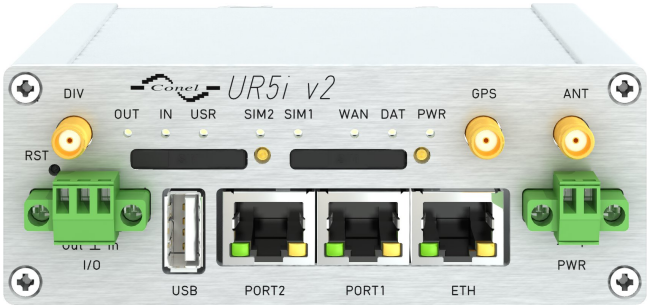
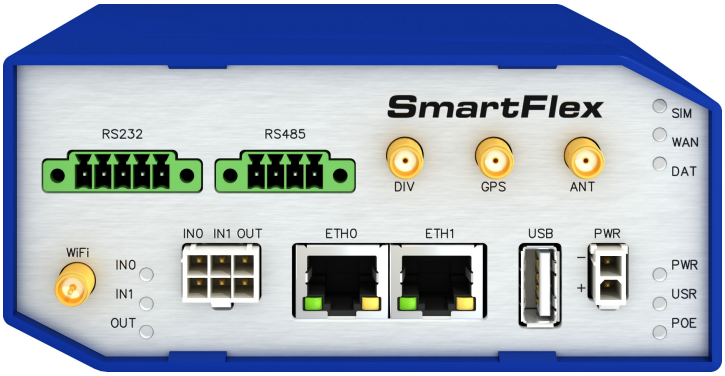
User Module

Modbus TCP2RTU

APPLICATION NOTE





ADVANTECH

Used Symbols

Danger – Information regarding user safety or potential damage to the router.

Attention – Problems that can arise in specific situations.

Information, notice – Useful tips or information of special interest.

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Modbus TCP2RTU user module provides the conversion of MODBUS TCP protocol to MODBUS RTU protocol, which can by used on the serial line. RS232 or RS485/422 interface cn be used for serial communication in the Advantech router. This is available as expansion port for v2 routers (PORT1 or PORT2 interface) or it is the standard interface included in some versions of v3 routers.

There is a common part PDU For both protocols. MBAP header is used for identification when sending MODBUS ADU to TCP/IP. Port 502 is dedicated for MODBUS TCP ADU.

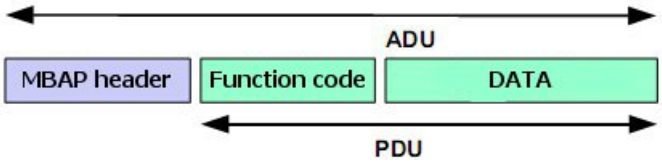

Figure 1: Modbus message on TCP/IP

When sending a PDU to the serial line, the address of destination unit obtained from a MBAP header as UNIT ID is added to the PDU along with the checksum.

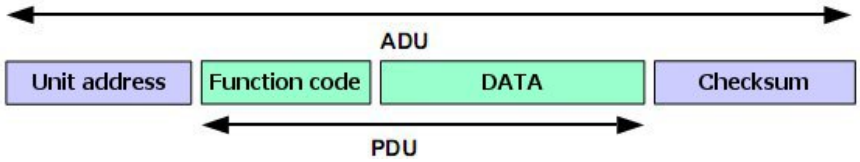

Figure 2: Modbus message on serial line

The module supports configuration of two independent serial interfaces, if available in the router. Automatic recognition of port RS485 from RS422 is supported. Detailed information about the serial interface can be found in the User's manual of the router or Expansion port (RS485/422, see [6]).

User module *Modbus TCP2RTU* is not contained in the standard router firmware. Uploading of the user module is described in the Configuration manual (see literature, Chapter 4). *Modbus TCP2RTU* is v2 and v3 router platforms compatible.

2. Configuration

Web interface is available for configuration of *Modbus TCP2RTU* user module. It is accessible by pressing the module name on the *User modules* page of the router Web interface.

The left part menu of the Web interface contains these items: *Stats*, *System Log*, configuration *Port 1*, *Port 2* and *Return*. *Return* switches this Web interface back to the interface of the router. *Stats* page shows statistical information. *System Log* shows the same log as in the router's interface. Configuration form is accessible by pressing *Port 1* or *Port 2* item according to the serial interface.

Meaning of the individual items:

Item	Description
Enable	Enables conversion of MODBUS TCP/IP protocol into MODBUS RTU
Expansion port	Expansion port, where the MODBUS RTU connection will be established. If there is no a MODBUS RTU device connected to the serial interface, it can be set up to "None" and this serial interface can be used for communication with another device. Only internal registers of the router can be read out in this case. For more information see chapter 3.2.
Baudrate	Applied communication speed
Parity	Control parity bit: • **none** – No parity will be sent • **even** – Even parity will be sent • **odd** – Odd parity will be sent
Stop Bits	Number of stop bits
Split Timeout	Time for breaking off message (see note below)
TCP Mode	Selection of mode: • **Server** – TCP server • **Client** – TCP client
Server Address	Defines server address when selected mode is *Client* (in *TCP Mode* item).
TCP Port	TCP port on which the router listens to requests for MODBUS TCP connection. For sending MODBUS ADU is reserved port 502.

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Item	Description
Reply Timeout	Specifies the time interval in which it is expecting a response. If the response doesn't receive, it will be sent one of these error codes: • *0A* – Transmission path unavailable *Gateway is not able to allocate internal transmission path from the input port to the output port. It is probably overloaded or incorrectly set.* • *0B* – The target device doesn't response *The target device doesn't response, may not be available.*
Inactivity Timeout	Time period after which the TCP/UDP connection is interrupted in case of inactivity
Reject new connections	When enabled, the router rejects any other connection attempts – the router no longer supports multiple connections
Enable I/O and XC-CNT extensions	Enable when using I/O or XC-CNT expansion board (on v2 routers)

Table 1: Configuration form

All changes in settings will be applied after pressing the *Apply* button.

Note: If a time between the two received characters is recognized to be longer than the *Split Timeout* parameter value in milliseconds, the message from all received data is compiled and then it is sent.

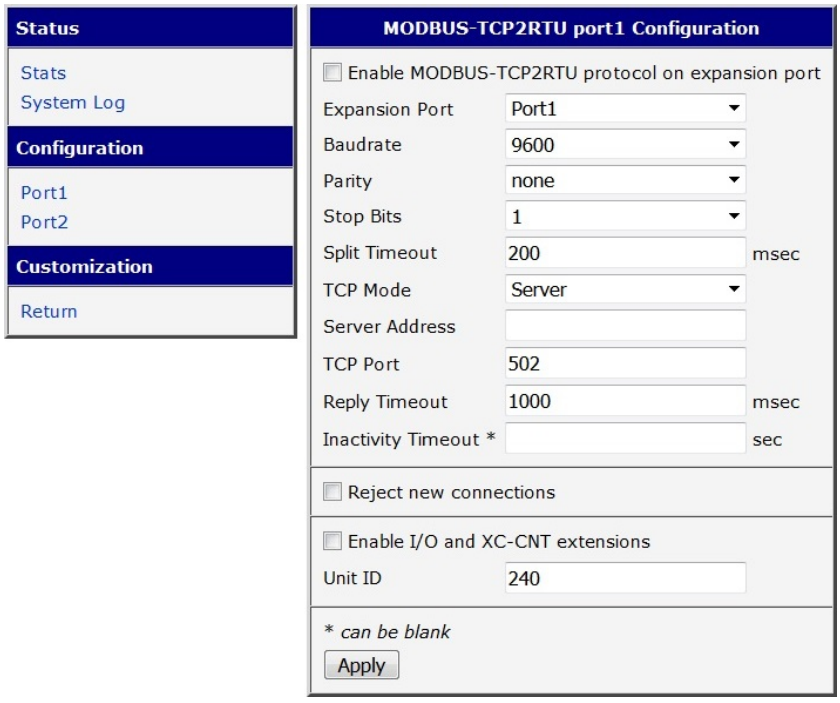

Figure 3: Configuration form

3. I/O & XC-CNT MODBUS TCP Server

3.1 Basic Characteristic

I/O protocol and XC-CNT MODBUS TCP server is one of the router communication protocol with a *Modbus TCP2RTU* user module based on the I/O interface and XC-CNT expansion boards. Router provides current state of inputs in real time. System can read it using message with 0x03 code (reading values of more registers). Using messages with the code 0x10 (writing values of more registers) system can control digital outputs and set the state counters.

3.2 Address Space of Router

Address	Access	Description
0x0400	R/-	upper 16 bits of temperature in router [°C] (with sign)
0x0401	R/-	lower 16 bits of temperature in router [°C] (with sign)
0x0402	R/-	upper 16 bits of the supply voltage [mV]
0x0403	R/-	lower 16 bits of the supply voltage [mV]
0x0404	R/-	not used, always 0
0x0405	R/-	not used, always 0
0x0406	R/-	not used, always 0
0x0407	R/-	not used, always 0
0x0408	R/-	state of upper 16 binary inputs: • bits 0 to 15 – not used, always 0
0x0409	R/-	state of lower 16 binary inputs: • bit 0 – level at the input BIN0 • bits 1 to 15 – not used, always 0
0x040A	R/W	state of upper 16 binary outputs: • bits 0 to 15 – not used, always 0
0x040B	R/W	state of lower 16 binary outputs: • bit 0 – level at the output BOUT0 • bits 1 to 15 – not used, always 0
0x040C	R/-	not used, always 0
0x040D	R/-	not used, always 0
0x040E	R/-	not used, always 0
0x040F	R/-	not used, always 0

Table 2: I/O

Address	Access	Description
0x0410	R/-	upper 16 bits of AN1 value, always 0
0x0411	R/-	lower 16 bits of AN1 value, value from 12-bit A-D converter
0x0412	R/-	upper 16 bits of AN2 value, always 0
0x0413	R/-	lower 16 bits of AN2 value, value from 12-bit A-D converter
0x0414	R/W	upper 16 bits of CNT1
0x0415	R/W	lower 16 bits of CNT1
0x0416	R/W	upper 16 bits of CNT2
0x0417	R/W	lower 16 bits of CNT2
0x0418	R/-	state of upper 16 binary inputs: • bits 0 to 15 – not used, always 0
0x0419	R/-	state of lower 16 binary inputs: • bit 0 – level at the input BIN1 • bit 1 – level at the input BIN2 • bit 2 – level at the input BIN3 • bit 3 – level at the input BIN4 • bits 4 to 15 – not used, always 0
0x041A	R/W	state of upper 16 binary outputs: • bits 0 to 15 – not used, always 0
0x041B	R/W	state of lower 16 binary outputs: • bit 0 – level at the output BOUT1 • bits 1 to 15 – not used, always 0
0x041C	R/-	not used, always 0
0x041D	R/-	not used, always 0
0x041E	R/-	not used, always 0
0x041F	R/-	not used, always 0

Table 3: XC-CNT – PORT1

Address	Access	Description
0x0420	R/-	upper 16 bits of AN1 value, always 0
0x0421	R/-	lower 16 bits of AN1 value, value from 12-bit A-D converter
0x0422	R/-	upper 16 bits of AN2 value, always 0
0x0423	R/-	lower 16 bits of AN2 value, value from 12-bit A-D converter
0x0424	R/W	upper 16 bits of CNT1
0x0425	R/W	lower 16 bits of CNT1

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Address	Access	Description
0x0426	R/W	upper 16 bits of CNT2
0x0427	R/W	lower 16 bits of CNT2
0x0428	R/-	state of upper 16 binary inputs: • bits 0 to 15 – not used, always 0
0x0429	R/-	state of lower 16 binary inputs: • bit 0 – level at the input BIN1 • bit 1 – level at the input BIN2 • bit 2 – level at the input BIN3 • bit 3 – level at the input BIN4 • bits 4 to 15 – not used, always 0
0x042A	R/W	state of upper 16 binary outputs: • bits 0 to 15 – not used, always 0
0x042B	R/W	state of lower 16 binary outputs: • bit 0 – level at the output BOUT1 • bits 1 to 15 – not used, always 0
0x042C	R/-	not used, always 0
0x042D	R/-	not used, always 0
0x042E	R/-	not used, always 0
0x042F	R/-	not used, always 0

Table 4: XC-CNT – PORT2

Address	Access	Description
0x0430	R/-	upper 16 bits of serial number
0x0431	R/-	lower 16 bits of serial number
0x0432	R/-	1st and 2nd byte of MAC address
0x0433	R/-	3rd and 4th byte of MAC address
0x0434	R/-	5th and 6th byte of MAC address
0x0435	R/-	1st and 2nd byte of IP address MWAN
0x0436	R/-	3rd and 4th byte of IP address MWAN

Table 5: Other information

Notes:

- In case of absence XC-CNT board all corresponding values are 0.
- Information about the current fitting and configuration of XC-CNT boards can be found in the system log after starting the user module.
- Writing is in fact possible to all registers. Writing to the registry, which is not designed for writing, is always successful, however there is no physically change.

4. Recommended Literature

[1] Advantech B+B SmartWorx: **v2 Routers – Configuration Manual** (MAN-0021-EN)
[2] Advantech B+B SmartWorx: **SmartFlex – Configuration Manual** (MAN-0023-EN)
[3] Advantech B+B SmartWorx: **SmartMotion – Configuration Manual** (MAN-0024-EN)
[4] Advantech B+B SmartWorx: **SmartStart – Configuration Manual** (MAN-0022-EN)
[5] Advantech B+B SmartWorx: **Expansion Port RS232 – User Manual** (MAN-0020-EN)
[6] Advantech B+B SmartWorx: **Expansion Port RS485/422 – User Manual** (MAN-0025-EN)
[7] Advantech B+B SmartWorx: **Expansion Port CNT – User Manual** (MAN-0028-EN)
[8] Advantech B+B SmartWorx: **ICR-3200 – Configuration Manual** (MAN-0042-EN)

Product related documents and applications can be obtained on *Engineering Portal* at https://ep.advantech-bb.cz/ address.