User Manual
NetCom Mini

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VS
com

Tel: +49 40 528 401 15
Fax: +49 40 528 401 99
Web: www.vscom.de
Support: service@vscom.de

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1 Overview

The NetCom Mini Serial Device Servers are designed to remotely operate serial ports over networks. The network interface is implemented as 100 Mbit/s Fast Ethernet. The transport is implemented via TCP/IP protocols. Therefore control is available via Ethernet, Intranet and Internet.

The supplied driver software for Windows operating systems implements virtual serial ports, which hide the network transfer from your applications. Software applications using standard COM ports need no change to operate via NetCom Mini through the virtual serial ports. The Manager software detects NetCom Mini servers in the LAN, and manages the installation of the serial ports.

2 Introduction

This manual covers the NetCom Mini devices. The devices come with a case well suited for industrial environments. Metal cases provide DIN Rail mounting, the lightweight plastic cases allow very easy mounting, or do not need that at all.

The NetCom Mini supports high serial speeds up to 115 kbps. The serial port provides communication via the common RS 232 mode. In a LAN the NetCom Mini announce their presence by UPnP, so use is possible even in non-Windows systems. The NetCom Mini are designed for possible compatibility with other products.

2.1 About this Manual

This manual covers many configuration options of the NetCom Mini Serial Device Server. The vast majority of these are set by software, sometimes in alternatives methods. To emphasize these in the text, special character styles are used.

Slanted	is used for text and names displayed by the software.
`Typewriter`	is used for sample input provided by the user.
Bold Face	is used for names of hardware components.

The version of the firmware described in this manual is 1.0.1, covered together with driver 1.0.24.

2.2 Features

- Single power supply
  DC 5V, 200 mA, supplied via Jack

- Ethernet 10/100BaseTx for auto-configuration

- Serial port interface: RS 232

- Max. 115.200 bps

- Control by RFC 2217 or TCP Raw mode

- TCP/IP configuration fixed, by DHCP or AutoIP

- Easy remote configuration via HTTP

- Drivers for Windows™ systems

- Documented interface for every networked operating system

2.3 Product Specifications

Most of the hardware characteristics are common for all models. However some must differ from model to model, they are shown in dedicated sections.

2.3.1 Common characteristics

Processor	ARM7 SoC
Ethernet connector	RJ45 10BaseT/100BaseTx
Serial connector	DB9 male
Serial ports	$1 \times RS232$
Serial signals	TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND
Serial LED	TxD is Green, RxD is Yellow
Serial Speed	110 bps up to 115.2 kbps
Parity	None, Even, Odd, Mark, Space
Data bits	5, 6, 7, 8
Stop bits	1, 2 (1.5 with 5 data bits)
Protocols	TCP/IP, UDP, DHCP, ICMP, ARP, Telnet, RFC2217, HTTP, UPnP
Driver software	Windows XP up to 7/2008 R2
Management	Web browser
Management software	Driver installation software, UPnP Manager
Power requirement	DC 5V, 200 mA
Power connector	6 mm Jack
Operating temp.	0°C to 70°C
Storage temp.	-20°C to 90°C
Approval	CE, FCC

Table 1: Common Specifications

2.3.2 NetCom Mini

Case	SECC sheet metal (1mm)
Dimensions	56×66×22 mm³ (W×D×H), 81×72×23 mm³ with connectors
Weight	150 g

Table 2: Special Specifications NetCom Mini

Figure 1: NetCom Mini Top and Front Side

2.3.3 NetCom Mini P

Case	Molded plastic
Dimensions	45×82×26 mm³ (W×D×H), 45×85×26 mm³ with connectors
Weight	70 g

Table 3: Special Specifications NetCom Mini P

Figure 2: NetCom Mini P Top and Front Side

2.4 Packing List

- NetCom Mini Serial Device Server

- Power supply 5V 800 mA

- CD-ROM with driver and configuration software

- Quick Installation Guide

3 Hardware Description

This section focuses on the options provided by the hardware of the NetCom Mini Serial Device Server.

3.1 Signal Assignment

It is of course important to know the exact location of the serial signals in the configured mode. Here is the table for the **Serial** DB9 male connector. For RS 232 the assignment is the same as on any PC (Com1/2). This is of course because RS 232 also specifies the connectors.

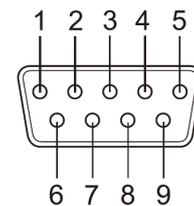| Pin	1	2	3	4	5
RS 232	DCD	RxD	TxD	DTR	GND
Pin	6	7	8	9	
RS 232	DSR	RTS	CTS	RI	

Table 4: Signals DB9 male

Figure 3: Connector DB9 male

3.2 Serial LED

Two LEDs show the status of the serial lines for data. A Yellow LED is responsible for **RxD** (Receive), while a Green LED is assigned to **TxD** (Transmit). When data is transported on transmit or receive line, the LED flashes, otherwise it is dark.

During the start of NetCom Mini these LED also show status information, see 3.4 and 3.5.

Yellow LED	Green LED	Status
Normal Boot Process		
Off	On	Device is powered, firmware starting
On	On	Blink on Yellow
Off	Off	Short dark
On	Off	Firmware is ready
Factory Reset		
Off	On	Device is powered, firmware starting
On	On	Factory Defaults are configured now
Off	Off	Short dark
On	Off	Firmware is ready with Defaults
Bad Firmware		
On	Off	Firmware corrupt, expects update
Normal Operation		
Flashing	—	Receiving RS 232 data
—	Flashing	Transmitting RS 232 data

Table 5: Serial LED Functions

3.3 Network

The NetCom Mini connects to Ethernet. The **LAN** connector for Ethernet is the usual RJ45. Simply connect it to your (switching) Hub. A direct connection to your computer requires a cross-over cable.

LEDs for Ethernet function are embedded into the RJ45 network connector. When the connect is done the Link LED on NetCom Mini (yellow) will light. When data traffic occurs on the network, this LED will blink. It depends on your network whether a 100 Mbit or a 10 Mbit connect will be established. A 100 Mbit net causes the Speed LED on NetCom Mini (green) to light, otherwise it will remain dark.

Yellow LED	Green LED	Status
Off	Off	No connection
On	Off	10 Mbit connection established
Blink	Off	10 Mbit data transfer (traffic)
On	On	100 Mbit connection established
Blink	On	100 Mbit data transfer (traffic)

Table 6: Ethernet LED Function

3.4 Power Supply

The NetCom Mini device is powered by a single 5V DC power supply, it requires up to 200 mA at boot time. A suitable power supply adapter is part of the packaging. Connect the cable to the **DC-IN** power jack on NetCom Mini, and put the adapter into the socket. The NetCom Mini will start the firmware.

Pin	+5V DC
Mantle	GND

Table 7: Power Jack

Figure 4: Power Jack

The boot process is signaled using the two LED for serial **TxD** and **RxD**. First Green lights, to show the device has power. Next the NetCom Mini configures the network interface. Depending on the actual configuration this may take some time, up to 90 seconds. After that time Yellow blinks twice, with the second blink Green gets dark. When this sequence is finished, the two LEDs change their function to reflect the state of the serial lines as **TxD** and **RxD**. Usually this means they get dark after boot.

3.5 Reset Button

This **Reset** button is inside the case, and shall be pushed with a small pin-like tool, a bent paper clip will do. A short press of this button just restarts the firmware, to help when somehow the device is no longer accessible.

A long press (press and hold five seconds) of the **Reset** button will cause not only the firmware to restart, but also to load the Factory Configuration prior to restart. This is also signaled with the two LED for serial **TxD** and **RxD**. When the button is pressed Green lights. As soon as the firmware detects a long press of this button, Yellow will light also. Release the button at this time. When the parameters are loaded and the firmware is ready, both LED get dark. Then Yellow blinks once to signal the ready state, finally both LED resume their function as state of the serial lines **TxD** and **RxD**.

A very long press (more than 10 seconds) will start the process of firmware update. This is also signaled by the LED (see 3.2). When only the yellow LED is on, release the button. Follow the instructions about Firmware Update in section 4.5.5.

4 Windows Virtual Com Driver

This chapter covers the use of NetCom Mini Devices via Virtual Com Ports installed by the supplied driver software for Windows. This first part here is for quick installation, so only the common options are covered. Further assumptions: Windows and the NetCom Mini are in default configuration, and all NetCom Mini in the local network shall be used for Virtual Com Ports.

4.1 First Time Installation Procedure

Before starting installation, it is essential to have an IP configuration ready for the NetCom Mini Device to install. You may read the TCP/IP Description (section 6) below. The default configuration is based on automatic IP Assignment, which is fine in many networks. If in doubt, please ask your Network Administrator for help.

The following description is based on Windows XP Professional, with Service Pack 3 installed. The installation on other configurations of Windows is similar. The installation of drivers is described first. This is followed by a procedure to verify a correct installation. The last part of this section is about the uninstall or update processes of drivers and tools.

Drivers are provided for Windows XP up to Windows 7 and Windows 2008 R2. There is one Installation process for both the x86 and x64 Editions, the correct drivers are selected automatically.

4.1.1 Start the Installation Wizard

This is the Installation Wizard, it is named NCMini-Install-7z.EXE. The '7z' is used, because it uses the tools from 7-zip to create a Self-extracting Installation package. You'll find the installer on the CD-ROM shipped with the NetCom Mini. The latest version is also available on the Internet. Start this program to install the drivers.

Figure 5: Installation Wizard

First of all a document is opened with latest information about the installation process. You may read and close the document at any time. Simultaneously the Driver Installer is started.

Figure 6: NetCom Mini Driver Installer

The installation program just allows to install the drivers or terminate the process. Of course the option to *Install* is the required choice.
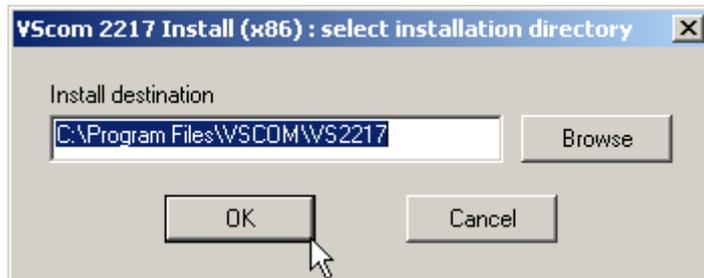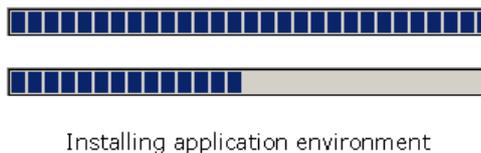

Figure 7: Start Driver Installation

A target folder for a file copy is requested. The tools and driver files are installed here. The tools will appear in the Start Menu, so a sub-folder of your Program Files is suggested. Just click the *OK* button.

Figure 8: Copy Driver Files

Some files are copied to your hard disk, this is the usual process similar to other Windows installations. The upper bar increases with the progress of each step performed in the installation process. The lower bar illustrates each step performed until full installation is finished.

At this time the drivers are installed to the system, but no serial port is added. This job is controlled by the NetCom UPnP Manager. The Installation package advances from the Installer to the Manager.
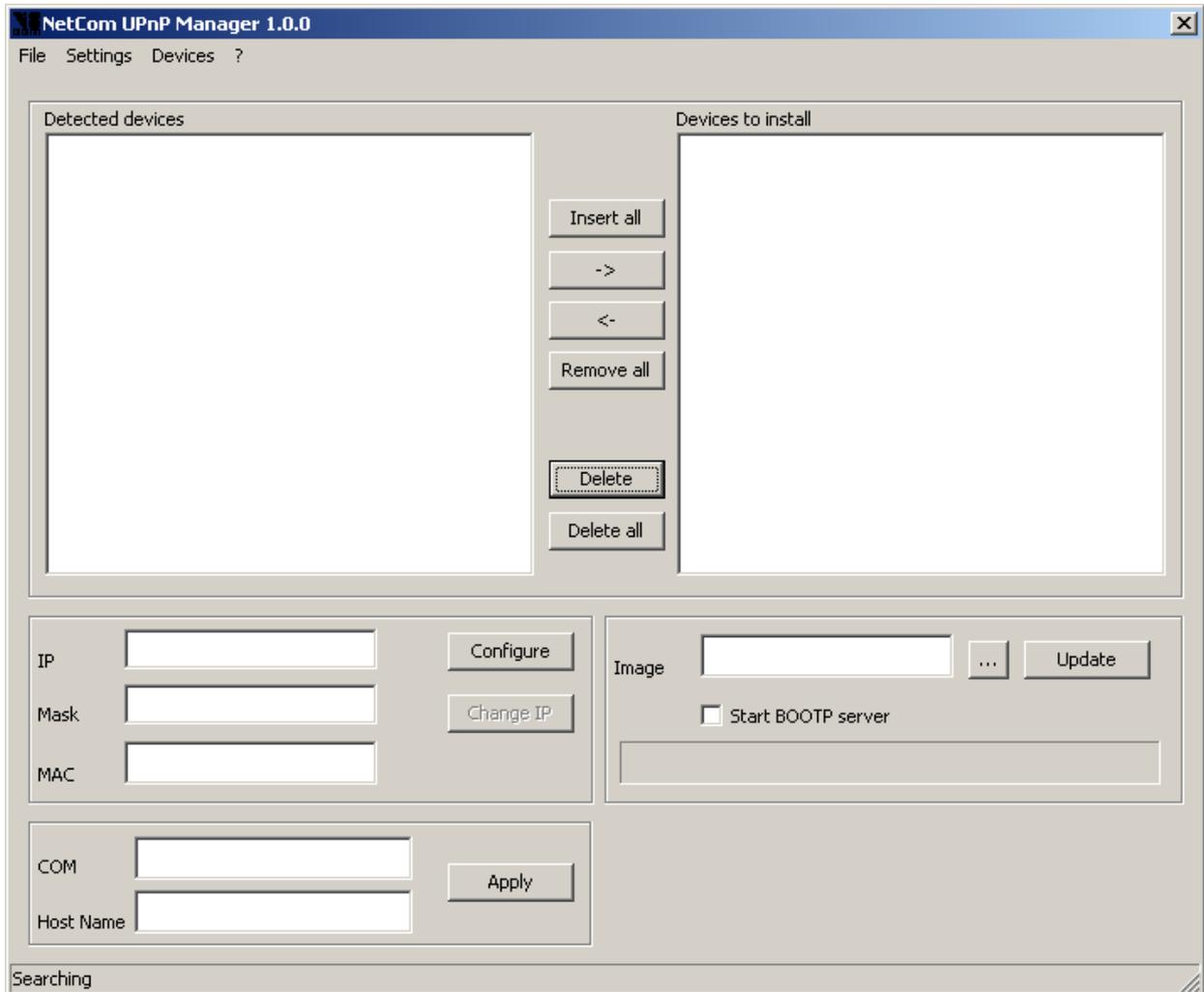

Figure 9: NetCom UPnP Manager

The NetCom UPnP Manager searches for NetCom Mini devices in the local network, it may take up to a minute until detecting all of them. During first installation all detected devices are configured for installation of a Virtual Com Port. So as soon as they are detected, they appear in the right window.

Now go to the Menu line, and select *Devices⇒Install*.
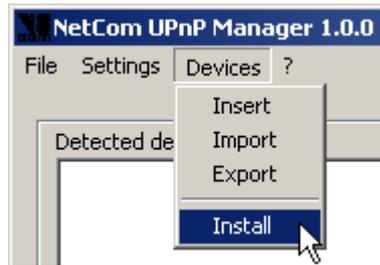
Figure 10: Invoke Installation

This option starts the Configurator program, which in turn installs the new Virtual Com Ports in the system. Finally the ports appear in the Device Manager (see figure 12).

4.2 Verify the Installation

In the Start Menu you'll find the new program group *VScom RFC 2217*. The installed programs are the Net-Com UPnP Manager, the Driver *Repair* program, the *RFC 2217 Configurator* and an option to *Uninstall* the software.

Figure 11: VScom drivers in the Start Menu

In the Device Manager the serial ports are listed in the usual section *Ports*. All installed NetCom Mini Devices are listed herein. The available options are described later.

Figure 12: NetCom Mini in Device Manager

4.3 Update the Drivers and Tools

To update the drivers and tools to a new version, simply start the Installation process. It will detect the existing older driver software, and present an offer to *Update*.
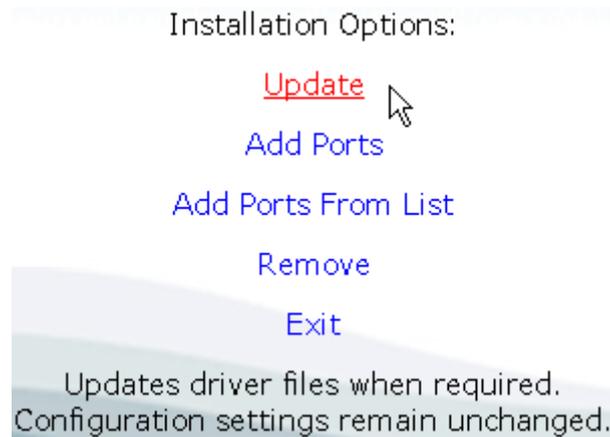
Figure 13: Driver Update

The other options are explained in the later section .

4.4 De-Installation

To remove a Virtual Com Port from the system, simply uninstall it from the Device Manager. To remove all the ports and the drivers from the system, use the *Uninstall* entry in the Start Menu.
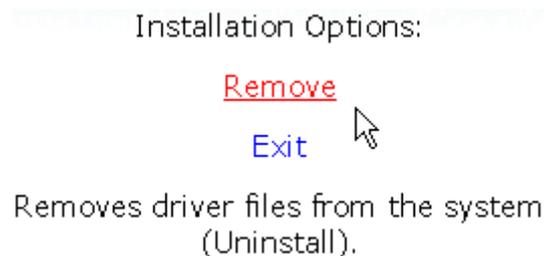
Figure 14: Driver Remove

Click on *Remove* to remove all Virtual Com Ports from the system. Further all installed driver files and applications are removed.

4.5 The NetCom UPnP Manager Software

For most of the required changes in the system configuration the supplied NetCom UPnP Manager is the ideal tool. This tool detects NetCom Mini devices in the local network. It also manages a database of devices, either automatically detected or defined by the user. Usually the second case happens when the network connection has to pass some Routers, which is the situation for

devices controlled via Internet. The Manager provides the option to change the configuration of the detected devices, and to install the serial interfaces as Virtual Com Ports.

Finally the NetCom UPnP Manager offers the option to update the firmware of NetCom Mini devices to a new version.
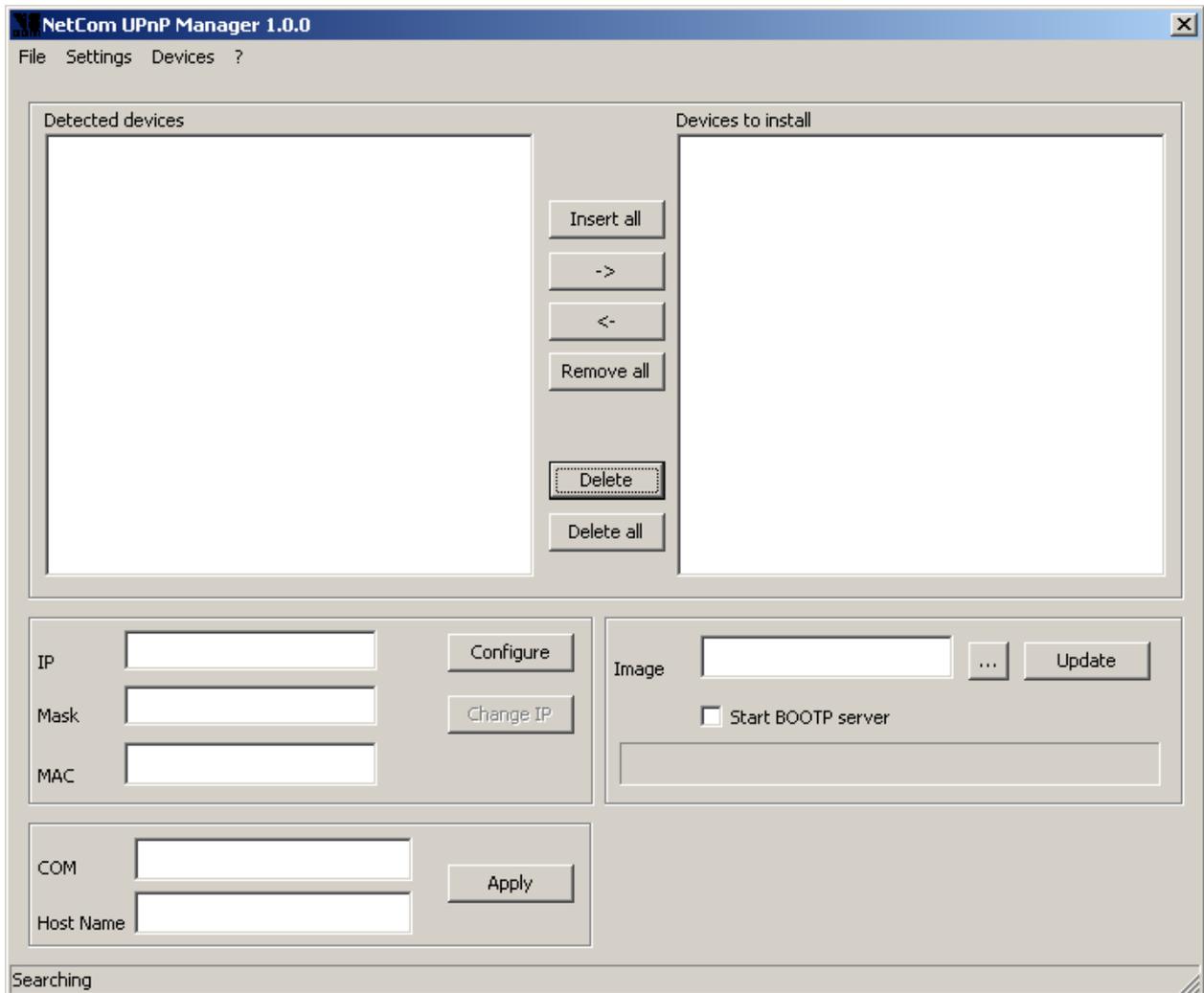
Figure 15: NetCom UPnP Manager User Interface

The left pane displays the NetCom Mini devices, which are known to the NetCom UPnP Manager. Devices discovered by UPNP first appear in the left. The user selects from these devices, and shifts them to the right pane. The right pane represents the NetCom Mini devices which shall be installed as a Virtual Com Port.

4.5.1 Device Discovery

The NetCom Mini devices use the protocol known as Universal Plug and Play or UPnP to make their services available on the network. UPnP enabled devices announce their presence by sending out certain data packages at regular intervals. Windows has the capability to receive these data, and interpret them. Also the NetCom UPnP Manager listens the network to detect those significant

data packages. It does so on its own, so it does not depend on the enabled Windows support for UPnP. Also it does not interfere with the Windows capabilities, it does not matter if Windows support is enabled or not.

The NetCom UPnP Manager receives the data from all UPnP devices in the network, and filters them to detect the NetCom Mini servers. Those will be shown with a green icon, also giving the serial number of the device.

Figure 16: Known NetCom Mini icon

The name is defined by the user. If the NetCom Mini is installed as a Virtual Com Port, the icon changes to blue color. Red is the third possible color. The icon becomes red, if for any reasons the device can not be contacted for configuration right now.

4.5.2 The Menu

The menu line presents four entries: _File_, _Settings_, _Devices_ and _?_.

4.5.2.1 File   is used to handle the current configuration data base and to exit the NetCom UPnP Manager program.

Reload discards all changes to the configuration since the last program start or saving of the configuration. It also initializes the check for installed Virtual Com Ports.

Save of course places the current configuration status into the permanent data base.

Save and Exit saves the configuration and terminates the NetCom UPnP Manager.

Figure 17: File Menu

Exit discards the configuration and terminates the NetCom UPnP Manager.

4.5.2.2 Settings   controls the way the NetCom UPnP Manager program operates.

Locate Data Bases defines the locations and the names of the two important databases of the NetCom UPnP Manager program. The default position is the directory where the program is installed.
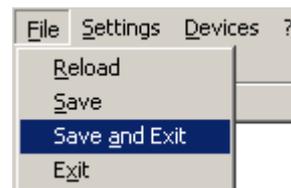

Figure 18: Settings Menu

The upper file is the "memory" of the NetCom UPnP Manager, all known Net-Com Mini devices are stored here. The lower file contains the list of devices to install Virtual Com Ports. This file is later used by the Installer to add the ports.

Figure 19: Data Base Files

4.5.2.3 Devices handles the NetCom Mini devices and their installation as Virtual Com Ports. In some installations it is not possible to automatically detect all NetCom Mini using UPnP, e.g. when the network connection is established via Internet. In such environments the user has to define the parameters of the NetCom Mini devices himself.

Insert is used to manually define the connection to a NetCom Mini device. Required is the IP Address and the TCP port used for RFC2217. Additionally the MAC Address and the Serial number of the device is required. Neither the NetCom UPnP Manager nor the driver software checks these parameters for semantic correctness, but both of them must be unique. So it is highly recommended to enter the correct values. The Host Name is optional, it is a convenient name for the IP Address.

Figure 20: Devices Menu

Import is also for external definition of NetCom Mini devices. Instead entering manually a long list of parameters, these values come from a text file (in CSV format). This file may define several devices at once, all are added to the list of known devices.

Export instructs the NetCom UPnP Manager program to save the list of desired Virtual Com Ports to the defined data base (see 4.5.2.2). This list is used by the Installer to create the Com Ports.

Figure 21: Manually Insert a NetCom Mini

Install first exports the device list. Then it starts the Installer and instructs it to create the Com Ports.

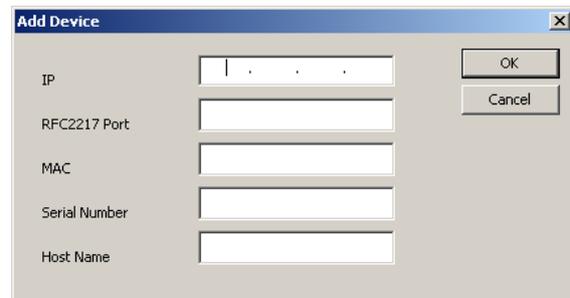**4.5.2.4 ?**   provides some information about the NetCom UPnP Manager program.

Figure 22: Information Menu

Legend displays the possible colors of the icons, and basically explains them.

About provides version information about the NetCom UPnP Manager program.

4.5.3 Installation of Virtual Com Ports

The two panes with the column of buttons in between them is the main area of configuration. The left pane lists all the detected NetCom Mini devices. The word "detected" not only includes devices detected by UPnP, but all known devices. These may be defined manually or by a list. Other known devices have been detected the last time NetCom UPnP Manager was run but are not re-detected until now.
The right pane represents all NetCom Mini devices selected for installation of a Virtual Com Port.

To install Virtual Com Ports for these devices the first step is to select and move the given entries from the left to the right pane. The movement can be done by drag&drop, or using the arrow buttons. All items may be moved at once from left to right using the button *Insert all*, while the *Remove all* button sends all entries from the right to the left pane.

The button *Delete* eliminates the selected entry from the data base of the NetCom UPnP Manager. If they are still active sending UPnP information the device will appear again in short time. Obviously the button *Delete all* performs the same job for all entries in both panes.

To actually install the desired Virtual Com Port use the Menu entry of *Devices→Install* (see 4.5.2.3). This starts the process of integration in the Device Manager. When this process is finished the icons in the right pane will turn to blue color.
Later starts of NetCom UPnP Manager with a changed list of ports to install will change the system configuration. Newly selected ports are added to the system, already existing ports get updated parameters or aren't touched at all. Finally devices removed from the list in the right pane have the associated Virtual Com Ports removed from the Device Manager.

Before installing the Virtual Com Port, the user may define the target Com Port for the device. The edit field named *COM* accepts the number. It is the responsibility of the user to avoid conflicts. In general it is recommended to accept the value selected by Windows.
Also a *Host* name can be provided here. This is useful for devices connected to via Internet, when the targets IP Address changes on occasions. Special tools (not provided yet) can check the current IP Address against the configuration in the system, and update the parameters.
Click the button *Apply* to assign the values to the entry in the pane. These parameters are saved to the system when the Virtual Com Port is installed.

4.5.4 Basic Configuration of NetCom Mini Devices

The network and other configuration of NetCom Mini devices is done using a web browser (see sections 5 and 5.3.2). For this operation the NetCom UPnP Manager provides an option to open the web browser with the required destination. Select the entry in the left or right pane, and click the button for *Configure*. When the configuration in the web browser is finished, typically the NetCom Mini device restarts. In any case, the new configuration information is announced by UPnP, so the NetCom UPnP Manager will receive and display this.

There is one possible problem, which happens in rare configurations. It may be impossible to open a TCP connection to the device. As consequence it is not possible to start an HTTP data transfer, so this configuration is not available. This happens when the IP Address of the device does not match the configuration of the computer. This situation is shown with the icon in red color. Then also the button *Configure* is disabled, i.e. in gray color. Instead the button *Change IP* is enabled now.

Figure 23: Configure IP Address

The NetCom UPnP Manager can handle this situation as well. Select the red icon, and enter a suitable IP Address and netmask in the appropriate fields. The MAC Address is already placed in the edit field. Then click the button *Change IP*. This will send a special message to the NetCom Mini device. It will temporarily change its IP configuration to the values given here. At the same time the NetCom UPnP Manager opens the web browser with the temporary IP Address. Change the configuration of the NetCom Mini to the intended parameters (e.g. enable the DHCP option), and save them.

4.5.5 Firmware Update

As the last available function the NetCom UPnP Manager program can update the firmware of a device. Firmware update is only possible in the local network. Technically it is the Ethernet Broadcast Domain.

First select the NetCom Mini to receive an update, by just clicking on it. Then use the button for *Configure* to open the browser. In the web browser click on the menu entry of *Firmware Update*.

The firmware update page presents the instructions to perform the process of sending the new software. The first two steps have already been done when you followed the instruction. Now change back to the NetCom UPnP Manager program, and select the new firmware file. Either type the name direct (e.g. `ncm_v101.bin`), or click the ellipsis button ... and select the new firmware. Then click the *Update* button, and change to the web browser. Now in the web browser click the button for *start update*, and the process begins. The progress can be monitored in the NetCom UPnP Manager program.
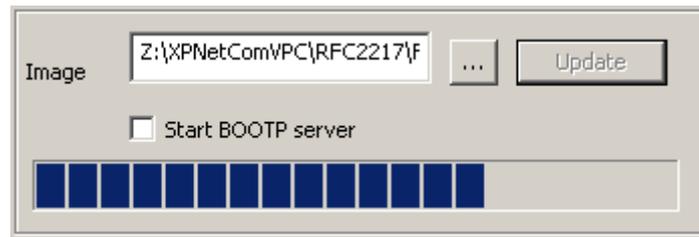
Figure 24: Firmware Update in Progress

4.5.5.1 BOOTP   For updating the firmware the NetCom Mini must have an IP address matching the configuration of the computer. Normally this is done by a DHCP server in the local network. If such a server is not available, the NetCom UPnP Manager program provides a special subset of this function.

Enable the checkbox for *Start BOOTP server*. Further enter a suitable configuration into the parameters *IP*, *Mask* and *MAC*. When the NetCom Mini requests an IP Address, the NetCom UPnP Manager receives the request. Since it comes from the configured MAC Address, it sends out the given IP Address and netmask. The NetCom Mini will either use these parameters, or those given from an existing DHCP server. The update process will continue.

5   Configure the Device

The NetCom Mini Servers are configured using a web browser with Java Script enabled. The address to enter into the browsers URL line is the IP Address of the device. So users need a tool to find this parameter.

5.1   Detect the Device

The NetCom Mini Servers use the UPnP protocol to announce their presence on the network. In Windows systems you can enable this function to find all UPnP enabled devices. There is a separate (short) instruction on how to do this, please open the UPnP Activation manual. The NetCom Mini Servers are displayed, a double click will start the browser for configuration. Also the IP Address is displayed along with the relevant TCP port number.

This UPnP process is functional as long as the IP configuration of the computer and the NetCom Mini match, i.e. communication via TCP or PING is possible. Such is always given when the NetCom Mini is in default configuration[1], and the PC gets its IP Address automatically. Since this is the situation in the vast majority of installations, you typically can skip the next paragraphs.

However some systems use a fixed IP configuration, without a DHCP server available on the network. Then the NetCom Mini also has to use a fixed IP Address matching the network. Since this first requires possible contact for setup, the PC must temporary use a different configuration. Most easy is to use an automatically received IP Address as the NetCom Mini does, this is suggested. Alternatively an unused IP Address like 169.254.0.* can be assigned to the PC.
Other options are to use a crossover Ethernet cable between NetCom Mini and the PC, or configure the NetCom Mini before connecting it to the network.

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[1]Read 3.5 on how to recall this

5.1.1 UPnP Limitation in Windows

Rarely there are configurations where Windows does not automatically detect and display the device. These happen when the IP configurations of the computer and the device do not match. Then Windows can not ask for extended device information, so Windows will not show it.

With NetCom Mini this will happen when the NetCom Mini has a non-matching fixed IP Address, or the computer has a fixed IP Address not matching the parameters supplied from a DHCP server. The second situation also occurs in the absence of a DHCP server. To solve problems like these the NetCom UPnP Manager has special capabilities to detect and configure the NetCom Mini device. See section 4.5.1 to learn the procedure.

5.2 Accessing to Configuration

Open your favorite web browser, and enter the IP Address as the target location. To avoid any confusion you should precede it with http://, so your browser has definite target information. Most browser programs do not need that. When you double-click the Icon in the Network Places, Windows appropriately opens the browser.
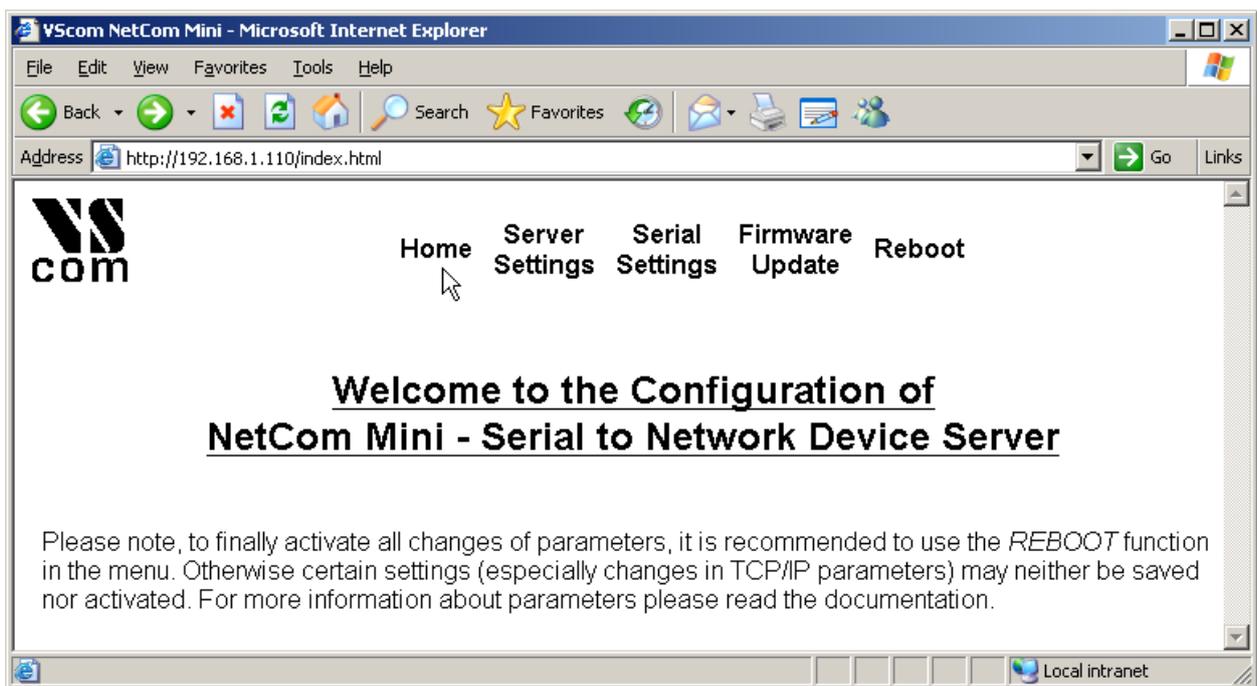Your browser should not suppress images, and it must support Java Script.

Figure 25: Configuration Menu

The NetCom Mini welcomes you with its *Home* screen. To access the different options of configuration, the items above function as a link. Some settings require a reboot to save and activate them.

5.3 Server Configuration

In your web browser click on the Icon of *Server Settings*, the browser opens the basic server information, the server parameters related to the IP Configuration, and the option to restore the Factory Defaults.

5.3.1 Server Info

Server Info

Server Type	111S
Software Version	1.0.0
Hardware Version	1.0
Serial Nr.	280100002

Figure 26: Server Information

Information about the selected NetCom Mini is displayed. Starting with the *Server Type*, this is the model of the NetCom Mini , followed by the *Software Version* and *Hardware Version*. The *Serial Nr.* is important to identify the device you are configuring right now.

5.3.2 Server Parameter

This is where the NetCom Mini is configured to operate on the network. The *Server Name* is for information only, some tools my represent this device by the given name. The value of `VScom_280100002` is just an initial value based on the Serial Number.

Server Parameter

Server Name	VScom_280100002
MAC Address	00-04-D9-80-C7-3E
DHCP	Enabled
IP Address	192 . 168 . 1 . 110
Netmask	255 . 255 . 255 . 0
Gateway	192 . 168 . 1 . 1
UPnP Port Number	6432
Internet Connection	☐

Save

Figure 27: Server Parameter

The *MAC Address* is the hardware address of the device. It must be worldwide unique, so there is no option to edit it.

In Factory Configuration the *DHCP* function is `Enabled`. This function not only refers to strict DHCP, instead it automatically assigns an IP Address. First NetCom Mini searches for a DHCP server to receive a configuration. If none is available it uses a mechanism named AutoIP. This will result in an IP Address in the range of 169.254.1.0 to 169.254.254.255, and a Netmask of 255.255.0.0 is configured. This is the same automatic configuration used by Windows computers in the same network. So in most installations communication is initially possible.
With automatic configuration the parameters *IP Address*, *Netmask* and *Gateway* are read-only, and just displayed.

Manual changes of IP parameters are only available with *DHCP* set as `Disabled`. Then enter *IP Address* and *Netmask*. The *Gateway* is required, if there are Routers in the network, otherwise it is empty.

The *UPnP Port Number* is `6432` by default, following the specifications. If for very rare reasons this port must be changed, this is possible.

Internet Connection is an option to optimize performance when NetCom Mini is used via Internet connections. The NetCom Mini attempts to aggregate data to bigger size IP frames for lower bandwidth. This happens on the cost of increased latency. Such optimization usually is not necessary in local networks, so this option is unchecked by default.

When you've changed the parameters as necessary, click on the button named *Save*. The new configuration is stored in non-volatile memory on the NetCom Mini , causing the device to perform a reboot. When changing to a fixed IP Address the browser will reload the page again. After changes to automatic configuration it may be required to detect the device again (5.1).
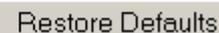
5.3.3 Restore Factory Defaults

Figure 28: Restore Factory Defaults

Restoring by **Reset** Button (3.5) requires physical access. The web interface provides a software option for getting back to the Factory Default configuration.

5.4 Serial Settings

In your web browser click on the Icon of *Serial Settings*. The menu to configure the operation of the serial port appears.

SerialConfig

Baudrate	38400 ▾ bits/s
Manual	38400
DataBit	8 ▾ bits/character
Parity	None ▾
StopBit	1 ▾ bit(s)
FlowType	None ▾
TCP Port	23
Telnet Protocol	RFC2217 ▾
Telnet Timeout	0 seconds (0 for no timeout)
	Save

Figure 29: Serial Settings

When you've changed the parameters as necessary, click on the button named *Save*.

5.4.1 Serial Port

When the NetCom Mini is used via the RFC2217 protocol, the serial parameters are controlled by the application which opened the serial port. The parameters configured here are not used then. Instead the default configuration is defined by RFC2217. If the application in use is the Virtual Com Port Driver in Windows, then the Windows VCOMM API immediately changes to a configuration given in the Device Manager.

Certain installations use a different operation without RFC2217 protocol. Then the serial parameters must be defined via this configuration section. They are saved to the non-volatile memory of the NetCom Mini server.

The *Baudrate* may be selected in a drop-down list of common values, or entered manually. If *Manual* is selected in the list, a value like 125000 my be typed into the respective field. NetCom Mini checks if the configuration is possible, and warns otherwise. *DataBit* per character, *Parity* and *StopBit* are quite usual parameters.

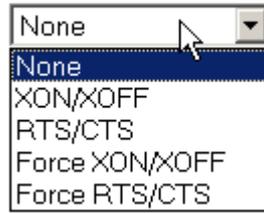The *FlowType* is available as standard configuration.

Figure 30: Flow Control Options

The options are:

None:	No flow control at all.
XON/XOFF:	Software flow control by XON and XOFF character.
RTS/CTS:	Hardware flow control by Signals RTS and CTS.
Force XON/XOFF:	Software flow control even when the protocol disables it.
Force RTS/CTS:	Hardware flow control even when the protocol disables it.

The *Force* options allow to activate flow control, even for older applications which disable it.

5.4.2 TCP Protocol

The RFC2217 protocol basically requires two parameters. First there is the *TCP Port*, the default value is 23 as defined for Telnet. This parameter may be changed according to network requirements.

Further the protocol used for the serial port is defined in the *Telnet Protocol* parameter. By default it is configured as *RFC2217* for enabled remote control. However alternatively it may be used *Raw*, i.e. no protocol added to TCP. All data is sent and received using the configured serial parameters (5.4.1). In Raw mode only data transfer is possible, neither status nor control information can be used.

Finally the *Telnet Timeout* parameter should stay as zero, unless explicitly necessary otherwise.

5.5 Firmware Update

The update of the firmware in NetCom Mini is done via the NetCom UPnP Manager in windows. Please see section 4.5.5 for details on the progress. The NetCom UPnP Manager must be able to automatically detect the NetCom Mini, so it is possible in the local network. Open the web browser for the configuration interface of NetCom Mini, and select the menu entry of *Firmware Update*.

Firmware Update

To update the firmware, do the following:

1. Start the NetCom UPnP Manager on your PC.
2. Select the desired device to obtain its IP and MAC addresses.
   If the device is not available on the list enter the parameters
   given below as the client IP and MAC addresses.
3. Choose the binary file containing the new firmware image.
4. Click "Update" button.
5. Click "Start update" button on this page.

Start update

IP Address: 192.168.1.107

MAC Address: 00-04-D9-80-CF-17

Figure 31: Firmware Update Menu

As a reminder, short instructions are given in the browser for the experienced user, along with IP and MAC Address. These are presented just in case the automatic can not fetch the parameters.

Click on the button *Start update*, so NetCom Mini will accept the commands and data to update the firmware. Once the update is finished, NetCom Mini reboots to start the firmware with clean status. The browser detects when NetCom Mini is available again, and opens the *Home* page.

5.6 Reboot

The *Reboot* function of course restarts the NetCom Mini, and some seconds later reloads the *Home* page into the web browser.

6 TCP/IP Description

TCP/IP is the protocol used on the Internet. Nowadays it is also used in local networks. This opens access to any device connected somewhere to the Internet. But a simple contact like plugging in a cable is not enough. The network has to be configured. Your network administrator is responsible to do that. If any question during configuration, ask him. Configuration means to set certain parameters in any device and computer.

Since IP-configuration is a frequent source of problems, a little bit of theory is provided here.

6.1 Recommended Settings

Basically every device on the LAN has a so-called IP Address. In typical small networks the IP Address is similar to 192.168.X.Y, and there is a corresponding netmask of 255.255.255.0. The X ranges from 0 to 255, while Y is from 1 to 254. The combination of X.Y must be unique in your LAN, i.e. two stations must not have the same configuration.

6.1.1 Static Configuration

All stations on the network have a fixed IP Address. In small networks this is typically of the 192.168-type. To configure NetCom Mini for your LAN, it must have the same 192.168.X as your computer, and the same netmask. So it needs a unique Y to establish communication.

6.1.2 DHCP Configuration

Another typical configuration is the automatic configuration. This requires a dedicated server in the LAN, which serves as a so-called DHCP server. Every device can send a request, the reply is a special configuration for this device on the network. The NetCom Mini Devices support DHCP by default, so just use or activate it.

For best operation the DHCP server itself should be configured. It may identify the NetCom Mini Device by its MAC- or Ethernet-Address. There should be an internal database, to always provide the same IP Address to stations with a given MAC. There are free DHCP server programs available[2] for Windows Operating Systems.

6.1.3 Automatic Configuration (APIPA)

A different type of automatic configuration is used by Windows and some other systems. If a station is prepared for automatic settings, it will search for a DHCP server (see above). But in SOHO networks this server might not exist.

Windows detects this failure, and the computer self-assigns an IP Address. This address is from the reserved LINKLOCAL block for such purposes. The IP Address is like 169.254.N.N, where N.N is from 1.0 to 254.255; the corresponding netmask 255.255.0.0 is mandatory.

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[2]DHCP Server for Windows, TFTPD32

The IP Address is selected by random, and checked if already used. The NetCom Mini Devices support this method. The process ensures the devices get a unique IP Address, and it also attempts to get the same address on the next start of the device.

This is only a workaround. The better solution is to install or configure a simple DHCP server program. Typical SOHO Internet Routers of today already have such a server. Or you may change your network to static configuration.

6.1.4 Other Configuration

If the configuration of your computer differs from these examples, strong reasons are likely. Ask your network administrator for proper parameters in this situation.

7 Glossary of Terms

AES: Advanced Encryption Standard
The successor of the now insecure DES. AES provides strong and modern encryption, with long keys up to 256 Bit (DES used 56 Bit).

APIPA: Automatic Private IP Addressing
A scheme to self-assign an Address to a network device. The device selects an address of the LINKLOCAL range 169.254.1.0 to 169.254.254.255 by random. If this address is unused, it assigns it to itself. Otherwise the next address is tested. It became widespread with Windows 98. The netmask is 255.255.0.0, these addresses are not routed on the Internet.

ART: Automatic Receive Transmit control
Special control for RS 485 modes. In RS 485 the line driver for transmitting must be disabled (tri-stated) when the device does not send data. In a 2-wire configuration this is known as data direction change, with 4-wire it is called line contention.

DHCP: Dynamic Host Configuration Protocol
A service used to retrieve an IP-configuration and optionally much more information from a database server.

FTP: File Transfer Protocol
A common protocol to access a file server.

HTTP: HyperText Transfer Protocol
The protocol used by web browsers to access a web server.

Internet: The net connecting networks
A set of protocols to exchange data between different networks. These information's are carried via a global network of fibers and satellite links.

IP: Internet Protocol
The basic definitions for data packages. These Internet frames are stored and transported embedded in data frames of the local network.

IP Address: Internet Address
The Internet address is noted as a group of 4 decimal numbers (IPv4). Each station on the Internet has a unique address. Some ranges are reserved for private networks, not connected to the Internet.

LINKLOCAL: Address range for private networks
This range 169.254.0.0-169.254.255.255 (Netmask of 255.255.0.0) is reserved for private networks, i.e. not connected to the Internet. Designed for small number of stations, using some automatic configuration scheme. Used with APIPA.

NAT: Network Address Translation
A technique to have a private LAN share one (few) public IP Address(es). With NAT the transport information in IP-frames is replaced by the public data of the NAT-Router.

Netmask: Groups stations to a Net
The AND-operation between the IP Address and the Mask is an important value. When to stations have the same result and the same mask, they are "in the same net". Which means they can communicate direct, without transmitting to a Router.

PAT: Port Address Translation
A technique to share a public IP Address by many internal servers on private addresses. The target address and port is replaced with values stored in an internal table. Mostly used together with NAT.

Router: Transmits data over the Internet
The backbone devices of the Internet. Routers connect two networks together. On one side they receive data frames containing IP-data. They extract these data, and send them on another side; there also stored in data frames of the second network. Typically they connect more than two networks. The basic task is to decide which route the IP-data must take now.

RS 232/V.24: common serial transmission
Characters are sent as separate bits, timing is well defined. The medium is copper cable, using typical +/- 12 Volt. Each signal is defined related to a common ground; one wire per signal plus GND. RS 232 is a point-to-point connection.

RS 422/V.11: Industrial serial transmission (multidrop)
A transmission method with balanced signals. Designed for higher speed, longer cables and is resistive against electrical noise. RS 422 allows for up to 16 receivers. The typical transmission is via twisted pair copper cable using balanced signals. Sender and receivers must share a common voltage range (max. +/-7Volt difference). Two lines per signal, plus common GND. RS 422 is a point-to-multipoint connection.

RS 485: Industrial serial transmission (multipoint)
The signals and cables are the same as RS 422. The transmitters can go tri-state. Several stations can send data on the same lines, at different times. RS 485 is a multipoint-to-multipoint connection.

SNMP: Simple Network Management Protocol
A general purpose configuration system. Devices understanding SNMP may be configured and monitored.

TCP/IP: Transmission Control Program/Internet Protocol
TCP establishes connections between two partners via the Internet. The data is sent in IP-frames, each frame is acknowledged be the recipient. Lost packages are repeated. Software using TCP has a secured transmission; the delivery of the data is guaranteed.

TKIP: Temporal Key Integrity Protocol
An encryption scheme for Wireless LAN. It was developed from the WEP. The key used for encryption is changed while data is transmitted. An attacker will not get enough data with the same key to break the code.

UDP: User datagram protocol
Similar to TCP the data is sent in IP-frames. But in opposite there is no connection or acknowledge by the recipient. The transmission is faster for small data, but data can get lost. Software using UDP must handle the related problems.

UPnP: Universal Plug and Play
Devices announce their presence on the network, and return their capabilities on the network. Depending on the type of device certain configuration is done, specific functions become available.
Specialized software can detect those devices, and offer their services without manual configuration.

VPN: Virtual Private Network
A public network is used to transport data for a limited set of stations. Drivers on these stations generate virtual network cables between the stations. In many installations the communication through the public network is encrypted, to avoid tampering of the lines.

WEP: Wired Equivalent Privacy
An encryption scheme used with early implementations of WLAN. The idea was to make it as difficult to read other persons data, as it was with cable communications. Due to weak definitions in WEP nowadays it may cost an attacker less than a minute to get the current encryption key.

WLAN: short for Wireless LAN
This is a general name, however today this phrase is used for the IEEE 802.11-protocol definitions.

WPA: Wireless Protected Access
This is the successor of WEP. WPA not only includes better strong encryption, there is also a set of functions to restrict access by means of user authorization, or different hardware parameters (MAC address, distance).