DGH A3000 Ethernet to Serial Converter
Users Manual

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Disclaimer:

The information in this publication has been checked and believed to be accurate; however, no responsibility is assumed for possible in-accuracies or omissions. Applications information in this manual is intended as suggestions for possible use of the product and not as explicit performance in a specific application. Specifications may be subject to change without notice.

The A3000 is not an intrinsically safe device and should not be used in an explosive environment unless enclosed in an approved explosion proof housing.

Revision Note:

Effective January 1st, 2012 – The A3000 DB-9 serial port connector has been changed from a DB-9 Female to a DB-9 Male Connector. The new connector pin out is referenced on the back of the A3000.

2. INTRODUCTION

The DGH A3000 Serial to Ethernet converters are designed to operate serial ports over 10Mbits/s or 100Mbit/s Ethernet networks. The data is transmitted via TCP/IP protocol. Therefore control is available via Ethernet, Intranet and Internet. The supplied driver software makes the network transparent to your applications. Software applications that support standard COM ports require no changes to operate over a network using the virtual serial port driver software.

The A3000 is packaged in a steel case well suited for industrial environments. The A3000 supports serial speeds up to 460 kbps. All serial ports operate in common RS-232 mode. The A3000 also offers the industrial RS-422 and RS-485 configuration. In RS-485 mode the A3000 may use the Automatic Receive Transmit (ART) control logic to follow the RS-485 specifications for transmitting data. No special code is needed in your software applications.

FEATURES

- Ethernet 10/100BaseTx for auto-configuration.
- Serial port: RS-232/RS-422/RS-485.
- Max. 460,800 bps half-duplex and full-duplex.
- TCP/IP configuration fixed or by DHCP.
- Easy remote configuration via SNMP.
- Drivers for Windows™ operating systems.
- Documented interface for every networked operating system.
- Single power supply: 9V-30Vdc, 200-600mA@12Vac 100-240V 47-63Hz, 25VA.

PRODUCT SPECIFICATIONS

Processor	ARM7 (S3C4510B)
Memory	8MB SDRAM 1MB Flash (2MB with 8 serial ports)
Ethernet connector	RJ45 10BaseT/100BaseTx
Serial Speed	14 bps up to 460,800 bps
Parity	None, Even, Odd, Mark, Space
Data bits	5, 6, 7, 8
Stop bits	1, 2 (1.5)
Protocols	TCP/IP, UDP, SNMP, DHCP, ICMP, ARP, Telnet, RTelnet, HTTP
Management	Serial console, Telnet, Web browser, SNMP
Driver software	Windows 2000/XP, Windows NT
Management software	Driver installation and configuration program, Management console
Operating temp.	0° to 55℃
Approval	CE, FCC

Table 1.0 Common characteristics.

Serial connector	DB-9 Male
Serial port	RS-232/RS-422/RS-485, configured by Dip Switch.
Serial signals	RS-232 TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND RS-422, RS-485 4-wire Tx+/Tx-, Rx+/Rx-, GND RS-485 2-wire Data+, Data-, GND
Power requirement	9V to 30Vdc, 200mA@12Vdc
Dimensions	73×115×27 mm³ (W×D×H) 101×121×27 mm³ with connectors
Weight	250 g

Table 2.0 A3000 Characteristics

PACKING LIST

- Power supply adapter, +12Vdc @ >0.5 Amps
- CD-ROM with driver and configuration software
- Quick Installation Guide

3. HARDWARE CONFIGURATION

POWER SUPPLY

The A3000 is powered by a single 9-30Vdc power supply. It requires 200mA up to 1400mA of current depending on the voltage supplied. A suitable power supply adapter is part of the packaging. Connect the cable to the power jack at the rear side of A3000 and put the adapter into the socket. The red power LED will light. You can connect a power supply of your choice providing the technical requirements are met.

ETHERNET

The connector for network is the usual RJ45. Simply connect it to your network switch or Hub. When the connection is made, the yellow Link LED will light. When data traffic occurs on the network, this LED will blink. A 100Mbit connection causes the green Speed LED to light. If will remain dark for a 10Mbit connection.

LED DESCRIPTIONS AND FUNCTIONS			
Red LED	Yellow LED	Green LED	Status
Off	--	--	Device off, no power
On	Off	Off	No connection
On	On	Off	10Mbit connection established
On	Blink	Off	10Mbit data transfer (traffic)
On	On	On	100Mbit connection established
On	Blink	On	100Mbit data transfer (traffic)

Table 3.0 LED Descriptions and Functions

SERIAL PORT SETTINGS

There is a four-position Dip Switch to configure the operating mode of the serial port on the A3000. Before connecting a serial device, the serial port Dip Switch configuration must be properly configured.

Warning: An incorrect configuration of the switches may cause serious damage in either the A3000 or the serial device when connected together. Do not connect a device to the serial port until the Dip Switch settings have been properly set and verified. The serial port switches are configured for RS-232 communications when shipped from the factory. The switches are pre-configured to the Down, Down, UP, UP positions (from left to right).

4. WINDOWS DRIVER QUICK INSTALLATION

This section describes the minimum steps required to install the Windows Driver and Net Manager programs. Before starting the installation it is essential to have an IP configuration ready for the A3000. You may read the section TCP/IP description below. In many networks the default configuration is fine. If in doubt, please ask your Network Administrator for help.
The following description is based on Windows XP Professional, with Service Pack 2 installed. The installation on other configurations of Windows XP is similar.

INSTALLATION PROCEDURE

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 the uninstall process.

START THE INSTALLATION WIZARD

The installation program wizard is named VSNSETUP.EXE. You'll find it on the CD-ROM shipped with the A3000 in the directory matching your computer operating system. The latest version of the wizard is also available on the Internet at www.dghcorp.com. The Installation Wizard for Windows NT is named VSNSTUNT.EXE. Start this program to install the drivers.

Your screen displays a Vscom logo. Select the folder to install programs and drivers into. In most situations the suggested default folder setting is fine, just hit the enter key.

FIND AND CONFIGURE A3000 DEVICES

During the installation process some files will be copied to your computer hard disk. This is similar to other Windows program installations. When all files are copied, the Net Manager (see note #1) program will be started. This searches for all the A3000 devices on your network.
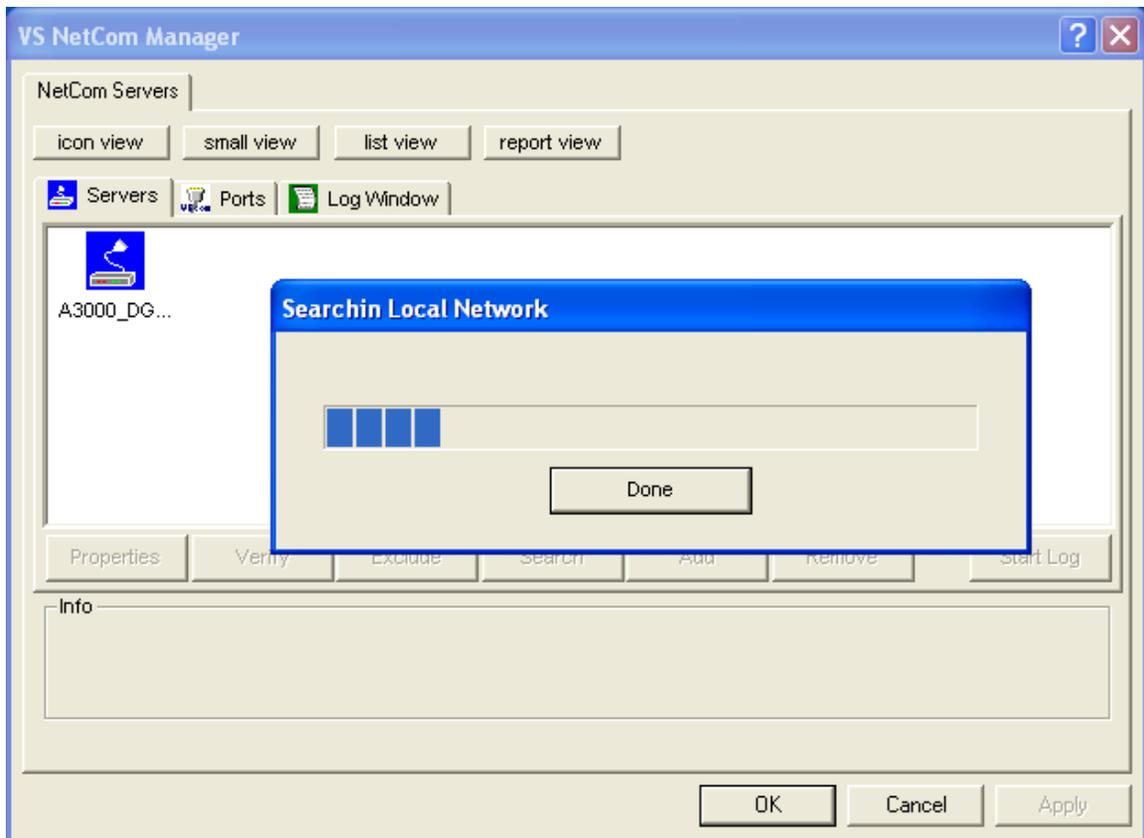
After a short time the search process is finished and all found A3000s are listed. In your very first installation of the drivers and software you should connect only one A3000 to your network. This single device is listed here. Identify it by comparing the serial number shown in the Net Manager.

Note #1: This program is covered in detail in a later section. For now follow the minimum steps.

Configure IP Parameters

As mentioned above, it is important to configure the A3000 to operate in your network. In many networks this is done using a special server. Please ask your Network Administrator for information. If you need to define parameters manually, double-click the device's icon.

This panel opens. Deselect the Option of "Use DHCP" and place your parameters as "IP address", "Netmask" and "Broadcast". Click on the "OK" button.

Configure Firewall

As you will see in Image 4 the driver may also operate by traversal of a Network Firewall. This requires a special configuration, which is skipped here. Please read in detail in section 5.2.6 Manual Detection/Installation of an A3000. For now proceed with the standard installation.

INSTALL DRIVERS

In the Net Manager, click the "OK" button and the installation continues. Windows detects the serial ports on the fresh A3000 as new Hardware. Using Windows XP Service Pack 2 you may be asked about to get latest drivers.

www.dghcorp.com   8
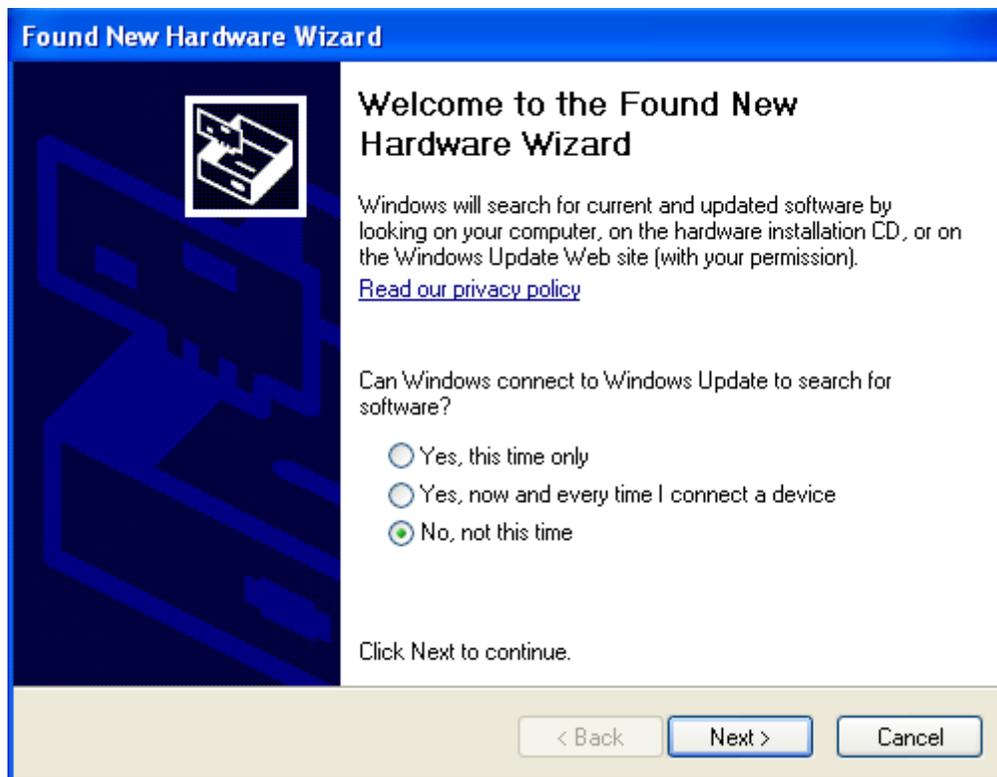
There are no later drivers on the Windows Update website. Select the third item and click on "Next". This question neither appears on Windows XP prior to SP2 nor on any previous Windows version

www.dghcorp.com   9
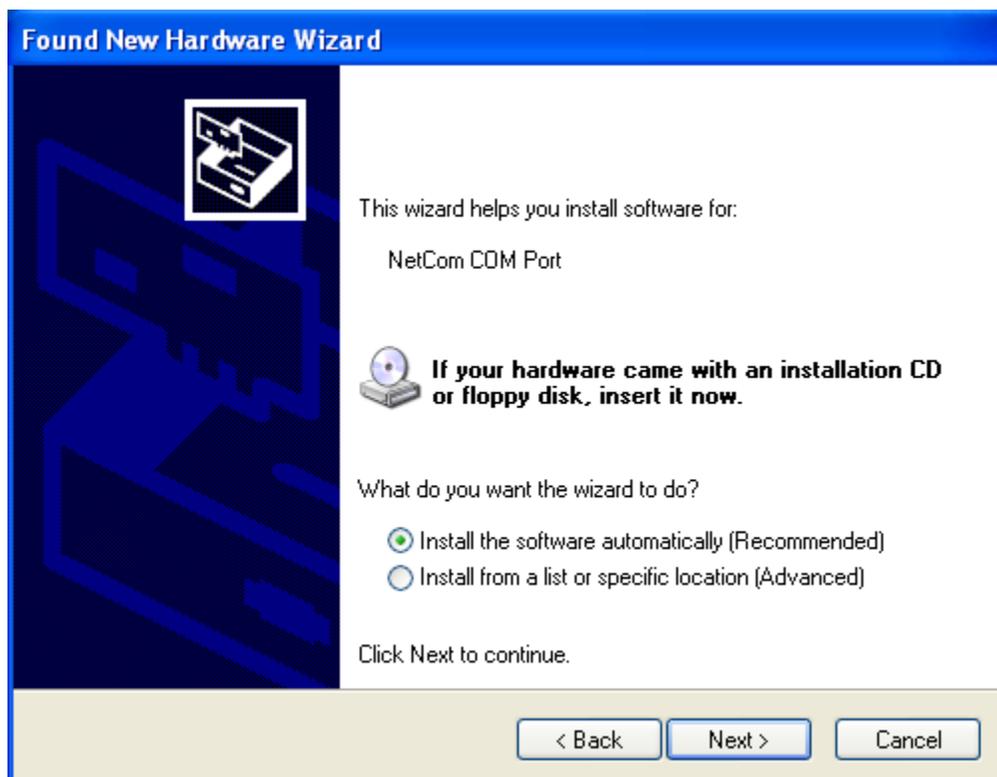
The pre-selected automatic installation is fine, just click on "Next". The driver files are already copied to your hard disk. Now Windows installs them in the system directory. To "Finish" the installation click on that button as it appears.

Repeat the procedure for each A3000 until all devices are successfully installed. In most situations it is not necessary to reboot the system.

VERIFY THE INSTALLATION

In the Start Menu you'll find "Vision Systems GmbH", a new program group. The installed programs are the Net Manager and an option to un-install the software. This group is not installed on the Windows NT.
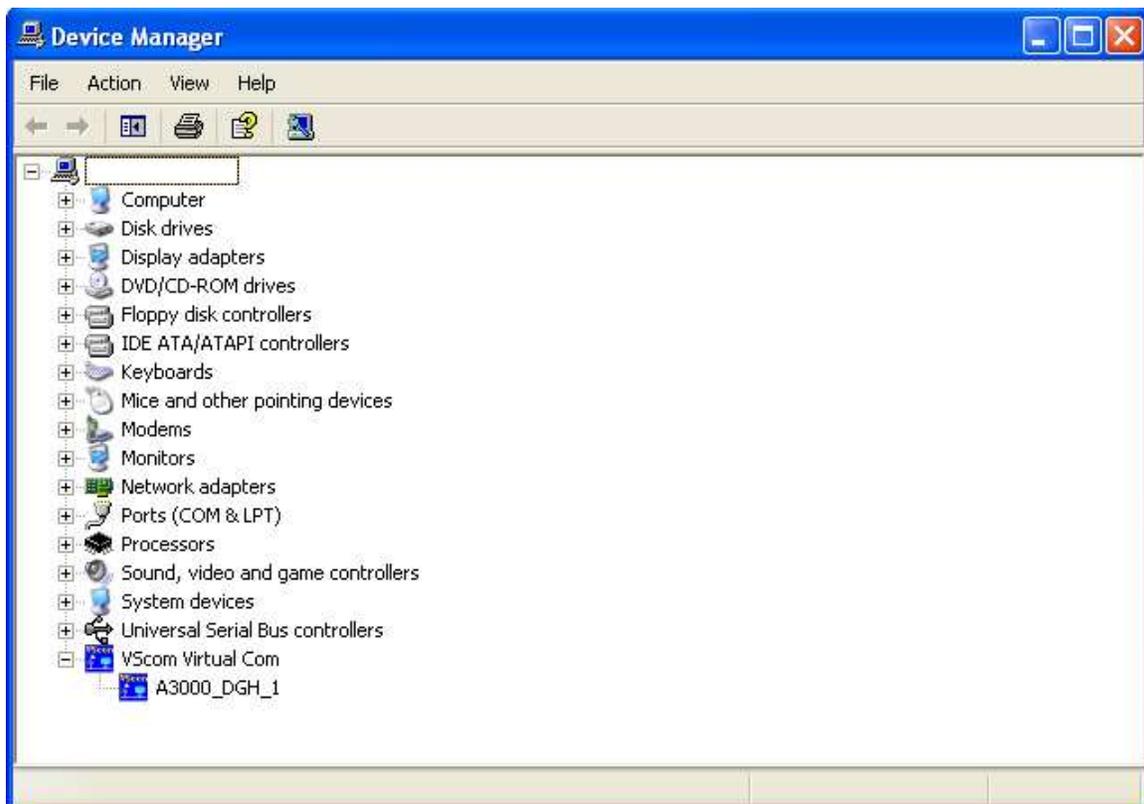
In the Device Manager the serial ports are listed in the "Ports" section. Additionally there is a new device class "Vscom Virtual Com". All installed A3000 devices are listed here. The available options are described later.

On Windows NT there is no Device Manager. You'll find the serial ports listed in the Control panel in the "Ports" applet. To configure the A3000 and special port options, there is an applet named Net Manager.

UNINSTALL THE DRIVERS

There are three methods to completely uninstall the drivers and program files. The usual way is to use the Add/Remove Programs applet in the Control Panel and remove the A3000 Net Manager Drivers. This will start the Uninstall program.

Alternately you may start the Uninstall program in the start menu. The third method is to start the Installation Wizard again. This will detect the drivers on the system. You have the options to repair the current installation or to remove the installed drivers.

5. SOFTWARE CONFIGURATION

The A3000 devices may also be used without installing the driver software. Customer applications may contact the A3000 directly using network functions. These setups require independent configuration of the A3000 and the serial port. There are several ways to perform the configuration. The A3000 offers: a web browser interface, a Manager program to use in Windows, configuration via serial port, via Telnet. The serial port option is used as a fallback when all other methods of configuration cannot be used or fail.

Configuration via web browser or Telnet requires a functional TCP/IP connection to the A3000 and knowledge of the device IP address. The easiest way to retrieve the IP address is to use the Net Manager program on the CD-ROM shipped with the A3000. In Windows 2000, XP and 2003 the Net Manager executable filename is NETCOMMGR.EXE. In Windows NT the executable filename is NETCOMMGRNT.EXE. Locate the correct file on the CD-ROM and double-click to start the Net Manager. If you already installed the drivers the program is also in the Start Menu.
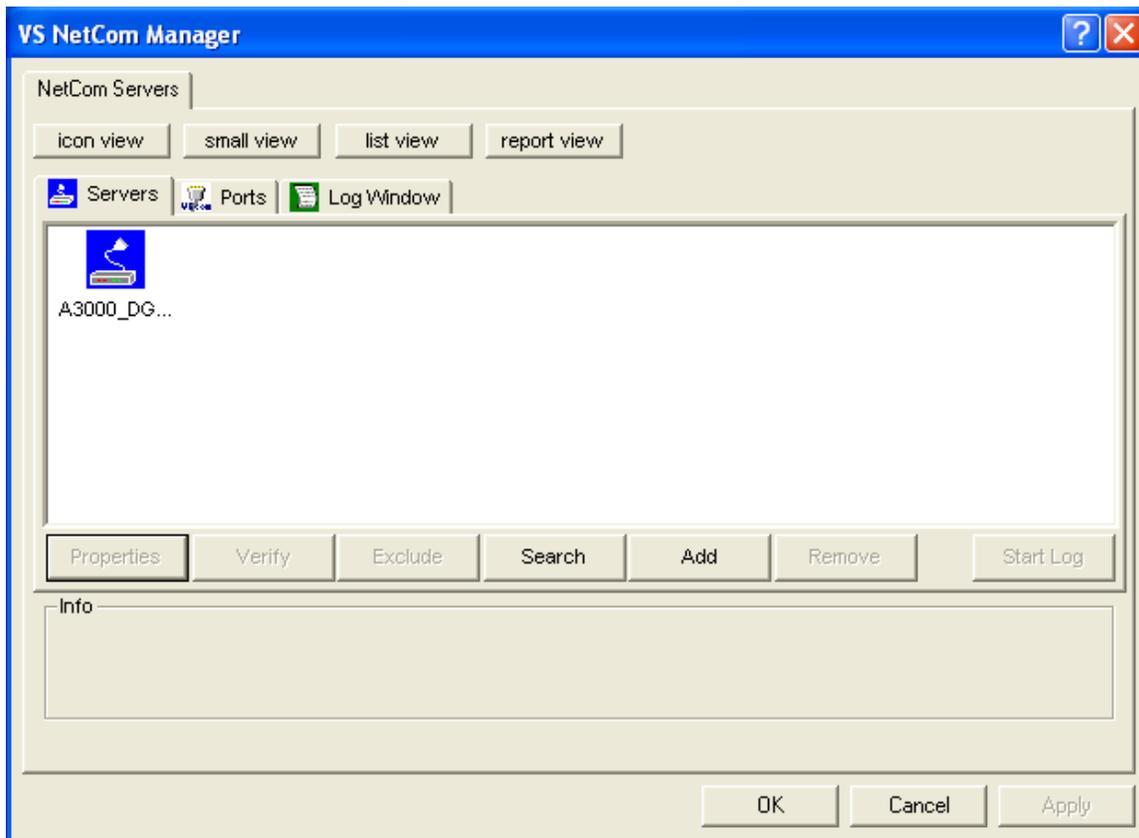
Identify the A3000 by comparing the serial number. Double-click the Icon of the A3000. You will see the IP-Parameters. Note the "IP address" to use it in your browser or via Telnet.

CONFIGURE IN WEB-INTERFACE

Open your web browser. In the address line type the IP address of the A3000. In the example above, type http://192.168.254.254 as the target. You may do this on any operating system you prefer.

The A3000 welcomes you with its "Home" screen. To access the different options of configuration, click on the images above function links. In many menus you'll see a blue question mark. This is the help symbol. When clicked, a short explanation pops up describing the features and function of the selected parameter. Some settings require a reboot to save and activate them. Whenever this occurs, the A3000 will prompt and request to REBOOT. You may reboot now, or later when the configuration is completed.

WEB BROWSER SERVER CONFIGURATION

The Server Configuration is a long menu divided in sections throughout this document.

Server Info

Server Info

Server Type	113
Software Version	2.0.0
Hardware Version	1.0
Serial Nr.	0050101793
UpTime	1 day(s) 01:57:30
Contact?	<unset>
Location?	<unset>

Information about the selected A3000 is displayed as "Server Info". Starting with the "Server Type", this is the model of the A3000, followed by the version of Software and Hardware. This will give a rough overview, which features are implemented or need an upgrade of the firmware. The "Serial Nr." is important to identify the device you are configuring right now. For further information the "UpTime" is listed. "Contact" and "Location" are User-defined information. They may later help to find the device in the installation and the person responsible for management.

Server Parameter

The "Server Parameter" allows configuration of the A3000 name and of course all parameters in IP-settings. So far the name is just informative, e.g. in the Net Manager program or SNMP. Manual changes of IP parameters are only available with "DHCP" set as Disabled. When DHCP is not used, enter "IP Address", "Netmask" and the "Broadcast" address. "Gateway" is required if there are Routers in the network. DNS is used to access other stations by name. The "ConfigPort" is used to access the A3000 for administration via Telnet. Use of the standard value for Telnet, TCP port number 23, is suggested but not mandatory. This does not change the function of the Telnet menus.

"KeepAlive" is an intrinsic function of the TCP/IP protocol. If used it causes network traffic that should not be a problem in a LAN application. This extra traffic may cause communications problems on Dial-Up connections because of the additional information being sent on the lower speed ("Dial-Up") connection. If this function is used, you must define an interval in seconds and the A3000 will have a better chance to react on network problems or failed hosts.

Authentication

"Authentication" sets a password to restrict access to the configuration of the A3000. Note that you must enter the Password twice.

Authentification

Password: **?** [   ]
Retype Password: [   ]

Date & Time

It may be helpful to have a correct time setting in the A3000. You may manually enter the time here. Note, there is no real time clock with a battery backup in the A3000. When the A3000 is restarted, the time is lost.

Date and Time Settings

Date & Time **?** [02-01-1970 23:33:30 UTC+21.]

Simple Network Time Protocol

State **?**   [Off ▾]

Mode **?**   [DHCP ▾]

Interval **?** [1800]

Server **?** [   ]

It is possible to configure the A3000 for automatic Time retrieval via SNTP. Define "State" for retrieval method of "Interval", "Startup" or "Off". Parameter "Mode" is used to find the Time Server. It may be defined direct or by DHCP. The "Interval" in seconds instructs the A3000 to regularly check for an update of the internal time settings. The Time Server may be given by IP-Address or by name. A name of course requires a DNS server. See "Server Parameter" on page above.

Click on the "Save" button below these options to store all configuration changes in the A3000. The A3000 may require a reboot to proceed.

WEB BROWSER SERIAL PORT CONFIGURATION

The "Serial Settings" are directly related to common serial configurations. The "Transfer Settings" configure the operation mode of A3000 on the network.

Serial Settings

When using the A3000 with a Virtual Communication Port in Driver Mode, the application program configures the communications port settings. However in other operating modes the serial parameters must be defined separately using the panel below.

Serial Settings

	Port 1
PortType (current)	rs232
DefaultModel	16550
MaxBaudrate	460800
Model?	16550
Baudrate?	19200
Manual?	19200
FlowType?	None
DataBit?	8
Parity?	None
StopBit?	1
RxFifoLength	2048
RxTriggerLevel?	11
TxFifoLength	2048
TxTriggerLevel?	800

The A3000 allows serial communications via three different communications standards, RS-232/RS-422/RS-485. Each standard is user-selectable via Dip Switches and the current setting is displayed as "PortType". The serial port is based on standard UARTs. The UART type and maximum speed is also displayed on the page and cannot be changed.

The "Baudrate" may be selected in a drop-down list or entered manually. If Manual is selected the value in the respective field is used to transmit data. The A3000 checks to see if the configuration is possible and warns otherwise. "DataBit" per character, "Parity" and "StopBit" are typical parameters.

The FlowType is available as standard configuration. There is also an Advanced setting, which gives very specific control to the user.

The A3000 can generate Events on RTS, DTR or as XON/XOFF when the serial receive buffer is filled/emptied. It will also respect the state of CTS, DSR or XON/XOFF when sending data to the connected serial device.

Transfer Settings

Mode❓   Driver Mode ⌄

TCP Port(Control)❓ 2000

TCP Port(Data)❓ 2001

KeepAliveMode❓ On Connect ⌄

KeepAliveInterval❓ 0

The "RxTriggerLevel" defines when the A3000 sends the received data to the host. If the amount of data meets the RxTriggerLevel the data is sent; even if there is still data coming on the serial line. If less data is received, the A3000 waits for further data before sending the buffer.

The "TxTriggerLevel" operates in a similar manner for transmission. If the defined amount is received from the network, the A3000 does not accept more data to transmit.

Transfer Settings

The Transfer Settings allow different modes. They are selected by the basic "Mode" setting. Depending on the current mode, only some of the many parameters are useful. The web configuration hides those parameters without function.

Basically, the A3000 devices can act as a server waiting for clients to contact it or as a client actively contacting a server or a little bit of both at the same time. Keep this in mind throughout this section.

Driver Mode

Only a few parameters function in "Driver Mode". The A3000 is operating as a Server. It accepts two connections per serial port. "TCP Port (Data)" connection is used to transmit the serial data. "TCP Port (Control)" connection is used to transmit control information. This control connection includes the configuration of the serial port as well as signals for changed Modem Status lines. This mode is required when the serial port is operated with the Virtual Com Port Driver and is the mode preset at the factory.

The A3000 can check if the connected Client is still alive. This may be done when a second Client wants to establish a connection (On Connect). It may also be done in regular intervals (Polling).

TCP Raw Server

In TCP Raw Server mode the A3000 waits for incoming data connections in Raw IP mode. As in the Driver Mode only the data connection is defined.

Transfer Settings

Mode?	TCP Raw Server
TCP Port(Data)?	2001
Max.Clients?	1

The A3000 allows for more than one connection at a time. However the customer must ensure the correct operation of the network.

TCP Raw Client

In Raw Client the A3000 establishes a Raw TCP connection to a pre-defined "Destination". The A3000 can hold multiple hosts as targets for a connection. They are entered as a comma separated list of DNS names or IP-Addresses. Each destination will have a TCP port number separated by a colon. Instead of a single IP-Address or DNS name, a range of IP-Addresses is also valid. The TCP port number must follow the address range values. For example, 192.168.254.12-192.168.254.17:2077.

Transfer Settings

Mode?	TCP Raw Client
Destination?	192.168.254.205:2001
Connect?	Triggered
ShortHoldTime?	0

The parameter "Connect" defines whether the A3000 uses the connections as Permanent, Triggered, or DSR. Using Permanent or Triggered, any activity on the serial ports establishes the connection. Inactivity of longer than the "ShortHoldTime" causes the A3000 to close the connection. With DSR, the TCP-connections follow the state of the DSR signal at the A3000 serial port. When it becomes active a connection is established until DSR becomes inactive. At that moment the connections are dropped.

Null Modem Tunnel

This is a mixed mode requiring parameters for server function and for the destination. The A3000 operates as a server while accepting connections in Driver Mode. If there is no current connection the A3000 may establish a connection as a client using the Driver Mode protocol. The A3000 will transmit serial data in both directions and will also pass information about the current settings of the Modem Status lines. The A3000 will also set the Modem Control lines as required by the other host. Since this operation requires another A3000 to accept the connection both A3000 operate together as a long Null-Modem cable. The data is sent via a tunnel through the network.

Transfer Settings

Mode?	Null Modem Tunnel
Server	
TCP Port(Control)?	2000
TCP Port(Data)?	2001
Client	
Destination?	192.168.254.205
TCP Port(Control)?	2000
TCP Port(Data)?	2001
Connect?	Triggered
ShortHoldTime?	0
KeepAliveMode?	On Connect
KeepAliveInterval?	0

The Server (top) configuration requires the same parameters as the Driver Mode, "TCP Port(Control)" and "TCP Port(Data)".

The Client (bottom) configuration requires a destination IP-Address. Here it is given by name, but a direct IP-Address may be entered. There is also a destination "TCP Port(Control)" and "TCP Port(Data)" to accept the connection of the A3000.

The connection is normally established in Triggered mode. For example, when some event occurs on the serial port it is held for the defined "ShortHoldTime". It is also possible to have the connection Permanent. As in the normal Driver Mode the function of a connected client can be checked via KeepAlive signals in different modes.

TCP Advanced Settings

All of the above operation modes are special configurations options. If none of the pre-defined modes fit your needs the TCP Advanced Settings allows the configuration of any Transfer parameter. TCP Advanced Settings provides for unusual combinations of modes and standard modes with unusual parameters.

Transfer Settings

Mode?	TCP Advanced Settings
Server?	On
TCP Port(Control)?	2000
TCP Port(Data)?	2001
Max.Clients?	1
Client?	Off
Destination?	192.168.254.205
TCP Port(Control)?	2000
TCP Port(Data)?	2001
Connect?	Triggered
ShortHoldTime?	0
KeepAliveMode?	On Connect
KeepAliveInterval?	0

UDP Data Transfer

The UDP mode sends data in single packets instead of a stream. This protocol requires a "UDP Port(local)" for listening to incoming data. Other stations on the network send their data to this port. The "Destination" is configured by IP-Address or name, plus the target "UDP Port(Dest)". See below.

Transfer Settings

Mode?	UDP Mode
UDP Port(Local)?	2002
Destination?	
UDP Port(Dest)?	2002
UDP MaxPacketSize?	1458
UDP Timeout?	0
UDP Trigger?	

"UDP MaxPacketSize" is a limit for the size of UDP packets. When the amount of data received on the serial port reaches this limit the UDP Frame is assembled and sent to the destination.

"UDP Timeout" defines when the A3000 sends the received data as a UDP Frame. If the reception of serial data is interrupted for this time (in milliseconds), the data sampled so far is sent to the destination.

"UDP Trigger" defines a sequence of characters. As soon as this sequence is detected in the received data, all data up to the end of this Trigger is sent to the destination. In most situations such a Trigger includes control or other special characters. Enter them numerically: as \xHH where HH is the hexadecimal code of the character, or as \OOO where OOO is the octal code of the character. The backslash itself must be doubled as \\.

WEB BROWSER NETCOM TOOLS

The tools are:

- The Ping utility to check if a station is available.
- Statistic information for each serial port.
- The Netstat utility to monitor used TCP connections.
- The option to update the firmware.
- Saving of Configuration to / Loading from a file.
- Syslog
- DebugLog

Ping

Enter the IP-Address or the name of a station in the field and click the "Ping" button. The network connection is checked by sending certain ICMP data packages. If the target responds, the network between the A3000 and the target is operational. The time required for an echo depends on the speed of the network. In a typical Ethernet only a few milliseconds, while it can be several seconds throughout the Internet.

Ping

IP Address: 127.0.0.1

Ping

PING 127.0.0.1 from 192.168.1.87 : 44 (72) bytes of data

52 bytes from 127.0.0.1: icmp_seq=0 ttl=255 time=1.560 msec
52 bytes from 127.0.0.1: icmp_seq=0 ttl=255 time=1.542 msec
52 bytes from 127.0.0.1: icmp_seq=0 ttl=255 time=1.542 msec

Statistics

Select the serial port to see its statistical information. The Statistics window reports the state of the modem status, control lines and the number of state changes. The number of characters sent and received is shown at the bottom.
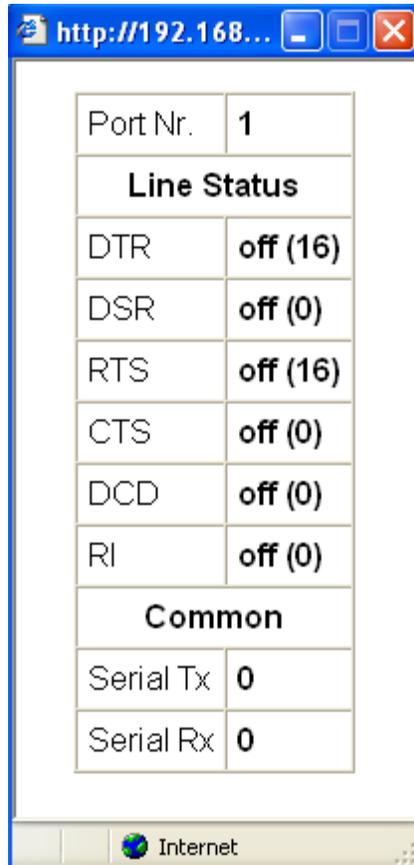
Netstat

Use Netstat to see the actual connection status of the A3000. This is a standard tool for network debugging. A "Foreign Address" of 0.0.0.0 is listed when the A3000 is waiting for an incoming connection (LISTEN). If the value is not 0.0.0.0, the connection is either active (ESTABLISHED) or closed (TIMEWAIT).

Firmware

To upload a new version of the firmware, put the name of the file in the field. Your web browser should display a "Browse" button that can be used to search for the new firmware file on the computer hard drive. Click on the "Update" button and the file will begin checking and loading. If the selected file is determined to be a valid firmware upgrade then it is stored in the A3000 Flash Memory. When the upload is finished, the A3000 will reboot.

FirmwareUpdate

Warning: All connections get closed and the server reboots after updating

[_____] [Browse...]
[Update]

Save and Load Configuration

It is possible to save the present A3000 configuration to a text file. It is also possible to load the saved configuration back into an A3000.

Configuration File

Save: *Save the Configuration Parameters in a File* [Download]

Load: [_____] [Browse...] [Upload]

Logging and Debug

Syslogging requires a server location where the logging and debug information will be sent. This feature allows the data sent to that server.

Syslogging

Syslog**?** [Off ▾]

Destination**?** [_____]

Facility**?** [1]

Debuglog**?** [Off ▾]

Debug Port**?** [0]

Using Debuglog the A3000 behaves as the server. Open a TCP connection to the configured port and receive all information generate.

CONFIGURE WITH NET MANAGER PROGRAM

There is a versatile Windows Operating System program called Net Manager that is shipped with every A3000. This program detects, manages and can configure the A3000 devices on your network. You can start it several ways. It is stored on the CD-ROM, named NETCOMMGR.EXE (NETCOMMGRNT.EXE on Windows NT). It is possible to start it directly from the CD-ROM.

When the Virtual Com Drivers are installed there are more options to run the program. In Windows NT the same Icon appears in the Control Panel to start the Net Manager program.

In Windows 2000, XP and 2003 Server the driver software installs a new device class "Vscom Virtual Com". The properties of the class open the Net Manager. Additionally the installation of the drivers created a new program group in the Start Menu.

This section focuses on management of the A3000 devices. The options to configure driver-specific options of the serial ports are omitted here. This includes some buttons and panels. They are described in total below in the drivers and panels documentation.

While in the configuration process, click on the screen buttons or double-click on the devices to open properties or options. In many situations a right-click with the mouse opens context-sensitive options. The Net Manager is designed to help configure driver options. For detailed configuration of an A3000 it is better to use the web browser interface or via Telnet.

STARTING NET MANAGER

When the Net Manager is started, it will "Search" the A3000 devices connected to your LAN using the SNMP protocol. This process may take up to 30 seconds. The devices on a LAN are typically found in the first seconds. If this is enough you can stop the search by clicking on the "Done" button.

The A3000 devices are listed here in the "Servers" panel. Since the "Search" uses broadcast mechanisms the range is limited. If you have routers in your network or you want to contact A3000 devices via the Internet you must "Add" them manually. Enter the network parameters to access an A3000 via the Internet.
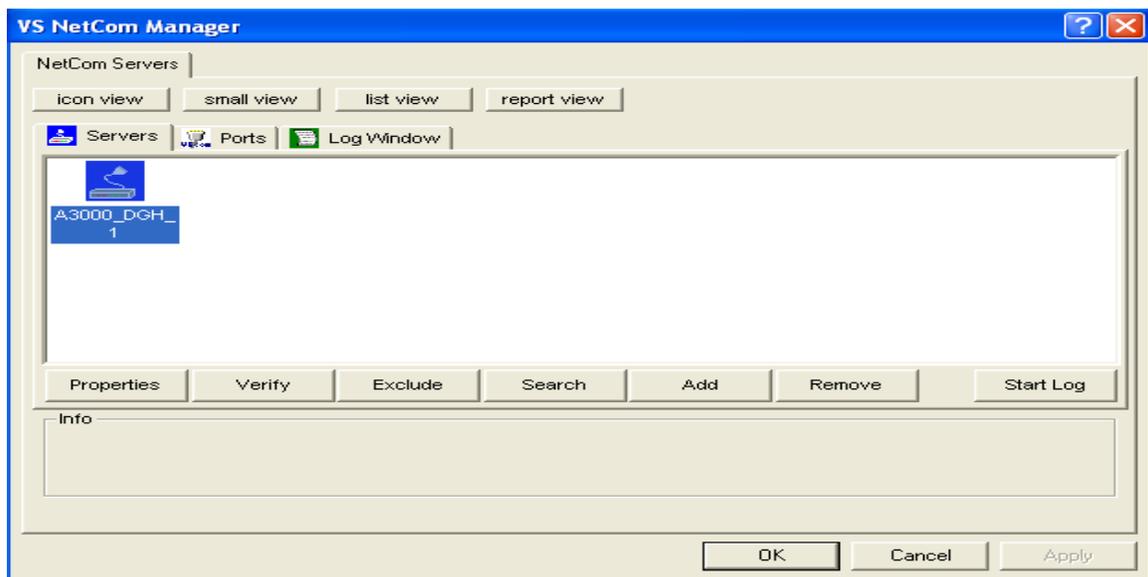
Highlight an A3000 and click on the "Properties" button to view the present settings. Or, double-click on the icon. Use "Verify" to contact the A3000 to check if it is properly configured and online. "Exclude" is only useful in conjunction with the Virtual Com Drivers and omitted here. "Search" repeats the search from the program start and may be used at any time. "Remove" removes a server from this list. This option is most often used to clear old data from the driver database. For monitoring purposes you may select an A3000 and "Start Log". This may be done for several devices at the same time. The output is visible in the "Log Windows" panel.

A3000 SERVER SETTINGS - INFO

As described above open the "Properties" of an A3000. The Server Settings start with the "Info" panel. Configure the Options as your network requires. The "Server Name" is just for information. As a factory setting it includes the serial number of the device. You may change it to any string since there is no functionality related to the name. This name is listed in the Server panel of Net Manager. The next parameters are fixed and displayed for information only.

The "Telnet port" can be used to configure the A3000 via Telnet. The value is a TCP port. Factory setting is the standard port for Telnet which is number 23. By default the A3000 is set to "Use DHCP" to automatically configure the IP-Address parameters. This is the suggested method. However there are several situations where this option cannot be used. In this case deactivate it. When inactive, other parameters may be changed.

The basic parameters "IP address" and "Netmask" are mandatory. If any of these are changed the Net Manager calculates a matching address for "Broadcast". You may also change this address.
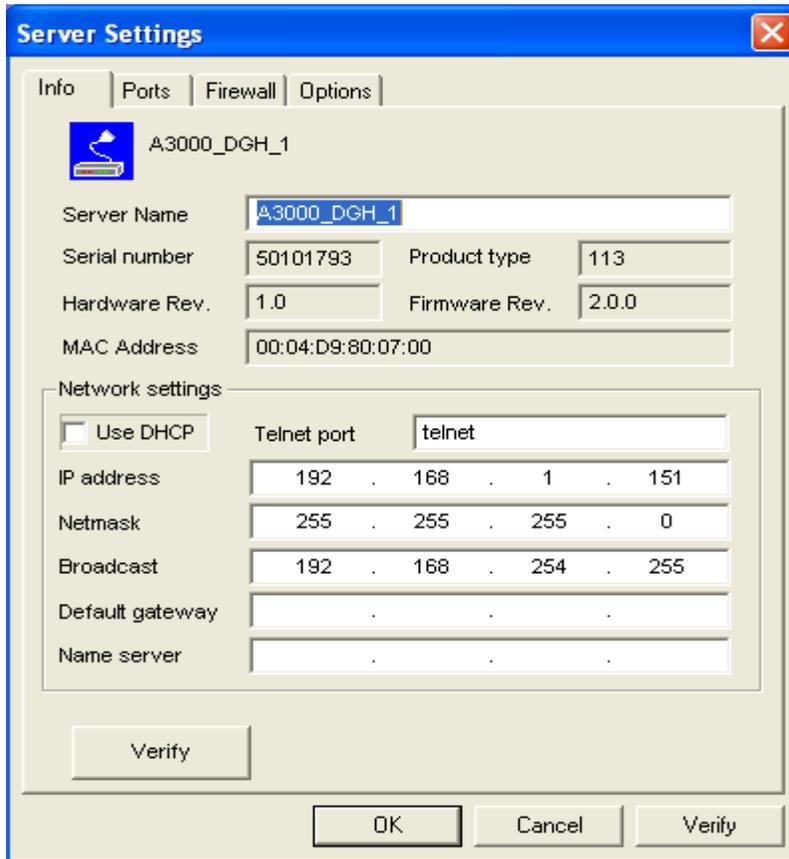
The DHCP option will also configure the "Default gateway" and the "Name server". Without DHCP you must enter these parameters by yourself. However they are not required in all configurations. So enter 0.0.0.0 if they are not used.

A3000 SERVER SETTINGS - PORTS

The "Ports" panel list displays the serial port of an A3000. Some of the options are driver related, e.g. the "Com Number". Each serial port may operate via three TCP ports. The "TCP Control Port" is used in the Virtual Com Driver mode and also in Null-Modem Tunnel. If Driver mode is not desired this parameter is ignored.

The "TCP Data Port" is used to transmit data to and from the serial port. Use the default or change the value to the settings required for your network. There is also a "UDP Data Port" used in packet data transfer. You cannot switch the A3000 to UDP mode with the Net Manager. But if the A3000 is already in this mode, you can change this basic parameter.
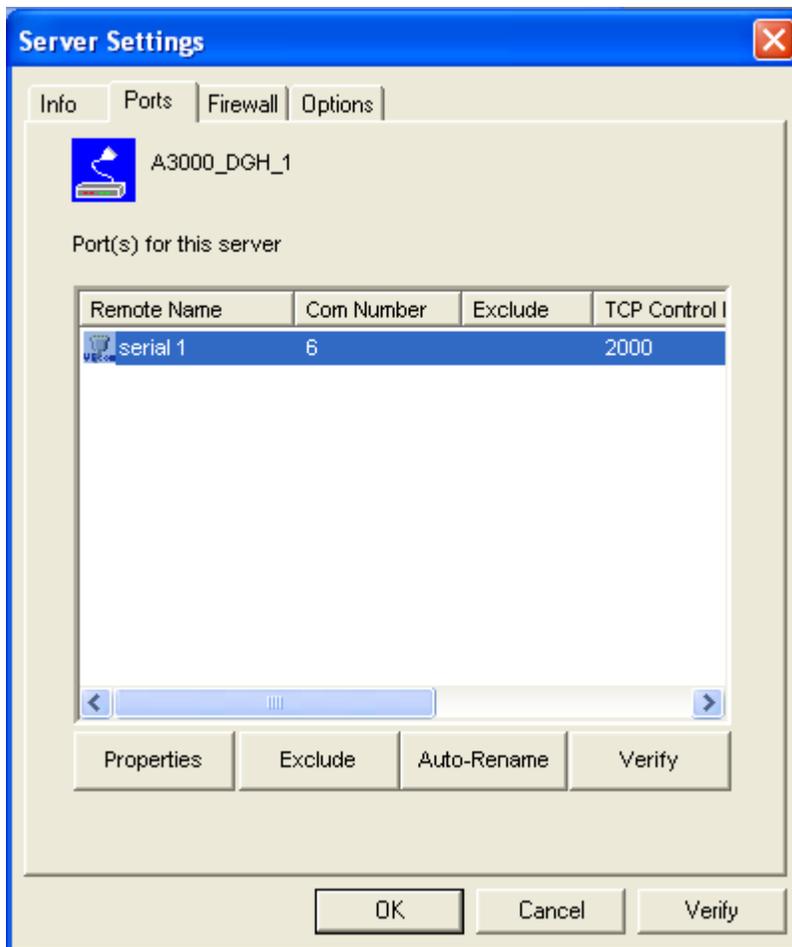
A3000 SERVER SETTINGS - FIREWALL

Many networks use a Firewall to protect the stations in the network from other networks, including the Internet. In some situations the contact to an A3000 must pass through such a Firewall. To do this you must "Enable Firewall" and enter the "Address" of the Firewall.
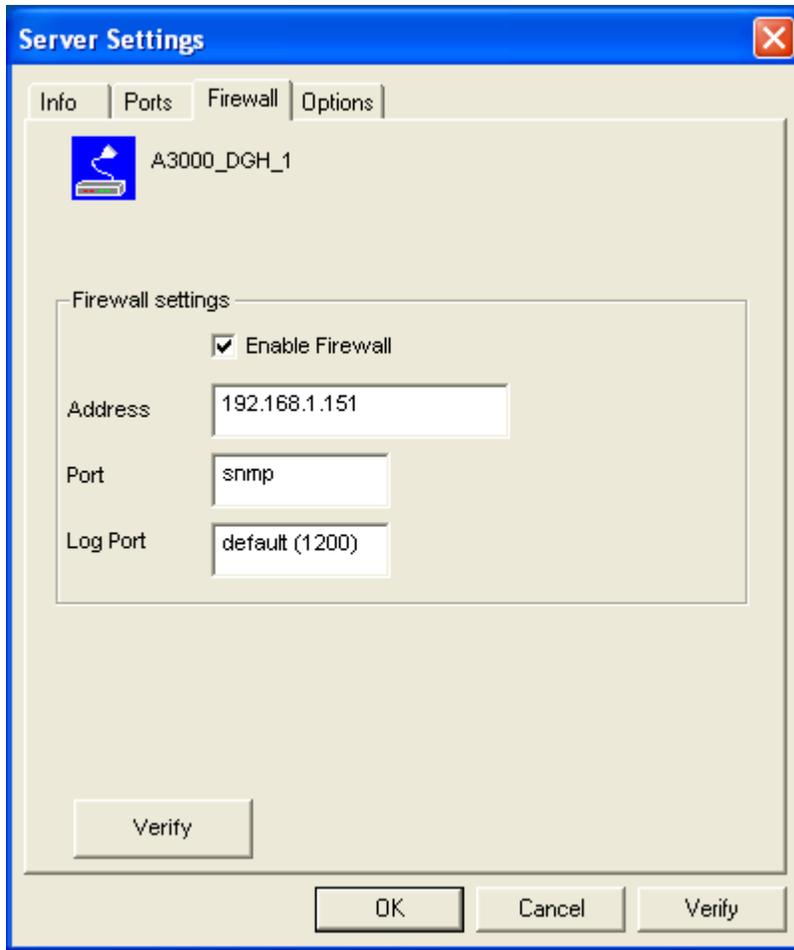
The Net Manager configures an A3000 via SNMP, which uses UDP. The Firewall must have a special "Port" to receive data and to transfer it to the internal network.

The same scheme applies to the logging option. By default an A3000 listens on port 1200 for logging connections. The Firewall must also have a special "Log Port" to receive this connection and to transfer it to the A3000.

The A3000 does not need any configuration to operate in a Firewall protected environment. There is a Firewall tutorial section later in this manual.

A3000 SERVER SETTINGS – OPTIONS

A "Safe to File" of the configuration is available, as well as the opposing "Load from File" of this data. You can also "Reboot" the A3000. This may be useful if an old connection blocks access to the A3000.

The "Apply Changes" button commits all parameter changes to the A3000. The "Verify" checks the current settings by reloading the status from the A3000 to the Manager program.
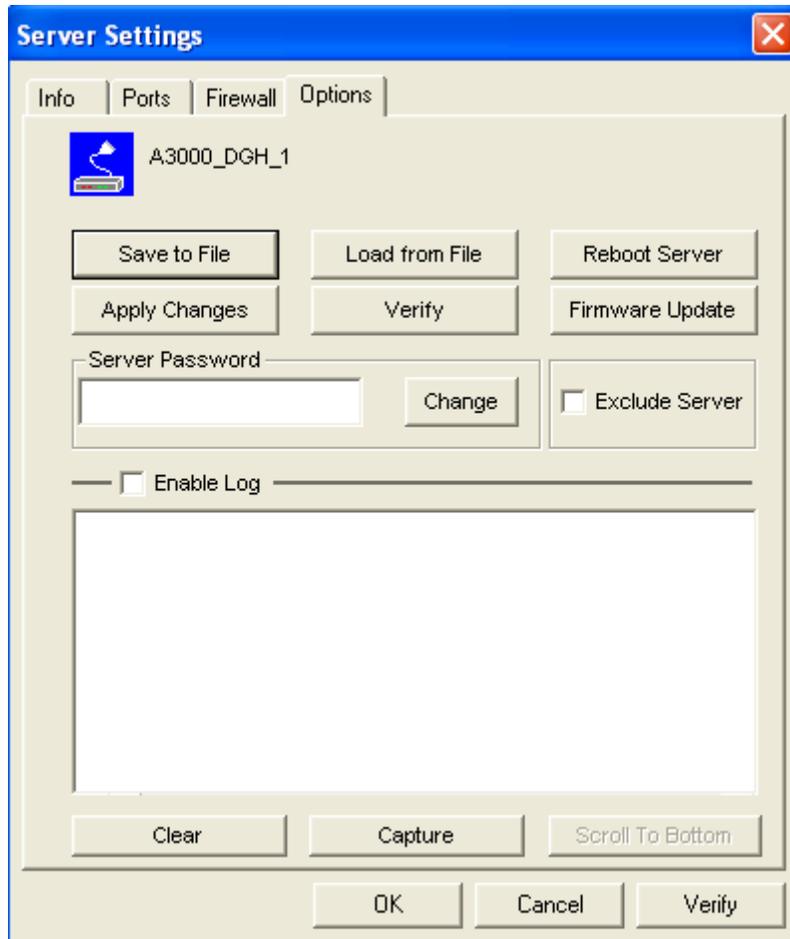
When you want to install a "Firmware Update", use this button. The A3000 may be protected against unauthorized access; in this case you must place the current "Server Password" in the dialog. The option to change the password is reserved for a future extension. "Exclude Server" is related to the Driver installation only.

You may "Enable Log" for monitoring and see events at the A3000. If enabled the log will also appear in the central "Log Window". At any time it's possible to "Clear" the log or "Capture" the data to a file.

MANUAL DETECTION/INSTALLATION OF AN A3000

Sometimes the Net Manager cannot automatically detect the A3000 server. To detect and configure devices the SNMP protocol is used. The detection is done by sending out a broadcast on all available network interfaces of your computer. This SNMP broadcast is realized as an Ethernet broadcast. Such a broadcast is only transmitted through Hubs and Switches. When there is a router between the computer and the A3000 the broadcast is not transmitted. This is especially the case when the A3000 is located somewhere via Internet or in large company networks. In this case, the detection has to be done manually. Click on the "Add" button in the Net Manager software. Enter the IP-Address of the A3000 in the Server Settings tab and click the button "Verify". Since the IP-Address of the A3000 is known the Net Manager sends a request directly to this target. Even routers transport this directed SNMP request. The A3000 sends the normal reply giving all required information to the Net Manager. Now it is possible to configure all options. Also the drivers for virtual serial ports are now installable.

FIREWALL CONFIGURATION

There can be problems when a Firewall is located between the A3000 and the Net Manager software. Many Firewalls protect the internal LAN by using the Feature of NAT (Network Address Translation). In this situation the IP-Address of the internal device is not visible on the Internet. Only the Firewall can be contacted via its public IP-Address. The Net Manager and the driver software for the virtual serial ports can handle such configurations.

SOHO Firewall example

A simple demonstration uses a SOHO router as the Firewall. This configuration will show the basic technical details. These details can be applied to the configuration of more complicated installations. On the SOHO router there is only one public IP-Address on the external side and typically 254 internal IP-Addresses for the LAN side. These internal addresses may be assigned by DHCP or static. Such routers offer a feature typically named "DMZ" which in fact is only a single exposed host. "DMZ" is not recommended for several reasons, including security reasons.

SOHO Virtual Servers

The router also offers "Virtual Servers" which is the option required for A3000 installation. These "Virtual Servers" (VSrv for short) operate by a technique called PAT (Port Address Translation). Certain data addressed to the public IP-Address of the router are forwarded to the internal private address of the A3000. The A3000 can be contacted via the public IP-Address of the router.

First configure the router for VSrv. The minimum is one VSrv for the A3000 itself. Next configure each serial port of the A3000 with two VSrv; one each for TCP or UDP transmissions. Please read your router for instructions. You need a port for the external interface and an IP-Address plus a port for the LAN side. The IP-Address is that of the A3000. The internal port for SNMP is 161 for UDP. The serial port requires ports 2000 and 2001 for TCP.

Port Address Translation		
Function	External port	Internal port
SNMP	8161/UDP	161/UDP
Control	9000/TCP	2000/TCP
Data	9001/TCP	2001/TCP

Table 4.0 Port Address Translation

For this example configure your router for VSrv and use the internal IP-Address of the A3000 for the targets. Connect the A3000 to your LAN. Now you are ready for a first test. Use Telnet to connect to the Data port of the A3000 serial port. Open a console (DOS Box) and type the command Telnet <routers-IP-Address> 9001. You will be connected to the serial port. Every character you type is sent out of the serial port and every received data is shown on your screen. The serial parameters are pre-configured in your A3000.

A3000 Detection through SOHO Firewall

Open the Net Manager and click on the "Add" button. The A3000 Server Settings dialog screen will open and select the "Firewall" panel.

Check the Option "Enable Firewall" and enter the IP-Address of the router in the "Address" field. In the field "Port" enter the target port for the SNMP configuration. From the Virtual Server example above this is port 8161. Since there is no configured VSrv for Logging ignore this field. Click the "Verify" button to have the Net Manager contact the router. This is a directed request so

there is no problem with broadcasts. Some ISP will block the SNMP protocol, which typically means they do not transport data for 161/udp to their customers. This is why port 8161 was used in the example. The router will transfer the request to UDP-Port 161 on the A3000, which is the port for SNMP. The A3000 will answer the request and send it out to your computer. The NAT function in the router will exchange the source IP of the data by its own public value so the Net Manager will see the answer come from the router. Receiving an answer to this data request satisfies the Net Manager.

This answer contains all the required information about the A3000 including its internal IP-Address. Select the panel of A3000 Server Settings to verify the information but do not make any changes here.

Serial Ports through SOHO Firewall

Now the A3000 is available in the Net Manager but the serial ports are still not usable. The information of the TCP-ports for the VSrv related to the serial port is still missing. In the A3000 Server Settings select the A3000 Ports Panel. Click the "Properties" button to open the configuration of the port.

Since the Firewall function is enabled the parameters for "Firewall mapping" are available for editing. Enter the ports defined in the router: 9001 and 9000 in this example. Note that so far there is no number for the Virtual Com Port available. The driver is not installed at this time and Windows does not know about the available hardware. This will happen later in the installation. Click the "OK" button and proceed with the driver installation as already described.

DMZ and Virtual Servers

Why is the DMZ function of the router not recommended? There are two reasons. First, only one device in the LAN can be defined as the DMZ target. The DMZ is implemented as "Send all IP data targeted for the router to the DMZ station as long as there is no specific rule for a different target". When a second A3000 is installed on the LAN the Virtual Servers have to be configured anyway. The second reason is security. When using the DMZ, the Firewall in the router becomes transparent and all data from outside is transferred to the LAN including all malicious data.

CONFIGURE A3000 VIA TELNET CONSOLE

There are situations where using the Net Manager program may not be appropriate and a graphical Web browser may also be unavailable. To enable configuration in this situation, there is the Telnet option and many users prefer it.

To create a Telnet session you need the IP-address of A3000 and you must be able to communicate with the A3000 via IP. If you PING the IP-Address of the A3000 and receive an Echo back the configuration is fine. This requires a predefined address, maybe set by a DHCP server. You may also use the Net Manager Program on a different computer to find the IP-Address of the A3000. Start your Telnet program and set it to use a terminal emulation of VT100. This is recommended but VT52 is also possible. The A3000 will automatically close a Telnet session when no user input has occurred for more than 3 minutes.

START TELNET SESSION

Select the Windows "Start" button, then select "Run" and then type telnet followed by the IP number of the device. For example, if the A3000 IP Address is '192.168.1.151' then type 'telnet 192.168.1.151' and then press "Enter". The telnet session should start.

The default Telnet port in the A3000 is port 23. If the port value has been changed from the default 23, use the new port value. If the A3000 is password protected you need to enter the password right now.

TELNET TERMINAL TYPE:

A prompt to determine the Terminal Type will appear after the Telnet session is started. Select the Terminal Mode setting that works best for the computer and monitor being used. Option #1, VT100, can be used on most computers.

TELNET MAIN MENU

The configuration with Telnet is menu-driven. This is the starting point for configuration. "ServerConfig" has all options to configure the A3000 itself including the IP-Parameters to access it. "SerialPorts" defines settings related to the serial port. "Tools" has some utilities like PING or displays statistics. In "Exit" you may leave the menu or reboot the A3000. At any time you can get a short hint by typing "H" for help.
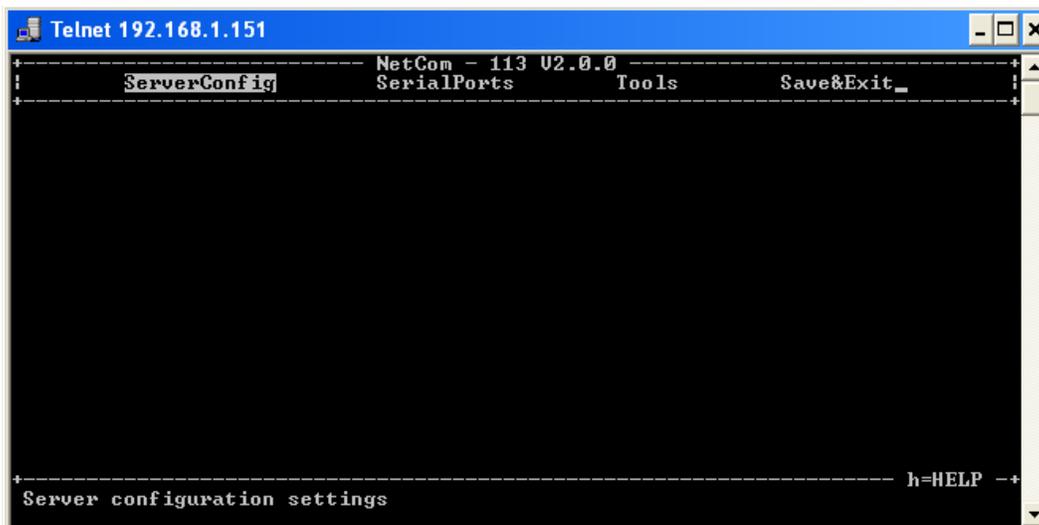
SERVER CONFIGURATION MENU

Parameter

Selecting "Parameter" brings up all Network configuration items listed below. Use the cursors to select the parameter you want to change. Hit <Enter> to go in Edit mode. Type the new value.

"Server Name" identifies the device when the driver software searches for devices. This will help you find the correct A3000 server. DHCP is for automatic IP configuration. "IP Address", "Netmask" and "Broadcast" are parameters you get from your network administrator; the same applies to "Gateway", "DNS" and "Domain". The "ConfigPort" is 23 by default, which is standard for Telnet. You should only change it if you have strong reasons. "KeepAlive" is the TCP-intrinsic function of connection checking. The related interval is defined in seconds.

```
Telnet 192.168.1.151                                          _ □ ×
+------------------------ NetCom - 113 V2.0.0 --------------------+ ▲
|       ServerConfig        SerialPorts       Tools        Save&Exit      |
+----------------------------------------------------------------+
                                                                    ▒
                         Server Parameter                           ▒

            Server Name              [A3000_DGH_1              ]      ▒
            MAC Address              00:04:D9:80:07:00                ▒
            DHCP                     Disabled                         ▒
            IP Address               [192.168.1.151]                  ▒
            Netmask                  [255.255.255.0]                  ▒
            Broadcast                [192.168.254.255]                ▒
            Gateway                  [192.168.254.1]                  ▒
            DNS                      [64.65.196.6]                    ▒
            Domain                   [                         ]      ▒
            ConfigPort               [23    ]                         ▒
            KeepAlive                Off                              ▒
            KeepAliveInterval        [0     ]                         ▒

+---------------------------------------------------- h=HELP --+
| Server configuration settings                                    ▼
```

Authentication

This menu allows users to enter a password. This password is later required to get access to A3000. It is also possible to leave the password empty and use no password authentication.


```
Telnet 192.168.1.151                                          _ □ ×
+------------------------ NetCom - 113 V2.0.0 --------------------+ ▲
|       ServerConfig        SerialPorts       Tools        Save&Exit      |
+----------------------------------------------------------------+
                                                                    ▒




                         Security Settings

            Password                      [empty]




+---------------------------------------------------- h=HELP --+
| Server configuration settings                                    ▼
```

Date & Time

The A3000 can retrieve actual date and time from a specified server.
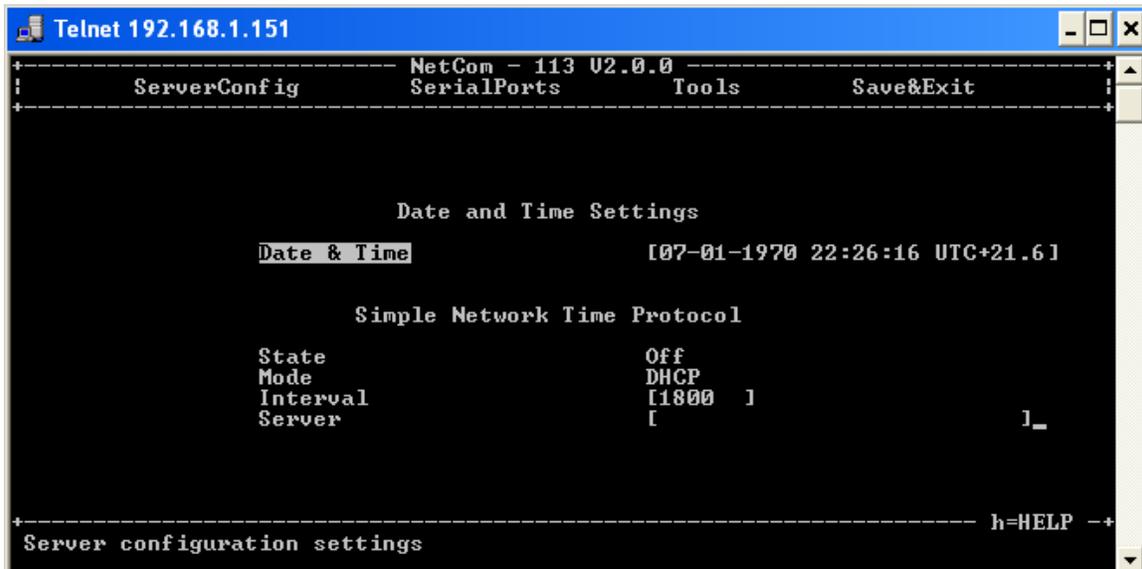
Retype the value of "Date & Time" using the DD-MM-YYYY HH:MM:SS UTC+/-TZ (Time Zone) format.

State

The "State" field has three possible settings:

- "**Off**": disables automatic time retrieval.
- "**Startup**": A3000 gets the time at reset or power on.
- "**Interval**": A3000 repeats to retrieve time.

Mode

The "Mode" field allows users to decide how to configure the server Time. It is possible to get the time by DHCP or direct specified. The "Interval" defines how often the A3000 retrieves the Time from the "Server".

INFO MENU

Info brings up general information about the device. This dialog displays some basic information about the installed A3000 server. The Administrator may provide some contact information here. "Contact" defines a person to contact for help, e.g. "Your Name, 555-HELP". "Location" is the physical place of the A3000, e.g. "Facility, Hall 12, Service Box 10".

```
Telnet 192.168.1.151                                                      _ □ ✕
+---------------------------- NetCom - 113 V2.0.0 ----------------------------+
|          ServerConfig            SerialPorts        Tools        Save&Exit  |
+----------------------------------------------------------------------------+



                              Server Info

                Server Type                  113
                Software Version             2.0.0
                Hardware Version             1.0
                Serial Nr.                   0050101793

                UpTime                       6 day(s) 00:50:16

                Contact                      [<unset>                    ]
                Location                     [<unset>                    ]_



+------------------------------------------------------------------- h=HELP --+
 Server configuration settings
```
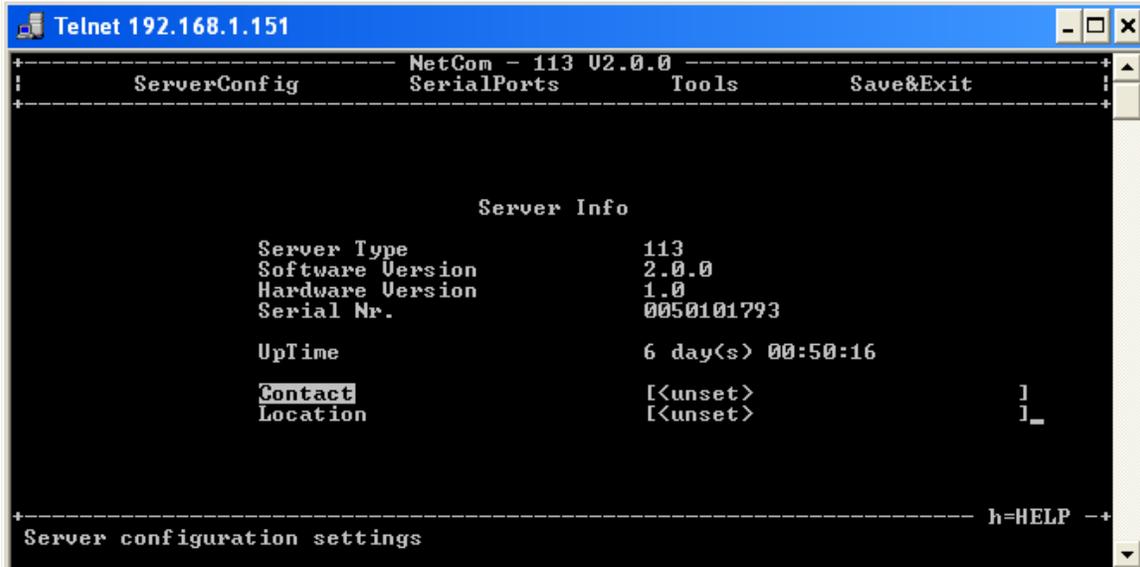
SERIAL PORTS MENU

The settings available in this menu are by port. First select the port to configure placing the cursor
and press <Enter>.

Communication Parameters

These settings used for the Raw connection type; i.e. if the Driver Mode is not used. The driver
will configure the parameters as the application requested it.

The parameters are organized in two groups: The "serial settings" define the basic behavior of the
serial port. The "Transfer Settings" configure the operation mode of A3000 on the network.

There are several options to specify on the serial port. The maximum serial speed is visible.
Configure the serial transmission by setting the "Baudrate" from a defined list. If you select
Manual in this list you may enter the number below. If the selected value is not possible an error
is displayed. Also configure character size, parity mode and the length of the stop bit.


```
Telnet 192.168.1.151                                                      _ □ ✕
+---------------------------- NetCom - 113 V2.0.0 ----------------------------+
|          ServerConfig            SerialPorts        Tools        Save&Exit  |
+----------------------------------------------------------------------------+

                            Serial Settings

                Port Nr.                     1
                PortType (current)           rs232
                DefaultModel                 16550
                MaxBaudrate                  460800
                Model                        16550
                Baudrate                     19200
                   Manual                    19200
                FlowType                     None
                DataBit                      8
                Parity                       None
                StopBit                      1
                RxFifoLength                 2048
                RxTriggerLevel               [11      ]
                TxFifoLength                 2048
                TxTriggerLevel               [800     ]

+------------------------------------------------------------------- h=HELP --+
 Serial port configuration settings
```

www.dghcorp.com

The "RxTriggerLevel" and "TxTriggerlevel" settings define when A3000 issues a "buffer empty/full" message. If the values are less than 16, they have direct impact on the handling of the serial port hardware FIFO. If you change the UART "Model" to 16450, the FIFO size is configured to support a single Byte. This option reduces latency times by increasing the network traffic.

FlowType opens a submenu of configurations. Handshaking is available via Standard XON/XOFF, RTS/CTS and DTR/DSR. There is also an Advanced option for detailed and customer specific configuration. The Advanced option allows configuration of the flow control in a special menu. Every combination for incoming and outgoing flow control may be defined with this option.

Data Transfer Modes

These are TCP/IP parameters. The TCP Port for "Data" transfers the serial data while the TCP Port for "Control" transfers the control information defined by the "VS NetCom" driver, if installed. Programs operating in Raw TCP mode (like Telnet) connect to the "Data" port for data transfer. Since there are more transfer modes (listed below), all parameters are explained at the "Advanced Settings".
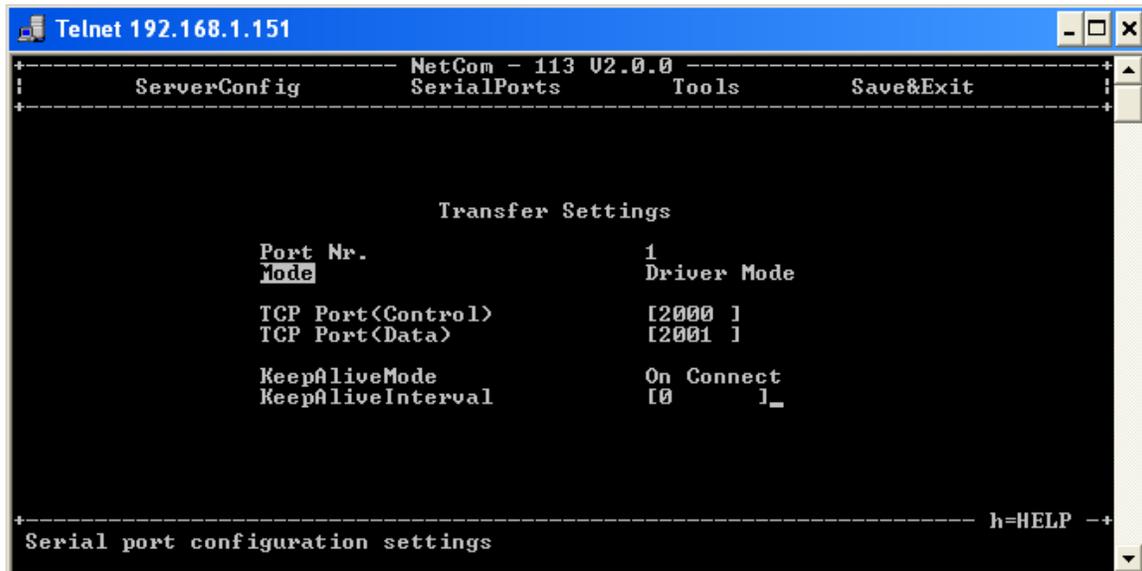
To change the current "Mode" of the serial port, place the cursor on the field and press <Enter>. A drop-down list of the available modes appears.

For demonstration purposes the "TCP Advanced Settings" mode is selected. All parameters may be changed. This allows some unexpected configurations. This example is used to show and explain all parameters and their purposes. Information is also available on-screen when typing help.

The A3000 usually acts as a network server. This means it accepts incoming connections. The most used Driver Mode is explained above. It is possible to disable this option by setting the "Server" to "Off". Usually there is only one client connection at a time but the limit can be raised.

In rare cases the A3000 can also operate as a network client. Setting the "Client" to "On" can enable this client option. In certain situations A3000 contacts a computer (server) defined by

"Destination" to send data. Most customers just need a Raw TCP connection to the server. "TCP Port(Data)" defines the target application. If the server is another A3000, both devices can also exchange control information via the "TCP Port(Control)". There are three types of "Connect": Permanent, Triggered and DSR. In Permanent mode A3000 connects to the server immediately. If the connection is interrupted for some reason the A3000 keeps trying until the connection is established again. In Triggered mode the A3000 connects to the server when data arrives on the serial port. When no more data arrives, "ShortHoldTime" (in milliseconds) defines how long to keep the connection before closing it. Warning: a time shorter than 1000 may cause problems. DSR controls the external device via the DSR signal. When the DSR becomes active at the A3000, the connection to the target is established. As long as DSR is active the A3000 operates similar to the Permanent configuration. When DSR becomes inactive, the connection is terminated.

The A3000 can monitor an open connection using the "KeepAliveMode". Please note that this option is effective only in Driver Mode and Null Modem Tunnel. If the Keep Alive function is required in the other modes then the global option in Server Parameters is available. "KeepAliveMode" has three settings:

- **Off**: no keep alive.
- **On Connect**: when a client is trying to connect to the server and there was a previous connection, the server checks to see if the connection still exists. If the first connection no longer exists the server accepts the new connection.
- **Polling**: the server checks in "KeepAliveInterval" (seconds), to see if a connection still exists.

There are several predefined configuration modes listed and described below.

Driver Mode

In Driver Mode the A3000 operates as a server. It accepts connections on the Data and the Control port. The control and data connections must originate on the same computer. The parameters for Keep Alive apply in driver mode. Only one computer is allowed to connect at a time.

TCP Raw Server Mode

The A3000 also operates as a server in this mode. It only accepts raw data connections to the Data port (this is also possible in Driver Mode). The Control port value is set to zero in TCP Raw Server Mode. In Raw Server mode multiple clients may connect. Serial data received is sent to each client and all clients can send data. The customer application is responsible to avoid data confusion and damage.

TCP Raw Client Mode

In Raw Client Mode the A3000 is a network client and it establishes a Raw TCP connection to a predefined "Destination". The Destination can hold multiple hosts as targets for a connection. They are entered as a comma separated list of DNS names or IP-Addresses. Each destination will have a TCP port number separated by a colon. Instead of a single IP-Address or DNS name, a range of IP-Addresses is also valid. The TCP port number must follow this range. For example, 192.168.254.12-192.168.254.17:2077. The Connect modes and Short Hold Time apply.

Null Modem Tunnel

This is a special mode. Two A3000s connect via network and simulate a long Null Modem cable between the two serial ports. This mode is symmetric as both A3000s operate as server and as client at the same time.

The server part operates in Driver Mode and waits for incoming connections. Serial data is transmitted as well as control and status signals on the serial port. The client part uses the three types of "Connect", Permanent, Triggered, and DSR.

UDP Mode

UDP is an Internet Protocol, which does not define a connection. There is no extra data to signal a successful transmission. Data may be sent and received faster than with TCP/IP. Please compare with the parameters for TCP Raw Server and Client Modes. The parameters to configure the UDP Mode are similar to a mixture of these modes.

Since there is no connection as in TCP/IP, the A3000 must be configured to receive data via UDP. The only parameter required is the local port number. To define where to send the data the A3000 needs the Destination and the port to address there. Since there is no connection, data cannot be sent in a stream. UDP uses packages. There are several ways to define the content for a package. The maximum size of such a package may be defined. If this amount of serial data is received a package is generated and sent. "UDP Timeout" (given in milliseconds) is an interval. If no serial data is received for this time all data available so far is sent as a package. A value of zero causes all data to be sent immediately. "UDP Trigger" defines a sequence of characters. As soon as this sequence is detected in the received data, all data up to the end of this Trigger is sent to the destination. In most situations such a Trigger includes control or other special characters. Enter them as: \xHH where HH is the hexadecimal code of the character or as \OOO where OOO is the octal code of the character. The backslash must be doubled as \\.

TOOLS MENU

Ping

The Ping tool allows for verification of network settings. Try to reach some computers on your local network. Enter the IP address of the device and try to "ping" it.

Statistics

The Statistics are presented on a by-port base. So you first select the serial port and then you have the information about modem status and control. Also the amount of data transferred is shown.

Netstat

Netstat is a common tool that is used to display the status of network connections. It may be used to monitor the actual status of the A3000.

```
■ Telnet 192.168.1.151                                           - □ ×
+----------------------- NetCom - 113 V2.0.0 ----------------------+
:         ServerConfig        SerialPorts       Tools       Save&Exit :
+-----------------------------------------------------------------+
1/1
          Proto Local Address          Foreign Address      State
          tcp   0.0.0.0:23             0.0.0.0:0            LISTEN
          tcp   0.0.0.0:80             0.0.0.0:0            LISTEN
          tcp   0.0.0.0:2000           0.0.0.0:0            LISTEN
          tcp   0.0.0.0:2001           0.0.0.0:0            LISTEN
          tcp   192.168.1.151:23       192.168.1.104:2749   ESTABLISHED
          udp   0.0.0.0:0
          udp   0.0.0.0:161
          udp   0.0.0.0:1025


+----------------------------------------------------- h=HELP -+
 Ping, Statistics, Netstat, Logging and Firmware
```

This is a sample result of Netstat. When there is more to display it will start with "1/2" in the first line or even more for a long list. You may change to a different page by using the Page Up/Down keys in your Telnet. The display is refreshed in a few seconds. Press the <ESC> key to return to the menu.

Logging

The A3000 has two options of Logging. There is the standard Syslog and a second option of logging via Telnet.

Activate the Syslog and define the machine with the Syslog Demon running. Also configure the Facility parameter. You may also connect to a special "Debug Port" on the A3000 to get all messages in real time.

Firmware

There is an option to upgrade the Firmware of A3000. This is either done via the actual channel (i.e. the serial or Telnet connection) or independently via a separate TCP/IP connection. This setting defines the parameter. The Firmware is sent coded in base64 via very simple programs like a second Telnet session or similar tools.

SAVE & EXIT MENU

Save Parameter

When changes are done, it is possible to save these modified settings here. Confirmation is requested before doing this.

Exit

Select this option to leave the program. A "save" confirmation prompt will appear for any un-saved parameters that have not been saved yet.

Reboot

You also leave the menu here but the A3000 is restarted. This activates any changes in the settings. This reboot is necessary for some changes like IP configuration. Others do not require a reboot. If parameters are changed during the session, confirmation for saving them is requested.

CONFIGURE A3000 VIA SERIAL CONSOLE

In some situations it may be impossible to get network access to the A3000. If this happens (e.g. accidentally misconfigured) neither Telnet nor the web interface is functional. It may even be impossible to use the A3000 manager program.

In this case you must connect to the A3000 via the serial port. Disconnect any serial cable from the A3000. Set the DIP-Switches to "RS-232 Configuration" or all switches down in the Off position. Then connect the A3000 with your computer using a standard modem cable (direct connection). If you do not have a modem cable use a Null Modem cable and plug the Null Modem adaptor to the serial port.

Open a serial terminal program (Hyper-terminal, mini-com, etc.) select 38400 bps, 8 Data Bits, No Parity as configuration. Once connected to the A3000 you must define the type of terminal emulation to be used. Set your terminal emulation to VT 100 (recommended, but VT52 is also possible) using the Arrow keys.

6. VIRTUAL COM DRIVER

When properly configured the serial port of the A3000 will appear as virtual serial port in your computer. The term "virtual" means that there is no physical computer hardware related to the serial port. However, the driver offers the full functionality of a hardware serial port in the system. The Windows API supports the programming interface used by the virtual driver. So Windows does not see a difference from Com1 and no application should detect changes either.

This section of the manual covers the correct installation of the drivers and serial ports. Please review Chapter 4, Windows Driver Quick Installation before proceeding.

INSTALLATION OF A3000 SERVERS

The Installation Wizard starts the A3000 Net Manager program. Often there are more than one A3000 listed and sometimes not all of them are assigned to this specific computer.

The "Exclude" button is used for that purpose. Select an A3000 and click on that button. The driver will later ignore this A3000 when installing and operating the serial ports. The Icon changes to the color olive when excluded.

Select the A3000 to install. You will notice yellow questions marks on each icon. These appear when the A3000 is not already installed for the Virtual Com driver. It may also appear if you open A3000 Manager without administrative privileges. If the mark changes to a red exclamation mark, the A3000 is not functioning. It may be without power, disconnected from the network, or removed. To clear the Net Manager display, use the "Remove" button.

If an A3000 is not operational when the Manager program is started, it is either displayed with the exclamation mark or not displayed at all. You may make it operational be connecting it now. To install it, use the "Search" button to find it in the network. Or "Add" it manually with that button.

Similarly you may exclude certain ports on a specific A3000 Server from installation as a Virtual Com port.

These are the special options used while installing the driver software. The Net Manager program may change the configuration any time after installation. This may result in serial ports appearing in or vanishing from the system.

CHANGING THE INSTALLATION

There are situations when the A3000 configuration needs a change. In the first case the A3000 has been moved to a different location or the logical structure of the network has changed. It may be that the IP-Address of A3000 is also changed either by Automatic (DHCP) or manually via a different interface like the Web browser. Because of the changed address the driver does not find the serial port to contact. Now open the Net Manager. It will re-detect the devices. In this process the Manager finds the already installed A3000 but with a new configuration. The Manager requests interaction from the user. This question assumes that the A3000 is newly installed. This will produce a Com port with a new number. If the A3000 is reconfigured, click on "No". When you do that, the parameters of the installed Virtual Com are changed to contact the same serial ports on a new network address.

The second case occurs when an A3000 is replaced by another device. This new device shall have the same configuration especially the same IP-Address. When you start the Net Manager it will detect a new device with parameters already in the database. The Manager requests interaction from the user. An installation of a new serial port is assumed again. If the device shall replace the old one, click on the "No" button.

In general the driver software and the Net Manager identify the A3000 devices by the combination of IP-Address and serial number. If one of these is changed the above requests appear.

CONFIGURE THE SERIAL PORTS

After the serial ports are installed any application may use them. They appear as "NetCom COM Port" in the Device Manager. An application program such as Window Hyper Terminal will not see any difference between hardware port Com1 and virtual port Com7. Meaning, HyperTerminal and most other programs will readily communicate through these Virtual Com ports.

Typically, a user selects a serial port in the application program and opens it. The program performs the configuration of bits per character, parity settings, number of stop bits and the flow control (handshaking). Windows sends these requests to the virtual port driver and the driver sends the configuration to the serial port in the A3000.

The same parameters may be pre-configured in the Device Manager. This is done via the "Properties" of the "NetCom COM Port". These standard parameters are defined in the "Local Settings" tab. Since most programs configure these parameters by themselves the values are very rarely used. A typical situation is a serial printer attached to this virtual port.

This process behaves differently in the Windows NT operating system. There is no Device Manager in Windows NT. Therefore to change these parameters then open the "Ports" applet in the Windows Control Panel.

As an alternative, it is recommended that you open the "Net Manager" applet to change the "Ports". Double-click on the small icon at the left of the dialog screen and select the "Local Settings" tab.

PERFORMANCE ISSUES

Serial operation through a network or the Internet causes some delay in transmission of data, approximately 5 milliseconds. When using an internal computer serial port this time may be just 100 microseconds. This can have an effect on the response time of systems. Some data protocols may accommodate and compensate for these small delays. Other time dependent

protocols many not allow for this. Many configurations are possible in order to try and compensate for this.

The configuration starts on the "Performance" tab and there are four defined sets of parameters. The default configuration is for "Best Performance". The driver software and the A3000 communicate with big data blocks. As a result a reaction on short events on the serial port is delayed. This is not optimal for applications operating with short data blocks and waiting for short answers. It causes transmission delays called Latency.

Latency may be reduced at the cost of reduced throughput for large data blocks. The fastest setting "Shortest Latency" is often referred to as "deactivate the FIFO". The FIFO on the serial ports is not really deactivated because this raises the risk of data loss. But the port is configured as if the FIFO is off, thereby gaining reaction times. Use the "Driver Default" to get the standard setting. Use "Advanced" to get access to detailed configuration.

NETWORK & MISC PROPERTIES

When you use the "Advanced" checkbox on the "Performance" tab then the "Network & Misc" tab opens automatically. The parameters on this tab control the operation of the driver software on the computer.

"Tx Network Buffer Size": If the application sends small chunks of data to the driver, these are buffered in order to send them in one large packet. This defines the size of the buffer and the maximum packet size sent to the serial port by the driver software.

"Rx Network Buffer Size": This is the size of the buffer to receive data from the A3000.

"Automatic Trigger": Based on internal rules, this checkbox selects a best value for "Tx Trigger Level". Deactivate it to control that parameter manually.

"Tx Trigger Level": Controls the time when data is sent to the A3000. If the Tx buffer holds at least this amount of data the driver immediately sends them. If there is less data the driver uses a timeout to determine when to send them.

"Network Timeout (ms)": This is the timeout.

"Overspeed": This is a special option not really related to network communication. Some older applications may be limited by maximum communications speed. With Overspeed you define a multiplier. The baud rate requested by the application is multiplied by this factor. The result is sent to the A3000 to configure the serial port. For example the application may be limited to 38,400 bps but there is a modem capable of 230,400 bps on the serial port. Set Overspeed to a value of 6.000 and configure the application to use 38,400 bps.

"Open If Absent": The A3000 may be used from a computer with a Dial Up connection. When this option is used the driver will delay the connection to the A3000s serial port. Even when an application opens the port and configures the parameters no data is sent. The connection is established when data is sent to the A3000 or when status information is requested.

"Keep Alive": This option will periodically send control information to the A3000 to check if the connection is still operational. As a result a Dial-up connection will not automatically close.

"Passive Modem": This option controls how often the driver retrieves Modem status information from the A3000. If activated, the driver never asks for the modem status. Instead the

A3000 informs the driver of any changes. If an application frequently requests the Modem status it gets the last value received. On slower networks like the Internet this option is recommended. If inactive the driver software retrieves the Modem status from the A3000 serial port each time the application requests it with a maximum frequency of 10 per second. If the latest retrieved information is not older than 100 milliseconds this value is returned.

"Simulate Device Off on Connection Loss": When this option is enabled the A3000 driver does not attempt to preserve transmitted data. If on a normal serial port the connected device is switched off, all data sent to this device gets lost. A3000 simulates this behavior. All data sent from the application to the driver is discarded when the TCP connection to the A3000 is lost. The A3000 attempts to re-establish the connection in regular intervals. When it is available again, data may be transferred from then on.

REMOTE SETTINGS PROPERTIES

The other panel created by activating the "Advanced" checkbox on the "Performance" tab is the "Remote Settings" tab. The parameters on this tab control the operation of the serial port on the A3000. They are defined and activated by the driver software.

"Tx Trigger Level": The serial port on the A3000 buffers data for transmission to external devices. If the amount of data in this buffer drops below this level the A3000 is able to receive new data. It will send a related event to the driver software.

"Rx Trigger Level": When the serial port has received this amount of data, these are sent to the driver on the connected computer. If the amount of data is less than this level, the A3000 applies a timeout of about 5 character times. This means the timeout varies with the serial transmission speed.

"Remote Flow Control" signals the A3000 to perform the handshake on its own. This is necessary because the network delay of some milliseconds is too long for reliable operation in many situations.

"Enable": The configuration shown here is active when the pre-defined performance levels are used. When using the "Advanced" option, Remote Flow Control is completely disabled. Enable as required.

While it is best practice to configure as above, you can disable certain events here. "CTS", "DSR" and "Tx XON/XOFF" control the output of data to the serial port. And "RTS", "DTR" and "Rx XON/XOFF" are used to stop transmission from the connected device. An application has the option to use any combination of these methods at the same time. The command to use them is transferred to the A3000. For example, if the port is configured to use Hardware Flow Control the A3000 will control the RTS line and observe the CTS line. If requested any of these methods may be unchecked. In that case the driver software on the computer will control the lines.

"Override App Settings": In rare situations it is necessary to ignore the applications configuration. Check this box and select the Flow Control to use with the device.

"Limits": These buttons are prepared for future software versions.

7. UNINSTALLING THE SOFTWARE

The drivers and services install on a computer like any other Windows program. Meaning, it is easy to remove the drivers from the computer in the "Control Panel" section under "Add/Remove Programs".

You must confirm the uninstall operation and the devices are removed from the system. All driver and configuration files will be removed from the Windows and System directories. A simple de-installation via the "Device Manager" may result in some driver files being left on the computer hard drive.

There is also a separate uninstall in the Windows Start Menu. This performs the same procedure used in the "Control Panel" section under "Add/Remove Programs" selection. You will also be asked to confirm the de-installation of the drivers.

You may also start the Installation Wizard a second time. It will detect any installed drivers. The options are to re-install the drivers similar to a repair installation. It is possible to completely uninstall the current drivers.

8. 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 on the Internet. But a simple contact like plugging in a cable is not enough. The network has to be configured. If you have any question during configuration, ask your network administrator. 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.

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.

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 an A3000 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.

DHCP CONFIGURATION

Another typical configuration is the automatic configuration. This requires a dedicated server in the LAN that 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 A3000 devices support DHCP, so just activate it.

For best operation the DHCP server itself should be configured. It may identify the A3000 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 for Windows operating system.

AUTOMATIC CONFIGURATION (APIPA)

Windows uses a different type of automatic configuration. If the stations are 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 169.254.N.N, where N.N is from 0.1 to 255.254; the corresponding Netmask 255.255.0.0 is mandatory. The address is selected by random and checked if already used.

The A3000 devices do not support this method. However it is legal to assign a static address from this range to the A3000. Try to find an unused address in you network starting at 169.254.0.1. Check by PING and ARP if the address is used. If not, assign it to the A3000. This is only a workaround. The better solution is to install or configure a simple DHCP server program. Typical SOHO Internet routers already have such a server. Or you may change your network to static configuration.

OTHER CONFIGURATION

If the configuration of your computer differs from these examples ask your network administrator for proper parameters.

9. HARDWARE DETAILS

SERIAL PORT

The A3000 serial port can be configured for one of three different serial communications standards. The serial port supports the RS-232, RS-422, or RS-485 standards. This is defined by a set of DIP-switches. Here is a list of the available modes and the switch settings.

Warning: A bad configuration may cause serious damage in the A3000 or the connected device.

	Line Mode, Comment	S1	S2	S3	S4
RS-232	Configuration via Serial Port, Note 1.	OFF	OFF	OFF	OFF
	Data Communication	OFF	OFF	ON	ON
	Reload Factory Values, Note 1.	OFF	OFF	OFF	ON
RS-422	Data Communication	OFF	ON	ON	ON
RS-485, ART, Note 1.	4-wire Full Duplex	ON	ON	ON	OFF
	2-wire Half Duplex with Echo	ON	ON	OFF	ON
	2-wire Half Duplex without Echo	ON	ON	OFF	OFF
RS-485, RTS	4-wire Full Duplex	ON	OFF	ON	OFF
	2-wire Half Duplex with Echo	ON	OFF	OFF	ON
	2-wire Half Duplex without Echo	ON	OFF	OFF	OFF

Table 5.0 Switch Configuration for A3000

Note 1: ART is the Automatic Receive Transmit control. In RS-485 this is the recommended option. The A3000 performs the required activation and disabling of the RS-485 transmitter by an internal automatic.

SIGNAL ASSIGNMENT

It is of course important to know the exact location of the serial signals in the configured mode. Here are the tables for the A3000 DB-9 Male connector as well as RJ45 and DB-9 male connectors found on most computers or USB-to-RS-232 adapters.

A3000 DB-9 Signal Assignments			
Pin	RS-232	RS-422/RS-485 4-wire	RS-485 2-wire
1	DCD	Tx- (A)	Data- (A)
2	RxD	Tx+ (B)	Data+ (B)
3	TxD	Rx+ (B)	
4	DTR	Rx- (A)	
5	GND	GND	GND
6	DSR		
7	RTS		
8	CTS		
9	RI		

Table 6.0 Signal Assignment for A3000 DB-9 female connector.

Typical Computer RS-232 DB-9 Signal Assignments			
Pin RJ45	RS-232	Pin DB-9	DB-9 male
1	RTS	7	
2	DTR	4	
3	GND	5	
4	TxD	3	
5	RxD	2	
6	DCD	1	
7	DSR	6	
8	CTS	8	

Table 7.0 Signal Assignments for RS-232 RJ45 and DB-9 male connectors.

Please note the GND signal in RS-422 and RS-485 modes. This signal must also be connected between the serial devices. With the exception of very special configurations, a serial cable without GND violates the specifications for RS-422 and RS-485.

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10. TROUBLESHOOTING GUIDE

The most common problems when using A3000s are caused by a failure in the configuration of network parameters. This is a list of some symptoms and tests to check them.

1) First examine the network configuration of your computer. Open a console window (MSDOS command prompt) and use the command IPCONFIG /ALL to retrieve the information. Among other information some data is displayed as this: Ethernet adapter Local Area Connection: Description..................: <Your LAN card> Dhcp Enabled.................: Yes Autoconfiguration Enabled....: Yes IP Address...................: 192.168.1.154 Subnet Mask..................: 255.255.255.0 DHCP Server..................: 192.168.1.1 If DHCP is activated and there is a DHCP server found, the configuration is OK. A common problem is an IP-Address like 169.254.xxx.yyy, because this is an automated address of APIPA. If no DHCP server is present in the network, a static configuration is recommended. Here we prefer the range of 192.168.1.1 up to 192.168.1.254 for computer and A3000. Change the computers configuration and select a similar address for A3000.

2) Start the Net Manager program. Search for the devices, the Manager performs a discovery of available A3000 devices. Check the properties of each device for a matching serial number. Once the A3000 is identified, check the IP-Address and the Netmask. If all this information is displayed as Zero, the IP-settings do not match your computers settings. To correct this, you need administrative privileges for your computer. Start the Net Manager as Administrator and configure correct parameters in the A3000. Close the Manager program.

3) Important: The default configuration of an A3000 may result in a fixed IP-Address. It will be the same for all connected devices. As a side effect the Manager cannot send a dedicated configuration to a certain device. Therefore it is best to connect several A3000 one by one, configure them individually, then connect the next, and search for that device.

4) Try to PING the A3000. Open a console window and use PING <IP-Address of A3000> to send some data. The replies should reach your computer in a few milliseconds. If they time out, check the IP parameters again.

5) Telnet to the A3000. Open a console window and use the Telnet <IP-Address of A3000> command to connect. The configuration menu appears. If not, open Net Manager and check the setting of "Telnet port" in the A3000. The default is the name "telnet" or the number 23.

6) Telnet to the serial port of the A3000. Open a console window and use the Telnet <IP-Address of A3000> <data port> command to connect. Everything you type is sent out through the serial port. Every data received is displayed on the screen. To check the operation, place a standard loop back plug to the serial port. You should see your own data as an Echo while typing.

7) Check the Device Manager for error messages.

8) Run Hyper Terminal and open the serial port of the A3000. Use the loop back plug to see the Echo of your typing. Use a Null Modem cable and connect it from COM1 to the A3000. Open a second Window of Hyper-terminal for COM1. Send some data between these two windows. Transfer a file using ZMODEM protocol.

9) Often so-called Personal Firewall programs cause unspecific errors when other software starts communicating. Check the documentation of the program to see how to allow access.

Many other problems occur because of a failed serial connection caused by wrong cabling. Here are some frequent causes.

10) The serial cable in RS 232 mode may be too long. This mostly happens with higher transmission rates.

11) In RS-422 and RS-485 it is mandatory to also connect the GND signal of all devices. The information is transferred (and defined) by the positive or negative difference of the Data+ and Data- lines. However the specification requires a common voltage range between the connected devices. To ensure this range the connected GND is required.

12) A network in RS-485 requires biasing resistors. The Data+ line requires a pull-up resistor to +5V. The Data- line requires a pull-down resistor to GND. The value is about 750 Ω to 1 kΩ. When no station is transmitting, the data lines float. This will cause noise and strange errors. The biasing resistors place a differential voltage to the lines of at least 200 mV. There should only be one pair of biasing resistors on the RS-485 network. They are not implemented in the A3000 serial ports.

11. GLOSSARY OF TERMS

APIPA: Automatic Private IP-Addressing A scheme to self-assign an IP-Address to a network device. The device selects an address of the LINKLOCAL range 169.254.0.1 to 169.254.255.254 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, the 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 from a database.

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. This information's is 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. Each station on the Internet has a unique address. Some ranges are reserved for private networks not connected to the Internet.

LINKLOCAL: This is a reserved address range for private (i.e. not connected to the Internet) networks. Designed for small number of stations. Used with APIPA.

NAT: Network Address Translation A technique to have a private LAN share one public IP-Address. With NAT the transport information in IP-frames is exchanged 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 identical value here, 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 exchanged 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: Industrial serial transmission (multi-drop) A transmission method with differential signals. Allows higher speed, longer cables and is resistive against electrical noise. RS-422 allows for up to 16 receivers. The transmission is via twisted pair copper cable using differential 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 is 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.

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.

WARRANTY

DGH warrants each A3000 series module to be free from defects in materials and workmanship under normal conditions of use and service and will replace any component found to be defective, on its return to DGH, transportation charges prepaid within one year of its original purchase. DGH assumes no liability, expressed or implied, beyond its obligation to replace any component involved. Such warranty is in lieu of all other warranties expressed or implied.

WARNING
The circuits and software contained in A3000 series modules are proprietary. Purchase of these products does not transfer any rights or grant any license to the circuits or software used in these products. Disassembling or decompiling of the software program is explicitly prohibited. Reproduction of the software program by any means is illegal.

As explained in the setup section, all setups are performed entirely from the outside of the A3000 module. There is no need to open the module because there are no user-serviceable parts inside. Removing the cover or tampering with, modifying, or repairing by unauthorized personnel will automatically void the warranty. DGH is not responsible for any consequential damages.

RETURNS

When returning products for any reason, contact the factory and request a Return Authorization Number and shipping instructions. Write the Return Authorization Number on the outside of the shipping box. DGH strongly recommends that you insure the product for value prior to shipping. Items should not be returned collect as they will not be accepted.

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