Technical Documentation

STEC-1…

Ethernet interface converter

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1 Properties of STEC-1

The STEC-1 (Serial to Ethernet Converter) is designed to enable devices with an RS-485 or RS-232 serial port to connect to a network so that it is possible to communicate with this device or devices directly over the network.

Communication is usually managed by a network-enabled PC software application, which communicates with the device or devices through the STEC-1. Whether this software is able to communicate with only the one or a number of STEC-1 devices (see Figure 1) depends simply on the software's capabilities.

The STEC-1 has a network port and a serial half-duplex port, which can be used as an RS-232 or RS-422 / RS-485 port.

If the serial port is being used for RS-422 / RS-485 communication, it is also possible to connect multiple devices of the same type to this interface, provided these devices can be addressed individually by their own communication protocol (see Figure 1).

The STEC-1 has a dual output power adapter with separate transformer windings for supplying the network module and the serial port. Data is exchanged through opto-couplers. These galvanic isolators help to prevent interference from spilling over from one section of the circuit to another.

Two versions of the STEC-1 are available: The STEC-1 E (enclosure) has a casing with an index of protection of IP65 and is therefore also suitable for use in demanding environments in the commercial or industrial sector. By contrast, the STEC-1 R (rail) is an open module (IP00) for mounting on a DIN rail and is intended for use inside other systems or installations.

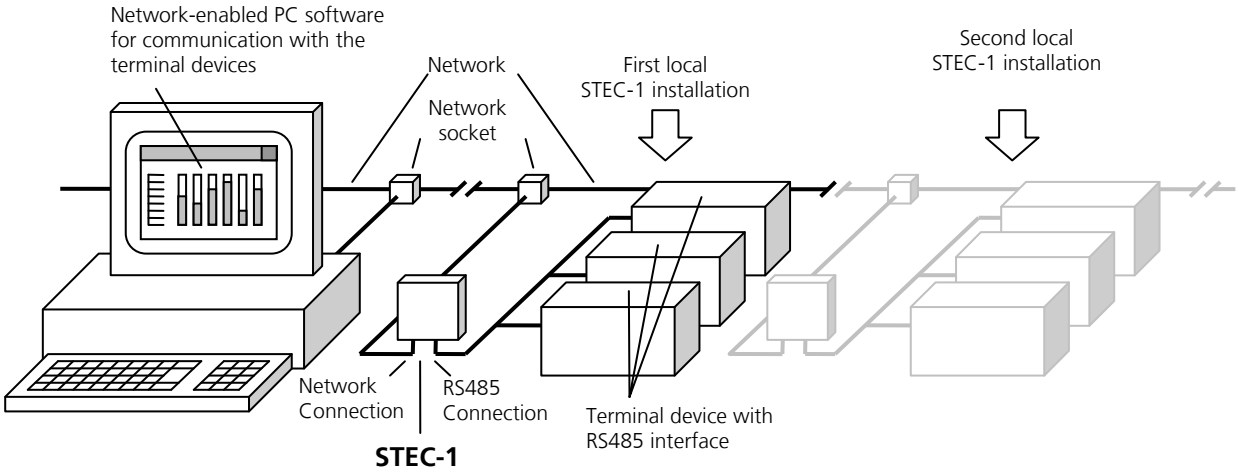

Figure 1: STEC-1 can be connected to multiple RS-485 terminal devices

2 Safety precautions

The STEC-1 acts as a TCP server for networking devices or systems having a serial port. Please only use the STEC-1 for this purpose. The manufacturer accepts no liability for any form of damage resulting from improper use!

The STEC-1 has been developed, manufactured and tested in accordance with state-of-the-art technology and with recognised safety rules and regulations. Nevertheless, hazards may arise from its use. For this reason, the following safety information must be observed:

⚠ **Do not change or modify the device or add any equipment without the prior consent of the manufacturer.**

⚠ **Only use original spare parts. These comply with the technical requirements specified by the manufacturer.**

⚠ **The installation, operation and maintenance of the STEC-1 must only be carried out by expert, authorised personnel. Specialised knowledge must be obtained by undergoing regular training.**

⚠ **Operators, installers and service technicians must comply with all applicable safety regulations. This also applies to any local safety regulations and accident prevention regulations which are not stated in these operating instructions.**

3 Design and operation

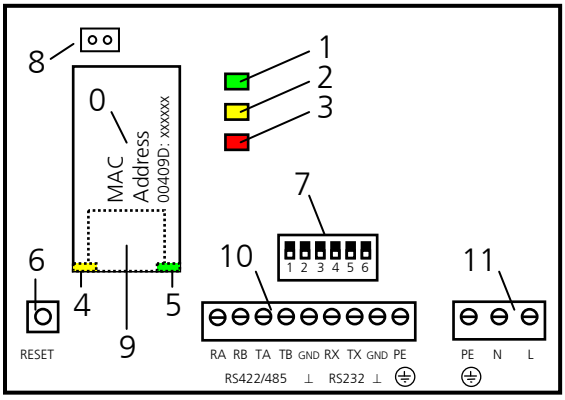

Figure 2: STEC-1 layout

3.1 Device information

(0) The top of the network module is labelled with the MAC address. The MAC address is unchangeable and is assigned separately for each individual device. As a result, there are no two devices in the world with the same identifier. During the installation and configuration of the STEC-1, the MAC address is needed to enable the device to be uniquely identified in the network in case other devices of identical or similar type are already operating with the same module in this network.

3.2 Indicators

(1) The green LED indicates the status of the STEC-1 power supply. The LED lights up permanently when the auxiliary power is switched on. If the LED flickers or is unlit, this indicates a problem with the auxiliary power or the mains adapter.

(2) The yellow LED lights up while data is being transmitted from the serial port to the network: Whenever data is being transmitted continuously, the LED flickers continuously in rhythm with the data transmission. In the case of an occasional transmission of small amounts of data, it lights up only briefly.

(3) The red LED lights up while data is being transmitted from the network to the serial port: Whenever data is being transmitted continuously, the LED flickers continuously in rhythm with the data transmission. In the case of an occasional transmission of small amounts of data, it lights up only briefly.

(4) When permanently lit, the yellow LED on the front of the network module indicates that a network connection has been established. Whenever the device is switched on or reset or rebooted, it may take up to a minute for a stable network

connection to be established and for the LED to light up permanently. A flashing or flickering LED indicates that the network connection is unstable. If a network connection cannot be established, the LED remains unlit.

(5) A rapid flashing of the green LED on the front of the network module indicates the presence of data traffic in the network, regardless of whether the data is destined for the STEC-1 or other devices. If the LED is permanently lit or unlit, it is to be assumed that there is a fault in the network.

3.3 Controls

(6) Briefly pressing the Reset button reboots the network module. It may take up to a minute for the module to re-establish the network connection. The latest settings are retained: they are not reset to the factory defaults. (cf. "Restoring the factory settings".)

(7) Using the 6-way DIL switch, it is possible to configure various options for operation of the serial port in RS-485 mode (see chapter "Optional RS-422 / RS-485 settings"). In RS-232 mode, these switches are irrelevant and should all be set to the OFF (down) position.

(8) This pin strip is used for production and testing purposes. During normal operation, there must be no bridge connected to the strip, otherwise the device could malfunction.

3.4 Ports

(9) Network socket for connecting a standard, 8-pin RJ-45 network cable.

(10) 9-pin terminal block for connecting the serial port. The STEC-1 features an RS-232 port and an RS-422 / RS-485. The RS-232 port uses RxD and TxD signals (control signals for hardware handshaking are not supported). The RS-422 / RS-485 port is equipped with RS-485 components, which differ from RS-422 components only by the greater number of subscribers that can be connected to it (RS-422: max. 10 subscribers; RS-485: max. 31 subscribers). Consequently, the interface can be operated in both RS-422 and RS-485 networks. It is possible to use either the RS-422 / RS-485 port or the RS-232 port. The simultaneous use of both ports is not supported because, internally, they are switched in parallel and would mutually interfere with each other. You will find a detailed connection description in Commissioning -> Connection.

(11) 3-pin terminal block for connecting the auxiliary power.

4 Commissioning

This section describes how to commission and configure an STEC-1 so that, as a TCP server, it can be addressed in the network by means of an IP address and the default port 2101 and enable communication to be established with the connected devices through their serial port.

The browser-based interface that you will be using to configure the device also allows you to change other settings that could cause the STEC-1 to no longer function as a TCP server correctly. During configuration, you must therefore adhere strictly to the instructions in this guide and leave all other settings at their factory defaults.

Any necessary setup or customisation of the network does not form part of this commissioning procedure. Setup and customisation should be carried out by the network administrator. Before the commencement of installation work, the network administrator should always be informed about the entire project (including the software to be used for communication with the STEC-1) so that potential problems with the network can be resolved in advance.

4.1 Prerequisites

The following information must be available before commissioning takes place:

- Parameters to be set for the serial port. It is necessary to set the parameters for the baud rate, number of data bits, parity, number of stop bits, and handshaking. These parameters depend on the devices to be connected. For the relevant settings, please refer to the technical documentation supplied with the devices or consult the manufacturer. It should be verified whether the STEC-1 supports the required parameters (see "Technical data").
- Parameters to be set for the network connection. It is necessary to configure the IP address and the subnet mask. Optionally, it may be necessary to specify a gateway address and change the default port of 2101. For the relevant parameters, and whether you need to specify a gateway address or use a port other than 2101, please consult your network administrator.
- Following connection and address assignment, the remaining steps of STEC-1 configuration are carried out within a web browser (e.g. Internet Explorer ®). Before you commence the commissioning procedure, you should therefore make sure that there is a free PC with a connection and access to the local network in which the STEC-1 is going to be installed. In cases of doubt, please consult your network administrator in advance.

4.2 Connection

The wiring of any port must always be carried out with the power supply switched off.

All local safety regulations must be observed during connection work.

Local lightning protection regulations must be observed for the routing of lines outdoors.

Connection work must be carried out only by appropriately trained and authorised personnel having knowledge of local building and safety regulations.

The network module is galvanically isolated from the serial port and the auxiliary power. Connection to a network can be established using a standard RJ-45 network cable.

The serial port has the RS-232 connections Rx (receive), Tx (transmit) and GND (earth potential). The PE connection (protective earth) is used to connect the cable shield. The cable shield should be connected to PE at both ends, i.e. at the STEC-1 and at the device to be connected.

If the device to be connected has a high power input, an equipotential bonding conductor should be integrated between the device and the STEC-1 (and should also be protected by the cable shield) in accordance with local rules and regulations to prevent the occurrence of equipotential currents, which could cause damage to the devices.

If the device to be connected does not have a PE connection, the cable shield can be fitted to one end only, i.e. at the STEC-1. While the shielding effect is diminished, it is still more effective than if there were no shielding at all.

The serial port has the RS-422 / RS-485 connections RA (receive +), RB (receive -), TA (transmit +), TB (transmit -) and GND.

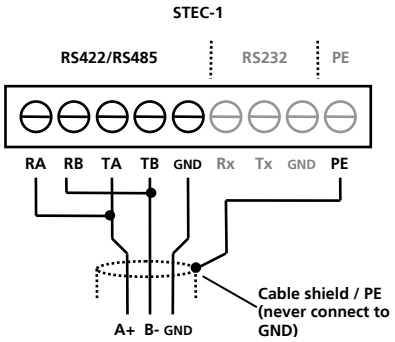

Figure 3: RS-485 2-wire operation

For RS-485 2-wire operation, the connections RA to TA and RB to TB can be interconnected by an external cable bridge (see Figure 3).

With RS-422 / RS-485 interfaces, it is generally recommended to also carry the ground potential (GND) of the devices to be connected as well as the signal lines if these devices do have a separate GND connection (not PE!). This helps to increase transmission reliability significantly, particularly in the case of longer lines.

For installation in RS-422 / RS-485 networks or a point-to-point connection with a device with a high power input, an equipotential bonding conductor should be integrated between the devices to be connected and the STEC-1 (and should also be protected by the cable shield) in accordance with local rules and regulations to prevent the occurrence of equipotential currents, which could cause damage to the devices.

⚠ **The cable shield must not be used as a GND conductor either in RS-232 mode or in RS-422 / RS-485 mode.**

⚠ **The GND connection must not be connected to protective earth (PE) either in RS-232 mode or in RS-422 / RS-485 mode because the interfaces of all the connected devices could be damaged by equipotential currents.**

4.3 Optional RS-422 / RS-485 settings

Using switches S1 - S6, it is possible to activate various options for terminating or biasing the RS-422 / RS-485 lines. Please note that only one bias point (S3 - S6) may exist in a RS-422 / RS-485 network at any one time. For this reason, the relevant switches S3 - S6 of the STEC-1 must be left Inactive (switch position OFF = factory default) if the necessary bias has already been implemented by a different device in the network.

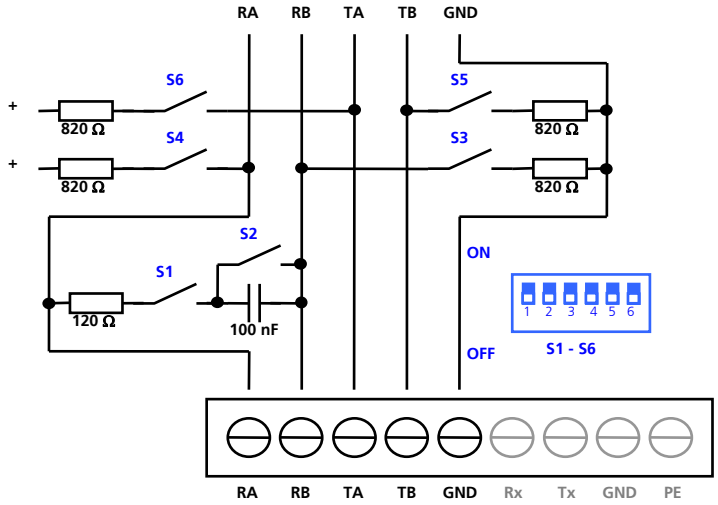

Figure 4: RS-422 / RS-485 setting options

Switch S1, S2

Using switches S1 and S2, it is possible to activate a termination point for receive lines RA and RB. This helps to reduce the risk of interference that could be caused by reflections at the line ends. When both switches are in the ON position, termination is provided by a 120 Ω resistor. In an RS-485 network, it is usually the two devices that are furthest apart that are terminated with 120 Ω.

In practice, however, it may be the case that the connected devices are unable to deliver the necessary driver current for this standard-compliant method of termination. These could be, for example, non-standard-compliant RS-232 <> RS-4222/RS-485 converters that do not have their own power supply, but rather are supplied by the RS-232 interface, which is not able to deliver the output required to drive the termination resistor. In such cases, switch S2 can be left in the OFF position with the effect that an additional capacitor is switched in series with the termination resistor, which prevents DC load but still enables AC termination.

Switch S3, S4 and S5, S6

Using these switches, it is possible to bias the receive lines (RA/RB with S4/S3) and transmit lines (TA/TB with S6/S5) using 820 Ω resistors for the power supply (+) and earth potential (GND). In the absence of data traffic, the transmit outputs of the subscribers are in a state of high impedance, thereby allowing a difference in electrical potential to arise across the lines (also in a state of high impedance), which could result in temporary or permanent communication interference. This phenomenon can be effectively prevented by biasing the lines with resistors.

As with the termination resistor, problems may occur with the devices to be connected if they do not have a standard-compliant interface (see above).

In RS-485 2-wire mode (see Figure 3), only the one bias point is permitted, either by S3/S4 or by S5/S6, because the biased circuits would be operating in parallel.

4.4 Assigning or modifying IP settings

For initial commissioning in a network, you will need the "finder.exe" application in order to assign IP addresses for the first time. IP addresses can be modified later using the web interface of the STEC-1.

The "finder.exe" file must be stored on a PC with access to the network in which the STEC-1 is going to be set up. Launch the application by double-clicking the "finder.exe" file in Windows Explorer.

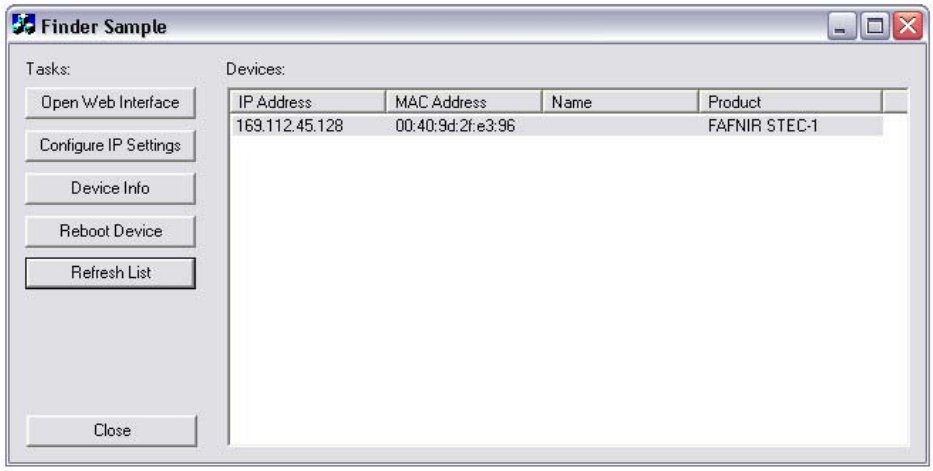

Figure 5: Finder – user interface

Once started, the application spends a few seconds searching the network for available devices before displaying a list of the found devices (see Figure 5). If multiple STEC-1 devices are found, the STEC-1 to be configured is identifiable from the others in the list by its unique MAC address (see Figure 2). Before you continue, the STEC-1 to be configured has to be highlighted in the list first.

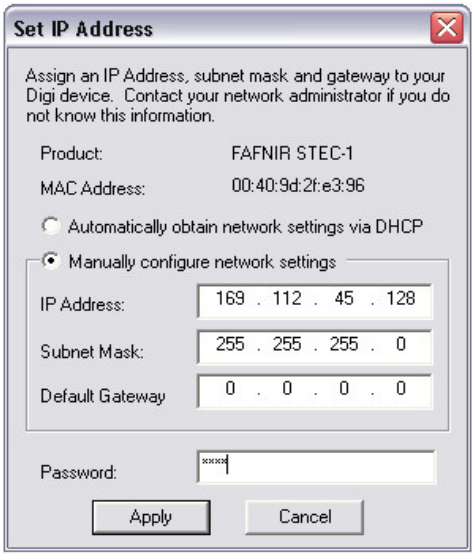

Figure 6: Finder – IP settings

To configure IP address parameters, click the "Configure IP Settings" button. In the relevant fields, enter the values given to you by your network administrator (see Figure 6). Before the new settings can be applied, you will need to enter the password "**dbps**" in the password field. Then click the "Apply" button to send the data to the STEC-1.

The new settings do not take effect until the STEC-1 has been rebooted. To reboot, click the "Reboot Device" button (see Figure 5).

Figure 7: Finder – reboot

In the window that subsequently opens (see Figure 7), enter the password "**dbps**" again. The reboot is initiated by clicking the "Reboot" button and may take up to 60 seconds. The "Status: Rebooting" display then changes to "Status: Ready" and it is possible to close the window by clicking "Close".

To start a new search, click the "Refresh List" button (see Figure 5). The STEC-1 is displayed in the list with its new IP address.

To call up the web interface for the STEC-1, you can now click the "Open Web Interface" button (see Figure 5). The web browser opens automatically and a connection to the STEC-1 is established. The web browser can also be opened manually. For the address, enter the IP address of the STEC-1, e.g. "http://192.40.50.207".

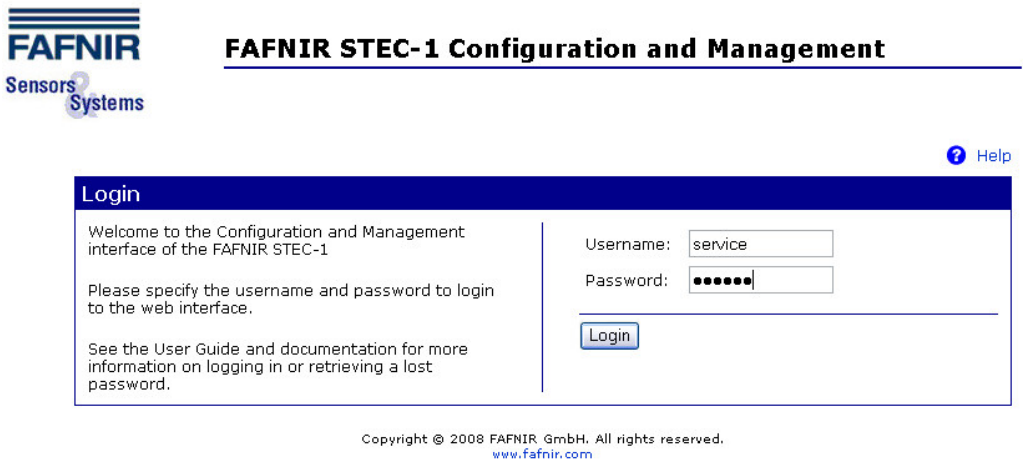

Figure 8: Web interface login

To access the configuration settings, enter the username service and the password access.

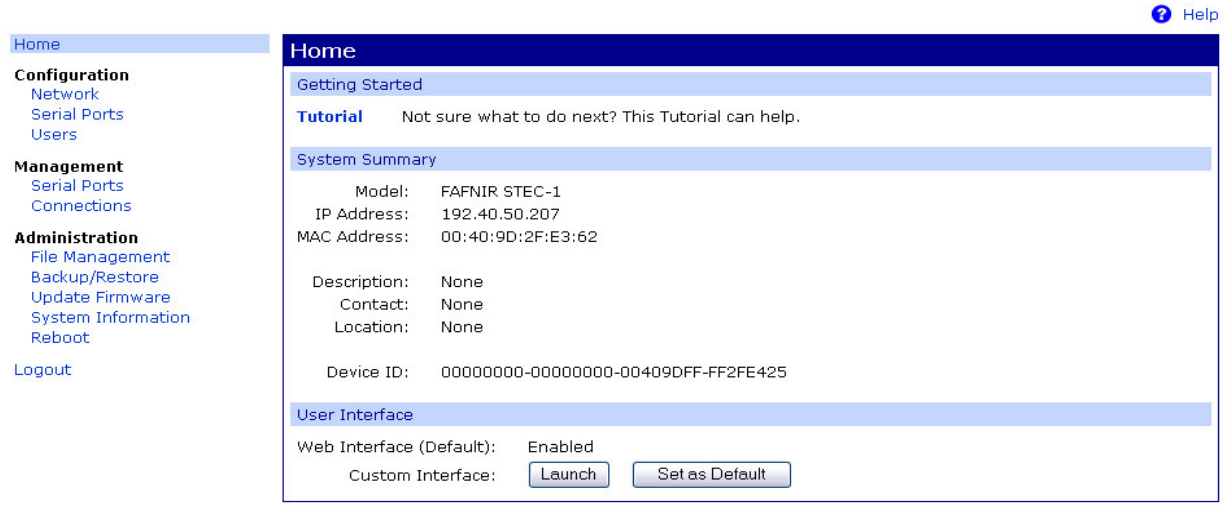

Figure 9: Web interface

This web interface also allows you to change other settings that could cause the STEC-1 to no longer function as a TCP server correctly. During configuration, you must therefore adhere strictly to the instructions in this guide and leave all other settings at their factory defaults.

You can modify the IP address by selecting "Network" -> "IP Settings" (see Figure 10). For the STEC-1 to operate as a TCP server, it is recommended that you assign a static IP address. The option for obtaining an IP address automatically using DHCP should not be selected unless your network administrator has expressly required you to do so.

Once you have entered the address parameters, it is necessary to click the "Apply" button so that the address parameters can take effect. To reboot the STEC-1 with the modified address parameters, click on the "Reboot" menu option on the left-hand side.

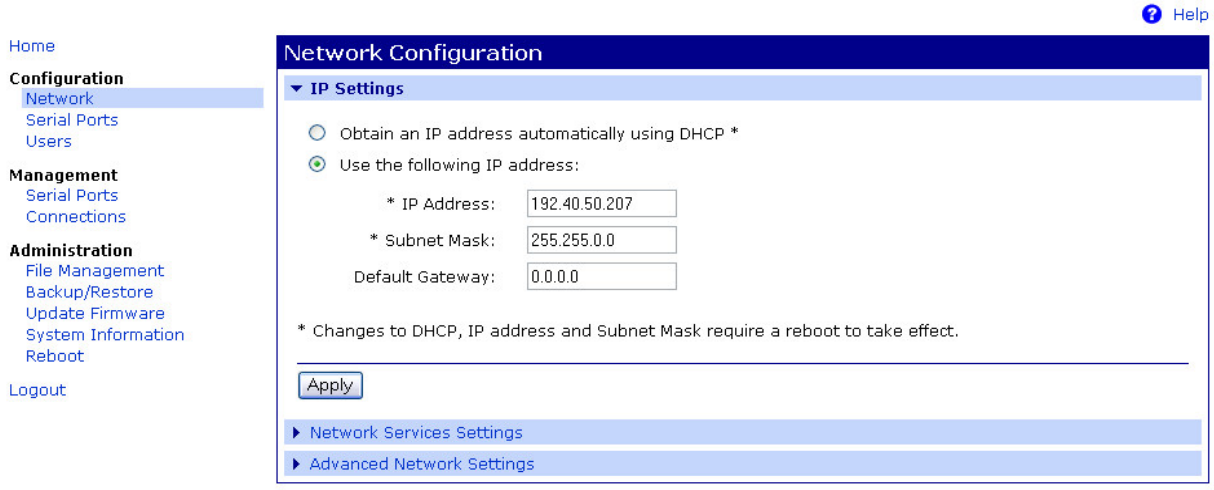

Figure 10: IP settings in the web interface

4.5 Serial port configuration

To access the basic settings for the serial port, follow the menu items "Serial Ports" -> "Port 1" -> "Basic Serial Settings".

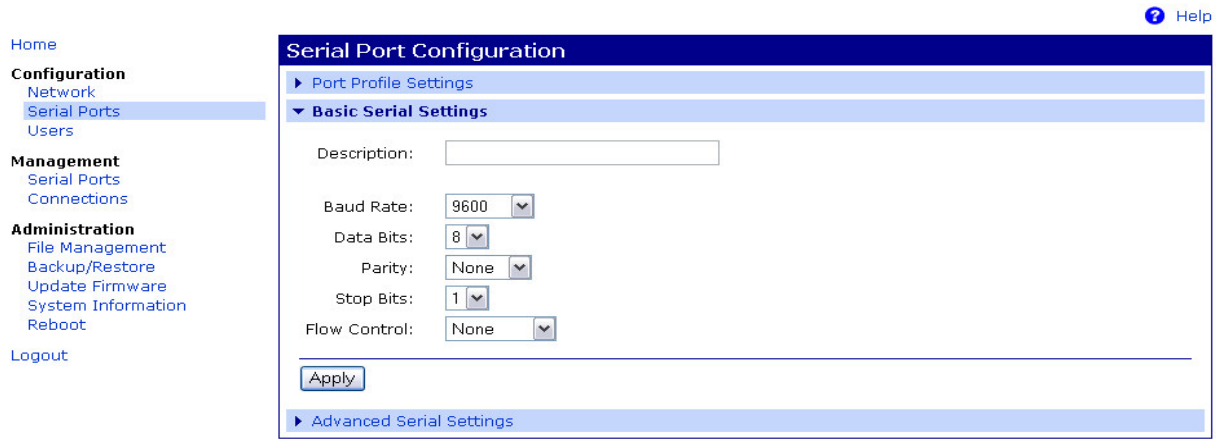

Figure 11: Serial port settings in the web interface

This is where you can configure the necessary parameters for the serial port under consideration of the following points:

- In the "Description" field, you may enter any text you wish, e.g. a meaningful description of the connected device. This entry is optional. The field can be left empty.
- The maximum "Baud Rate" is 38,400.
- "Flow Control" must not be set to "Hardware".

Other relevant settings include the "idle seconds", which can be found under "Advanced Serial Settings" (see Figure 11). The exact option name is "Close connection after the following number of idle seconds".

This value specifies the number of seconds after which a network connection would be disconnected automatically if there were no longer any data being exchanged with the STEC-1. In practice, this automatic disconnection tends to occur, for example, in the event of an unexpected connection termination whereby the connection could not be closed normally. If the STEC-1 did not then force the connection to close after a specific number of seconds (idle seconds), it would not be possible for a new connection to be established because the STEC-1 would attempt to keep the old connection open.

The factory default time is 60 seconds. This function can be deactivated by entering a time value of 0 seconds. However, since the "unexpected connection termination" described above is not a rare occurrence in relatively large networks, we would strongly advise against deactivating the function.

4.6 Backing up and restoring settings

Using the Backup and Restore functions, it is possible to backup the current settings and to restore them at any time.

The backup file is always saved with the name "backup.cfg". For this reason, it is recommended that you create a separate folder for each backup file if you wish to back up the settings of a number of different STEC-1 devices to the same drive.

The CD-ROM supplied contains the file "fafnir_default.cfg", which you can use to restore the factory settings.

5 Technical data

Dimensions	STEC-1E – 150 mm x 160 mm x 60 mm STEC-1R – 112 mm x 75 mm x 58 mm
Casing index of protection	STEC-1E – IP65 STEC-1R – IP00
Ambient temperature	0 °C to +40 °C
Auxiliary power	230 V AC, 50/60 Hz, ±10 %, ≤ 7 VA
Network interface	
Connection	RJ-45, 8-pin
Speed	10 Mbit / 100 Mbit, automatic detection
Isolation from serial port	≥ 250 V AC
Serial port	
Connection	Screw-type terminal block
Type	RS-422 / RS-485: RA, RB, TA, TB, GND RS-232: RX, TX, GND
Mode	Half duplex
Speed	50 bps to 38,400 bps
Isolation from network interface	≥ 250 V AC

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