TCP2RTU PoE and WiFi

Transparent bidirectional converter Modbus TCP to RTU/ASCII (RS232/RS485)

With PoE Ethernet or WiFi

And power output for an external device

TCP2RTU PoE and WiFi

Datasheet

Created: 22.9.2021

Last update: 10.11 2022 09:04

Number of pages: 24

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ABOUT THE DEVICE

TCP2RTU PoE and WiFi and WiFi is a transparent bidirectional converter from Modbus TCP protocol over Ethernet or WiFi to Modbus RTU or ASCII over RS232 or RS485.

TCP2RTU PoE variant

The converter is powered from PoE standard or from an external power supply unit. There is also a **power output** available to power the connected or other device. PoE can power the converter and the device behind it at the same time. Power **output can be turned on and off** in the **WEB interface**.

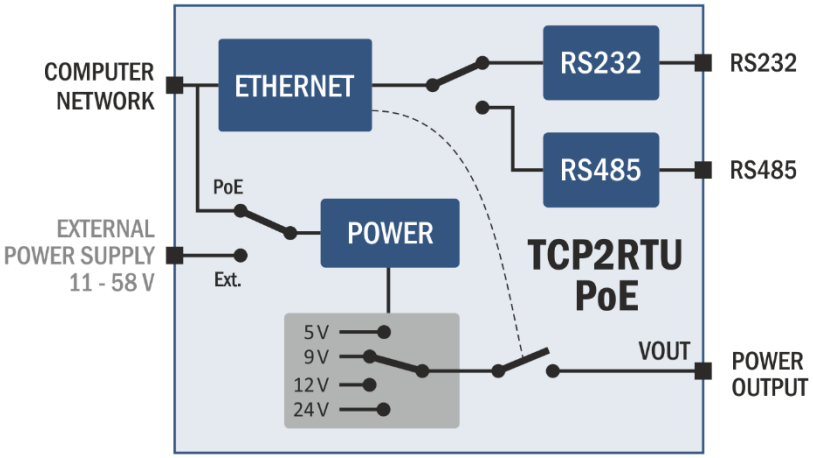


fig. 1 – block diagram of TCP2RTU PoE

TCP2RTU WiFi variant

The converter communicates via WiFi and is powered from an external power supply unit. There is also a **power output** available to power the connected or other device. Power **output can be turned on and off** in the **WEB interface**.

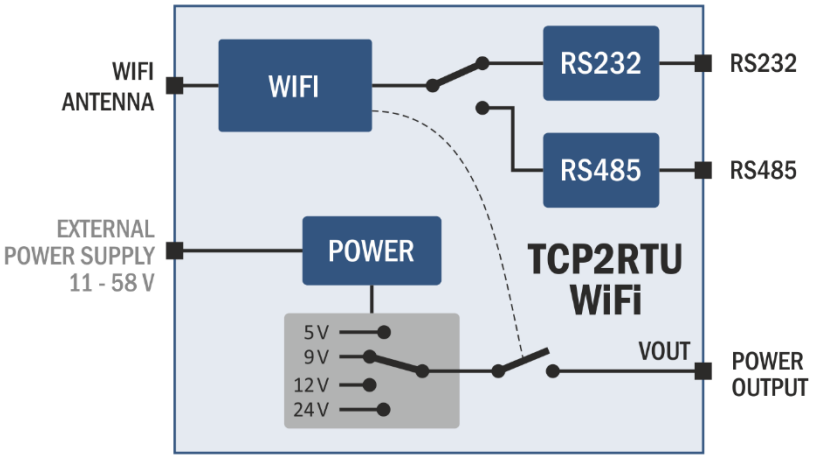


fig. 2 – block diagram of TCP2RTU WiFi

Features

- **Bidirectional converter from Modbus RTU/ASCII to Modbus TCP over Ethernet.**
- **TCP2RTU PoE**
  - Modbus TCP on **Ethernet**.
  - Powered from **PoE** or an external power supply (11 – 58 V).
- **TCP2RTU WiFi**
  - Modbus TCP on **WiFi**.
  - Powered from an external power supply (11 – 58 V).
- Power output for the connected device, 5, 9, 12 or 24 V – output can be turned on or off using the WEB interface.
- Power is galvanically isolated from all the other parts of the device.
- Easy configuration using the WEB interface
- **Switchable RS232 or RS485 line**
- Used signals RS232: RxD, TxD, RTS, CTS, GND
- Used signals RS485: RxTx+, RxTx-
- Power indication, data indication, network activity indication
- Industrial metal chassis.

The following image shows the system connections with Modbus TCP and RTU protocols.

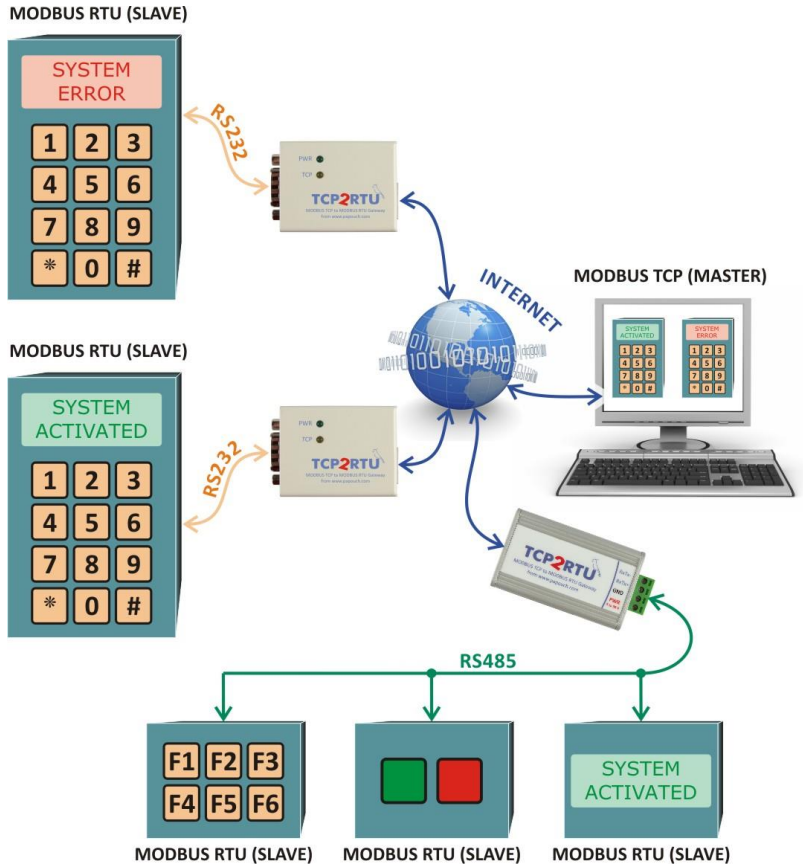


fig. 3 – example of a system using TCP2RTU to connect devices communicating by Modbus TCP and RTU

CONNECTIONS

Power

TCP2RTU PoE: The converter can be powered one of the following ways:

1) From a PoE switch according to IEEE 802.3af („active PoE“).
2) Using a “passive PoE” injector with range from 44 to 57 V.
3) From an external power supply 11 – 58 V. Connect the power supply to the jack connector saying Power. Plus is inside.

TCP2RTU WiFi: The converter is powered from an external power supply 11 – 58 V DC.

Ethernet

Ethernet interface 10/100 Mbps is connected using a standard RJ45 connector. Connect it using a patch cable to an Ethernet switch.

If you want to use PoE for powering the device, your Switch has to be capable of powering a device according to PoE IEEE802.3af standard.

WiFi

EDGAR WiFi: There is SMA RP antenna connector to connect to WiFi. (Small antenna is a included.)

RS232

Converter can only use one communication line at a time!

Line type is selected on the side of the device using **SW4**. Leave this switch open to communicate on RS232.[1]

Serial line is connected according to RS232 specifications. Individual signals connections of RS232 interface are in the following picture. As indicated, pins 1, 6 and 9 are not connected. Using jumpers J1 and J2 (inside the converter) you can power your device as if connected to the VOUT power terminal.

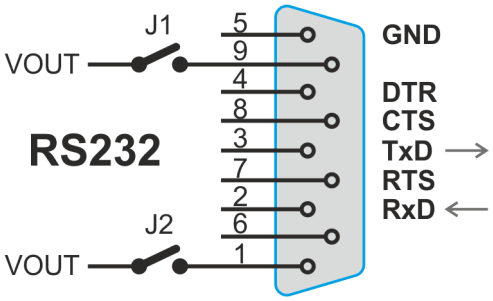


fig. 4 – RS232 conector pinout

[1] **Switch state is only read during the power up of the device or a reset. Changes made during the normal operation will not affect the communication line type.**

RS485

Converter can only use one communication line at a time!

Line type is selected on the side of the device using **SW4**. Leave this switch open to communicate on RS232.[1]

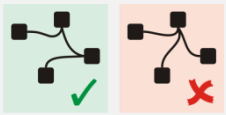
RS485 line connects to the RxTx+ and RxTx- terminals[2].

Line termination can be connected using **SW1** switch. (Line termination should be connected on both ends of the line).

Biasing resistors can be connected using **SW2** and **SW3** switches. (These resistors should only be connected on a single point in line.)

Some basic recommendations for connecting RS485 line (bus):

- We recommend using common TP cable used for computer network and using one twisted pair as RS485 communication cables
- All devices should be connected from one to another and not in a star topology (see picture on the right). Maximum length of such line should be 1,2 km
- Use termination at each end of the line (use Termination jumper if available).
- Shielding, if available, connect to the ground on one side of the line only!



Power output VOUT

This output is not available on the Edgar Lite version of this converter.

Power output is mostly used in situations where the Edgar is powered from PoE. VOUT power output can power the connected device as well.

Power output is DC and the voltage is determined by the switches on the side of the unit. Power output can be controlled via the WEB interface (see page 13) or using an HTTP GET command in three steps: Off, Low power, High power. Maximum output currents are shown in the table below:

SW5	SW6	Output Voltage	Maximum current Low Power	Maximum current High Power
OFF	ON	**5 V**	380 mA	630 mA
ON	ON	**9 V**	200 mA	350 mA
OFF	OFF	**12 V**	145 mA	260 mA
ON	OFF	**24 V**	70 mA	130 mA

High Power / Low Power option has a significant impact on the idle power consumption of the converter. We recommend only using the necessary maximum current based on the actual power consumption.

To use the High-Power mode while using an external power supply, the power supply voltage must be at least 15V DC.

[2] Some manufacturers label RxTx+ as A and RxTx- as B.

CONFIGURATION

TCP2RTU PoE: Setting IP Address

1) Set the correct IP Address now. The default IP address is 192.168.1.254 with subnet mask 255.255.255.0. If your network is not compatible with this range, set a new IP address suitable for your network using the Ethernet configurator software.

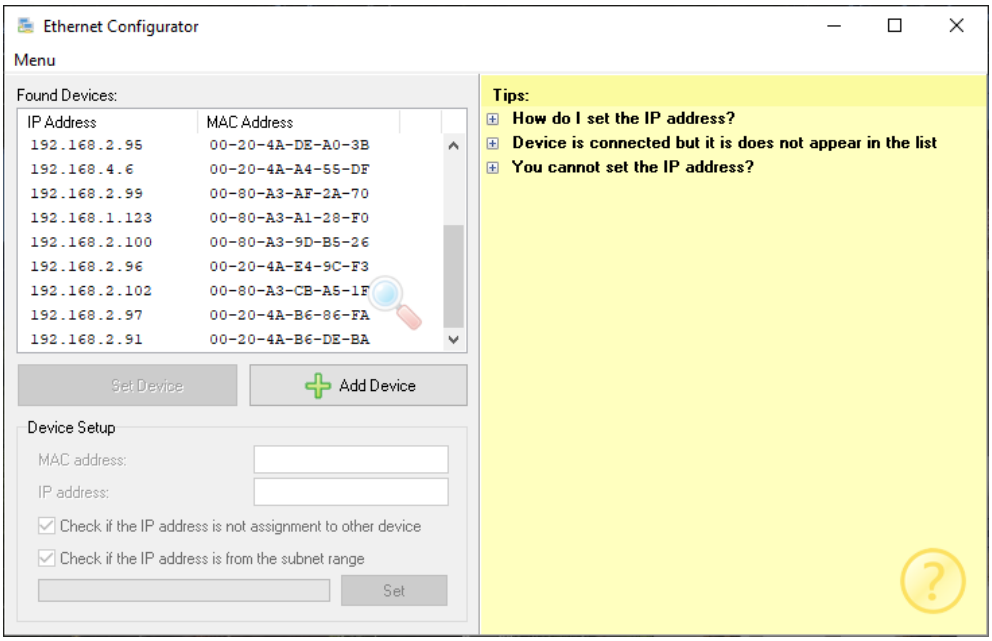


fig. 5 – Ethernet Configurator to set the IP address

1) After the IP address is set, you can connect to the device using a WEB browser by entering your new IP address like this: *http://192.168.1.254/* (example for the default IP address)
2) After setting the IP address, there is no need for any other setup for the basic function – Ethernet → serial line[3] converter.

TCP2RTU WiFi: Connecting

Converter in default state:

1) After switching on, the converter works in Access Point (AP) mode with the network name (SSID) *TCP2RTU_WiFi_AP* without security. This mode is indicated by a LINK indicator.
2) Connect to this access point with your computer or mobile phone and open *http://192.168.1.254/* in your web browser or simply enter *edgar.com*.
3) The web configuration interface described below opens. In this mode, the WiFi interface is not password protected and is only used for simple first access to the configuration. Once logged in, the first thing to do is set the highest security your hardware can provide.

If the IP address is not known or the connection to the AP fails:

1) Press the Reset button located in the hole under the antenna.

[3] Default serial parameters regardless of the selected line type are: speed: 9600 Bd, data bits: 8, parity: none, stop bits: 1, data port 10001, mode TCP.

2) The LINK indicator light will now flash, indicating that the converter is temporarily switched to AP mode with the network name *TCP2RTU_Config_AP*. This mode ends after restarting the converter.
3) Connect to this access point with your computer or mobile phone and open *http://192.168.1.254/* in your web browser, or simply enter *edgar.com*.
4) The web configuration interface described below opens. In this mode, the WiFi interface is not password protected and is only used for simple first access to the configuration. Once logged in, the first thing to do is set the highest security your hardware can provide.

If IP address is known:

1) You can connect to the device using a web browser at the following address: http://192.168.1.254/ (an example is given for the default IP address that is set from the factory)

Web interface

All other configuration is made using the in-built WEB interface. **Web interface** can be accessed on the device's IP address (Default IP address is 192.168.1.254.)

Web interface is secured using a simple user name and password.

The responsive web interface is optimized for Mozilla Firefox, Google Chrome and other browsers with the Chromium rendering core.

Configuration is divided into sections based on the setting type. It is available in Czech and English.

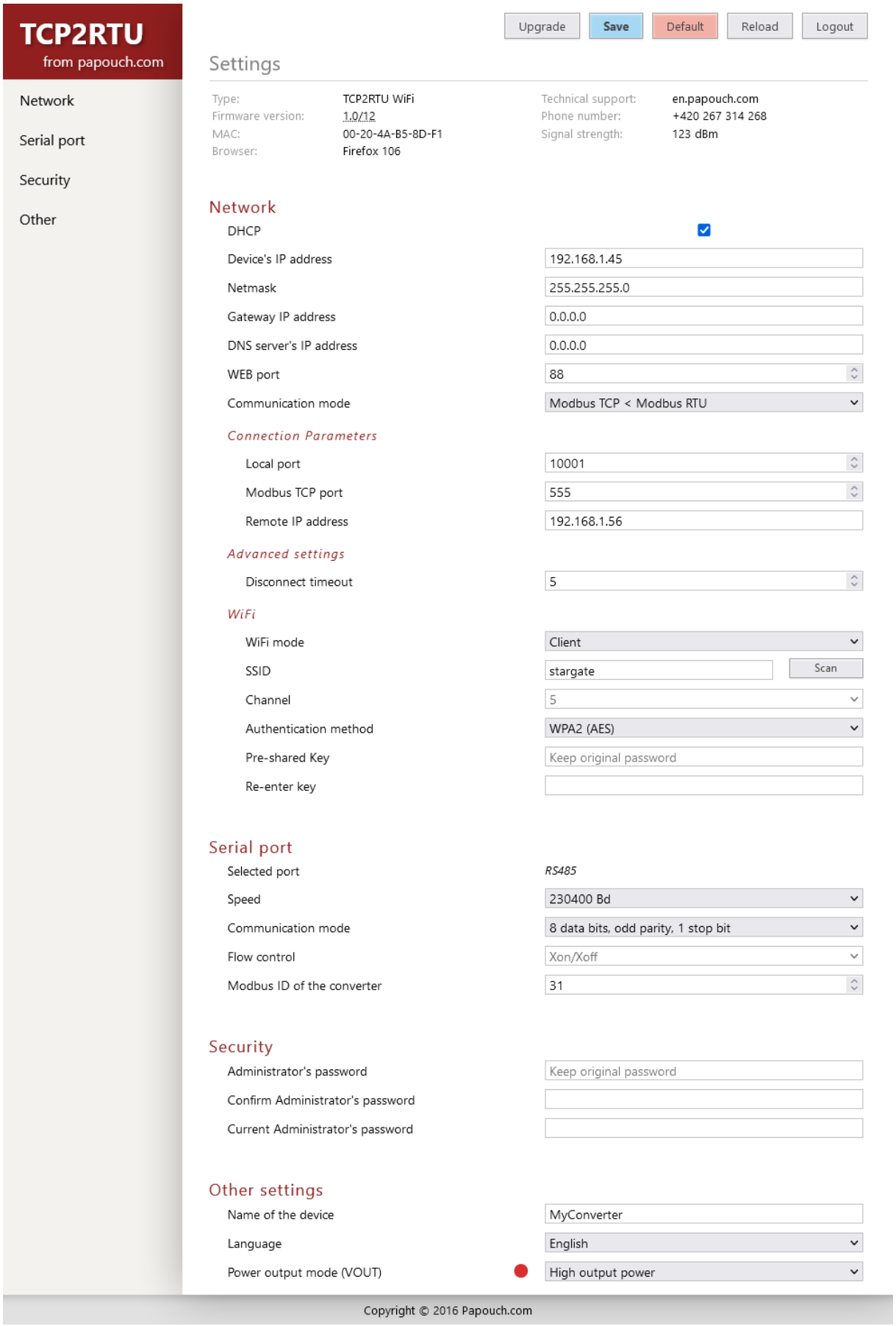


fig. 6 – WEB configuration

Network section

This section contains network parameters settings.

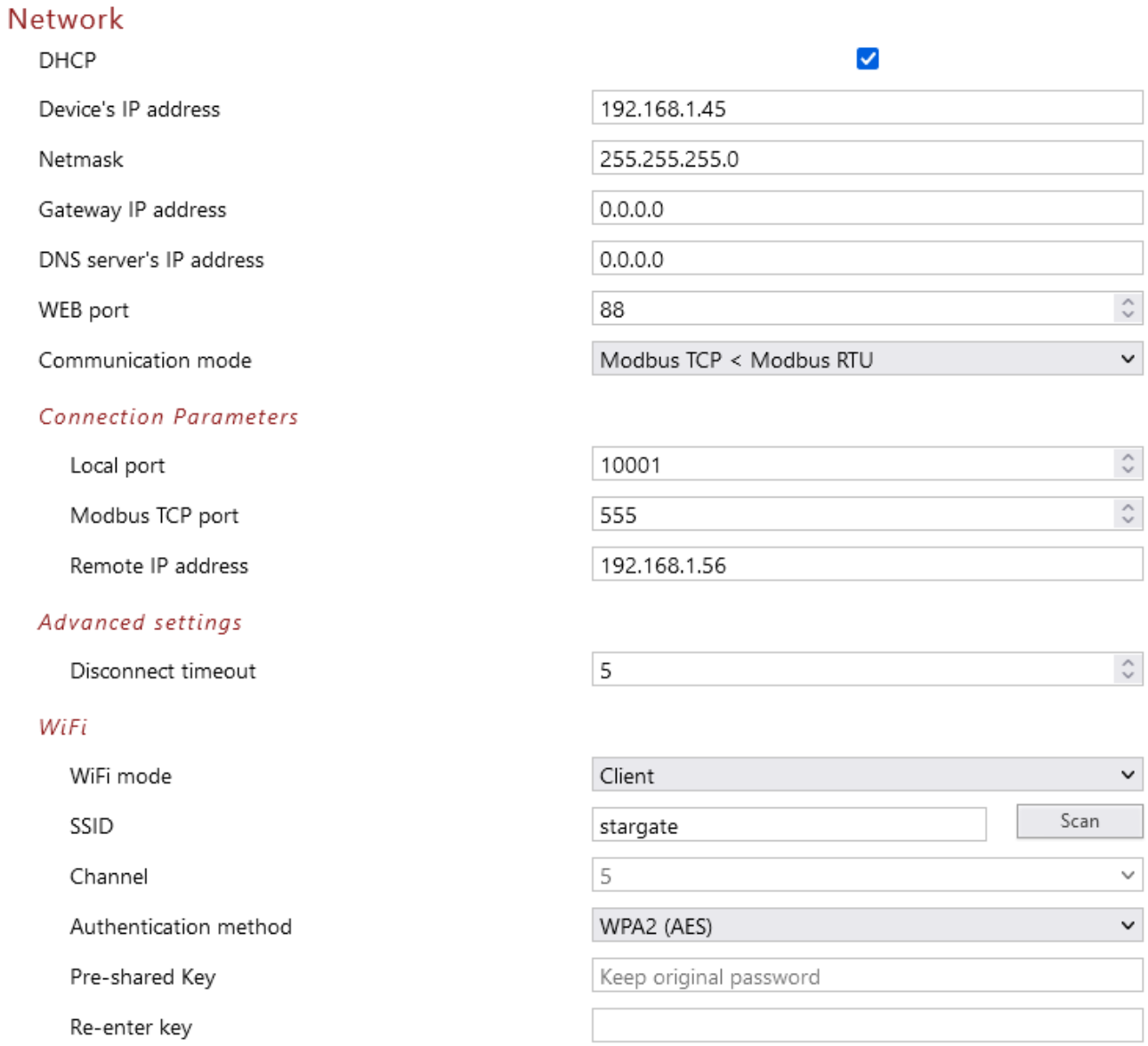


fig. 7 - network settings

If the DHCP option is checked, *IP address, Subnet mask, Gateway and DNS server* will be set to zeros. When the page is reloaded, it will show the actual settings from DHCP server.

If the converter is to communicate with a device outside its network, *Gateway* address must be filled in. *DNS server* address can also be required.

Select **communication mode** from these options:

- Modbus TCP > Modbus RTU: Ethernet Master (TCP) reads slaves on serial port (RTU) of the convertor. Communication must be directed to *ModBus TCP port*.
- Modbus TCP > Modbus ASCII: Ethernet Master (TCP) reads slaves on serial port (ASCII) of the convertor. Communication must be directed to *ModBus TCP port*.
- Modbus TCP < Modbus RTU:
    - Converter acts as a slave with set *Modbus ID of the converter* (in Serial port section).

  - Data from the serial line in ModBus RTU are converted to ModBus TCP over the Ethernet.
  - *Modbus ID of the converter* can be set to 0 – converter then converts all received data. Or it can be set to 1 to 247, then the convertor only converts data from the give ID.

- Modbus TCP < Modbus ASCII: The same as the previous option, only the serial line ModBus is ASCII.
- HTTP GET: Allows to write and read data from a ModBus RTU device using HTTP GET request. For example: set.xml?id=31&inst=4&adr=123&val=32752 writes value of 32752 to a device with ID 31 to its address 123 using 0x04 instruction code. **This function will be added in the next version.**
- *MTU Size* (Maximum Transmission Unit) is a parameter determining the maximum length of the IP datagram (in bytes). Usually this is set to 1400 bytes.[4]
- *Keep-alive interval* is a time in seconds determining how often (in seconds) the TCP keep-alive packet should be sent to maintain the connection.[4]

WiFi

(This part of settings is only available in the WiFi variant.)

The main option is to choose the WiFi mode. Client and Access point are available. In client mode the converter connects to an existing network. In Access point mode the converter creates a network to which you can connect.

Scan button is only available in client mode. A list of available networks will show upon pressing it. – by clicking on one of them its SSID will fill along with encryption method. After entering the password, the converter will connect to the selected network.

Channel option is only available in Access point mode and means the number of channel on which the network is available.

Password field only works to enter the password. Once it is saved, it only shows “keep current password” text. If you don’t need the password to change, do not enter anything in the field. The password is stored internally. (The password cannot be extracted from the device).

Serial port section

Serial port parameters are available here.

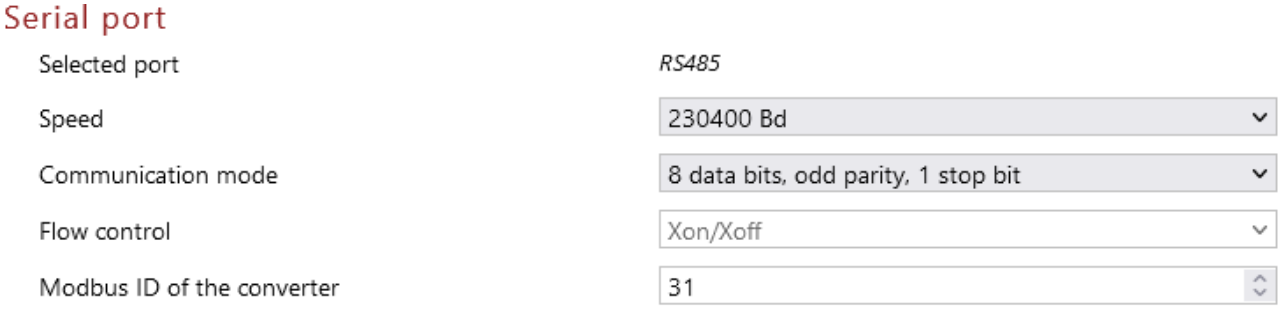


fig. 8 – serial port settings

[4] Please consult your network manager whether you need another MTU size.

Selected line type text shows the current state of the **SW4** switch. You can chose from RS232 (SW4 off) or RS485 (SW4 on).[1] This item cannot be selected via the WEB interface.

Speed is user selectable from following options: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 a 230400 Bd

Following *Communication* parameters are available:

- 8 data bits, bez parity, 1 stop bit
- 8 data bits, even parity, 1 stop bit
- 8 data bits, odd parity, 1 stop bit
- 8 data bits, bez parity, 2 stop bits
- 8 data bits, even parity, 2 stop bits
- 8 data bits, odd parity, 2 stop bits

HTTP GET section

This function will be added in the next version.

This function is only accessible if HTTP GET option is selected in Network section > Communication mode!

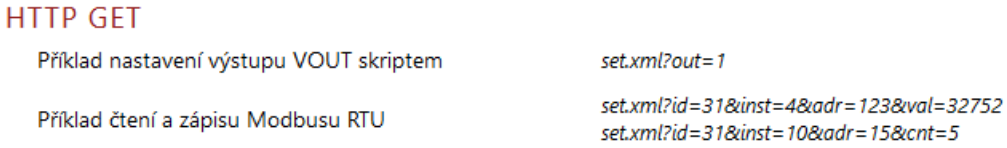


fig. 9 - HTTP GET section has no settings

Write in a register using an HTTP GET: Allows to write data to a ModBus RTU device using HTTP GET request. The following is an example of how to write a value of 32752 to a device with ID 31 to its address 123 using 0x04 instruction code:

set.xml?id=31&inst=4&adr=123&val=32752

Read from a register using an HTTP GET: Allows to read data from a ModBus RTU device using HTTP GET request. The following is an example of how to read five registers starting from address 15 out of a device with ID 31 using 0x10 instruction code:

set.xml?id=31&inst=10&adr=15&cnt=5

Maximum of 100 bytes of data can be sent in one GET from the serial line to the server and vice versa. The next data is sent in a separate GET.

Power output VOUT can also be controlled using the GET: The same options are available using get as if manually set in the *Others* section - Off (0), Low Power (1), High Power (2). Number from 0 to 2 must be sent in *out* attribute to the set.xml script. For example: (Low power set with a default IP address):

192.168.1.254/set.xml?out=1

Security section

Here the password for the WEB interface can be set.

fig. 10 – security settings

When a text *Keep original…* is shown, it means this section will be left intact without changes during the saving of these settings. (The entered password will not be shown for security reasons.) Passwords can be changed by filling any of the fields at any time.

Others section

This is where the WEB interface language, device name and power output parameters are set.

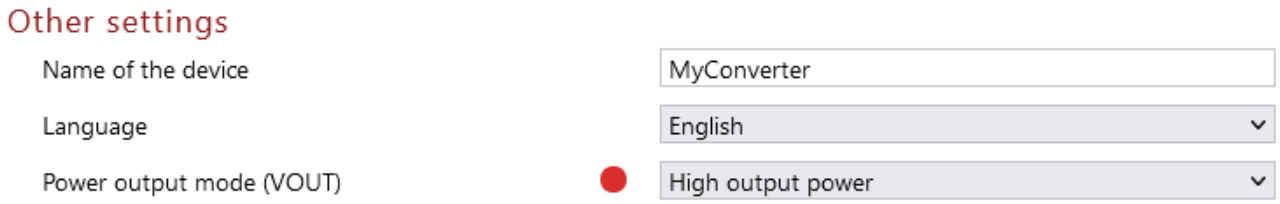


fig. 11 – other settings

Power output mode (VOUT) is meant to control the VOUT power output.

The output can be set to three steps: *Off, Lower output power, High output power*.[5] The power output voltage is set separately by DIP switches on the side of the device (see page 7).

Colored indicator next to the power output mode field will be greyed out when the power output is off, green when it is on, and red if the power output is overloaded or shorted.

[5] Maximum output currents for each voltage are described on a table on page 6.

CONFIGURATION USING TELNET

Telnet configuration is only available with the Ethernet version.

Connection

IP address is not known

It is recommended that the IP address should be set using the Ethernet Configurator.

1) Open the window of the cmd command. (In the Windows OS select Start/Run, enter `cmd` in the provided line and click Enter.)
2) Make the following entries into the ARP table:
   a. Type `arp -d` and confirm by Enter. This will delete the current ARP table.
   b. Use the following command to assign 192.168.1.254 to the module MAC address:

      `arp -s [new_ip_address] [MAC_address_of_device]`

      example: `arp -s 192.168.1.254 00-20-4a-80-65-6e`
3) Now open Telnet. (Type in `telnet` and click Enter. [6])
4) Enter `open [new_ip_address] 1` and confirm.
5) After a while, the terminal will display an error message saying that connection failed. However, this step is necessary for the module to enter the IP address into its ARP table.
6) Connect to the IP address of the module. (Type in `open [IP address in dotted format] 9999` and click Enter.)
7) So far you have only entered the configuration mode of the module. The IP address has not yet been set. It must be set in the menu Server Configuration > IP Address. If you close the configuration mode without saving the settings and IP address configuration, the whole procedure must be repeated!
8) If the entered IP address is valid, the device displays an introductory text ending with:

   `Press Enter for Setup Mode`

   Press Enter within 3 seconds, otherwise the configuration mode will close.
9) The device will display a preview of its settings.
10) The preview ends with a paragraph called “Change setup:” which lists the groups of parameters that can be configured. Network parameters can be changed in the “Server” section where you can set a new network address and other parameters.

[6] In OS Windows Vista or higher, the client for Telnet is not a standard part of the system. Install it using the following procedure:

a) Open the “Control Panels/Programs and Features” menu.
b) On the left, click “Enable or disable features of Windows system” (this option requires the administrator to log in).
c) The “Features of Windows system” window displays. Here tick the “Telnet service Client” field and click Ok. The client for Telnet will be installed.

IP address is known

1) In OS Windows choose Start/Run, enter `telnet` in the provided line and press Enter. [6]
2) Connect to the IP address of the module. (Type in `open [IP address in dotted format] 9999` and press Enter.)
3) If the entered IP address is valid, the device displays an introductory text ending with:

   Press Enter for Setup Mode

   Press Enter within 3 seconds, otherwise the configuration mode will close.
4) The device will display a preview of its settings.
5) The preview ends with a paragraph called “Change setup:” which lists the groups of parameters that can be configured. Network parameters can be changed in the “Server” section.

Telnet main menu

Individual items can be chosen using the numbers written next to them. Choose the required number and press Enter.

The menu structure is as follows:

```
Change Setup:
  0 Server
    ...
  7 Defaults
  8 Exit without save
  9 Save and exit              Your choice ?
```

Server

Basic Ethernet settings.

This section contains the following parameters:

```
IP Address : (192) .(168) .(001) .(122)
Set Gateway IP Address (N) ?
Netmask: Number of Bits for Host Part (0=default) (16)
Change telnet config password (N) ?
```

IP Address

(IP address)

IP address of the module. The digits must be entered one by one and separated by Enter.

Default value: 192.168.1.254

Set Gateway IP Address

(set the IP address of the gateway)

Gateway IP addr

(IP address of the gateway)

In “Set Gateway IP Address” enter “Y“ to change the IP address. The system then prompts you to change the Gateway IP address. The digits must be entered one by one and separated by Enter.

Netmask

(network mask)

Here you specify the number of bits of the IP address that make up the network part.

The Netmask is set as a number of bits determining the range of available IP addresses of the local network. If, for example, value `2` is entered, the structure of the Netmask is `255.255.255.252` . The entered value specifies the number of bits from the right. The maximum is 32.

Default value: 8

Example:
The mask 255.255.255.0 (binary form: 11111111 11111111 11111111 00000000) =. number 8.
The mask 255.255.255.252 (binary form: 11111111 11111111 11111111 11111100) = number 2.

Change telnet config password

(Set the password for Telnet)

Enter new Password

(Enter the password for Telnet)

This parameter is used to set a new password which is required prior to any configuration via Telnet or via WEB interface (admin password).

For item “Change telnet config password”, enter “Y” to change the password. The system then prompts you to change the password.

Factory Defaults

By pressing number 7 the device restores the default settings.

The default setting means that all parameters will return to their initial factory settings. The IP address remains unchanged; the web interface port is set to 80.

Exit without save

To close the configuration mode without saving the changed parameters.

Save and exit

This option saves the changes. If any parameter has been changed, the device is restarted. The restart takes several tens of seconds.

INDICATORS

Four indicators are on the device:

- **ON** indicator is lit once the power is connected (Either PoE or an external).
- **COM** indicator is lit when a communication on the serial line is in progress.
- **LINK** indicator is lit in the *TCP/UDP* mode once the connection is established. In the *HTTP GET* mode the indicator flashes when a packet is sent to a remote server.
- **VOUT** indicator is lit when the power output is enabled.

DEVICE RESET

TCP2RTU PoE:

Using the following instructions, you can reset the device to its factory settings. Unlike the reset performed within the Telnet settings (see page 17), this reset also sets the IP address to its default: 192.168.1.254.

1) Disconnect the power (or the Ethernet cable) from the device.
2) Press and hold the button located in a small opening below the Ethernet connector.
3) Reconnect the power and hold the button for at least 10 seconds until a yellow indicator on the Ethernet connector flashes 4 times.
4) Release the button.

TCP2RTU WiFi:

Enter the configuration AP mode by pressing the RESET button under the antenna connector. In this mode any changes can be made. The settings are described on page 8 below title: *If the IP address is not known or the connection to the AP fails:*.

TECHNICAL PARAMETERS

PoE power .....according to the IEEE 802.3af standard

External power supply .....11 to 58 V DC (with polarity reversal protection)

Min. voltage - VOUT High power ..... 15 V

Converter power consumption.....typ. 1 W

Consumption VOUT - Low Power .....max. 5 W

Consumption VOUT - High Power .....max. 8 W

Power	I_{IN} VOUT High power	I_{IN} VOUT Low power	I_{IN} VOUT off
12 V	-	100 mA	92 mA
24 V	78 mA	48 mA	45 mA
48 V	40 mA	25 mA	24 mA

tab. 1 – Typical current draws from the power supply

Power connector.....barrel type 3.8 × 1.3 mm; + pole inside

Operation temperatures.....-20 to +70 °C

Dimensions (w/o connectors) .....83 × 56 × 23.4 mm

Enclosure material.....0,8 mm sheet metal

IP coverage .....IP 30

Power output (VOUT)

Output voltage .....5, 9, 12 or 24 V (selectable by switches)

Overload and shortage protection .....yes

Max. Low Power mode load .....> 1,6 W (see page. 7)

Max. High Power mode load.....> 3 W (see page. 7)

RS232

Signals used.....TxD, RxD, RTS, CTS, GND

Communication speed.....300 Bd to 230.4 kBd

Data bits .....7[7], 8

Parity .....even, odd, no parity

Stop bits.....1, 2

RS485

Signals.....RxTx+, RxTx-

Overvoltage protection.....transil diode 6.5 V

Communication speed.....300 Bd to 230.4 kBd

[7] 7-bit communication is possible only in TCP2RTU_PoE.

Data bits 7, 8

Parity ..... even, odd, no parity

Stop bits 1, 2

Ethernet Interface

Type ..... TBase 10/100 Ethernet

Connector RJ45

PoE power („active PoE“) ..... according to IEEE 802.3af

Power range for "passive PoE" ..... 44 – 57 V

Wi-Fi

Specifications ..... IEEE 802.11 b/g/n

Frequency ..... 2.4 GHz

Antenna connector ..... SMA RP

Other parameters

HTTP GET encryption ..... 128 bit AES; Rijndael; CFB method

Weight ..... 150 g

Default network parameters

IP address 192.168.1.254

Subnet mask ..... 255.255.255.0 (8 bits; C mask)

Gateway IP address 0.0.0.0

Available options

35 mm DIN rail mount ..... optional accessory (sold separately)

Please do not hesitate to contact us in case you have any special requirements for TCP2RTU PoE and WiFi converter parameters or functions.

Papouch s.r.o.

Data transmission in industry, line and protocol conversions, RS232/485/422/USB/Ethernet/GPRS/WiFi, measurement modules, intelligent temperature sensors, I/O modules, and custom-made electronic applications.

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