows you to integrate corresponding 2- or 4-wire bus systems into a TCP/IP network with the help of the Com-Server.



Especially when using longer cable lengths in industrial environments, potential differences need to be taken into consideration. To prevent transmission problems and hardware damage caused by this, we recommend galvanic isolation using an external isolator (e.g. W&T RS422/485-Isolator Type 66201).

DIP switch settings

Mode	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
RS422, RS485 4-wire bus master	OFF	OFF	OFF	OFF	ON			OFF
RS485 4-wire automatic control	OFF	ON	OFF	OFF	ON			OFF
RS485 2-wire automatic control	ON	ON	OFF	OFF	ON			OFF

Pin assignment and function RS422/485, DB9 male

Pin	Direction	Signal	Description	Default function (1)
1	OUT	TxD A/-	Transmit Data A	Data output
2	IN	RxD A/-	Receive Data A	Data input
3	OUT	RTS A/-	Ready To Send A	Handshake output
4	IN	CTS A/-	Clear To Send A	Handshake input
5	---	GND	Signal Ground	---
6	OUT	TxD B/+	Transmit Data B	Data output
7	IN	RxD B/+	Receive Data B	Data input
8	OUT	RTS B/+	Ready To Send B	Handshake output
9	IN	CTS B/+	Clear To Send B	Handshake input

(1) with factory default setting

Betriebsarten

The DIL switches are used to set the following modes:

- **RS422, RS485 4-wire bus master**

Provides one data and handshake channel each in each direction. The RS422/485 drivers and receivers are always active in this mode.

- **RS485 4-wire with automatic control**

One data channel is available in each direction. The RS485 driver chip is automatically activated each time data is sent out and then disabled when data is finished sending. The receive channel is always active in this mode.

- **RS485 2-wire bus with automatic control**

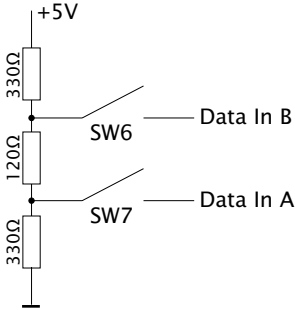
One data channel is available in each direction. The RS485 driver chip is automatically activated each time data is sent out and then disabled when data is finished sending. The receive channel is deactivated when the driver is on, and on when the driver is disabled.

Handshake for RS485 modes

RS485 bus systems do not use flow control in the traditional sense for data integrity, but rather a logical protocol. The handshake procedure for the Com-Server must therefore be set to NO (see *The serial parameters (Menu: UART Setup)*).

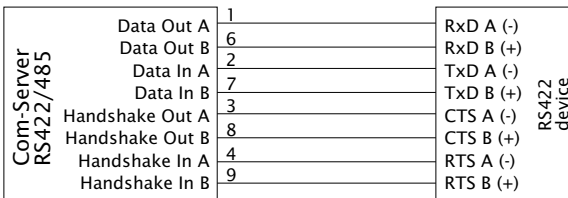
Terminating

All RS485 modes require a termination network on the bus system which ensures a defined rest state in the high-ohmic phases of bus operation. Connection of the bus system with a termination network can be done in the interface by closing the DIP switches 6 and 7 on the module:

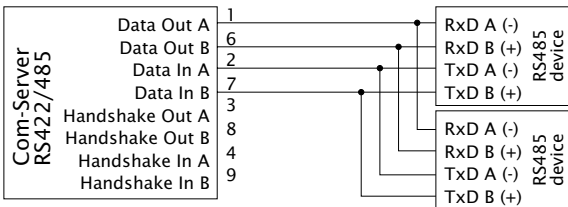


Wiring examples

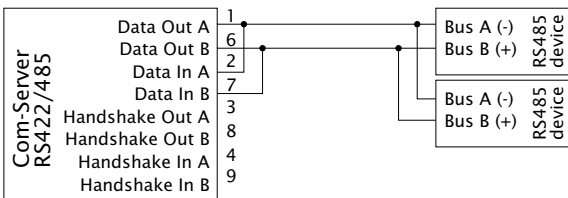
RS422 connection with hardware handshake



RS485 connection (4-wire bus master)



RS485 connection 2-wire

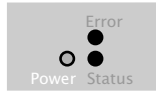


6 LED displays

- Network LEDs
- Power, Status , Error LED

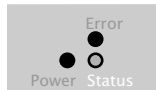
6.1 LED displays

Power-LED



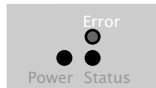
OFF: There is no power present. Check the correct connection of the supply (PoE or the external power supply)
ON: Power is present (PoE or the external power supply).

Status-LED



Flashes whenever there is activity on the serial port. 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 Com-Server'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 Com-Server and when the error occurred) can also be read out using the Telnet configuration tool.

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 Com-Server 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 Com-Server 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 Com-Server is no longer capable of being operated in this condition. Repeat the software update over the network (see *Firmware update of the Com-Server*), and address the Com-Server 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

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**

OFF: The Com-Server is not detecting a Link pulse from a hub or switch. Check the cable or the hub port.

ON: The Com-Server has a valid link to a hub or switch. The Speed LED indicates the data rate in this case.

Flashing: The Com-Server is receiving or sending network packets

7 Configuration access to the Com-Server

After completing the hardware installation and assigning the IP address, the remaining Com-Server configuration takes place over the network. Here either a Telnet client or, after it has been activated, an Internet browser can be used.

- Telnet configuration under Windows

- Configuration with the Internet browser

7.1 Configuration menu structure

The setup of the Com-Server is treelike regardless of whether the configuration is used for a Telnet client or an Internet browser. 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 Com-Server (see “Assigning the IP Address”). Access is then possible from virtually any computer having network access and an installed TCP/IP protocol.

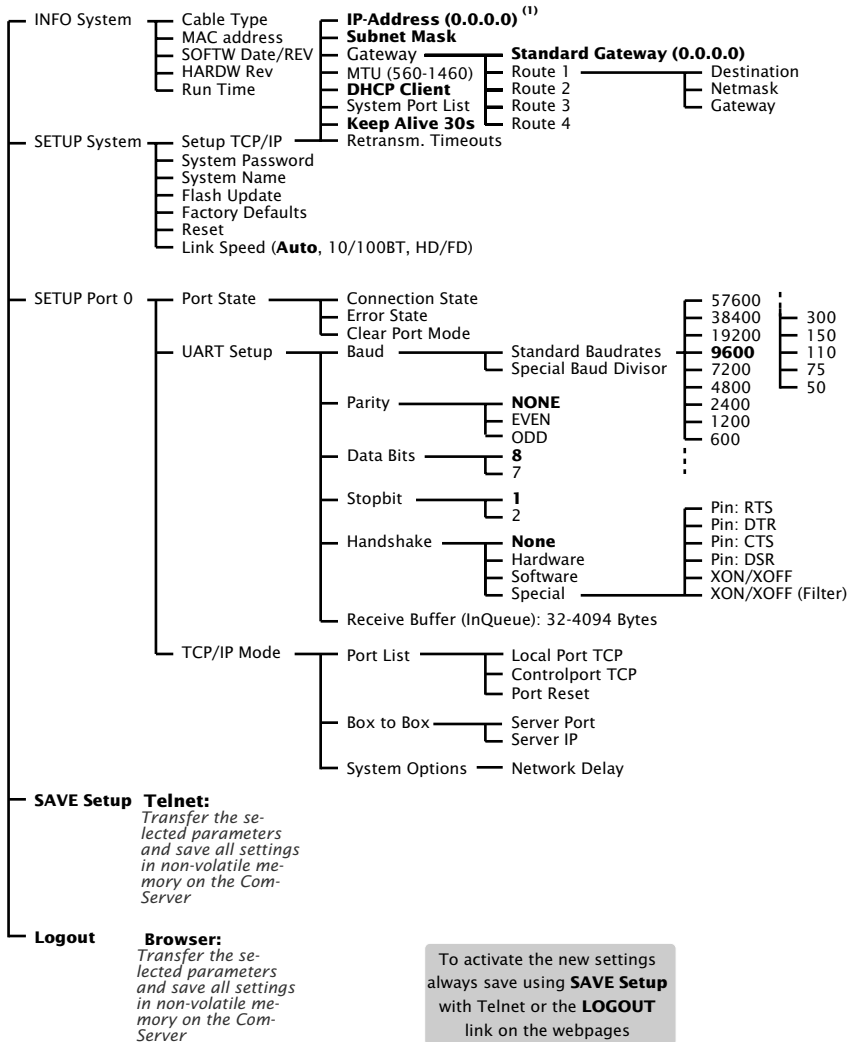
A detailed description of both configuration access types, their conditions as well as the respective navigation within the menu tree can be found in the following section.



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 Com-Server, 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.



7.2 Configuration via Telnet

On Unix/Linux systems as well as Windows up to XP the telnet client is included in the standard installation of the operating systems.

The configuration menu for the Com-Server is reached through TCP port 1111. You must therefore start the connection from within the Telnet client using the corresponding parameters:

```
telnet [IP-Adresse] 1111
```

With Windows Vista the telnet client must be explicitly installed together or after the fact. Here we recommend starting using the WuTility inventorying and management tool. If the telnet client is not installed on the respective system, an alternate telnet client (putty.exe) is automatically used.

If the connection could be opened and no system password is assigned (= factory default setting), you will see the following menu in your Telnet window. If a system password was configured, this will be asked for in front of the menu.

```
*****
* Com-Server LC *
* "COMSERVER-0A1B2C" *
*****
1. INFO System
2. SETUP System
3. SETUP Port 0 (Serial)
4. SAVE Setup
```

7.2.1 Navigation within the Telnet menu

An overview of the entire Com-Server 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 Com-Server 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.

7.3 Configuration via Browser - Web Based Management

The Com-Server also allows configuration via HTTP protocol and a standard Internet browser. The menu structure of the WBM (**Web Based Management**) is compatible with the Telnet configuration.

7.3.1 Activating WBM with the WuTility-Tool

The Web-Based-Management of the Com-Server can be activated at any time using WuTility as part of assigning the network parameters. Select the Com-Server 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 Com-Server homepage:

http://[IP-Adresse oder Hostname]:[Portnummer]

7.3.2 Activating WBM via the serial interface

When serially assigning the IP number, you can optionally specify the TCP port number under which the WBM should be accessible. To do this, first connect the serial port A on the Com-Server and the COM port on your computer using a null modem cable. Start a terminal program and set the transmission parameters to 9600 baud, 8 data bits, no parity and no handshake. During a reset of the Com-Server hold the x key down until after approx. 2 sec. the IPno.+<Enter>: prompt appears. Now directly following the IP address enter the extended address string *+w[Portno.]*. *Portno.* represents here the desired TCP port in decimal format. A value of 0 deactivates the WBM.

After finishing your entry by pressing the Return key, the values are stored in the non-volatile memory and you can immediately access the Com-Server and the set WBM port using your Internet browser.



Additional information about serial configuration possibilities for the Com-Server can be found in the sections Assigning the IP Address.

Example 1:

Here the IP address *172.17.231.99* is assigned to the Com-Server and *+w80* is used to activate the WBM on the HTTP standard port.

```
xxx... -> Com-Server
IP no.+<ENTER>: <- Com-Server
172.17.231.99+w80 -> Com-Server
172.17.231.99-1 <- Com-Server
```

Example 2:

In this example the Com-Server gets an IP address, subnet mask and gateway. In addition *+w8585* is entered to activate WBM on TCP port 8585.

```
xxx... -> Com-Server
IP no.+<ENTER>: <- Com-Server
172.17.231.99,255.255.0.0,172.17.231.1+w8585 -> Com-Server
172.17.231.99,255.255.0.0,172.17.231.1+w8585 <- Com-Server
```

7.3.3 Activating WBM from the configuration menu

If you want to activate WBM on an already operational Com-Server, you can do this via Telnet configuration. Start a Telnet session on port 1111 of the Com-Server. 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.

7.3.4 Starting and navigating the WBM

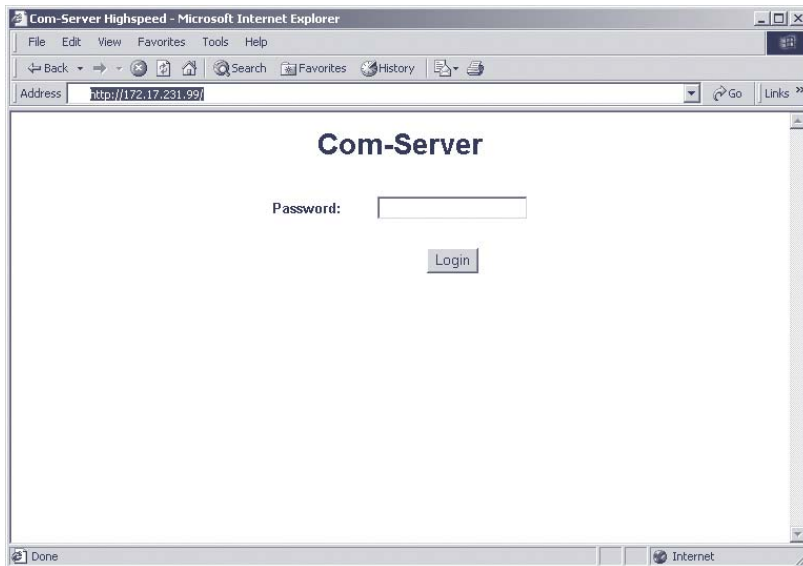
To access the Web pages after activating the WBM, start your Internet browser and enter the IP address of the Com-Server and the configured port number in the address line:

http://[IP-Adresse]:[Portnummer]

Address

If the HTTP standard port 80 was configured for WBM, you do not need to explicitly indicate the port number in the address line.

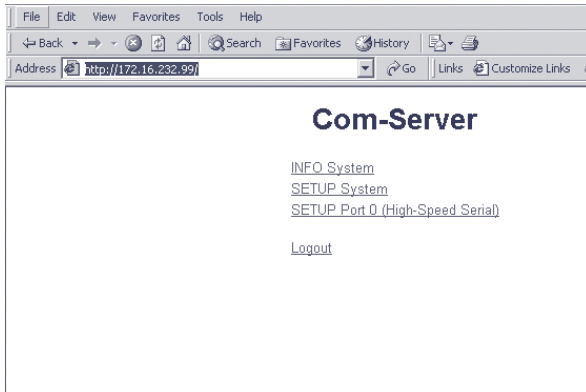
You will now be given the start page of the Com-Server with the system password prompt. The factory default setting is for no system password, so that you can get to the configuration menu by simply actuating the login button.



Navigation

Since the WBM of the Com-Server 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.

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 logout page then offers the following possibilities for ending the configuration session:



The *Save* button causes the Com-Server to save all the changes you made in its non-volatile memory and quits the configuration session.



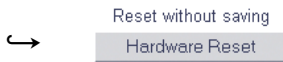
The *Abort* button causes the Com-Server to reject all the settings you made and quits the configuration session.




The *Restore Defaults* button resets the Com-Server to its original factory setting. All settings including the network parameters IP address, subnet mask and gateway address are lost.



The *Firmware Update* button activates the mode in which the Com-Server expects a firmware update via TFTP protocol (see section *Firmware Update of the Com-Server*). Update mode can be exited only by complete transmission of a valid firmware or by interrupting the supply voltage. When using the *WuTility* tool for the firmware update, this mode is automatically started. In this case a manual start is not necessary.



Restarts the Com-Server, comparable with interrupting the supply voltage. Data from any other opened connections to the Com-Server are lost in this event.

 *The functions located on the logout page of the Com-Server can also be found in the Telnet menu branch SETUP System → Setup TCP/IP.*

8 The basis configuration of the Com-Server

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

■ Menu: INFO System

■ Menu: SETUP System

8.1 Save your settings

When configuring using either Telnet or Web Based Management, all the changes are first saved only temporarily in the Com-Server. To make sure the settings remain intact even after a reset or power failure, each configuration session must be ended with an explicit save procedure.

Telnet

From the main menu select *SAVE Setup*. Respond with *y* to the *Save Changes ?* prompt. If a correct entry was made, the text *Saving...* will appear on the monitor, and the Com-Server saves all the settings you made in its non-volatile memory. Once the data have been saved, they are activated each time the Com-Server is turned on or reset.

Entering anything other than *y* or simply pressing the ENTER key returns you to the main menu without saving the values.



*Exceptions are the network parameters IP address, subnet mask and gateway, since these are also relevant for the running configuration session. To save and activate these you must enter *q* to quit the Telnet configuration after executing *SAVE Setup*. The Com-Server then autonomously performs a reset and only then begins to work with the new settings.*

Browser - WBM

Exit the configuration session using the Link *Logout* and click on the *Save* button.

8.2 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 Com-Server. 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 Com-Server hardware.

↳ **Run Time**

Shows the time in hours and minutes since the last Com-Server restart.

8.3 Menu: SETUP System

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

8.3.1 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 Com-Server will be making connections to another subnet. Enter the subnet mask of the subnet in which the Com-Server 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 Com-Server 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 Com-Server will use these values only after closing the current Telnet connection using q.

↪ **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 Com-Server. 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 Com-Server attempts to find a DHCP server and get an IP address from it. Entering 0 deactivates DHCP and the Com-Server 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 Com-Server are reached. Entries are made in decimal. The value 0 disables the service.

The TCP/UDP ports with access to the serial port on the Com-Server can be configured from the submenu *Setup Port 0 → TCP/IP Mode → Port List* konfiguriert werden.

- WBM Port (Default = TCP/0)
Chapter *Configuration via Browser*
- Telnet Configuration Port (Default = TCP/1111)
Chapter *Configuration via Telnet*
- SNMP (Default = UDP/161)
Chapter *SNMP management*
- Device Reset Port (Default = TCP/8888)
Chapter *Reset of the Com-Server*
- Init Flash Update Port (Default = TCP/8002)
Chapter *Firmware update of the Com-Server*
- Read Config Port (Default = TCP/8003)
Chapter *Up-/Download configuration data*
- Write Config Port (Default = TCP/8004)
Chapter *Up-/Download configuration data*
- Info Port (Default = UDP/8513)
Chapter *Inventory via UDP*



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 Com-Server. Restore the factory default values by performing a hardware reset of the Com-Server.

↪ **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 Com-Server generates a keep-alive packet. If the partner does not answer this packet, the connection is reset in the Com-Server. This deletes any data still contained in the serial in- and output buffers.

Example: A TCP client has opened a connection to TCP server port 8000 of the Com-Server and the network connection is interrupted. After the set keep-alive time plus 2s for two repetitions has elapsed, the Com-Server closes the connection and is again ready for any other clients.

↪ **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 Com-Server and its respective communications partner would you need to increase this value.

8.3.3 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 Com-Server.

- Telnet configuration menu (Default = 1111/TCP)
- WBM (if enabled)
- Read the configuration file (Default = 8003/TCP)
- Write the configuration file (Default = 8004/TCP)
- Reset Com-Server (Default = 8888/TCP)
- Reset Port Status (Default = 9084/TCP)
- Controlport (Default = 9094/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 Com-Server no later than 2s after the TCP connection has been established.

Queries from SNMP managers are only responded to by the Com-Server if the community corresponds to the system password.

For additional information on using system passwords in conjunction with the configuration and control ports, see the section *Expanded Services of the Com-Server*.

8.3.4 Menu: SETUP System – System Name

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

If the tag `<wut/>` is used inside the system name, the Com-Server replaces it each time there is an output or communication with the last three places of its Ethernet address.

8.3.5 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 Com-Server.

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!

8.3.6 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.

8.3.7 Menu: SETUP System → Reset

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



All data from any still open network connections are lost.

8.3.8 Menü: SETUP System → Link Speed

The Com-Server LC 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 Com-Servers 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 Com-Server) 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 Com-Server reset. Data from any open network connections is lost. If the newly selected setting is not supported by the port used on the switch or hub, the Com-Server may then not be accessible.

8.4 Das Menu ... → TCP/IP Mode → System Options

↳ Network Delay [10ms-Ticks] Default: 0000)

This value specifies the minimum delay time of the Com-Server 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.

9 Configuration of the serial port

■ Configuring the serial transmission parameters

In addition to the usual settings for baud rate, data bits, parity and stop bits, the various handshake procedures and available special functions of the individual control signals are explained here.

■ Setting the TCP/UDP services with access to the serial port

9.1 The serial parameters (Menu: UART Setup)

All RS232 parameters relevant to operation are configured in the submenu *Setup Port 0 → UART Setup*. An overview of the entire configuration tree can be found in the section *Structure of the Configuration Menu*.

If you are using the device in conjunction with the *W&T COM Port Redirector*, it is not necessary to configure the serial parameters in the Com-Server. The *COM Port Redirector* automatically sets the parameters needed by the serial application in the Com-Server.



The settings only become active after saving with SAVE Setup or pressing the button Save on the Logout page.

9.1.1 Baud rate, Data bits, Stop bits, Parity

The desired transmission parameters can be selected by entering the corresponding designation in the respective branch of the menu tree. Invoking *Save Setup* in the master menu or *Save* on the WBM logout page saves the changes you made in the non-volatile memory of the Com-Server and simultaneously activates them.

Freely selectable baud rate (Special Baud Divisor)

In the submenu Special Baud Divisor you can enter any desired divisor for generating the baud rate. This makes it possible to work even with non-standard baud rates. The baud rate and divisor are calculated using the following formulas:

$$\text{Divisor} = \frac{83 \cdot 10^6}{32 \cdot \text{Baudrate}} \quad \text{Baudrate} = \frac{83 \cdot 10^6}{32 \cdot \text{Divisor}}$$

The maximum baud rate of the Com-Server LC is 57.6kBd, which corresponds to a divisor of 45.

The currently configured baud rate is displayed when selecting the submenu *SETUP Port 0 (serial) → UART Setup*.

9.1.2 The handshake modes

(SETUP Port 0 → UART Setup → Handshake)

This menu provides three standard modes for flow control of the serial port. As opposed to these predefined handshake profiles, you can use the Special submenu to specify the function of each control signal individually. Details on the control line functions are contained in the description of the submenu *Handshake* → *Special*.

↪ **Hardware handshake**

Flow control is handled using the RTS and CTS signals. The Com-Server only sends data to the serial device if the CTS input is High. In the opposite direction the Com-Server indicates readiness using the RTS line.

Function of the control signal: RTS: Flow Control
 DTR: Show Connection
 CTS: Flow Control
 DSR: NO

↪ **Software handshake**

The software handshake is implemented using the two ASCII characters (11H)=XON and (13H)=XOFF. In the standard setting Software Handshake these two codes are considered by the Com-Server as control characters and are filtered out from the actual data flow in both directions. This filtering can be turned off individually for each data direction in the Special submenu.

Function of the control signal: RTS: NO (Default HIGH)
 DTR: NO (Default HIGH)
 CTS: NO
 DSR: NO

↪ **NO handshake**

Turns off any hardware or software flow control for the serial interface. All the data are output to the connected terminal device regardless of the status of the inputs CTS and DSR. Any impending overflow of the serial input buffer is not

signalled by the Com-Server. The setting NO Handshake makes sense for any data transmission that uses a serial protocol for data integrity or flow control.

Function of the control signal: RTS: NO (Default HIGH)
DTR: NO (Default HIGH)
CTS: NO
DSR: NO

↪ **Special**

Here it is possible to configure the function of the control lines differently from the three predefined protocols. Toggle between on and off by entering the menu number of the desired function. Settings made here are correspondingly overwritten by selecting one of the three predefined handshake modes.

↪ **Pin: RTS & Pin: DTR**

The following functions can be assigned to the outputs RTS and DTR:

1. Flow Control – If this function is turned on, the Com-Server handles the RS232 flow control through the corresponding output. The ready state for serial data is signaled by a HIGH signal (+3...12V). If the memory limit of the input buffer is reached, the line is set to LOW (-3...-12V).

2. Show Connection – The output is switched to the serial port depending on an existing TCP connection. HIGH (+3...12V) indicates an existing connection.

3. NO (Default=HIGH) – The outputs are not used by the Com-Server and carry a constant HIGH level (+3...12V).

4. NO (Default=LOW) – The outputs are not used by the Com-Server and carry a constant LOW level (-3...-12V).

↪ **PIN: CTS und PIN: DSR**

The inputs CTS and DSR can be assigned the following functions:

1. Flow Control – The serial flow control is performed using the corresponding pin. Serial data are output only

if the input was set to HIGH (+3...12V) by the connected terminal device.

4. NO (Manual IN) – The selected input is ignored by the Com-Server.

↳ **XON/XOFF**

Here the handshake can be configured for XON/XOFF separately for each data direction. "*XON/XOFF Receive*" switches processing of this control character for serial receiving on: After receipt of an XOFF sent by the RS232 terminal device, the Com-Server stops serial data output until it receives an XON. If "*XON/XOFF Send*" is turned on, the Com-Server generates an XOFF when it is no longer able to receive serial data.

↳ **XON/XOFF (Filter)**

If XON/XOFF is turned off for flow control, this option can be used to separately determine for both data directions whether the Com-Server filters these control characters out of the actual data.

1. Send-Filter (Data direction network → serial)

If this option is turned on and XON or XOFF characters occur in the actual data, the Com-Server filters them out and does not pass them along to the terminal device. Select this mode generally for bi-directional RS232 connections, since otherwise you will have problems with data traffic. If the Send-Filter option is turned off, all the data including the XON and XOFF characters are sent unfiltered on the RS232 interface. This mode only makes sense if the connected terminal device is a graphics printer whose data stream can be expected to contain handshake characters.

2. Receive-Filter (Data direction serial → network)

If this option is turned on, the Com-Server interprets the XON and XOFF characters sent by the serial terminal device as control bytes and does not insert them into the network data stream. This ensures that the recipient in the network only gets actual user data. If Receive-Filter is turned off, the XON and XOFF characters sent by the serial terminal device are transmitted to the network together with the actual user data. This mode requires

of the respective recipient in the network that it be able to separate actual data from control data.

The currently selected parameters are shown in the top line of the *UART Setup* menu:

[Baud], [Parität], [Datenbits], [Stopbits], [Handshake]

Possible values for the handshake variables are:

		Send-Filter	Receive-Filter
[N]	No handshake	---	---
[H]	Hardware handshake	---	---
[S]	Software handshake XON/XOFF	ON	ON
[Special]	Special setting configuration menu "Handshake-Special"	---	---

9.1.3 Receive Buffer (InQueue)

The Com-Server is factory configured with a serial input buffer capacity of 4094 bytes. The sub-menu Receive Buffer allows you to reduce this to 32 bytes, with only even values permitted.

In most applications the emphasis is on maximum data throughput, so we recommend not changing the maximum value of 4094. It does however make sense to reduce the value when working with serial protocols together with unreliable or noisy network connections. This prevents datagram repetitions from being accumulated on the part of the serial master when there are connection errors and keeps them from being sent in bundled form after the connection is resumed.



Please ensure that when communicating without serial flow control the Receive Buffer is at least as large as required for the longest expected serial data packet.

9.2 TCP-/UDP port numbers (Menu: TCP/IP Mode)

In the menu branch *Setup Port 0 → TCP/IP Mode r Port List* you can configure the TCP server ports for all services with access to the serial ports on the Com-Server. Changes to the port numbers must be set the same in the client-side communication partner. A value of 0 disables the service.



Changes to the factory-set port numbers as well as disabling services should be done with caution, since these can result in a connection break to any connected communication partners such as the COM Port Redirector. If the Local Port is disabled, no data exchange with the serial connected device is possible. The default values can be restored by resetting the Com-Server to its factory default settings.

Local Port TCP (Default = 8000)

Under this port number a data-transparent TCP connection to the serial port on the Com-Server is made available. The port is required for use in the operating modes *TCP Server*, *COM Port Redirector* and *Box-to-Box*.

For detailed information see chapter:

Data transfer per TCP/IP-Sockets
The Windows COM port redirector
Box-to-Box mode

Controlport (Default = 9094)

The control port allows configuration of the serial port on the Com-Server over the network. Use of the control port is required for operation together with the *COM Port Redirector*.

For detailed information see chapter:

The Windows COM port redirector
The Controlport

Reset Port Status (Default = 9084)

For special applications this port offers the ability to carry out a forced reset of the Com-Server port: the parameters for the current connection are deleted.

For detailed information see chapter:

Reset Com-Server Port

10 Data transfer per TCP/IP-Sockets

The most direct way to exchange data with a serial device connected to the Com-Server is via TCP sockets. This is especially useful in cases where communication needs to be integrated into your own programs.

Comparable to traditional telephony, TCP connections always consist of an active, calling side (=Client) and a passive, call-answering side (=Server).

The Com-Server LC works like a TCP server and enables network clients to access the serial connected device.

■ The Com-Server as TCP-Server

10.1 The Com-Server as TCP-Server

TCP is a connection-based protocol, i.e. during data transmission there is a fixed connection between client and server. TCP possesses all the mechanisms for opening and closing a connection and ensuring errorless data transfer over the network.

The connection is controlled by the user program (client process), which opens (connect()) and closes (close()) the connection. Once a connection is established, data can be exchanged bidirectionally between the two processes. The Com-Server output all the data from the LAN to the serial port and in return reads in all the data from the serial port in order to convey it to your client process.



When there is no connection, the entry FREE must be visible in the Com-Server port menu SETUP Port 0 → Port State → Connection State. If a connection is active, the entry In Use Port number <IP address> appears there.

10.1.1 Configuration of the local port number

To open a connection to the Com-Server, a client needs an IP address and the TCP port number. Direct access via TCP to the serial port of the Com-Server is done using the port number stored in the menu branch *Setup Port 0 → TCP/IP Mode → Port List r Local port (TCP)*. Port number 8000 is pre-configured at the factory:

It must be noted that only one TCP client at a time can be connected to the serial port of the Com-Server. If there is already a connection, any attempt from another client is rejected until this first connection has been properly closed or ended by means of a reset.

10.1.2 Optional settings

Serial transmission parameters

Baud rate, data bits, parity and handshake procedure must conform to the connected serial device. For details see section *Configuration of the Serial Port*.

Serial receive buffer

The Com-Server has a serial receiving buffer with 4kB capacity. When the factory setting is used the contents of the receive buffer is automatically cleared when a network connection is opened.

Network Delay

In its default setting the Com-Server attempts to sent the serially arriving data to the network-side application with as little delay as possible. Particularly when working with host serial protocols it may be necessary to send the protocol blocks enclosed in a network packet if possible. The option *Network Delay* in *Setup Setup Port 0* → *Setup TCP/IP* → *System Options* allows an artificial delay in transmission for this purpose. Details can be found in section *Menu ... Setup TCP/IP* → *System Options*.

Keep Alive Time

The factory default setting for the keep-alive check is 30 seconds. I.e. if there is no data traffic the Com-Server checks during the set time interval to see whether the connected network application can be reached. If there is no reply, for example due to a break in the network infrastructure, the Com-Server resets the connection internally and thus enables a new connection to be opened. Details can be found in section *Menu SETUP System* → *Setup TCP/IP*.

11 The Windows COM port redirector

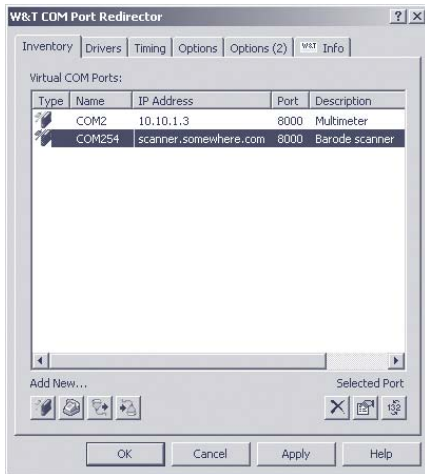
With the COM Port Redirector available for Windows 9x, NT, 2000, XP, Vista and Windows7 the virtual COM ports are installed in the respective system. These behave in a serial application exactly like normal local ports, but are actually located on Com-Servers located in the network. In this way serially communicating programs can profit from the advantages of network transmission without changing a single line of program code.

■ Download and installation of the COM redirector

11.1 Overview

The W&T COM Port Redirector implemented as a Windows core driver provides virtual COM ports which behave like local standard ports with respect to opening applications.

Configuration is registry-based using the COM Port Redirector configuration tool from the Windows start menu. With older versions you find a corresponding applet in the control panel. The COM Port Redirector supports all serial W&T COM Servers as well as W&T LAN modems. In addition, the Soft Link function (license required) allows serial applications to be coupled for any computer.



The following sections describe a quick start-up which is sufficient for many applications. More detailed information for all configuration options for the W&T Com Port Redirector can be found in the online help.

11.2 Download & installation of the W&T COM redirector

The latest version of the COM Port Redirector as well as additional tools, application descriptions and FAQs can always be downloaded from our Web site <http://www.wut.de>. The simplest way to navigate from there is by using the menu tree on the left side of the page. Follow the

Downloads → Com-Servers

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

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

11.2.1 Installation of the W&T COM port redirector

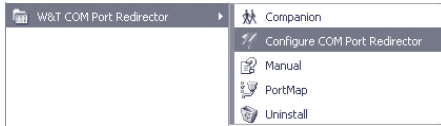
System requirements for installing the W&T Com Port Redirector:

- Operating system Windows NT, 2000, XP, Vista, Win7 (including all Server and 64Bit editions)
- Login as administrator or with administrator rights



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

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



11.2.2 Uninstalling the W&T COM Port Redirector

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

11.3 Set up virtual COM ports

To set up a new virtual COM port, start the COM Port Redirector configuration applet in the control panel and click on the Com-Server button. A dialog box opens which you fill in and then click on OK. All settings can also be corrected later by editing the corresponding entry in the port list. Once all your entries have been made, click on OK. It is not normally necessary to restart Windows in order to use the new COM port.

TCP-Port

The entry field *TCP Port* in the dialog box contains the TCP port used for transporting the serial user data. To communicate with a Com-Server configured with the factory default settings, you must use the following value:

↔ Com-Server Port A: 8000

In addition to the indicated TCP port for user data transport, the COM Port Redirector uses an additional TCP connection for exchanging configuration and status information. The port number used for this is always calculated from the formula *data port* + 1094 (e.g. 8000 + 1094 = 9094). If – for example when a firewall is present – you need to deviate from the prescribed TCP port, the TCP ports entered in the COM Port Redirector must also be set correspondingly in the following menu branches of the Com-Server:

Data port:

SETUP Port 0 → *TCP/IP Mode* → *Port List* → *Local Port*

Controlport:

SETUP Port 0 → *TCP/IP Mode* → *Port List* → *Controlport*

11.3.1 Com-Server settings

Starting with the factory default setting of the Com-Server only the 3 network-specific parameters *IP Address*, *Subnet Mask* and *Gateway Address* need to be configured for operating with the *COM Port Redirector*. It is not necessary to set the serial transmission parameters such as baud rate. These are determined by the serial application and sent by the *COM Port Redirector* to the Com-Server over the network.

Only if a TCP port which differs from the factory default setting was entered in the *COM Port Redirector* do you need to configure the corresponding values in the following menu branches of the Com-Server as well:

Data port:

SETUP Port x → *TCP/IP Mode* → *Port List* → *Local Port*

Controlport (= Datenport + 1094):

SETUP Port x → *TCP/IP Mode* → *Port List* → *Controlport*

12 Box-to-Box-Mode

In „Box to Box“ mode any two Com-Server serial ports can be logically linked to each other over the network. The two connected serial terminal devices are in constant online contact in this mode.

- Typical applications

- Configuration of Box-to-Box connections

12.1 Box-to-Box application

This mode is based on a permanent TCP connection between two serial ports on Com-Servers distributed in the network. One of these ports acts as the master, the other as slave, though it essentially makes no difference which device is acting as master or slave. The master port functions as a TCP client and is thereby responsible for opening (after configuration or reset) and closing (after deactivating *Box-to-Box* mode).

On the network side, Box-to-Box mode only exchanges data when there are serial user data present. As long as the keep-alive check is deactivated in the Com-Servers, there is no acknowledgement traffic beyond the TCP protocol. (see *chapter Menu SETUP System → Setup TCP/IP*).

As a consequence of the permanent connection, both Com-Servers in a Box-to-Box connection must have fixed IP addresses. It is not possible to operate using host names and URLs with the Com-Server LC. If this is necessary – such as in conjunction with DSL connections – the TCP client mode can be replaced with COM-Servers of the Highspeed generation.

Typical applications

- Replacing complex serial star topology wiring, such as in small business systems
- Serial connections over longer distances. A pair of Com-Servers replaces two line drivers and offers in addition error correction using the Ethernet transmission procedure.
- Serial remote connection using already existing Ethernet-Internetwork connections (routers, bridges, etc.).
- Implementing serial connections with frequently changing operating sites without additional cable expenditure - simply plug into the Ethernet cable!

12.1.1 Configuring Box-to-Box-Mode



Only the Master port is configured for „Box to Box“ mode; The Slave IP address and Slave port number are set only on the Master port! Settings in the Special Options submenu and parameterizing of the serial port can and must be done on both ports (see examples at the end of this section).

The following settings must be made in the Submenu *SETUP Port x* → *TCP/IP Mode* → *Box to Box* of the Com-Server which is specified as the master:

↪ **Slave Port** (set only for master port)

Port of the serial Com-Server Slave port. The following port numbers are pre-configured at the factory:

- Port A = 8000 (all models with only one serial port)
- Port B = 8100
- Port C = 8200
- Port D = 8300

The serial port of a Com-Server can easily be „connected“ with one of the up to four serial ports of another Com-Server.

↪ **Slave IP-Address** (set only for master port)

IP address of the Com-Server in which the Slave port is located.

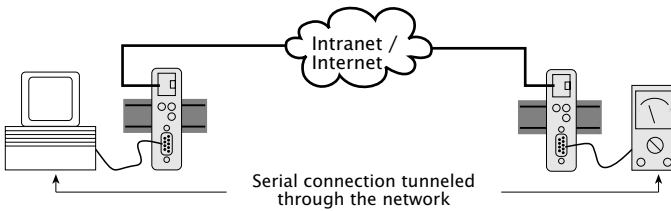
Once you have entered all the parameters in the Com-Server port menu, press the *ENTER* key several times to return to the main menu and save the entries with *SAVE Setup*. The message *Saving...* appears, then *Box to Box* mode is activated. The entry *Box to Box Master* now appears in the *SETUP Port x* → *Port State* → *Connection State* menu. The connection status can be read at any time in this menu both for the Master and for the Slave port. In addition, both Status LEDs for the respective Com-Server ports begin to flash cyclically at approximately 1x a second.

12.1.3 Deactivating Box to Box mode

Proper deactivation of the mode is also done through the Box-to-Box master. In the menu *SETUP Port 0 → TCP/IP Mode → Box to Box* set the Slave Port entry to zero (0), or use the menu *SETUP Port 0 → Port State → Clear Port Mode*.

If for any reason the Slave port is not released, you may also use the menu *SETUP Port 0 → Port State → Clear Port Mode* in the *Slave port* menu.

12.1.4 Sample configurations for Box to Box mode



Box-to-Box Master

IP address: 172.16.231.8
Port number of Port A: 8000

SETUP Port 0

- TCP/IP Mode
 - ↳ Box to Box
 - ↳ Slave Port **8000**
 - ↳ Slave IP address **172.016.231.005**
- UART Setup
 - ↳ Baud --> ...
 - ↳ Parity --> ...
 - ↳ Data Bits --> ...
 - ↳ Stopbit --> ...
 - ↳ Handshake --> ...

Box-to-Box Slave

IP address: 172.16.231.5
Port number of Port A: 8000

SETUP Port 0

- TCP/IP Mode
- UART Setup
 - ↳ Baud --> ...
 - ↳ Parity --> ...
 - ↳ Data Bits --> ...
 - ↳ Stopbit --> ...
 - ↳ Handshake --> ...

The Slave address is only configured on the Master Com-Server. The Dispatch Strings may be set on both ports however. In addition, the serial transmission parameters (baud rate, data bits, etc.) in *both* Com-Servers must conform to those of the connected devices.

13 Status and error messages

- Status messages of the menu *Port State*
- Resetting a fixed mode: *Clear Port Mode*

13.1 Menu Setup Port 0 → Port State

In this menu you will find information about the configured TCP/IP mode of the Com-Server port, the status of the network connection and a listing of error which occurred. In addition, Clear Port Mode can be used to clear a fixed set mode.

↳ Connection State

This menu permits online connection control. The display is organized as follows:

<p>Connection State</p> <p>FREE</p>	<p>The port is in standard mode and has no connection.</p>
<p>Connection State</p> <p>In Use: Port 2000 (172.016.231.001)</p>	<p>The port is in server mode and has a connection to the process having the port number 2000 on the TCP/IP-station with IP address 172.16.231.1</p> <p>→ Client address</p>
<p>Connection State</p> <p>B2B Master Slave Locked: Port 8000 (172.016.231.001)</p>	<p>The port is in Box to Box master mode and has a connection to the Slave with IP 172.16.231.1, port 8000t</p> <p>→ Configured TCP/IP mode</p> <p>→ Address of the B2B partner</p>

↳ **Connection state B2B mode:**

- Unlock: The port is for the indicated mode but has **no active** connection.
- Locked: The port is for the indicated mode and has an **active** connection to the configured server/slave
- Scanning: The Com-Server wants to open a connection and **searches** for the configured B2B slave or master.
- Disconnect: The Com-Server wants to open a connection it is refused by the server/slave

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

↳ Error State

This list shows the errors which occurred on the port. If more than five errors have occurred since the Com-Server was last reset or since the last time the error table was cleared, the oldest entry is always overwritten. The most recent entry is in first position and the oldest in last position. Preceding each entry is the time when the error occurred in hours and

minutes since the last time the Com-Server was reset. You can clear the error table in order to have all the entries available again.

No halt on XOFF/RTS/DTR

The connected serial device does not respond to the stop signal set by the Com Server 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.

Overrun Error

The data register of the serial receiver component was written even though the previous character could not be read out. The cause of this may be for example a baud rate configured by the freely selectable baud rate divisor greater than 57.6kBd with a correspondingly high data load.

Parity Error

A character received on the serial port has an incorrect or missing parity bit. Please check that the transmission parameters for the Com Server and the corresponding serial terminal device are the same. Parity errors can also be caused by EMI problems or 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 Com Server and serial terminal device configurations are the same.

↳ Clear Port Mode

Use this command to simply and easily revert the port to standard TCP/IP mode. The previously configured TCP/IP mode (TCP server or Box to Box) is deleted.



The changes made using Clear Port Mode are also effective without SAVE Setup after exiting the menu, i.e. they are saved directly in the non-volatile memory.

14 Expanded services of the Com-Server

In the preceding sections we explained all the standard processes that are implemented in the Com-Server. These client/server processes cover the majority of the application possibilities for the Com-Server. Implementation of more complex scenarios often requires however that the software be individually adapted.

For users who make use of socket programming, the Com-Server offers additional functions beyond pure data transfer.

- The control port and its data structure
- Status requests and configuration of the serial port
- Resetting the Com-Server
- Uploading/downloading of the configuration data
- Inventory taking per UDP
- SNMP management

14.1 The controlport

The TCP client and TCP server processes for sending data to the serial port of the Com-Server do not allow influencing the serial port itself. But some applications make it necessary that the status and configuration of the port be known and capable of being changed at all times.

Parallel with the data connection to the *Local Port*, a control connection can be opened on the TCP *controlport*. Through this connection it is possible to read out the current status of the port (handshake lines and error states) or to despatch commands. The user data itself is only transported through the actual data connection.

Die Control-Portnummer ist im Menüweig *SETUP Port 0 → TCP/IP Mode → Port List → Controlport* konfigurierbar. Ab Werk ist der Schnittstelle folgender Wert zugeordnet:

The TCP port number of the control port is stored in the menu branch *Setup Port 0 → TCP/IP Mode → Control port*. The following port numbers are pre-configured at the factory:

- Port A = 9094



The control connection can only be opened if the Com-Server port functions as a TCP server. In Box to Box mode this service is not available.

The data- and control ports are independent of each other. They may be individually opened and closed whenever desired.

Use of the system password

If a system password has been configured (see section „Basic Configuration of the Com-Server“), this must be null-terminated (= [password] + 0x00) and sent to the Com-Server via the Control Port within 2s after a connection has been successfully opened. If the Com-Server 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.

14.1.1 The control structure

For the purpose of exchanging information and commands, data records having a defined length and structure are exchanged through this connection.

To request an info structure (completely filled data record from the Com-Server port), you only need to send any desired character to the control port. To despatch a command, the Com-Server expects the complete structure (30 bytes) in a TCP packet. If no allocatable data (e.g. just half of a structure) pass through the contro port, the reply is still an info structure. The declaration of the structures is made in C language. Note for all structures:

A ***word*** corresponds to a 16-bit integer

A ***char*** corresponds to a byte (8bit)

Hex convention: ***0x*** preceding the value

The info structure has a fixed length of 30 bytes and is comprised of the following individual structures:

```
#pragma pack(1) //Packen der Strukturkomponenten auf 1-Byte-Grenzen
typedef struct _rem_box_cntrl
{
    char        zero_1;
    COM_ERROR   _ce;
    COM_STAT    _cs;
    BOX_CNTRL   _bc;
    char        zero_2;
}
    REM_BOX_CNTRL;
#pragma pack()
```

zero_1/zero_2

The two characters *zero_1* and *zero_2* are the start and end characters of the structure and must always be zero.

The structure **COM_ERROR**

The *COM_ERROR* structure has a length of one WORD (16-bit integer) and contains all the error states of the serial port.

```
typedef struct _com_error
{
    union
    {
        word error_flags;
        struct _err_flags
        {
            word f_data      : 1; //not used/reserved
            word f_net       : 2; //not used/reserved
            word f_com       : 1; //Set when COM port error detected
            word f_break     : 1; //Reflect the break flag
            word f_cts_time  : 1; //Time out while waiting on CTS
            word f_dsr_time  : 1; //Time out while waiting on DSR
            word f_rlsd_time : 1; //Time out while waiting on RLSD (CD)
            word f_overrun   : 1; //Overrun error
            word f_parity    : 1; //Parity error
            word f_frame     : 1; //Framing error
            word f_status    : 1; //not used/reserved
            word no_use_1    : 1; //not used
            word no_use_2    : 1; //not used
            word f_rx_over   : 1; //Ring buffer overrun after handshake
            word no_use_3    : 1; //not used
        };
    };
} COM_ERROR;
```

The structure **COM_STAT**

The *COM_STAT* structure has a length of three WORDS (16-bit integer) and contains the status of the handshake lines as well as the number of bytes which are in the send and receive buffers of the serial port. It also allows you to directly influence the handshake lines and buffer.

```
typedef struct _com_stat
{
    union
    {
        word com_flags;
        struct _com_flags
        {
            word cts_hold      :1; //CTS line                -LowByte
            word dsr_hold      :1; //DSR line                |
            word ri_hold       :1; //not used/reserved |is set with every
            word rlsd_hold     :1; //reserved/reserved |received packet
            word dtr_hold      :1; //DTR line                |
            word rts_hold      :1; //RTS line                |
            word x_receive     :1; //XOFF received          |
            word x_send        :1; //XOFF was send          -
        };
    };
};
```



```

        word break_mode   :1; //1 = set_break was set           - HighByte
                           //0 = clear_break was set         |
        word dummy        :1; //not used                       |
        word send_xoff    :1; //Send XOFF asynchron           |
        word flush_rd     :1; //Flush serial input buffer     |
        word flush_wr     :1; //Flush serial output buffer    |
        word set_rts_dtr  :1; //set RTS to rts_hold and      |
                           //DTR to dtr_hold                 |
        word set_break    :1; //Independent setting break mode|
        word clear_break  :1; //Independent clearing break mode-
    };
};
word cbInQue;           //Receive byte count of COM ring buffer
word cbOutQue;         //Transmit byte count of COM ring buffer
} COM_STAT;

```

Flushing buffers and influencing the handshake:

- 1) Copy the complete structure of an info packet received by the Com-Server port and fill in the HighByte of the `COM_STAT` structure.
- 2) All commands whose flags have the value 1 are executed. If you set the flag `set_rts_dtr`, be sure that you also set the flags `rts_hold` and `dtr_hold` in the LowByte correspondingly as well.



Depending on how the Com-Server and the `box_cntrl.f_flags` structure are configured, the RTS and DTR signals will be used for a LOCK/UNLOCK display or for serial flow control. In this case the Com-Server itself takes over control of these pins. The command flag `set_rts_dtr` should therefore be used only for the following setting of the `box_cntrl.f_flags` structure:

```

f_rts_disable und f_dtr_disable = 1
f_inx_dtr und f_inx_rts = 0

```

Sending a break signal

The `set_break/clear_break` flags can be used to activate/deactivate break mode and send a break signal to the serially connected device. Activated break mode is signaled by `break_mode=1`. After setting `set_break`, break mode is activated and break signal is generated. The level of the data output


```

word hs_off_limit;    //if number of free bytes in ring buffer
                    // < hs_off_limit then setting handshake stop
char PEChar;         //Replace this char if serial parity error (function
                    //must be enabled first by setting f_flags.f_pechar= 1)

struct _commands
{
    unsigned char save_command :4;    //Save COM-Configuation
                                    //0 = no save
                                    //1 = save without EEPROM Update
                                    //2 = save with EEPROM Update

    unsigned char clear_error :1;    //1 = clear error in display/lamps
    unsigned char set_fact_def :1;   //1 = set factory defaults and reset
    unsigned char free_cmd :2;      //not used
};

union
{
    word hs_flags;
    struct hs_flags
    {
        word f_cts_connect :1; //Connect/Disconnect with CTS (HIGH/LOW)
        word f_dsr_connect :1; //Connect/Disconnect with DSR (HIGH/LOW)
        word f_cts_accept :1; //Accept Connection only by CTS=HIGH
        word f_dsr_accept :1; //Accept Connection only by DSR=HIGH
        word no_use0 :12; // not used
    };
};

union
{
    word f_flags;
    struct _f_flags
    {
        word f_rts_disable :1; //RTS will not change at LOCK/UNLOCK
        word f_dtr_disable :1; //DTR will not change at LOCK/UNLOCK
        word f_outx :1; //Enable softw. handshake while sending
        word f_inx :1; //Enable softw. handshake while receiving
        word f_outx_cts :1; //Enable hardware handshake on CTS
        word f_outx_dsr :1; //Enable hardware handshake on DSR
        word f_inx_dtr :1; //Enable hardware handshake on DTR
        word f_inx_rts :1; //Enable hardware handshake on RTS
        word f_parity :1; //Enable parity check & error report
        word f_pechar :1; //Enable replacement of received char
        word f_inxfilter :1; //Enable xon/xoff filter while receiving
        word f_outxfilter :1; //Enable xon/xoff filter while sending
        word f_rts_default :1; //1 = While RTS is not used, RTS is active
        word f_dtr_default :1; //1 = While DTR is not used, DTR is active
        word f_user_time :1; //not used
        word clr_err_char :1; //1= If Com-Server is in client mode,
                               //serial chars with framing or parity
                               //errors will not open the connection
    };
};
} BOX_CNTRL;

```

Configuring the serial port

1. Copy the complete structure of an info packet received by the Com-Server and fill in the `BOX_CNTRL` structure. This allows you to read out the default values and only enter the values you want to change.
2. To work with the configuration, the value `save_command` in the structure has to be set. `save_command = 2` causes the Com-Server to save this configuration in non-volatile memory and to use it again after a restart. A `1` does not overwrite the non-volatile memory, i.e. after a restart the old configuration is used.

Functions of the RS232 outputs RTS and DTR

If the flags `f_rts_disable` and `f_dtr_disable` are set to 0, the corresponding RS232 output uses an enable level to signal to signal an active connection between the serial port and a client in the network. If the Com-Server itself is configured as a TCP client, a constant enable level is output, regardless of whether there is an active connection or not.

Alternately a 1 in the flags `f_inx_rts` and `f_inx_dtr` can assign the function of serial flow control to the respective RS232 output. If flow control is enabled, the corresponding flag for the `LOCK/UNLOCK` display must have the value 1 (= `LOCK/UNLOCK` display disabled).

If the respective RS232 output does not have the function of either `LOCK/UNLOCK` display or flow control, the flags `f_rts_default` and `f_dtr_default` can be used to specify the default state after a Com-Server reset (1=Enable, 0=lock level).

14.2 Reset Com-Server-Port

Factory default = 9084/TCP

For special applications this port makes it possible to carry out a forced reset of the Com-Server port. All current connections to the serial port are immediately closed, regardless of whether the respective partner is reachable.



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



For automatic detection and preventing the TCP connections from hanging, we recommend using the keep-alive function of the Com-Server.

Use of the system password

If a system password has been configured (see section „Basic Configuration of the Com-Server“), this must be null-terminated (= [password] + 0x00) and sent to the Com-Server via the Control Port within 2s after a connection has been successfully opened. If the Com-Server 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 Com-Server immediately closes the TCP connection as soon as it has been established and performs a port reset.



When invoking this service, the contents of the serial input and output buffer are lost. The port can be opened by any desired station and should only be used in extreme cases! No data excepting the password are permitted to be transported through this connection! The port is opened by a host and then immediately closed by the Com-Server.

14.3 Reset des Com-Servers

Factory default: 8888/TCP

The reset socket has been implemented in case the Com-Server ever needs to be completely reset. If a connection is opened on this port, the Com-Server 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 Com-Server“), this must be null-terminated (= [password] + 0x00) and sent to the Com-Server via the Control Port within 2s after a connection has been successfully opened. If the Com-Server 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 Com-Server 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 Com-Server is in its base state! This reset can be performed from any station and should be done only in extreme cases.

14.4 Up-/downloading configuration data

Factory default: 8003/TCP=read, 8004/TCP = write

These services allow you to read out the configuration data for the Com-Server stored in the non-volatile memory and send it to another Com-Server. Especially when installing a large number of Com-Servers having the same settings this method eliminates having to open a Telnet configuration connection for each individual unit.



The factory default port number under which these services 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 Com-Server*), this must be null-terminated (= [password] + 0x00) and sent to the Com-Server via the Control Port within 2s after a connection has been successfully opened. If the Com-Server 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, the Com-Server expects or sends the configuration data directly after the TCP connection has been established.

Reading out the configuration data on port 8003

All the client application needs to do is open a TCP connection to Port 8003 of the Com-Server. The Com-Server accepts it, automatically sends its 2048-byte long configuration and then closes the connection to the client.

The client application can store this data now in a binary file and use it for downloading to other Com-Servers.

Writing configuration data on port 8004

Uploading to a Com-Server is analogous to reading out the configuration data. After opening a TCP connection to Port 8004 of the Com-Server, the latter expects the 2048 bytes for a new configuration. After the client closes the TCP connection, the Com-Server saves the data in its non-volatile memory and performs a reset.

The value of the IP address remains unaffected by a configuration upload.

Application

To operate multiple Com-Servers having the same configuration, you must first assign each unit with its own IP address. Then use Telnet to fully configure a Com-Server with the desired parameters and use Port 8003 to read the non-volatile memory out. The file thus created can now be uploaded to the remaining Com-Servers.



The procedure described here is a substitute for the relatively time-consuming configuration using a Telnet session. All the settings are saved in the non-volatile memory and are still available after a reset or power loss. Only a factory default reset overwrites the settings assigned by the factory set standard values.

14.4.1 Up-/downloading under Windows

For Windows computers you can also up- or download the configuration data using the W&T tool *WuTility*, which is also used for the firmware update. You can find a corresponding download link on the Web data sheet pages for the Com-Servers at the following address: <http://www.wut.de>

14.5 Inventory taking per UDP/8513

UDP port 8513 allows you to open an info-structure with device-specific information from the Com-Server. After receipt of a network packet with any contents directed to this port, the Com-Server replies with the info-packet. By configuring the request packet as a broadcast, you can inventory all the W&T devices located in the local network.



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.

14.5.1 The infopaket

Each infopacket consists of 3-6 data structures. *BOX_VERSION* contains information on the respective model of the Com-Server and its firmware status. The structure *BOX_DESCRIPTOR* provides the network-relevant data such as MAC- and IP-address. The 3.-6. structure *PORT_DESCRIPTOR* provides information about the configured mode and the current connection status of the individual ports. The total length of the InfoPacket is calculated as follows: $10 + 22 + (\text{port_no} \times 10)$ bytes.

```
#pragma pack(1)
typedef struct _BOX_VERSION // ( 10 byte )
{
    unsigned int version; // 0x10: 1.0 (Version of this structure)
    unsigned int sw_rev; // z.B. 1.24 (0x1501)
    unsigned int hw_rev; // C2_EURO = 2.0 (0x0002)
                        // C4_MINI = 4.0 (0x0004)
                        // C5_100BT = 5.0 (0x0005)
                        // C8_LOW_VOLTAGE = 8.0 (0x0008)
                        // C91 Com-Server LC = 9.1 (0x0109)

    unsigned int reserved[2];
}BOX_VERSION;

typedef struct _BOX_DESCRIPTOR // ( 22 byte)
{
    unsigned char mac_addr[6]; // MAC-Adresse des Com-Servers
    unsigned long IP_number; // IP-Adresse des Com-Servers
    unsigned long gateway; // Gateway
    unsigned long subnet_mask; // Subnet Mask
    unsigned int MTU; // MTU
```

```

        unsigned int port_anz;           // Anzahl der Ports im Com-Server
    }BOX_DESCRIPTOR;                    // (port_anz * 10 byte)

typedef struct _PORT_DESCRIPTOR        // ( 10 byte )
{
    union
    {
        unsigned int wState;
        struct _new_type
        {
            unsigned char port_type; // 0x01 = serieller Port (Serial CPU-Port)
                                     // 0x02 = Serieller Port (UART Port)
                                     // 0x03 = reserved
                                     // 0x04 = Digital E/A
                                     // 0x05 = Analog E/A (in Vorbereitung)
                                     // 0x06 = W&T Dual Port RAM
            unsigned char state;     // 0=free, 1=connect, 2=waits
        };
    };
    unsigned int mode;               // 0x0001 = TCP-Client
                                     // 0x0002 = TELNET-Client
                                     // 0x0003 = FTP-Client
                                     // 0x0004 = Box2Box-Client (aktiv)
                                     // 0x0005 = UDP Send/ReceiveMode
                                     // 0x0006 = MULTI PORT (DPRAM, SERIAL PROTOCOL)
                                     // 0x0007 = SNMP-Agent
                                     // 0x0008 = Box2Box Server (passiv)
                                     // 0x0010 = SLIP Router
                                     // 0x0020 = PPP Router (in Vorbereitung)
                                     // 0x0030 = Box2Box Bus System: Slave Box
                                     // 0x0040 = Box2Box Bus System: Master Box
    unsigned long remote_IP;        // wenn state == CONNECT, sonst 0
    unsigned int remote_port;       // wenn state == CONNECT, sonst 0
}PORT_DESCRIPTOR;

typedef struct _WT_INTERN3            // ** all parameters in Hostorder / Low Byte First **
{
    BOX_VERSION bv;                  // Port = UDP_BOX_INFO_8513
    BOX_DESCRIPTOR bd;
    PORT_DESCRIPTOR pd[ACT_PROCESS];
} WT_INTERN3;
#pragma pack()

```



All variables of types Integer and Long are mapped in host order, i.e. the low-value bytes come first. The IP address 172.17.2.3 appears for example in byte order 3, 2, 17, 172.

UDP packets are connectionless and unsecure datagrams. Especially when using broadcasts the Com-Server's own request as well as reply packet can get lost. To reliably ascertain all the Com-Servers installed in a subnet you should therefore repeat the broadcast if necessary.

14.6 SNMP management

Many networks are managed through a central network management system via SNMP protocol. The Com-Server LC supports for this purpose the following branches of the MIB-2:

System

Interfaces

IP



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.



If a system password was configured in the Com-Server, queries from SNMP managers are only answered if the community contained there corresponds to the system password.

15 Firmware-Update of the Com-Server

Since the operating software is under constant development, this device also allows you to perform a firmware update. The available upload variations are described here.

- Where do I get the current firmware?
- Network firmware update unter Windows
- Network firmware update under UNIX

15.1 Where do I get the current firmware?

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

<http://www.wut.de>

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

Search
 for Prod. no.:

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.



⚠ *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.*

15.2 Network firmware update under Windows

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

- The executable update tool for transferring the firmware to the Com-Server.
- The file with the new firmware for transferring to the Com-Server.

It is not necessary to do any special preparation in the Com-Server 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 Com-Server 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 Com-Server, 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 Com-Server will be non-operational after an incomplete update.

15.2.1 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 Com-Server 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 inventorying using *WuTility* is not possible. In this case the Com-Server can be manually entered in the inventory list using the menu item *Add device*.

The screenshot shows a 'New Device' dialog box with the following fields and options:

- Description: [Empty text box]
- IP address: 192.168.0.20
- HTTP port: 80
- Ethernet address: 00c03d
- Password: [Empty text box]
- Base Device: 8 . 0
- I/O Module: [Empty text box]
- Product ID: [Empty text box]
- Custom-made: [Empty text box]
- Hardware: [Empty text box]
- Also known as: Com-Server Highspeed (dropdown menu)
- Software: [Empty text box]
- Buttons: OK, Cancel, Edit all (checked)

Enter the IP address of the Com-Server in the corresponding entry field and check the option *Edit all*. Under *Also known as...* select the hardware family of the device:

Click on *OK* to close the dialog box. The device is added to the inventory list.

?	00c03d:000000	192.168.0.50	Com-Server 10BaseT	?
---	---------------	--------------	--------------------	---

Manual initializing of the update process

For security reasons the Com-Server must first be initialized for receiving new firmware. This initializing is done using a password-protected TCP connection to port 8002. If this port is blocked by a firewall for example, the Com-Server can instead be prepared for receiving the firmware 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 Com-Server. At the same time all network services (including PING) with the exception of the TFTP server are stopped. A return to standard mode is only possible by sending firmware or performing a hardware reset of the Com-Server.

15.3 Incomplete and interrupted updates

The Com-Server 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 Com-Server must be manually added to the WuTility inventory list for this purpose. For details, see the previous section.

Appendix

- Overview of the port numbers
- Example: Serial assignment of the IP address under Windows
- Technical Data


Used ports and network security

The port numbers factory set in the Com-Server:

Port number	Application	Password protection?	Configurable?
8000 (TCP)	Socket server Port A	nein	ja
1111 (TCP)	TELNET Configuration port	ja	ja
9094 (TCP)	Controlport Port A	ja	ja
9084 (TCP)	Reset Port Status Port A	ja	ja
8888 (TCP)	Reset Com-Server	ja	ja
8002 (TCP)	Initialize Firmware-Update	ja	ja
8003 (TCP)	Read configuration data	ja	ja
8004 (TCP)	Write configuration data	ja	ja
8513 (UDP)	Inventory	nein	ja
161 (UDP)	SNMP	ja	ja

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 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 Com-Server. If differing numbers are used for changeable ports, be sure that these are not assigned in duplicate.*

The Com-Server 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 Com-Servers. 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 Highspeed Com-Servers 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 Com-Server 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**

(see section on *SNMP management*)

In order to be able to incorporate the Com-Servers 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**

(see section on *Inventorying via UDP*)

Like all intelligent components from W&T, the Com-Servers 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 of the Com-Servers*)

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

- **Reading/writing the configuration data**

(see section on *Up-/Download of the configuration data*)

The *WuTility* tool as well as a customer's own applications can be used to read from and write to Com-Servers. Both of the TCP ports 8003 and 8004 used for this are protected by the system password.

- **Com-Server Reset and Port Reset**

(see section on *Reset Com-Server-Port* and *Reset the Com-Servers*)

The TCP ports 8888, 9084 allow for resetting of fixed modes of a port and for fully resetting the Com-Server. All the ports are not configurable and are protected by the system password.

- **Controlport**

(see section on *The Control Port*)

The TCP control ports (factory defaults 9094) allow the COM port redirector as well as a customer's own applications to configure the serial transmission parameters and control lines of the individual serial ports on a Com-Server. All ports are protected by the system password.

Serial assignment of the IP address under Windows

Serial assigning of the IP address and even the subnet mask and gateway address can be done using the free mini-terminal program „Easyterm“, which has been optimized especially for this task. Alternately of course you can use any other terminal program such as that included with Windows or Hyperterminal as described here.

Easyterm

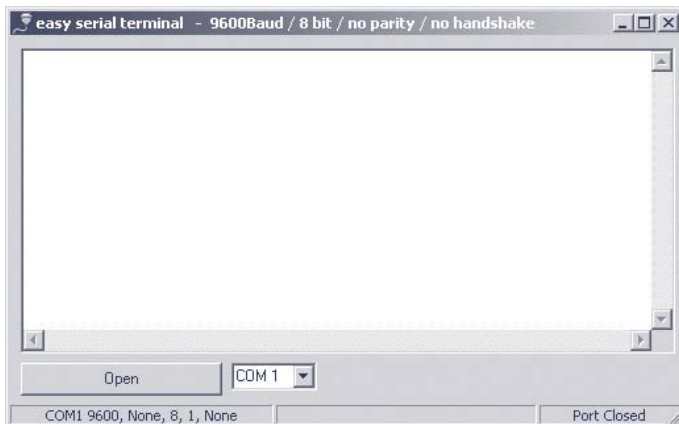
The most current version of the tool can be downloaded from our Web site at <http://www.wut.de>.

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

Downloads -> Com-Server

path to get to the menu branch containing a direct download link for the tool.

After starting the program, you must simply select the COM port the Com-Server is connected to from the lower pull-down menu and then click on the Open button. All serial transmission parameters are already preset.



Now turn the Com-Server on and off to reset it and while it is starting up hold down the „x“ key (lower case, no Caps Lock!). After about 2-3 seconds the prompt *IP no.:+<ENTER>*: will appear in the terminal window.

Now enter the IP address you want to assign in the usual dot notation (e.g. 172.17.10.10). There will be no immediate echo of characters, so the individual inputs will not be seen on the monitor. Only after you have pressed Return to confirm is the completely entered IP address returned by the Com-Server.

Each separated by a comma, this method can also be used to assign subnet mask and gateway address.

Example 1

Assigning only the IP address:

```
172.15.222.5 <ENTER>
```

Example 2

Assigning IP address, Subnet Mask, Gateway:

```
172.15.222.5,255.255.0.0,172.15.222.1 <ENTER>
```

Example 3

Assigning IP address, Subnet Mask, Gateway and activating Web Based Management on TCP port 80:

```
172.15.222.5,255.255.0.0,172.15.222.100+80 <ENTER>
```



To avoid unintended changes to the IP address, the DHCP client of the Com-Server is automatically deactivated when configuring using the serial port.

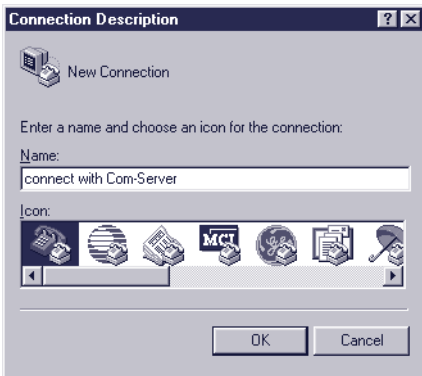


If you have made improper entries or typing mistakes, the Com-Server will return FAIL followed by its actual current IP address. The procedure must then be repeated.

Hyperterminal

To serially assign the IP address you can also use Hyperterminal, which is bundled with Windows. Start this procedure under *Start → Programs → Accessories → Hyperterminal*.

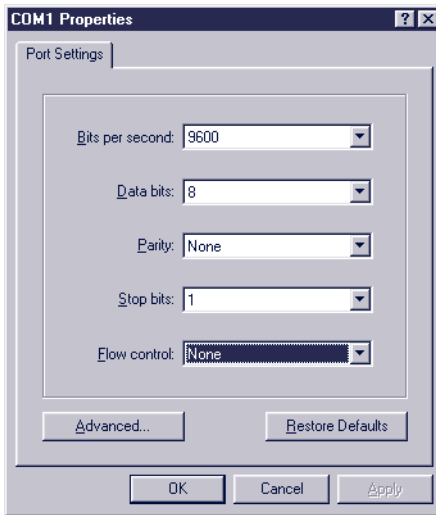
- 1.) In the first window you assign a name for the connection you wish to build. this allows you to directly start Hyperterminal with the correct transmission parameters the next time you want to assign an IP address:



2. In the lower selection box of the following window please select only the COM port to which the Com-Server is connected.



- The transmission parameters are 9600 baud, 8 data bits, no parity, no protocol:



- After you have confirmed the settings with OK, you will find yourself in the actual terminal window. All keyboard entries are output through the selected COM port. Now turn the Com-Server on and off to reset it and while it is starting up hold down the „x“ key (lower case, no Caps Lock!). After about 2-3 seconds the prompt *IP no.:+<ENTER>*: will appear in Hyperterminal.
- Now enter the IP address you want to assign in the usual dot notation (e.g. 172.17.10.10). There will be no immediate echo of characters, so the individual inputs will not be seen on the monitor. Only after you have pressed Return to confirm is the completely entered IP address returned by the Com-Server.



To avoid unintended changes to the IP address, the DHCP Client of the Com-Server is automatically deactivated when configuring using the serial port.

WuTility - Inventory and management tool

In Windows environments the WuTility Tool can also be used for inventory and management of Com-Server installations. Pressing a button lists all the Com-Servers located in the local network together with their key data. Following are the most interesting functions which can be run directly from the list:

- ✓ Assigning the IP address, even if the currently set address does not fit in the local network
- ✓ Copying of entire configuration blocks from one Com-Server to any other
- ✓ Creating and archiving configurations
- ✓ Firmware updates

Where do I obtain this tool?

The latest version is always published on our Web pages at the following address:

<http://www.wut.de>

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

Downloads -> Com-Server

path to get to the menu branch containing a direct download link for the tool.

Hardware-Reset to factory defaults

In addition to resetting the Com-Server to its factory defaults using the Telnet configuration (Port 1111), this can also be done via hardware. For this purpose all models have two adjacent jumpers on the board. For normal operation these jumpers must be out. To set the factory defaults, proceed as follows:

- Power off the Com-Server and open the enclosure
- Insert *both* jumpers and reconnect the supply voltage. An internal self-test will be performed during which messages will be issued on serial port A. The Fail message 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 Com-Server, open both jumpers and close up the housing again.

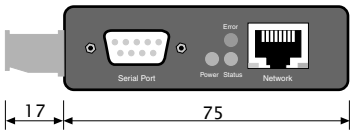


Resetting the non-volatile memory results in a loss of all the settings which are different from the factory defaults, including the IP address.

Technical data and formfactor model 58661

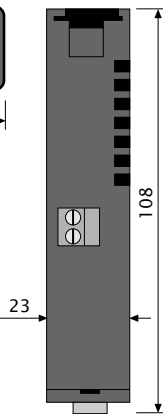
Supply voltage ... Power-over-Ethernet External supply...	37 - 57V DC from PSE
... DC	24V - 48V (+/-10%)
... AC	18Vrms - 30Vrms (+/-10%)
Current draw	typ. 55mA @24V DC PoE Cass 1 (0,44-3,84W)
Permissible ambient temperature storage	-40 ... +70°C
... operating	0 ... +60°Cv
Permissible relative humidity	0 - 95% (not condensing)
Network	10/100BaseT, RJ45 for STP cables
Galvanic Isolation	Network: min 1,5kV rms
Dimensions	approx. 105 x 75 x 22mm
Weight	approx. 150g
Serial ports	1 x RS232/422/485 configurable, DB9/Male
Baud rates	50 to 57.600 kBit/s
Data formats	7, 8 Data bits, 1, 2 Stop bits, NO, EVEN, ODD Parity
Flow control	Hardware-Handshake or Xon/Xoff protocol

Front view 58661



Measure in mm, +/-1mm

Bottom side 58661



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