Professional Fieldbus Connections

SERIP-100
Serial Device Server
User manual

UMSERIP100-2201

SERIP-100

Serial Device Server: User manual

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Important user information

This manual explains how to install, operate and configure a *SERIP-100*. This device may only be used for the applications described in this document.

This manual is to be used with a *SERIP-100* with firmware version 2.2.

These instructions are intended for use by trained specialists in electrical installation and control and automation engineering, who are familiar with the applicable national standards and safety procedures.

Safety Precautions

ELECTRICAL HAZARD

- This equipment must be installed and serviced only by qualified personnel. Such work should be performed only after reading this entire set of instructions.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Apply appropriate personal protective equipment and follow safe electrical practices.
- Turn off all power supplying the equipment in which the *SERIP-100* is to be installed before installing, wiring or removing the *SERIP-100*.
- Always use a properly rated voltage sensing device to confirm that power is off.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.

Failure to follow these instructions could result in death or serious injury!

Document conventions

Throughout this manual we use the following symbols and typefaces to make you aware of safety or other important considerations:

	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
	Indicates a potentially hazardous situation that, if not avoided, could result in damage to equipment.
	Indicates information that is critical for successful application and understanding of the product.
	Provides other helpful user information that does not fall in above categories.
	Provides supplemental user information.
Acronym	This typeface is used to introduce acronyms or product names.
`Command`	This typeface is used to represent commands, prompts, input fields and filenames. In the context of programming it is used for functions, variable names, constants or class names.
`Placeholder`	This typeface is used to represent replacable text. Replaceable text is a placeholder for data you have to provide, like filenames or command line arguments.
`User input`	This typeface is used to represent data entered by the user or buttons.
`Screen output`	Screen output or program listing

Chapter 1. Introduction

SERIP-100 is a serial to Ethernet interface converter. The unit enables serial devices to connect to an IP-based Ethernet LAN.

The *SERIP-100* receives data on the serial port, converts the data stream into either a TCP or UDP packet and transmits the packet via the Ethernet network. Vice versa, data contained in packets received on the network interface are transmitted on the serial port.

Two *SERIP-100* operating in UDP tunneling mode can be used to overcome the length limitation of RS-232 and to connect two serial devices utilizing IP network infrastructure.

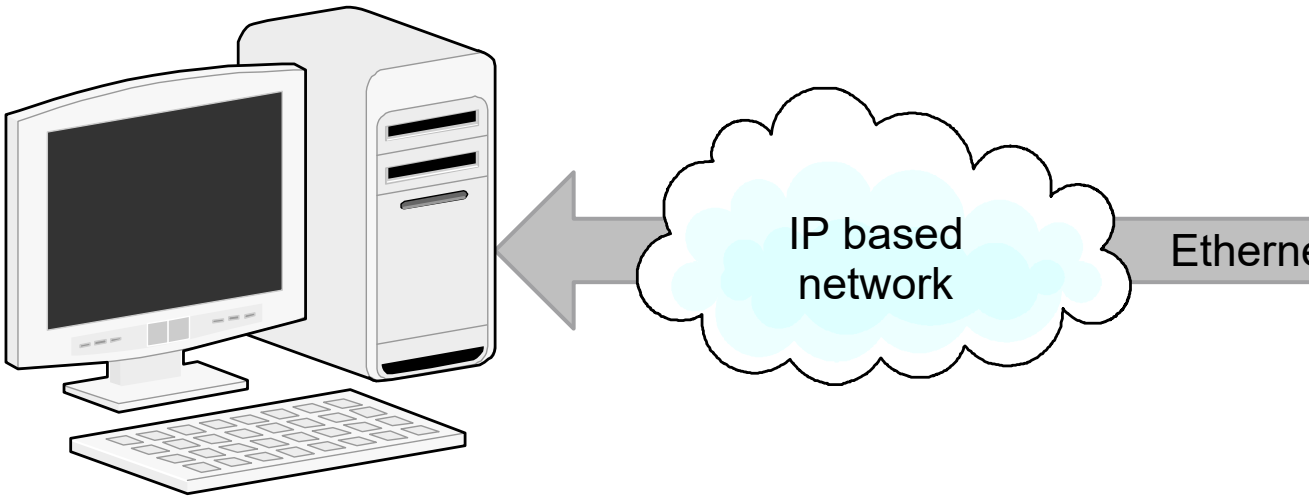


Figure 1.1: SERIP-100 operation

Configuration of the gateway is simple and conveniently performed using a web browser which connects to the embedded web server.

The unit's firmware adheres to the Internet Standards (RFCs) as close a possible. This provides it with a high degree of compatibility with a broad range of available commercial and open source middleware, drivers and utilities.

Features

The *SERIP-100* gateway provides the following key features:

- Versatile modes of operation (Server, Client, UDP tunnel)
- Telnet protocol compliant (any port)
- Includes *SERIP Toolkit* with virtual COM port redirector software for Windows operating systems
- Compatible with the ttyd virtual device driver and Termpkg package for Linux
- Embedded web server for easy configuration and commissioning using a web browser
- Firmware upgradeable via Ethernet
- DIN rail mountable
- 24 V DC (10-30 V) power supply
- Status LEDs for power, Ethernet link and communication status

Quick start checklist

- Read this set of instructions properly and in its entirety.
- Mount the unit.
- Connect the power. Do not connect yet serial ports.
- Configure the Ethernet communications settings with a web browser (using an Ethernet crossover cable) or with a terminal program like *HyperTerminal* (using a null modem cable)
- Configure the serial line communication settings.
- Configure the operational aspects of the device.
- Wire serial line interfaces.

Chapter 2. Description

The power and RS-485/RS-422 terminals are placed on the top side of the unit. The RS-232 and Ethernet connectors are placed on the bottom side of the unit as shown in the following illustration:

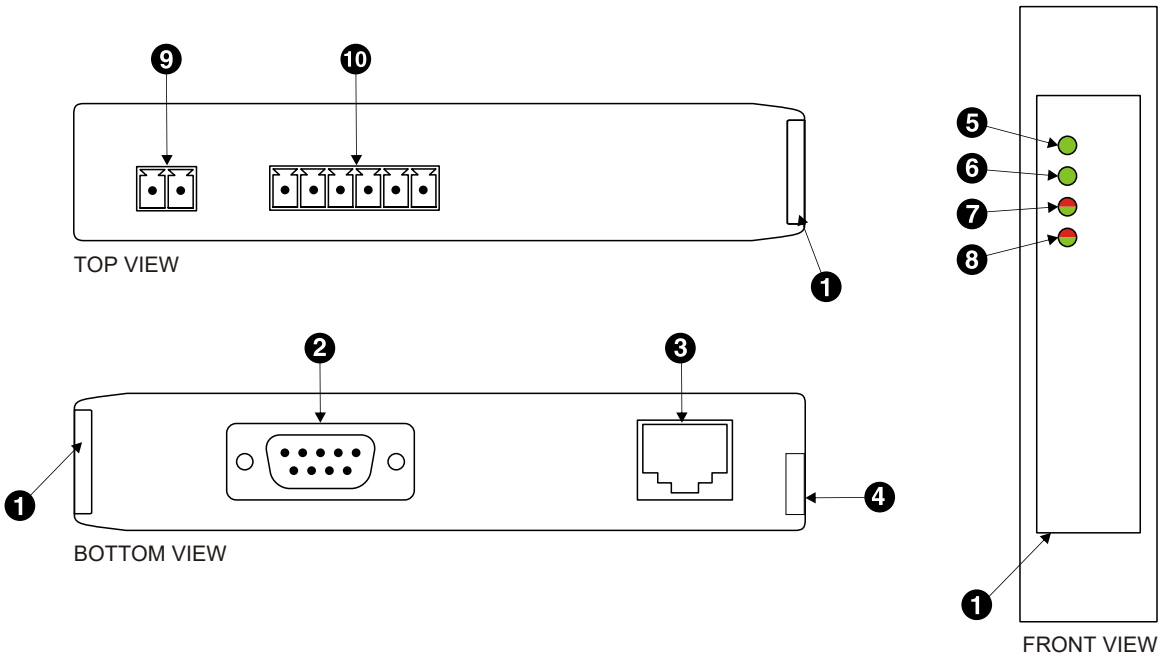


Figure 2.1: Location of connectors

1. Clear front cover
2. RS-232 connector
3. Ethernet connector
4. DIN rail clip
5. Power LED
6. Ethernet link LED
7. Status 1 LED
8. Status 2 LED
9. Power terminals
10. RS-485/RS-422 terminals

LED indicators

Four LEDs located at the front panel indicate the status of the device. The LEDs assist maintenance personnel in quickly identifying wiring or communication errors.

A LED test is exercised at power-up, cycling each LED off, green and then red for approximately 0.25 seconds. At the same time the power-on self test of the device is performed.

The following table outlines the indicator condition and the corresponding status after the power-on self-test has been completed:

LED	Function	Condition	Indication
Power	Power	Off	No power applied to the device.
		Green	Power supply OK
Link	Ethernet link	Off	No Ethernet link
		Green	Ethernet link OK
Status1	Device status	Off	No Ethernet connection. No data on serial port.
		Flashing green 0.5 s rate	Connection on Ethernet but no data transmission or reception on serial port.
		Green	Connection on Ethernet and data transmitting or receiving on serial port.
		Flashing red 0.5 s rate	No connection on Ethernet but data is received on serial port.
		Red	The device has an unrecoverable fault; may need replacing. Flashing sequence and rate of Status2 LED indicates fault class.

Table 2.1: LED diagnostic codes

Operating modes

TCP Server mode

The *SERIP-100* operates as a server listening on the configured TCP port for connections from a client. As soon as one client is connected, it will receive the serial port data stream via TCP. Any data sent to the *SERIP-100* by the client will be forwarded to the serial port.

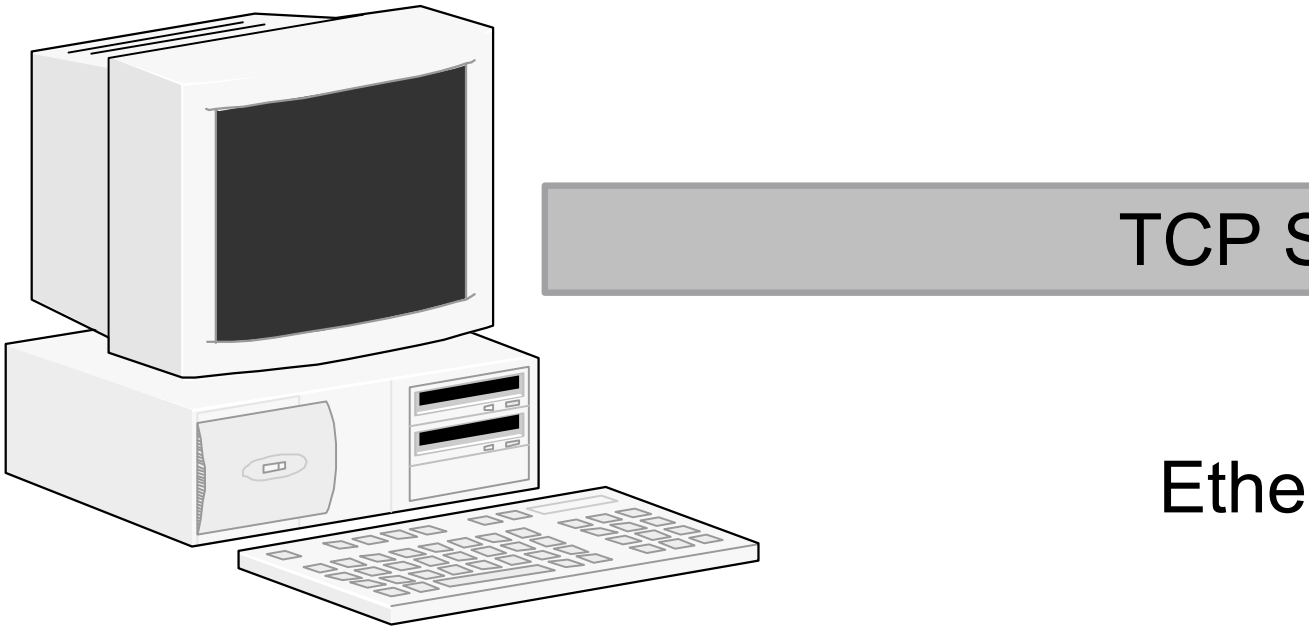


Figure 2.2: SERIP-100 in TCP Server mode configuration accepting connections from a PC

Telnet Server mode

The *Telnet Server* mode is similar to the *TCP Server* mode but offers in addition support for the *Telnet* protocol. This means all characters received or transmitted on the TCP connection are encoded with the Telnet protocol.

The *Telnet Server* mode is the most commonly used mode and is utilised by the *telnet* utility as well as serial port redirectors and virtual serial port device drivers.

TCP Client mode

The client mode is the opposite of the server mode and requires a TCP server to connect to. After a connection to the nominated server has been established, any data received on the serial port is delivered to the server as TCP data stream. Any data sent to *SERIP-100* by the server will be forwarded to the serial port. The *SERIP-100* will automatically re-connect to the specified Server if the connection has been lost.

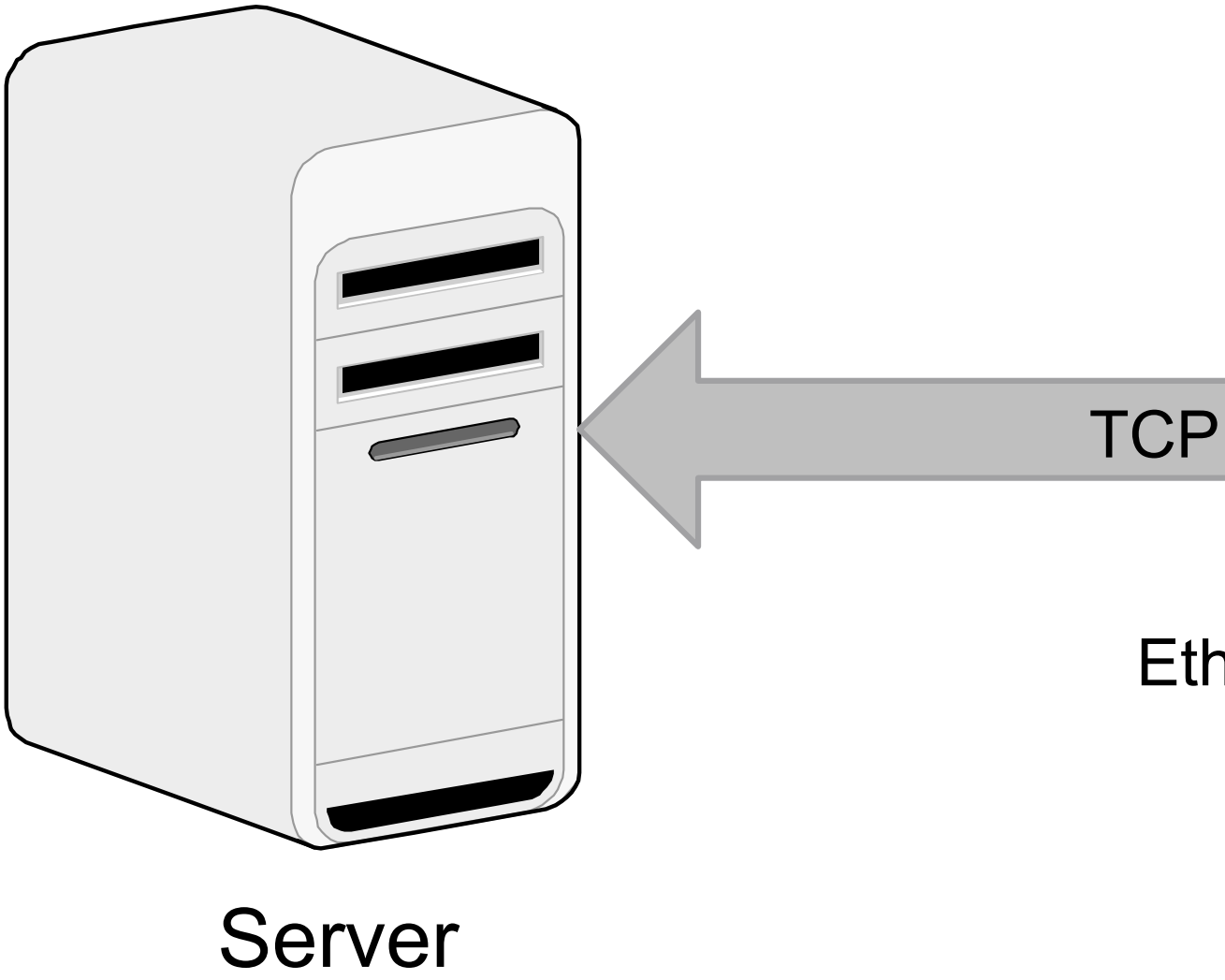


Figure 2.3: SERIP-100 in TCP Client mode configuration connecting to a server

Telnet Client mode

The *Telnet Client* mode is similar to the *TCP Client* mode but offers in addition support for the *Telnet* protocol. This means all characters received or transmitted on the TCP connection are encoded with the Telnet protocol. This mode is also known as *reverse Telnet*.

Client/Server operation

Two *SERIP-100* can be combined using the TCP protocol while one is working in server mode and the other peer in client mode. *Client/Server* operation is typically used to connect two *SERIP-100* in order to extend the range of a RS-232 link.

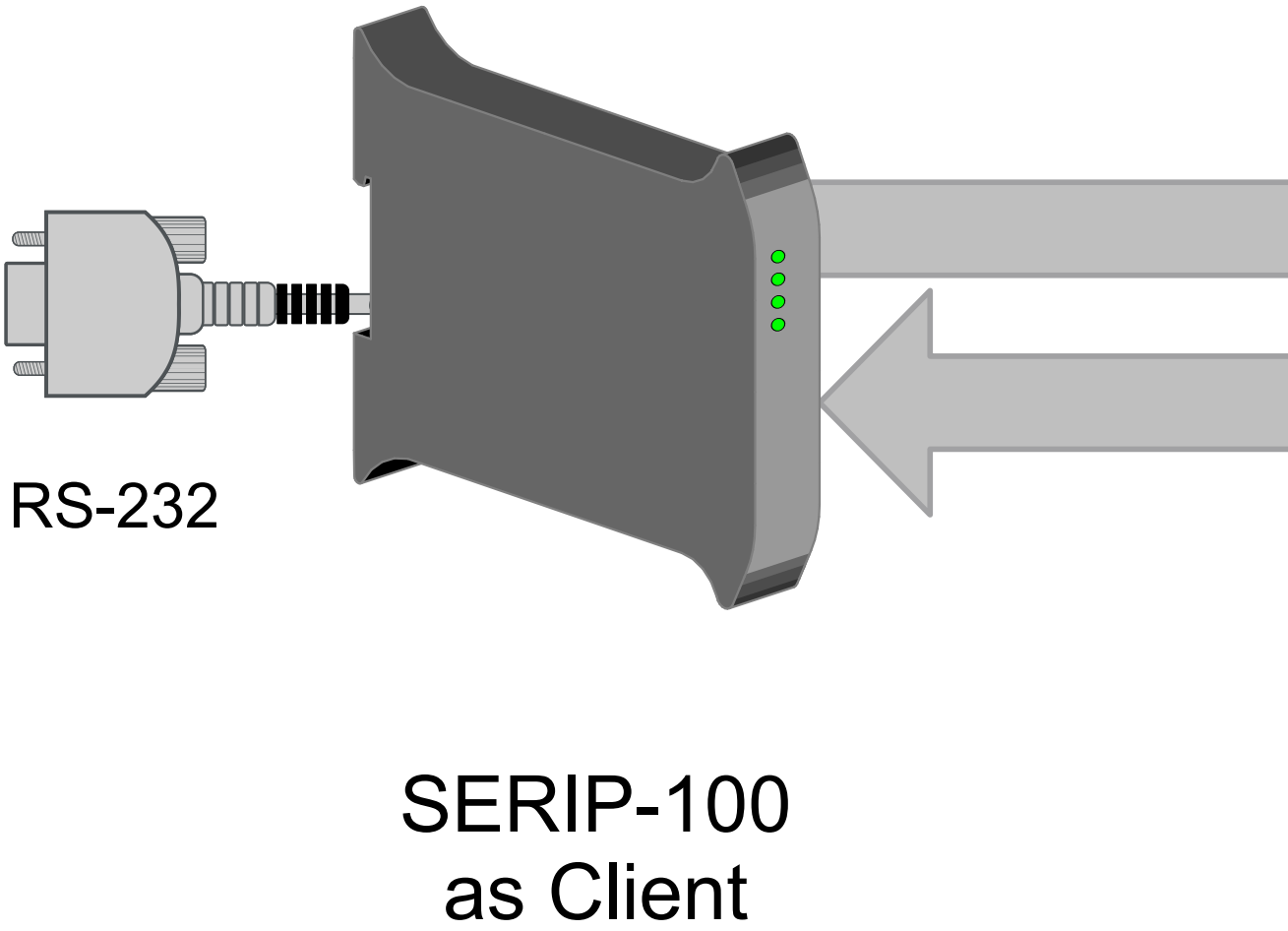


Figure 2.4: Two SERIP-100 in Client/Server mode configuration

UDP tunneling

This mode utilises the UDP protocol for receiving and sending data. It does not require a connection between a server and a client, instead it requires a nominated peer where to send data. Any data received on the nominated UDP port is streamed to the serial port. If data is received on the serial port, it is embedded into a UDP packet and sent to the nominated peer. UDP tunneling supports broadcasting of received serial data to the local subnet. For broadcasting enter 255 . 255 . 255 . 255 as *Peer IP Address*. UDP tunneling is typically used to connect two *SERIP-100* in order to extend the range of a RS-232 link.

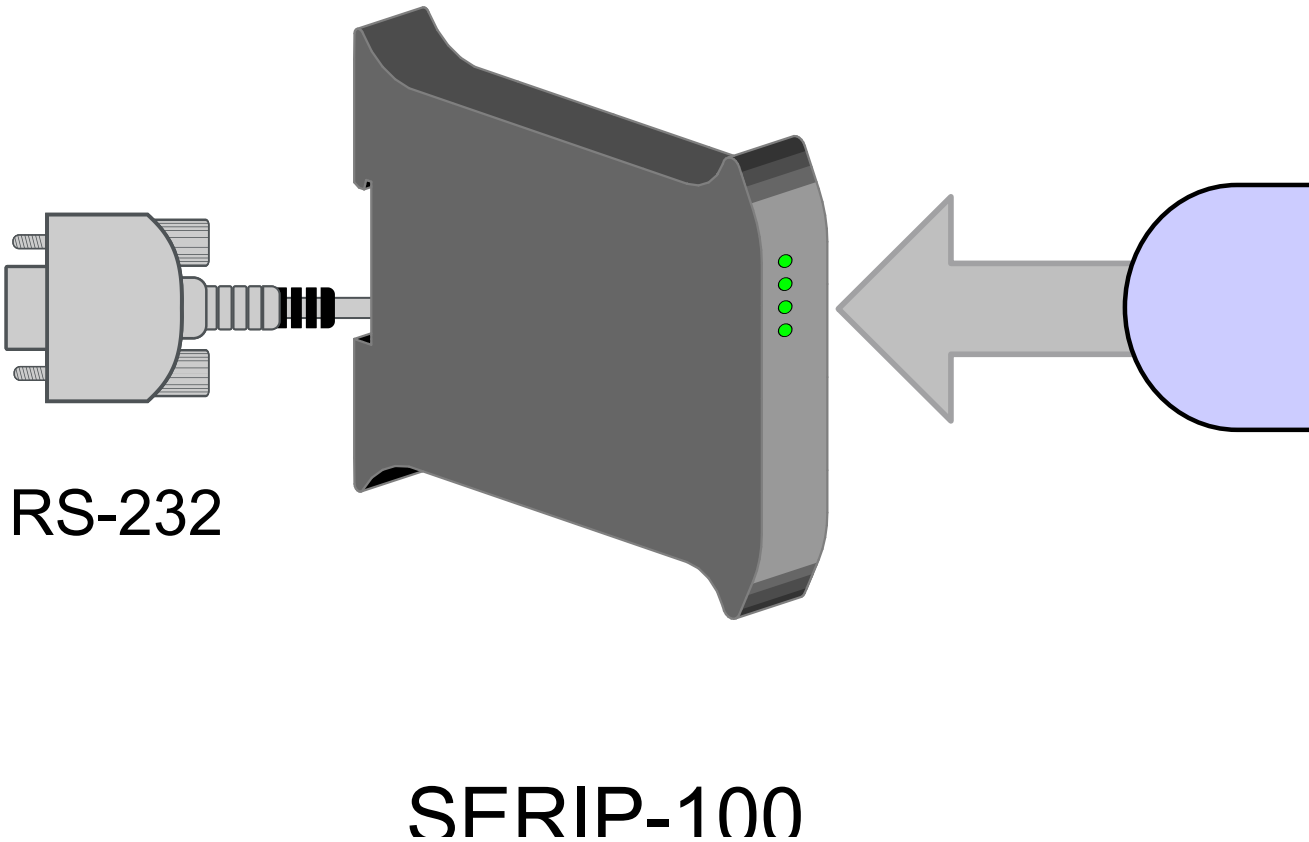


Figure 2.5: Two SERIP-100 in UDP Tunnel mode configuration

Chapter 3. Installation

Regulatory notes

1. The *SERIP-100* is suitable for use in non-hazardous locations only.
2. The *SERIP-100* is not authorized for use in life support devices or systems.
3. Wiring and installation must be in accordance with applicable electrical codes in accordance with the authority having jurisdiction.
4. This is a Class A device and intended for commercial or industrial use. This equipment may cause radio interference if used in a residential area; in this case it is the operator's responsibility to take appropriate measures.
5. The precondition for compliance with EMC limit values is strict adherence to the guidelines specified in this set of instructions. This applies in particular to the area of grounding and shielding of cables.

FCC Notice (USA only)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada Notice (Canada only)

This Class A digital apparatus complies with Canadian ICES-003.

Unpacking, handling and storage

1. Please read this set of instructions. carefully before fitting it into your system.
2. Keep all original packaging material for future storage or warranty shipments of the unit.
3. Do not exceed the specified temperatures.

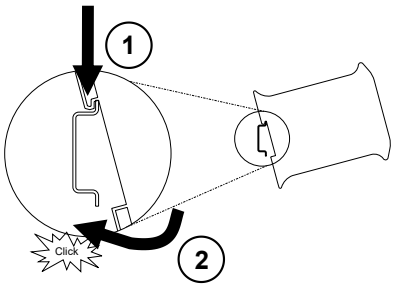
Before connecting anything

1. Before installing or removing the unit or any connector, ensure that the system power and external supplies have been turned off.
2. Check the system supply voltage with a multimeter for correct voltage range and polarity.

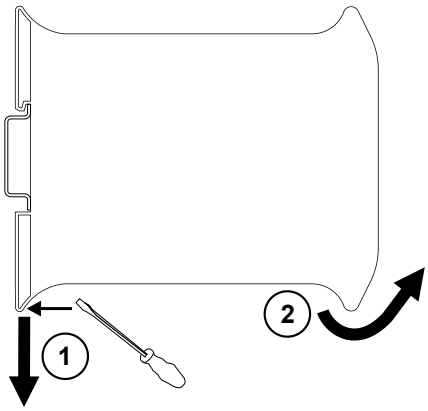
3. Connect the power supply cable and switch on the system power. Check if the Power LED is lit.
4. Turn off system power.
5. Connect all I/O cables.
6. Once you are certain that all connections have been made properly, restore the power.

DIN rail mounting and removal

The *SERIP-100* gateway is designed to be mounted on a 35 mm DIN rail according to DIN/EN 50022. The enclosure features a 35 mm profile at the back which snaps into the DIN rail. No tools are required for mounting. Please observe the rules outlined in the section called “Mounting rules”.



To mount the unit on a DIN rail, slot the top part of the *SERIP-100* into the upper guide of the rail and lower the enclosure until the bottom of the red hook clicks into place.



To remove the *SERIP-100* from the DIN rail, use a screw driver as a lever by inserting it in the small slot of the red hook and push the red hook downwards. Then remove the unit from the rail by raising the bottom front edge of the enclosure.

Mounting rules

The enclosure provides protection against solid objects according to IP 20 / NEMA Type 1 protection rating. When mounting the unit observe the following rules:

- No water splash and water drops
- No aggressive gas, steam or liquids
- Avoid dusty environments.
- Avoid shock or vibration

- Do not exceed the specified operational temperatures and humidity range.
- Mount inside an electrical switchboard or control cabinet.
- Make sure there is sufficient air ventilation and clearance to other devices mounted next to the unit.
- Observe applicable local regulations like EN60204 / VDE0113.

Powering the SERIP-100

Before connecting power please follow the rules in the section called “Safety Precautions” and the section called “Before connecting anything”.

Power is supplied via a 3.81 mm 2-pin pluggable terminal block located at the top side of the mounted unit (refer to Figure 2.1, “Location of connectors”). The following table and picture shows the power terminal socket pinout:

Pin	Signal	Function
1	V+	Positive voltage supply (10 - 30 V DC)
2	V-	Negative voltage supply, DC power return

Table 3.1: Power supply connector pinout

Make sure that the polarity of the supply voltage is correct before connecting any device to the serial ports! A wrong polarity can cause high currents on the ground plane between the V- power supply pin and the serial port ground pins, which can cause damage to the device.

Wiring the RS-485/RS-422 interface

The gateway’s serial port can be configured by software to use the RS-485 or RS-422 physical layer. This is done through the web interface (See the section called “Configuring serial port”).

The RS-485 and RS-422 signals are located at the 3.81 mm 6-pin pluggable terminal block on the top side of the mounted unit (refer to Figure 2.1, “Location of connectors”). The following table and picture shows the pinout:

RS-485

RS-422

Pin	RS-485 signal	RS-422 signal	Description
3	GND	GND	Signal common
4	D+	TX+	Non-inverting RS-485 and RS-422 terminal
5	D-	TX-	Inverting RS-485 and RS-422 terminal
6		GND	Signal common
7		RX+	Non-inverting RS-422 receiver terminal
8		RX-	Inverting RS-422 receiver terminal

Table 3.2: RS-485/RS-422 connector pinout

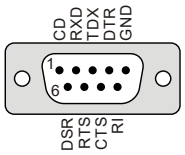
- Line termination is required and is typically done with a 120 Ohm 1/4 W resistor. For RS-485 operation the bus must be terminated at both ends. For RS-422 operation a termination resistor must be inserted between the RX+/RX- signals.
- Maximum number of RS-485 nodes without repeater is 32.
- Stub connections off the main line should be avoided if possible or at least be kept as short as possible. Stub connections must not have terminating resistors.
- Maximum cable length to 1200 m (4000 ft).
- To assure a high degree of electromagnetic compatibility and surge protection the cable should be twisted pairs and shielded. An additional cable conductor or pair may be used for the GND reference.

Do *not* connect the cable shield to the GND pins! Use an external chassis ground connection to terminate the shield.

Wiring the RS-232 interface

The use of the RS-232 interface must be configured using the web interface (See the section called "Configuring serial port").

The RS-232 connector is a male 9-pin D-sub type located at the bottom side of the mounted unit (refer to Figure 2.1, "Location of connectors"). It has industry standard EIA-574 data terminal equipment (DTE) pinout as shown in the following table and picture:



Pin	Signal	Function	Direction
1	DCD	Data carrier detect	in
2	RXD	Receive data	in
3	TXD	Transmit data	out
4	DTR	Data terminal ready	out
5	GND	Signal ground	
6	DSR	Data set ready	in
7	RTS	Request to send	out
8	CTS	Clear to send	in
9	RI	Ring indicator	in

Table 3.3: RS-232 connector pinout

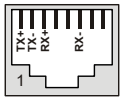
- Maximum cable length is 15 m (50 ft) or a length equal to a line capacitance of 2500 pF, both at the maximum standard bit rate of 20 kbps. If operating at higher bit rates the maximum cable length drops to 3 m (10 ft) at a bit rate of 57.6 kbps.
- To assure a high degree of electromagnetic compatibility and surge protection the RS-232 cable should shielded. The shield shall be connected to an external chassis ground at the either or both ends, depending on the application.

- The shield must *not* be connected to the GND pin.

To connect the *SERIP-100* to a PC (Personal Computer) or any other device with data terminal equipment (DTE) pinout you need a null-modem or cross-over cable.

Connecting Ethernet

The following table describes the 10BASE-T Ethernet RJ-45 connector pinout:



Pin	Signal	Function
1	TX+	Non-inverting transmit signal
2	TX-	Inverting transmit signal
3	RX+	Non-inverting receive signal
4		Internal termination network
5		Internal termination network
6	RX-	Inverting receive signal
7		Internal termination network
8		Internal termination network

Table 3.4: Ethernet connector pinout

- We recommend to use Category 5 UTP network cable.
- Maximum cable length is 100 m (3000 ft).

Chapter 4. Ethernet & IP configuration

Before configuring the *SERIP-100*, obtain a unique static IP address, subnet mask, and default gateway address from your network administrator.

The factory default IP address of the *SERIP-100* is 169.254.0.10 which is in the Automatic Private IP Addressing (APIPA) address range.

There are several methods of configuring the unit's IP address:

1. Removing your PC from your corporate network and using a cross-over network cable (see the section called "IP setup using a web browser and a cross-over network cable").
2. Via the Serial Port 1 and a terminal program like *HyperTerminal* (see the section called "IP setup using a terminal program like HyperTerminal").
3. Leaving your PC connected to your corporate network and temporarily changing the IP settings on your PC to match the subnet of the *SERIP-100* (see the section called "Temporarily changing the IP settings on your PC").

In order to connect to the *SERIP-100* via TCP/IP, your PC must be on same IP subnet as the gateway. In most situations this means that the first three numbers of the IP address have to be identical.

IP setup using a web browser and a cross-over network cable

This method applies only to operating systems like Windows, which support APIPA (Automatic Private IP Addressing). It also requires your PC to be configured for DHCP. If your computer is configured with a static IP address, follow the procedure in the section called "Temporarily changing the IP settings on your PC".

1. Disconnect your PC from your corporate network. If your computer is configured for DHCP it should now automatically fall back to use a default IP address from the APIPA range 169.254.x.x (Windows PCs only).
2. Connect an Ethernet crossover cable from the *SERIP-100* to the computer.
3. Start *Internet Explorer*.
4. In the address box, type **`169.254.0.10`** and then press **`Enter`**.
5. Click **`Configuration...`** and then **`Ethernet & IP`** in the menu on the left side of the page.
6. Enter the IP address, subnet mask, and gateway address assigned to your *SERIP-100*, then click **`Save`**.
7. Reconnect your computer to your corporate network.

IP setup using a terminal program like HyperTerminal

1. Connect a null modem RS-232 cable between your PC and the *SERIP-100*'s Serial Port 1.

2. In Windows XP, click **Start**, point to **All Programs**, point to **Accessories**, point to **Communications**, and then click **HyperTerminal**.

3. When *HyperTerminal* starts, it opens a dialog box and asks for a name for the new connection. Enter a name (for example, deviceconfig) then click **OK**.

4. The Connect to dialog opens. Select the COM port you will be using in the Connect using drop-down list box, then click **OK**.

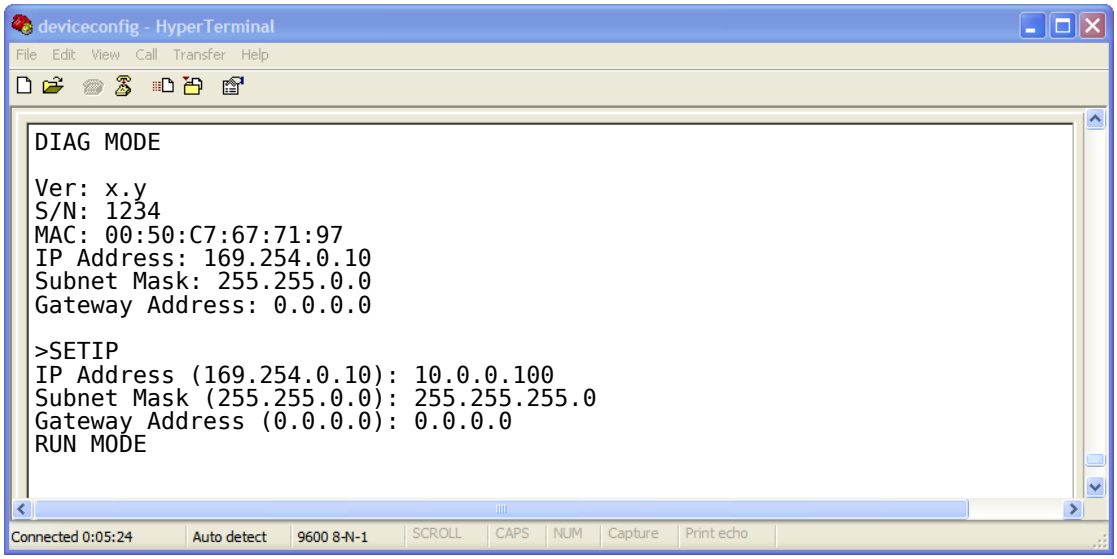
5. Select **9600**, **8**, **None**, **1**, **None** in the COM Properties dialog, then click **OK**.

6. *HyperTerminal* is now connected to the serial line.

7. Keep the **space** bar pressed in *HyperTerminal* and power-cycle your device at the same time.

8. A menu should appear after one or two seconds showing device information, the current IP configuration and a > prompt.

9. Type **SETIP**, then press **Enter** within 10 seconds after the prompt is shown:



10. The device will show current values and prompt for new values for IP address, net mask and gateway address. Enter the new values and press **Enter**. A key press must be received at least every 10 seconds otherwise the device will go back to *RUN MODE* and resume normal operation.

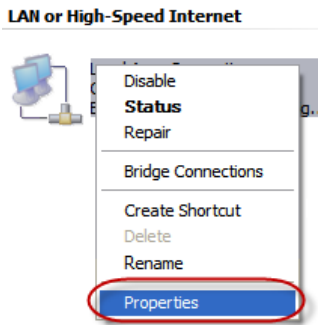
11. The gateway will return to the main prompt. Type **X** and press **Enter** to leave *DIAG MODE* and resume normal operation indicated with RUN MODE.

Temporarily changing the IP settings on your PC

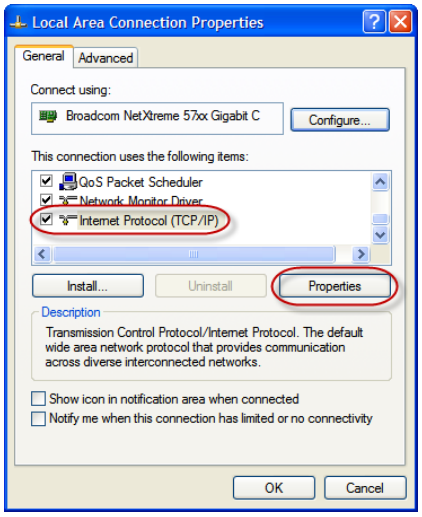
This method involves manually assigning an IP address to your PC in the same subnet as the gateway. The default subnet of the gateway is 169.254.0.0/16.

1. Connect the *SERIP-100* to your Ethernet network.

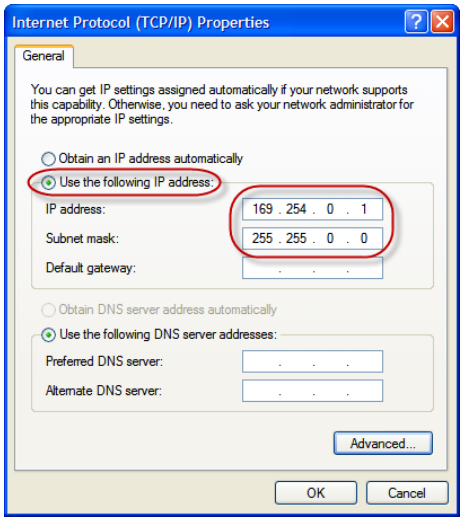
2. On a Windows PC, open the `Control Panel` and double-click on **`Network Connections`**. Right-click on the Network Connection associated with your network adapter and select **`Properties`**:



This will show the `Local Area Connection Properties` Dialog:



3. Select the **Internet Protocol (TCP/IP)** entry and click on **Properties** to open the TCP/IP Properties dialog as shown below:



4. Write down your current settings so they can be restored later.

5. Select **Use the following IP address** and configure a static IP address in the same subnet as the device, for example `169.254.0.1` and the subnet mask `255.255.0.0`. Click **OK** to save the changes.

6. Start *Internet Explorer*.

7. In the address box, type **169.254.0.10** and then press **Enter**.

8. Click **Configuration...** and then **Ethernet & IP** in the menu on the left side of the page.

9. Enter the IP address, subnet mask, and gateway address assigned to your *SERIP-100*, then click **Save**.

10. Restore your computer's original settings.

Chapter 5. Web browser based management

The *SERIP-100* incorporates an embedded web server. This allows you to connect to the device and monitor and configure it using a web browser. Most browsers should work, provided they support JavaScript. We recommend *Internet Explorer* 6.0 or higher.

Connecting to the SERIP-100

Once you made sure that your PC is configured to be on the same subnet as the *SERIP-100*, start your web browser. In the address box, type the IP address of your device (169.254.0.10 is the default), and then press **Enter**. (See Chapter 4, *Ethernet & IP configuration*)

The web browser will establish communication with the embedded web server and an overview page similar to the following picture will appear:

Figure 5.1: Device management and configuration via the web browser

❶ Gateway IP address
❷ Main menu
❸ Configuration sub-menu
❹ Information area

Use the menu bar shown on the left side to navigate the different pages.

In order to connect to the *SERIP-100* via TCP/IP, your PC must be on same IP subnet as the gateway. In most situations this means that the first three numbers of the IP address have to be identical.

Monitoring and diagnostic

The *SERIP-100* offers several web pages which allow monitoring of the status of the different communication networks and the device performance.

Device status

The `Overview` page shows the principal device status as shown in the following picture:

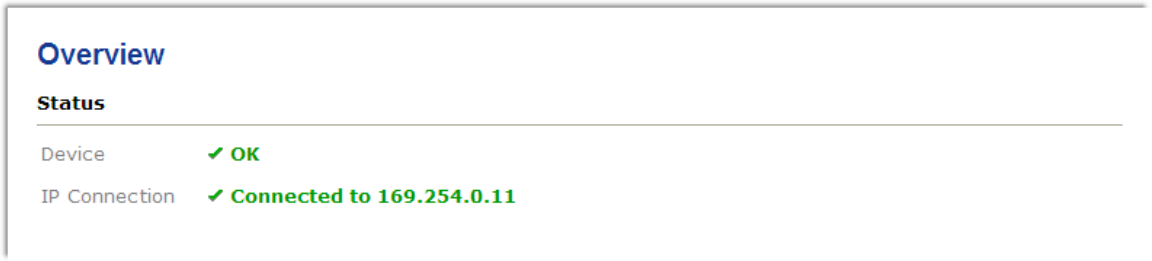


Figure 5.2: Overview page

The value shown in the `Device` row represents the device status register which keeps track of run-time faults. All run-time faults are latched and must be reset by the user. The following faults can be listed here:

`OK`
: The device is fault free.

`Watchdog reset`
: This warning indicates that the device was reset by it's internal watchdog supervision circuit.

`Brown out reset`
: This warning indicates that the device was reset by it's internal supply voltage monitoring circuit. This fault occurs when the supply voltage drops below the lower limit.

`Device out of memory`
: This warning indicates that the internal dynamic memory has been exhausted and due to this a certain function could not be completed.

`Device configuration data write failure`
: This alarm indicates that the configuration data could not be written to the non-volatile memory. Configuration data changes will be lost once the device is power-cycled or reset.

`Reset to factory defaults`
This alarm indicates that the device' configuration data was reset to factory defaults. The device requires re-commissioning.

Ethernet status

The `Ethernet Status` page shows status and statistics about the Ethernet traffic. These values provide valuable information used to troubleshoot network problems. This page is automatically updated every 5 seconds.

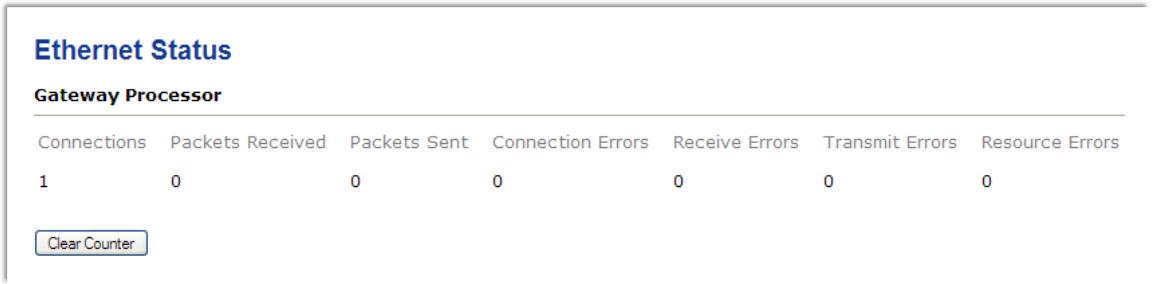


Figure 5.3: Ethernet status page

This page shows accumulated readings since the *SERIP-100* was last activated or reset. If power to the *SERIP-100* is lost, all cumulative values are reset to zero.

The following statistics are maintained:

`Connections`
A counter that increments each time a client or server connects to the gateway.

`Packets Received`
A counter that increments each time an inbound message is successfully received.

`Packets Sent`
A counter that is incremented each time an outbound message leaves.

`Connection Errors`
This counter applies to client modes only. It is incremented each time a connection attempt failed.

`Receive Errors`
Number of errors while receiving an inbound packet from the network.

`Transmit Errors`
Number of errors while sending an outbound packet to the network.

`Resource Errors`
Counter of low memory resource situations.

The cumulative diagnostic data is reset when the device is power cycled or reset. The data is also reset by pressing the **`Clear Counter`** button.

Finding the firmware version and serial number

Click on the **About** menu entry on the menu bar to show the product information as shown below:

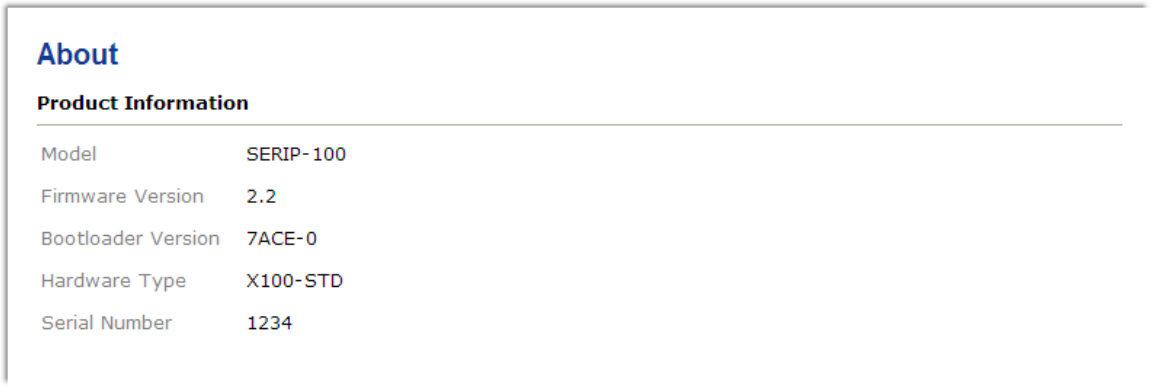


Figure 5.4: About page

This product information is important for service and support inquiries. The following product information is provided:

`Model`
: The model name of the product. The Model defines the functionality of the product.

`Firmware Version`
: The firmware version that is installed.

`Bootloader Version`
: The version of the Ethernet bootloader. This is relevant for firmware upgrades.

`Hardware Type`
: Type of hardware the *SERIP-100* is based on. The Type is relevant to identify the device for regulatory compliance.

`Serial Number`
: The serial number of the *SERIP-100*. The serial number is specific to your device.

Configuring and commissioning

The configuration pages are accessed by clicking on the **`Configuration...`** menu entry on the menu bar which then expands a configuration sub-menu. All configuration settings are kept in the device non-volatile memory.

If you make changes to any settings, remember to save each page before changing to a different page!

Configuring Ethernet and IP

Select the **Configuration→Ethernet & IP** sub-menu from the menu bar to open the Ethernet and IP settings which are shown below:

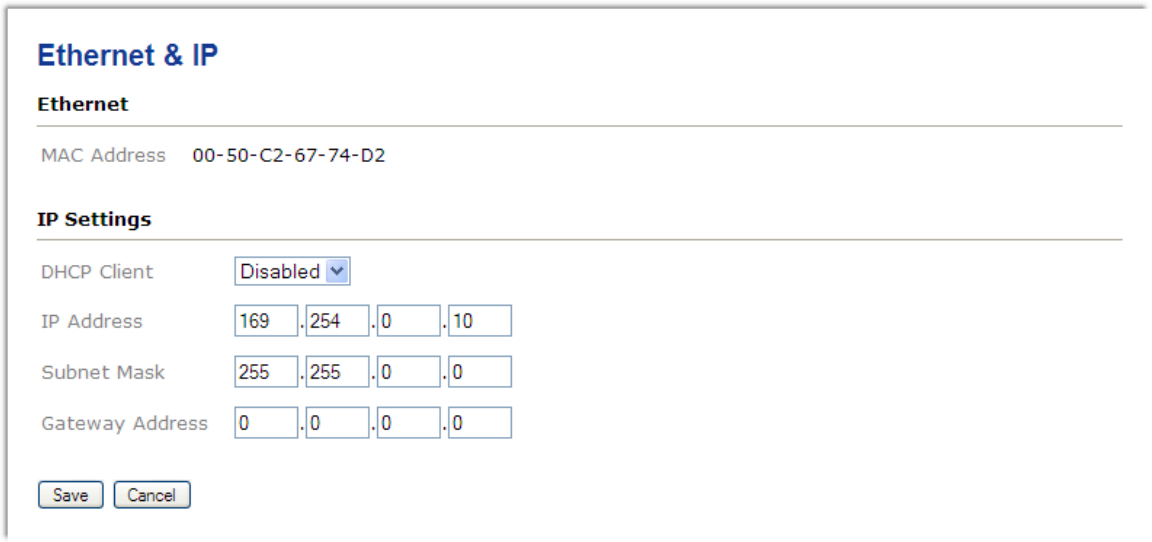


Figure 5.5: Ethernet and IP settings page

The following Ethernet parameters are shown:

MAC Address
: The device' unique MAC address. This number is hard coded and cannot be changed.

The following Internet protocol (IP) settings can be entered:

DHCP Client
: Select Enabled to have the IP address assigned via DHCP. When enabling this option it is important to have a reliable DHCP server available in the network at all times. The *SERIP-100* will not communicate without an IP address. A missing IP address is indicated with a distinct LED diagnostic code.

IP Address
: The static IP address assigned to this device if DHCP is not used. This IP address is different to the IP address assigned through DHCP.

Subnet Mask (also known as network mask)
: If you have a router, enter the subnet mask for the segment to which this device is attached.

Gateway Address
: If your network segment has a router, enter its IP address here. Otherwise leave the address as 0.0.0.0.

Once you click **Save** the new settings are stored and applied instantly. Existing TCP/IP connections to the device are terminated and must be re-established using the new IP address.

The new settings are confirmed with the following page:

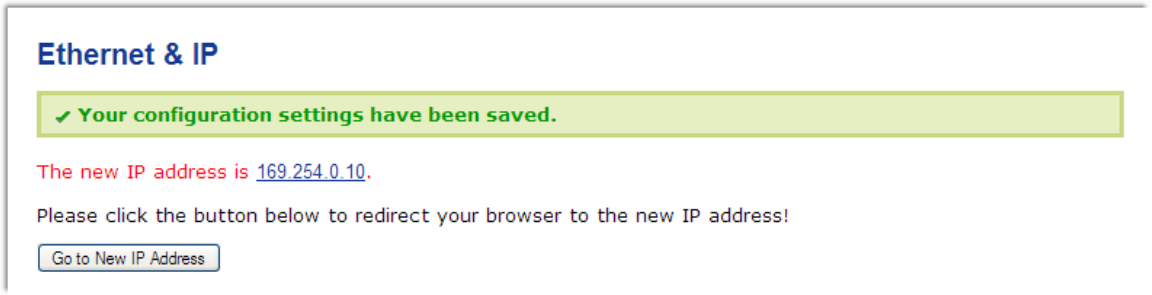


Figure 5.6: IP settings changed to static IP confirmation

Please write down the new IP address so you are able to communicate with the device in the future!

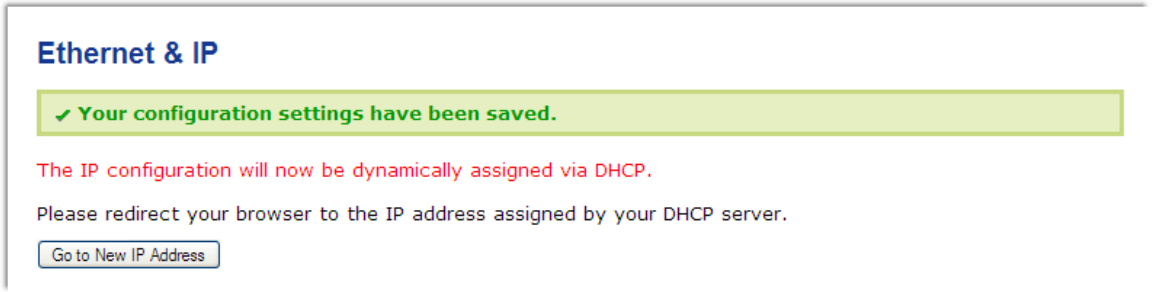


Figure 5.7: IP settings changed to DHCP confirmation

Configuring Operating mode

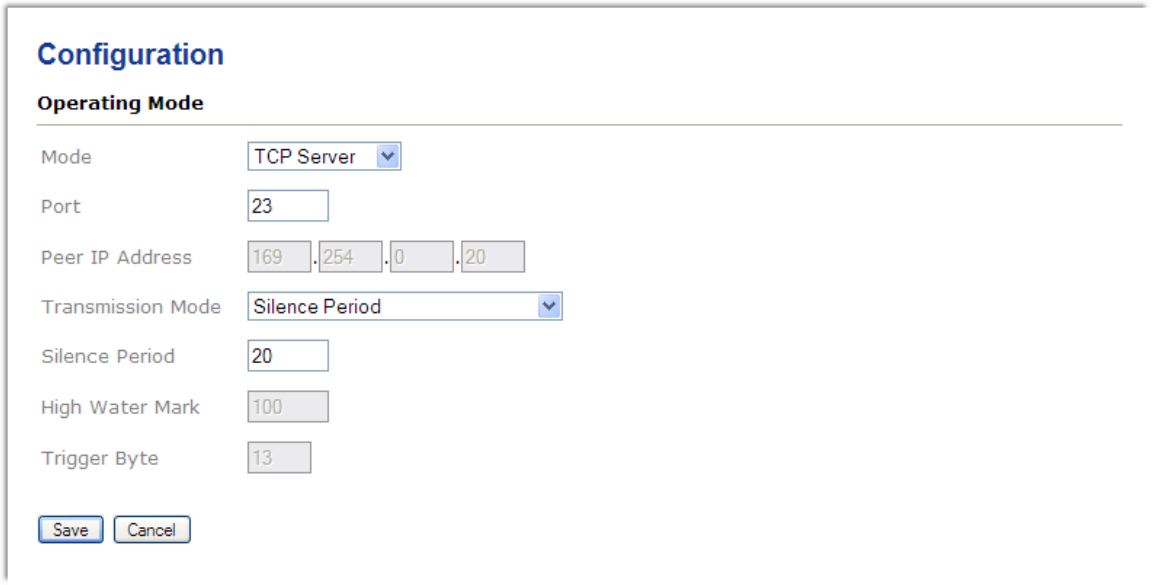


Figure 5.8: SERIP-100 settings page

`Mode`

The *SERIP-100* gateway can operate in different modes. Refer to the section called "Operating modes" for more details about the various operating modes. If used in conjunction with a virtual serial port redirector software, this should be set to `Telnet Server` or `TCP Server`. Both `Telnet` and TCP modes operate over the TCP protocol but the two `Telnet` modes offer support for the *Telnet* protocol. If two gateways are used to extend a serial link `UDP tunnel` is the best choice.

`Port`

Set this to the TCP or UDP port the gateway shall use for Ethernet connections.

`Peer IP Address`

The IP address of a server the gateway shall connect to if in client mode or if in UDP mode the IP address the gateway accepts UDP packets from. Only used in client modes or UDP mode.

`Transmission Mode`

Data received on the serial port is internally buffered. Different methods can be chosen to determine when the buffered data is transmitted via the Ethernet link. Buffering can be disabled by setting transmission mode to `Immediate`. The various transmission settings allow fine-tuning and optimisation of the Ethernet traffic generated by the gateway. This helps reducing the amount of Ethernet traffic as multiple data bytes are consolidated into one Ethernet packet.

`Silence Period`

This setting can only be changed if transmission mode is set to any of the silence period options. If enabled data received on the serial port is buffered and only transmitted once no character has been received for the configured silence period.

`High Water Mark`

This setting can only be changed if transmission mode is set to any of the high water mark options. If enabled data received on the serial port is buffered and only transmitted once the amount of buffered characters has reached the high water mark setting. In any case the internal buffer is always emptied after 1 s.

`Trigger Byte`

This setting can only be changed if transmission mode is set to any of the trigger byte options. If enabled it defines the decimal value (ASCII) of a trigger byte. Upon reception of this character on the serial port, the internal buffer is transmitted over the Ethernet link. Common choices is the return character (*CR*, 13) for line mode transmission or end of text (*ETX*, 3) for block oriented protocols. In any case the internal buffer is always emptied after 1 s.

Configuring serial port

The serial port settings must be configured to match the settings of your serial device. Select the **`Configuration`**→**`Serial`** sub-menu from the menu bar to open the serial settings which are shown below:

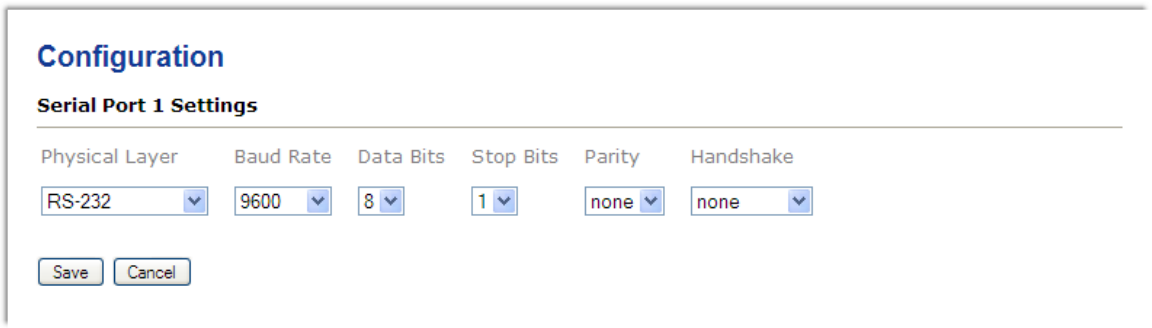


Figure 5.9: Serial settings page

The following serial settings can be entered:

`Physical layer`
: Can be set to two-wire `RS-485`, `RS-422` or `RS-232` mode. RS-232 is the default. Depending on this setting either the D-sub (RS-232) connector or the terminal block connector (RS-485/422) of the *SERIP-100* is utilized.

`Baud rate`
: Communication speed

`Data bits`
: Number of transmitted data bits

`Stop bits`
: Can be configured to be `1` or `2`.

`Parity`
: Changes parity mode to either `none`, `even` or `odd`.

`Handshake`
: `RTS/CTS` handshake can be enabled to to perform flow control between the *SERIP-100* gateway and the serial device (RS-232 only).

Once you click **Save** the new settings are stored and applied instantly. A confirmation message is shown.

Remote restarting the device

You can perform a remote restart of the device from the web interface. A remote restart is similar to power cycling the device. Possibly connected clients are disconnected and communication is interrupted until the device has rebooted.

To perform a remote restart, click on the **Configuration** sub-menu and then click on the **Restart** menu entry. This will open the device restart page as shown below:

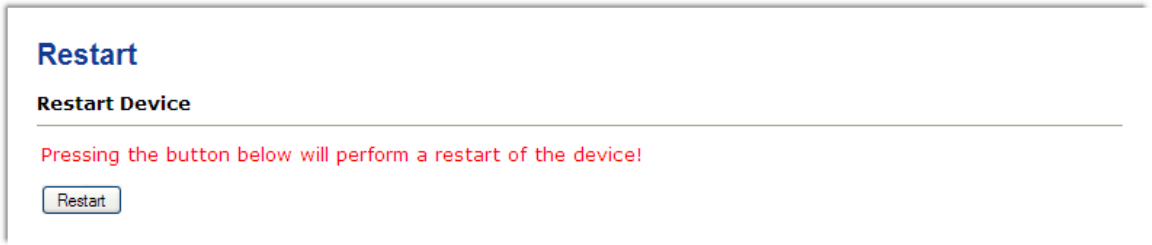


Figure 5.10: Restart device page

Click on the **Restart** button to perform a restart of the device. The restart is confirmed with the following notification:

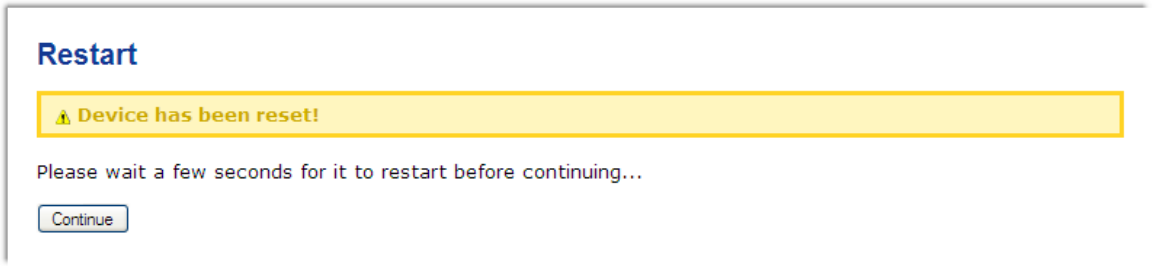


Figure 5.11: Restart confirmation page

Please allow a few seconds before continuing working with the device as it has to fully start-up first, before being able to respond to further web browser requests.

After a remote restart a *Watchdog reset* alarm is shown on the device' home page. This is a side-effect of the remote restart procedure and the alarm shall be ignored and cleared.

Backup and restoring of configuration settings

The *SERIP-100* allows configuration settings to be uploaded onto a PC.

This is a beneficial for archiving purposes but also allows easy deployment of similar devices by the means of loading settings from a previously stored reference device.

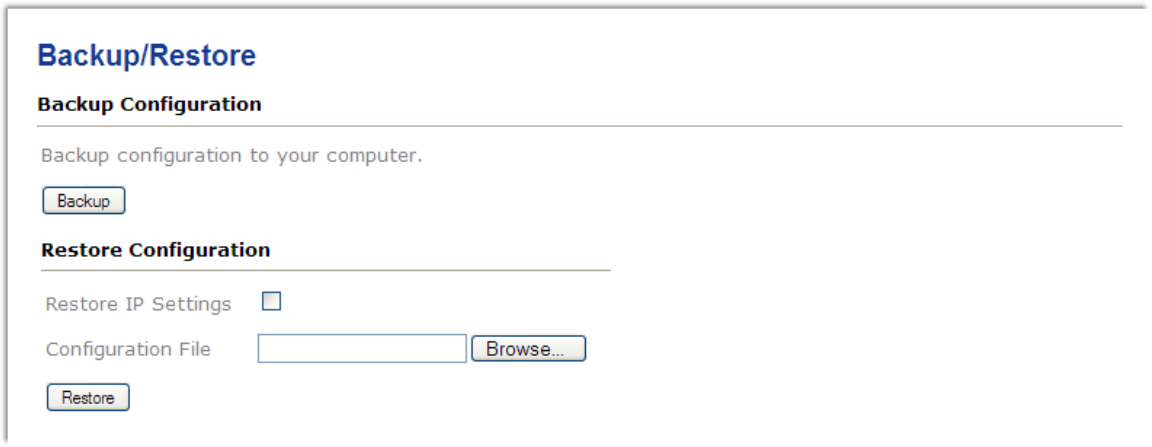


Figure 5.12: Backup/Restore page

To store the configuration settings on your PC, click on the **`Configuration`** sub-menu and then click on the **`Backup/Restore`** menu entry. Then click on **`Backup`**. Your web browser will open a file download dialog which allows you to save the configuration file on your PC. The file name of the configuration file reflects the model name and the serial number and has the `.config` extension.

In case the configuration is password protected, the username and password will not be stored in the configuration file!

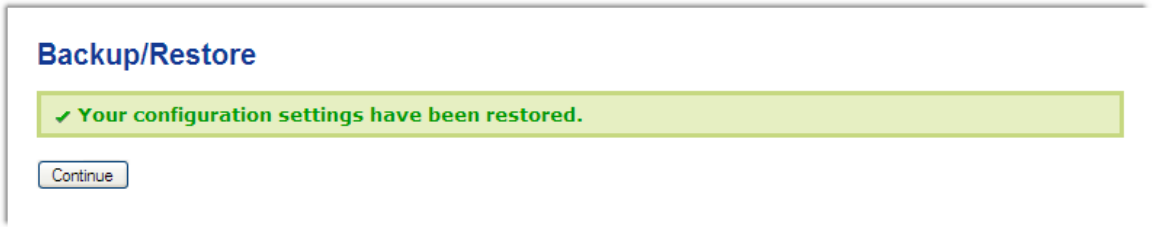
To restore the settings from a configuration file, click on the **`Browse`** button and select a `.config` file matching the model of your device. Then click on **`Restore`**.

There are two options to restore a previously saved configuration set:

`Restore IP Settings` un-checked
: Default. All but the IP settings are restored. This option is useful when device settings shall be duplicated onto another device which will operate on the same network and hence requires its own distinct IP settings.

`Restore IP Settings` checked
: The complete settings are restored. This option is useful if a device is replaced with a new device and the new device should inherit the previously set IP address.

The successful restoration of configuration settings is confirmed with the following message:



In case of an error message, the settings may have only been partially restored and it is important to review all the settings for correctness.

Password protection

Access to the configuration pages can be protected with a password. To configure a password, click on the **Configuration** sub-menu and then click on the **Password** menu entry.

Figure 5.13: Password page

To enable a password, check the **Enable Password** checkbox and enter a user name and a password in the form. The password must be entered twice to make sure it is typed correctly. Click **Save** to confirm the password.

Only one password protected user can be configured. If a new user and password is entered the previous user name is deleted.

Make sure you record or memorize the username and password before you press the **Save** button! The only way to recover from a lost password is by resetting the device to factory defaults which requires physical access to the device.

To log on to password protected configuration pages, click on a configuration menu entry. The web browser will open a password dialog similar to the one shown below:

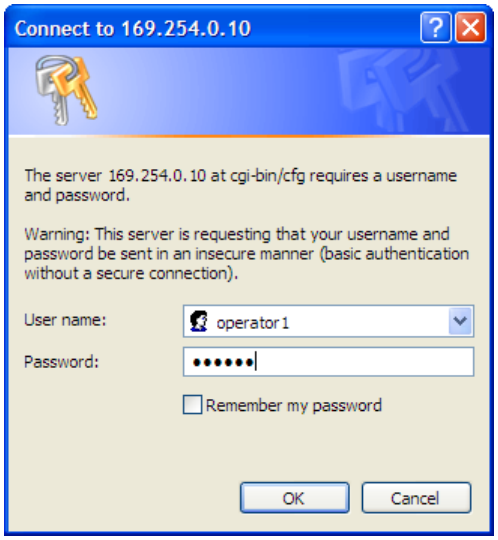


Figure 5.14: Authentication dialog

To remove password protection, log on, uncheck the **Enable Password** checkbox and click **Save** to confirm.

Firmware upgrade

The unit's firmware can be upgraded via Ethernet.

Please contact us for an *Application Note* describing the upgrade procedure and for required software tools.

Chapter 6. Virtual COM port redirector

A virtual COM port redirector software package called *SERIP Toolkit* is provided for Windows PCs.

servers is managed by the SERIP COM Manager program, the control centre for the *SERIP Toolkit*. The *SERIP Toolkit* is using three components to provide the connectivity between

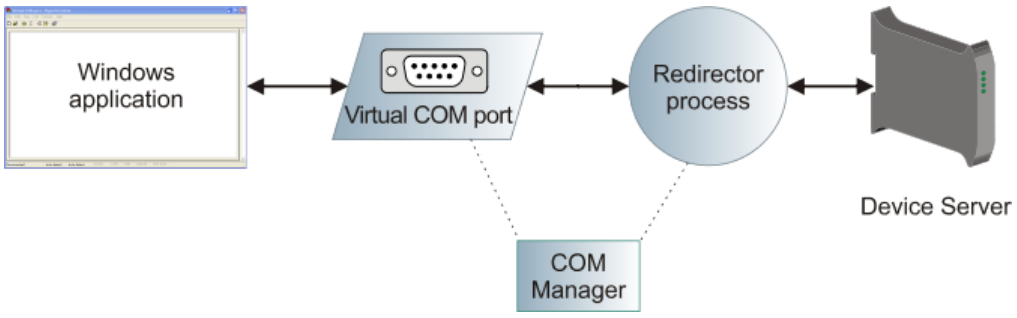


Figure 6.1: Components of the SERIP Toolkit

Virtual COM Port

The first component is a virtual COM port device driver which emulates a physical serial port. Windows applications can open and read or write data to virtual COM ports similar to a real COM port. From an application's perspective there is no difference between a real COM port and a virtual one. The *SERIP COM Manager* allows up to 255 COM ports to be created.

Redirector

The second component is a redirector. The redirector is a background process responsible for connecting the virtual COM port with a remote serial device server. A redirector is always attached to a virtual COM port and can be either in stopped, idle or connected state.

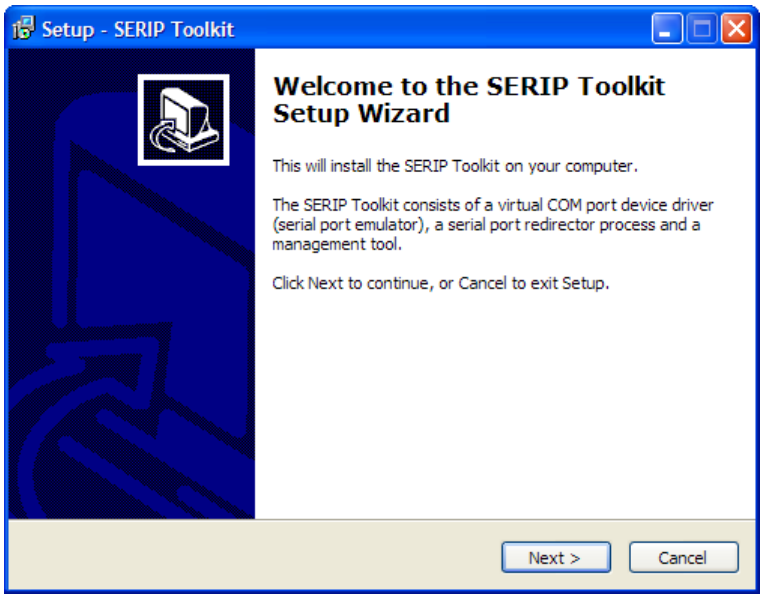
COM Manager

The third component is the *SERIP COM Manager* application. The *SERIP COM Manager* application is used to configure both Virtual COM Port and Redirector. It is also responsible for automatic starting of the redirector processes during the start-up of the computer.

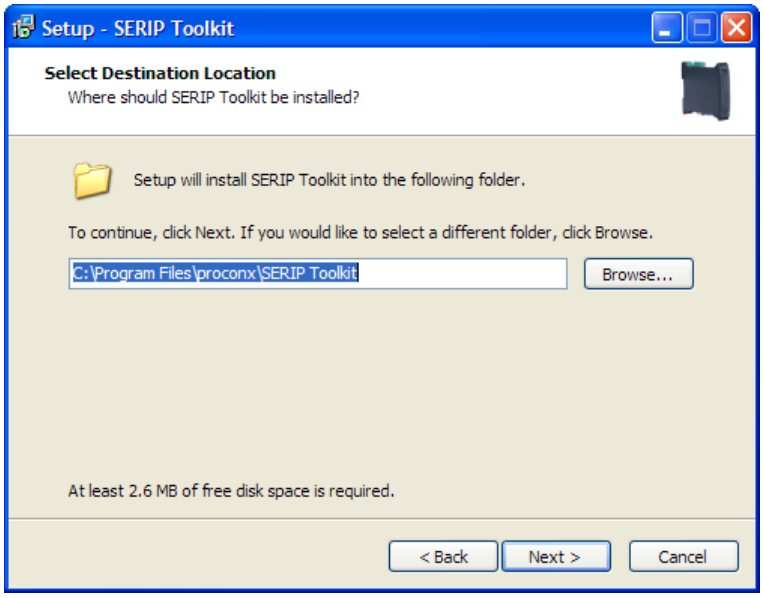
Installing the SERIP Toolkit

The *SERIP Toolkit* can be installed on the following versions of the Windows operating system: Windows 2000, Windows XP, Windows Vista, Windows 7, Windows Server 2003, Windows Server 2008.

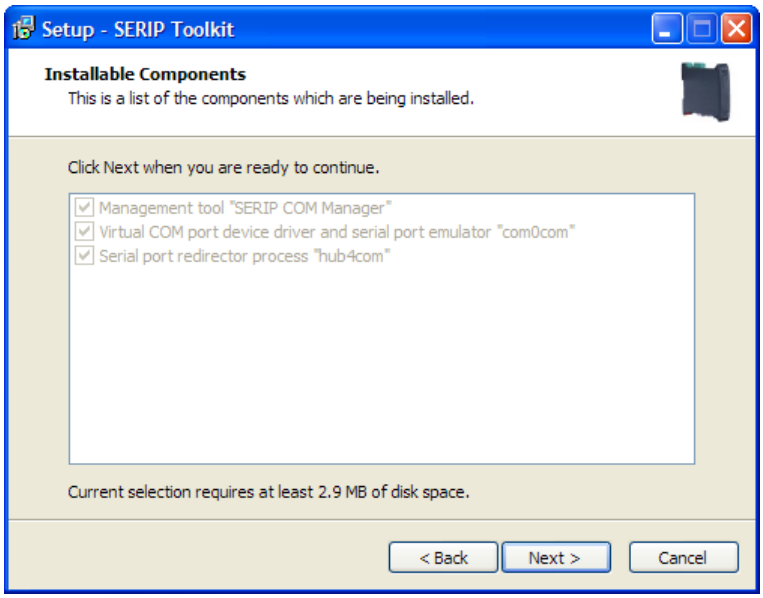
1. To install, run the self-extracting Installer executable:



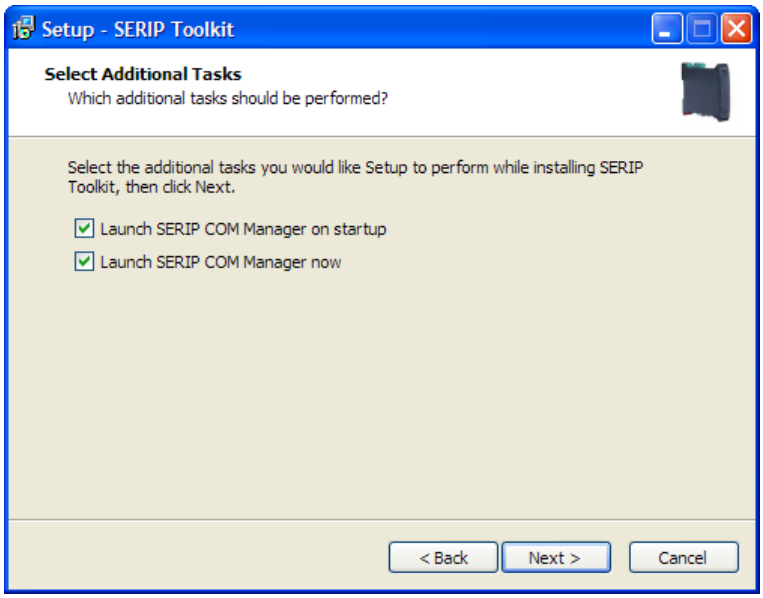
2. Confirm the `Destination Folder`. We recommend to keep the setting suggested by the installer. Click **`Next`** to continue:



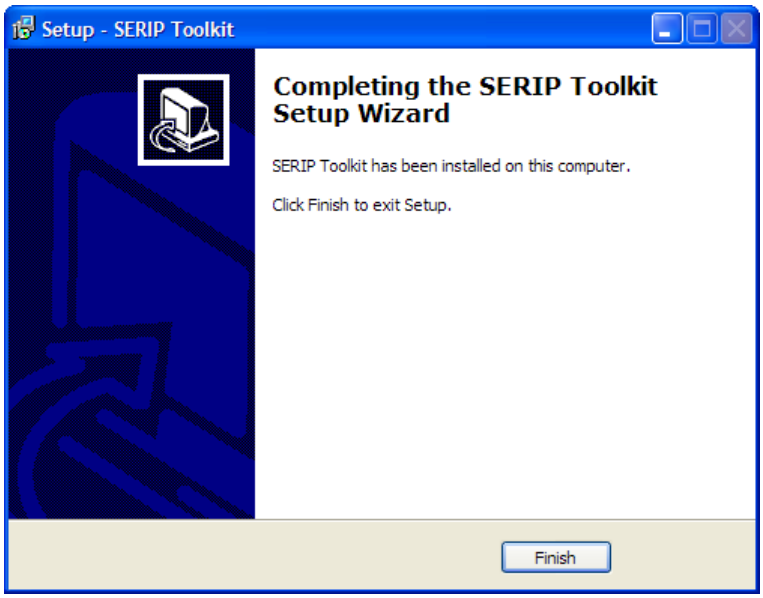
3. Confirm the components for installation and click **`Next`** to continue:



4. Keep the two `Additional Task` check-boxes checked so the *SERIP COM Manager* is automatically launched every time your computer starts and to continue after this installation with creating and configuring virtual COM ports.

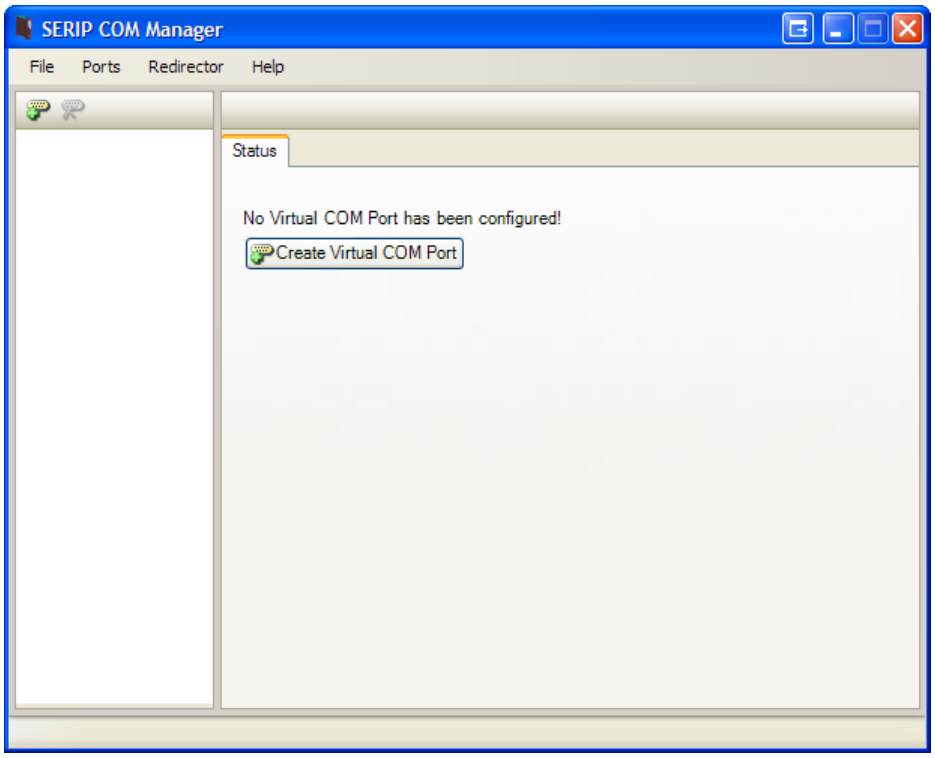


5. The installation is completed, click **`Finish`** to exit the installer:

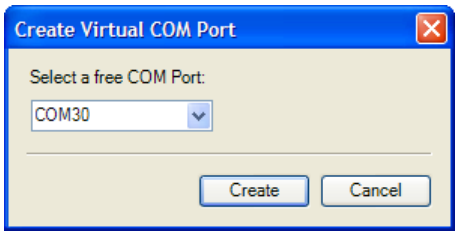


Creating virtual COM ports

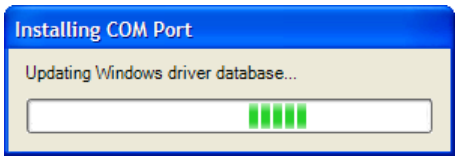
1. Launch the *SERIP COM Manager* and click on the **`Create Virtual COM Port`** button to create a new virtual COM port:



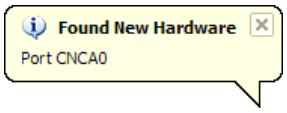
2. Select an entry from the list of unallocated COM ports and click **Create**:



3. The installation begins and the Windows driver database is updated with a pair of serial port emulators named CNCA and CNCB:



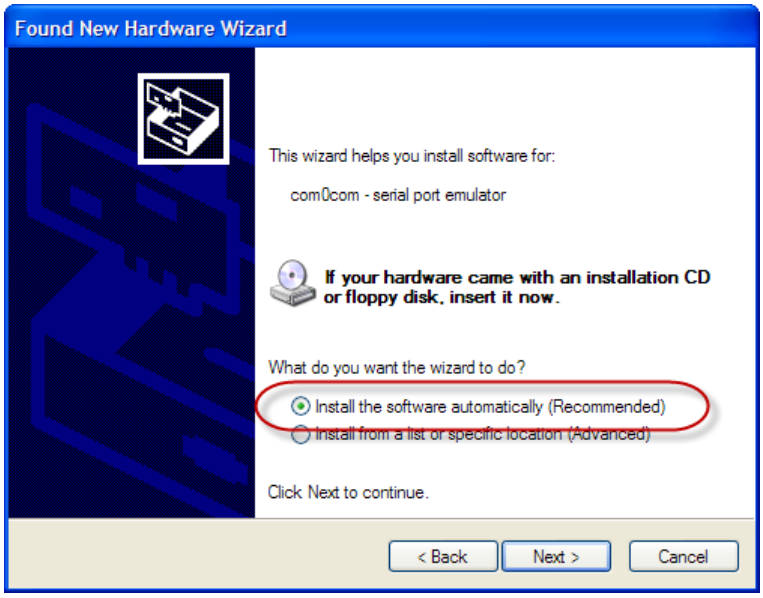
4. A pop-box informs that new hardware was found:



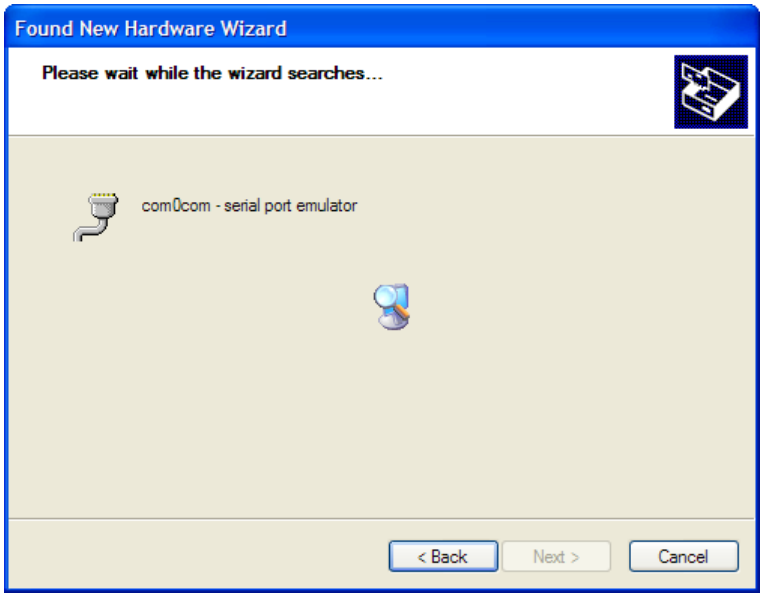
5. Following that, the Found New Hardware Wizard is started twice, first for CNCA and once finished with CNCA for CNCB.

6. Click **Yes, this time only** and then **Next**:

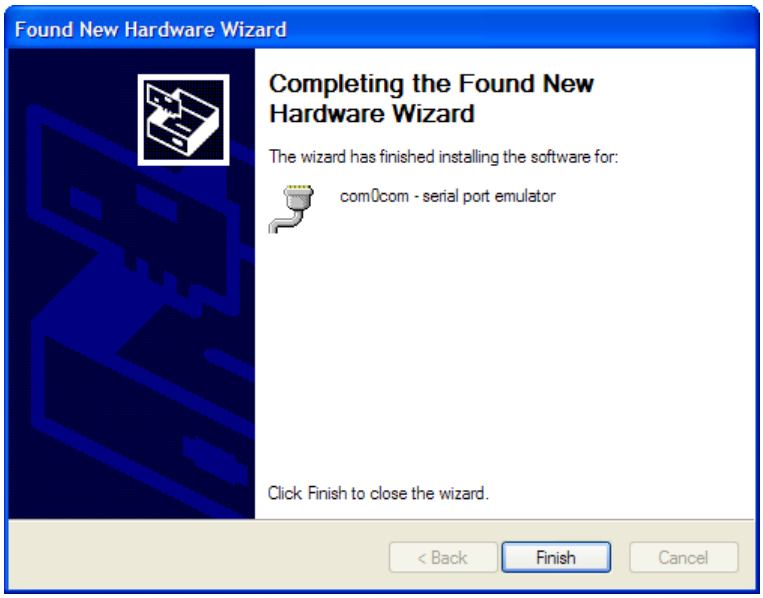
7. Click **Install the software automatically** and **Next** to confirm the installation:



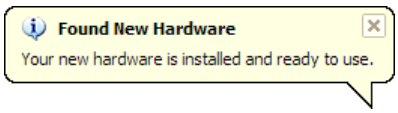
8. A serial port emulator is installed. Once finished click **Next**:



9. Click **`Finish`** once the installation has finished:



10. This step has to be repeated a second time for `CNCB` and is then confirmed with the ready-to-use pop-up window as shown below:



The virtual COM port is now ready to be used.

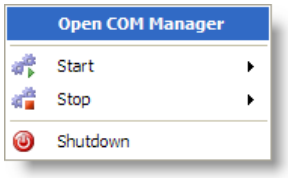
Starting and stopping

For COM port redirection to work, the *SERIP COM Manager* application must be running and the redirector background process must be started.

To start the *SERIP COM Manager* application, launch it from the Windows start menu. If the *SERIP COM Manager* is already running it displays a small icon in the Window system tray:

To launch the *SERIP COM Manager* when the computer starts, add the *SERIP COM Manager* application to the Windows `Startup` program group as shown below. Usually the installer does this already for you.

Right-click on the system tray icon to open the *SERIP COM Manager* context menu:



The context menu allows the main window of the *SERIP COM Manager* to be shown using the **Open** command. The **Shutdown** command closes all TCP/IP connections with serial device servers and terminates the *SERIP COM Manager* application. The **Start** and **Stop** commands can be used to selectively start and stop a COM port redirector process without opening main window.

Shutting down the *SERIP COM Manager* disconnects all serial device servers!

SERIP COM Manager user interface

The main window of the *SERIP COM Manager* is shown below. It can be opened from the system tray icon's context menu.

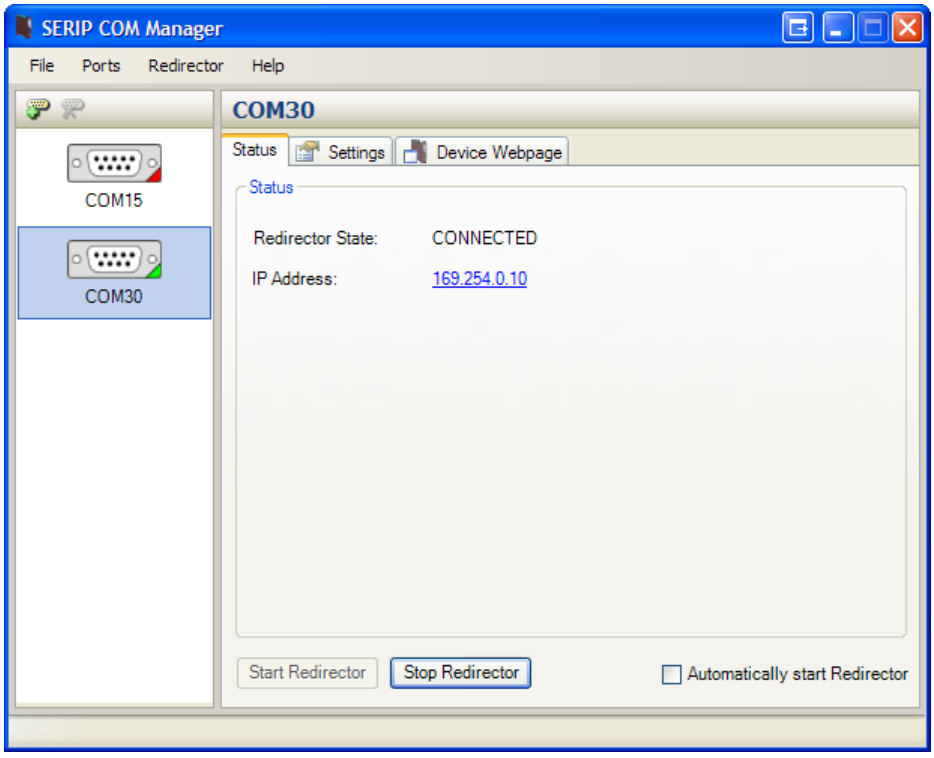


Figure 6.2: SERIP COM Manager main window

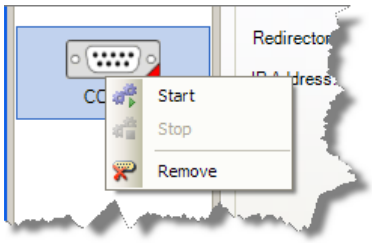
The COM port pane on the left side of the main window shows all installed virtual COM ports. The currently selected COM port is highlighted. A coloured triangle at the bottom right corner of the COM port icon indicates the status of redirector process. Red indicates stopped, yellow indicates connecting or idle state and green indicates connected state.

On the right hand side of the main window a tabbed pane shows the current redirector status, redirector configuration information and the web interface of the remote device server.

You can use the toolbar button to add a new virtual COM port or to delete the currently selected port.

A port can only be deleted if the associated redirector process is in STOPPED state!

With a right mouse click on a COM port a context menu can be opened. From the context menu a virtual COM port can be started, stopped or removed:



Status pane

The status of a serial port redirector process can be monitored on the status pane.

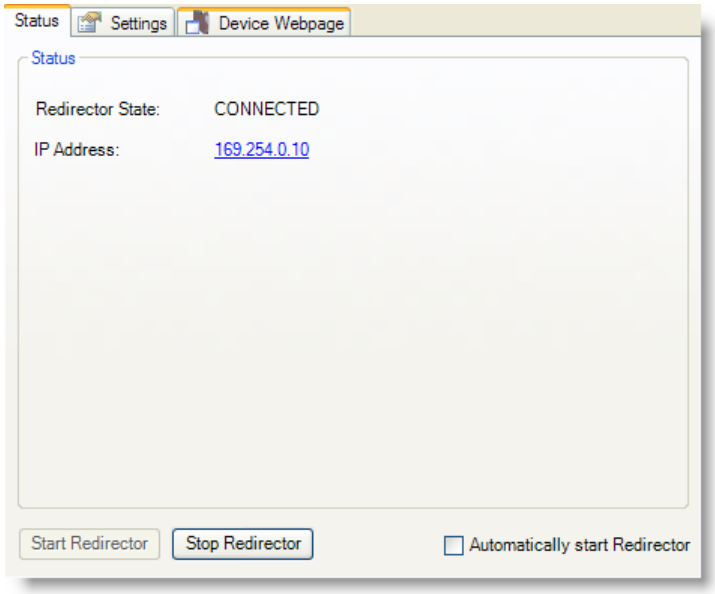


Figure 6.3: SERIP COM Manager status pane

Redirector State

Can be any of these states:

STOPPED

The redirector process has not been started. Click **`Start Redirector`** to start.

CONNECTED

The redirector process has been started and a successful connection to the *SERIP-100* device server has been established.

`IDLE`
The redirector has been started and is ready for a connection request.

`Starting`
The redirector is in the process of starting up.

`Connecting`
The redirector process has been started and tries to establish a connection with the *SERIP-100* device server.

`ERROR`
An error within the redirector process occurred. Check the status line for more details about the error.

`IP Address`
Lists the IP address to be used for a connection if in client mode or the IP address of the connected client if in server mode.

`Start Redirector`
Starts the redirector process. Once started, the virtual COM port is connected with the serial device server.

`Start Redirector`
Stops the redirector process and closes the TCP/IP connection with the serial device server.

`Automatically start Redirector`
Check this box if the redirector process shall be started without user intervention upon launch of the *SERIP COM Manager*.

Settings pane

Below is a sample window of the *SERIP COM Manager* settings pane.

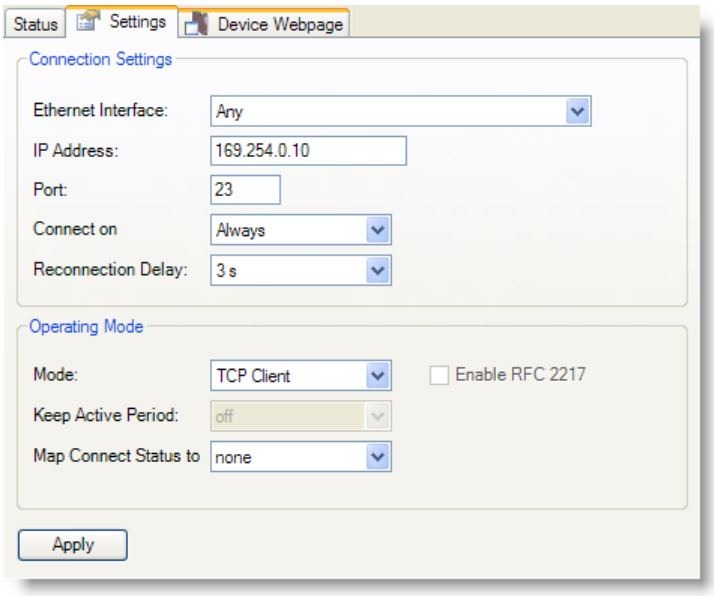


Figure 6.4: SERIP COM Manager settings pane

Connection Settings

`Ethernet Interface`
Usually set to Any but can be changed to use only a specific Ethernet card with the *SERIP-100* device server.

`IP Address`
Enter here the IP address of the *SERIP-100* device server. This value is pre-set to be the default IP address 169.254.0.10 of the *SERIP-100* device server

`Port`
Each serial port on the same serial device server must use a different TCP or UDP port number.

`Connect on`
It is possible for the redirector process to connect depending on the status of a modem control line of the virtual COM port. This could for example be set to DTR so the connection is only established when the application opens the COM port and disconnected when it closes the COM port.

`Reconnection Delay`
Delay time between connection attempts. Setting is only available in client mode.

Operating Mode

`Mode`
This mode must match the opposite of the mode setting of the *SERIP-100* device server. The default is `TCP client`.

`Keep Active Period`
Can only be activated in Telnet modes. Sends NOP Telnet commands to monitor the health status of the connection and avoid disconnection due to inactivity.

`Map Connection Status to`
The TCP connection status can be indicated on one of the modem status lines of the virtual COM port. That way the application software using the COM port knows whether a connection is established or not.

Device Webpage pane

The `Device Webpage` tab offers convenient access to the *SERIP-100* device server's web browser interface.

Figure 6.5: SERIP COM Manager device web page pane

Redirecting the virtual COM port to a SERIP-100 serial device server

If the *SERIP COM Manager* is not already running, launch it from the Windows start menu otherwise right-click on the *SERIP COM Manager* icon in the Windows system tray and select the **`Open SERIP COM Manager`** command to launch it.

1. from the list on the left.
2. Make sure the redirector process is in `STOPPED` state. If not click the **`Stop Redirector`** button.
3. Click on the **`Settings`** tab.
4. Enter the IP address of your *SERIP-100* device server.
5. Press the **`Apply`** button to configure the IP address.
6. Check that the `Port` and `Mode` settings match what you have configured on the device server. You can click on the **`Device Webpage`** tab to verify and change the settings of the device server.
7. Press the **`Apply`** button again to store the settings.

8. Click on the **Status** tab and click the **Start Redirector** button to start the redirector. If you want the COM port automatically connect to your device server every time the computer is started, check the Automatically start Redirector box.

9. The coloured indication triangle of the COM port icon on the left pane should change colour from red (stopped) to yellow (started) and then to green (connected).

10. The virtual COM port is ready to be used.

Chapter 7. Decommissioning

Before disconnecting the *SERIP-100* unit please follow the rules in the section called "Safety Precautions".

Disconnecting

1. Ensure that the system power and external supplies have been turned off.
2. Disconnect power supply plug.
3. Disconnect all I/O cables.
4. Remove the *SERIP-100* from the DIN rail following the procedure described in the section called "DIN rail mounting and removal".

Disposal

This product must be disposed of at a specialized electronic waste recycling facility. Do not dispose of in domestic waste.

Appendix A.Specifications

Product name	*SERIP-100*
Interfaces	
Ethernet	1
Serial ports	1, software configurable as either 1 x RS-232 or 1 x RS-485 or 1 x RS-422
User interface	
LED indicators	Power (green), Ethernet link (green), 2 status (bi-color red/green)
Monitoring & configuration	Web browser based
Diagnostic	
High availability features	Watchdog supervision, brown-out detection
Serial Port RS-232 interface	
Connector	male 9-pin D-sub, DTE, EIA-574 pin-out
Physical layer	EIA-232-F
Isolation	non-isolated
Signals	RXD, TXD, RTS, CTS, DTR, DSR, DCD, RI
Speed	300, 600, 1200, 2400, 4800, 9600, 19200, 57600, 115200 bps
Serial Port RS-485/RS-422 interface	
Connector	3.81 mm 6-pin pluggable terminal block header
Physical layer	EIA-485-A, 2-wire or 4-wire
Isolation	non-isolated
Speed	300, 600, 1200, 2400, 4800, 9600, 19200, 57600, 115200 bps
Max. number of nodes	32
Ethernet port	
Connector	8-pin RJ-45 socket for Cat 5 UTP
Physical & Data Link Layer Layer	IEEE 802.3i 10BASE-T
Isolation	1.5 kV galvanic
Speed	10 Mbit/s
Max. cable length	100 m (328 ft)
Ethernet frame types	802.3
Protocols	TELNET (RFC 854, RFC 855, RFC 2217), HTTP, IP, TCP, DHCP, NBNS, ARP
Concurrent connections	1 virtual serial port, 2 HTTP
Power supply	
Connector	3.81 mm 2-pin pluggable terminal block header
Voltage	10-30 V DC
Current	30 mA typical @ 24 V DC
Intrinsic consumption	750 mW
Electromagnetic compatibility	
Emissions (radiated and conducted)	AS/NZS CISPR 22 / EN 55022 (Class A)
Immunity	EN 55024
Electrostatic discharge	EN 61000-4-2
Radiated RF	EN 61000-4-3
Fast transients	EN 61000-4-4
Conducted RF	EN 61000-4-6

Enclosure	
Material	Self-extinguishing PC/ABS blend (UL 94-V0)
Mounting	35 mm DIN rail (EN 60715)
Classification / Type rating	IP 20 / NEMA Type 1
Cooling	Convection
Environmental	
Operating temperature	0 to 60 °C / 32 to 140 °F
Storage temperature	-25 to 85 °C / -13 to 185 °F
Humidity rating	10 to 95% relative humidity, non condensing
Operating ambience	Free from corrosive gas, minimal dust
Physical	
Dimensions	101 x 22.5 x 120 mm / 3.98 x 0.886 x 4.72 in
Weight	0.12 kg / 0.265 lb
Compliance	
Australia	C-Tick
Europe	CE, RoHS
USA	FCC Part 15 (Class A)
Canada	ICES-003 (Class A)

Dimensions

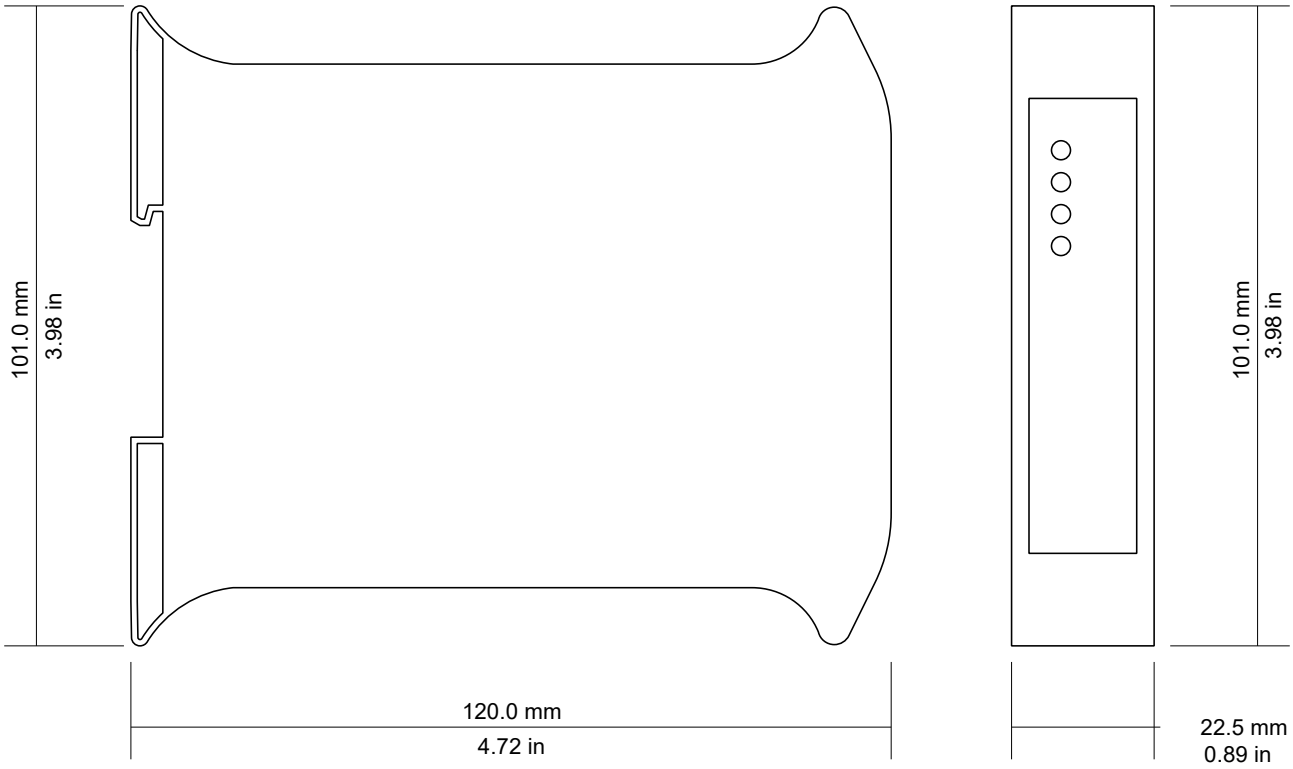


Figure A.1: Enclosure dimensions

Glossary

10BASE-T
: 10 Mbit/s twisted pair Ethernet standard. Standardized in IEEE 802.3i.

APIPA
: Automatic Private IP Addressing

Class A
: Class A equipment is that used in commercial or light industrial environments.

DIN
: German Institute for Standardization

DIN rail
: 35 mm wide mounting bracket standardized in DIN/EN 50022.

DTE
: Data terminal equipment. DTE and DCE devices have different pinouts for RS-232 connectors. A PC for example is a DTE.

EIA
: Electronic Industries Alliance. Standard organisation for serial communication.

EIA-232
: Standard for serial transmission of data between two devices, also known as RS-232 and V.24.

EIA-422
: ANSI/TIA/EIA-422 standard for serial transmission of data between two devices, also known as RS-422 and V.11.

EIA-485
: ANSI/TIA/EIA-485 standard for serial transmission of data between multiple devices, also known as RS-485.

EIA-574
: Standard for the pinout of serial D-sub connectors.

EMC
: Electromagnetic compatibility

EMI
: Electromagnetic interference

EN
: European standard

ESD
: Electrostatic discharge

Ethernet
: The standard for local area networks developed jointly by Digital Equipment Corp., Xerox, and Intel. Ethernet is used as the underlying transport vehicle by several upper-level protocols, including TCP/IP.

Fieldbus
: Digital communication network used to connect process instrumentation and control systems.

Frame
: A single block of data transmission from a device.

Gateway
: A network device that passes data between different networks or fieldbusses. It is different to a Bridge in that protocol conversion occurs above the application layer rather than in the datalink layer.

Gateway address
: The IP address of the gateway or router used to access the Internet from the local are network.

HMI
: Human-Machine Interface

IEEE
: Institute of Electrical and Electronics Engineers

IP
: Internet Protocol

IP
: Ingress Protection Rating according IEC 60529. Standard for various grades of electrical enclosures.

IP address
: A numeric address used by computer hosts to transmit and receive information over the Internet.

ISO
International Standards Organisation

KiB, KiByte
1024 bytes. The SI standard recommends the usage of the binary unit prefix *Ki* for 1024.

MAC address
Every piece of Ethernet hardware has a unique number assigned to it called it's MAC address. MAC addresses are administered and assigned by the IEEE organization.

NEMA
National Electrical Manufacturers Association. NEMA defines standards for various grades of electrical enclosures.

Node
A communications device on the network.

PC/ABS
Polycarbonate-ABS. Widely used thermoplastic material.

Physical Layer
This layer defines everything required to make a physical connection to the network or fieldbus.

PLC
Programmable Logic Controller

RS-232
See *EIA-232*.

RS-422
See *EIA-422*.

RS-485
See *EIA-485*.

SCADA
Supervisory Control and Data Acquisition

Subnet mask
A numeric address used in conjunction with an IP address to segment network traffic; used to restrict transmissions to certain subnets.

Switch
A device that facilitates transmissions between nodes in a star-formed network

TCP/IP
Transport Control Protocol/Internet Protocol. Connection-orientated transfer protocol.

Telnet
A network protocol (RFC 854) for character based terminal access

TIA
Telecommunications Industry Association. US trade association and standardization commitee.

UL 94
Plastics flammability standard released by Underwriters Laboratories of the USA.

Watchdog
A fail-safe mechanism which resets a device if it becomes unresponsive.

Index

Notes