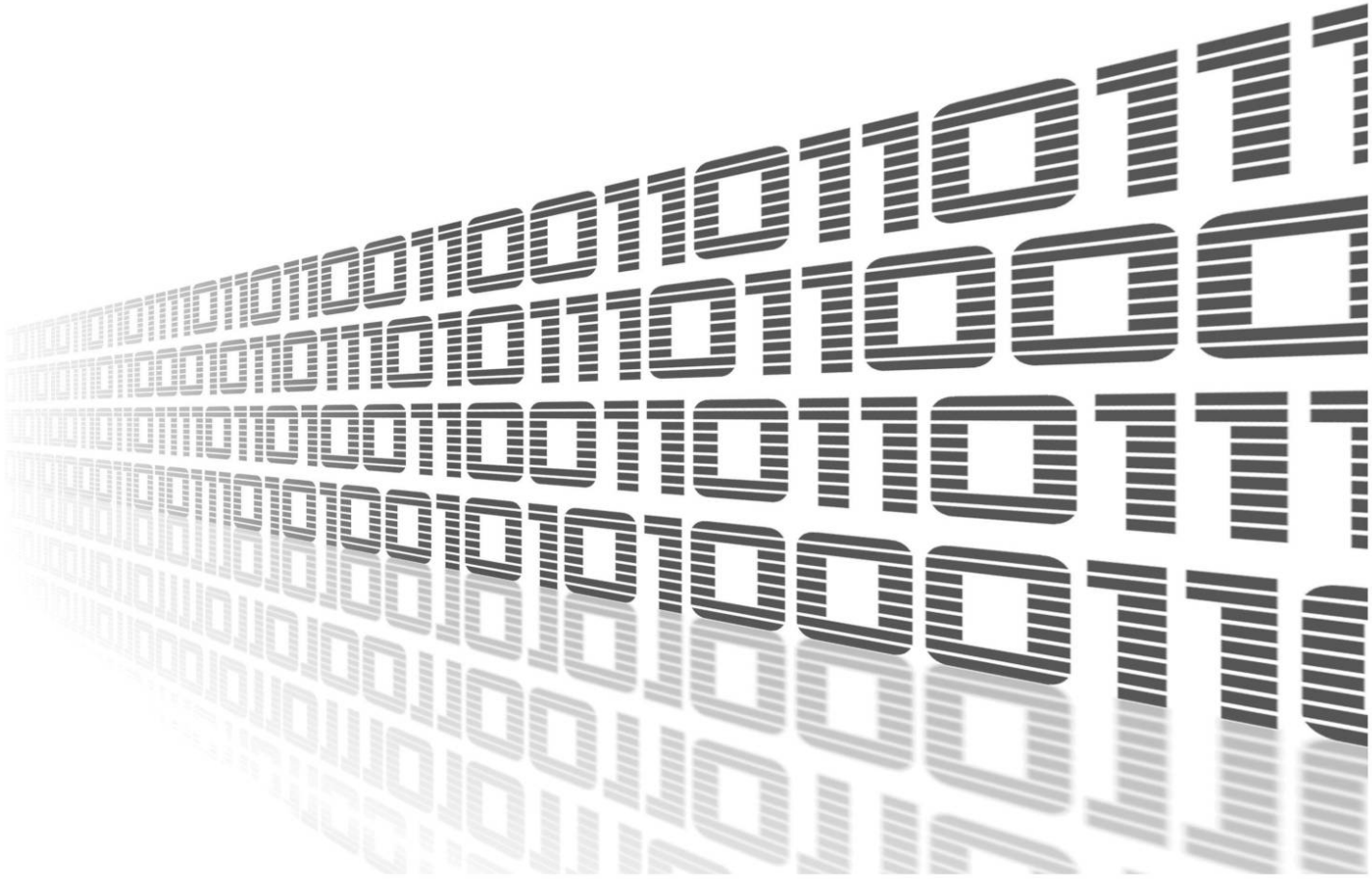
ADVANTECH

RouterApp

Protocol MODBUS TCP2RTU



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Used symbols

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

Attention – Problems that can arise in specific situations.

Information – Useful tips or information of special interest.

Example – Example of function, command or script.

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1. Changelog

1.1 Protocol MODBUS TCP2RTU Changelog

v1.0.0 (2011-07-19)

- First release

v1.0.1 (2011-11-08)

- Added automatic detection RS485 interface and control of RTS signal for RS485 line

v1.0.2 (2011-11-25)

- Minor improvements in HTML code

v1.0.3 (2012-09-19)

- Fixed unhandled exceptions
- Added sending modbus error message 0x0B if reply timeout expire

v1.0.4 (2013-02-01)

- Added sending modbus error message 0x0B if bad crc is received

v1.0.5 (2013-05-22)

- Added read out functions of I/O and CNT port

v1.0.6 (2013-12-11)

- Added support of FW 4.0.0+

v1.0.7 (2014-04-01)

- Increased size of internal buffer

v1.0.8 (2014-05-05)

- Added blocking of new clients when connected client is active

v1.0.9 (2014-11-11)

- Added TCP mode client
- Added serial number and MAC adress into modbus registers

v1.1.0 (2015-05-22)

- Improved requests processing

v1.1.1 (2015-06-11)

- Added test of data length in crc check

v1.1.2 (2015-10-14)

- Disabled signal SIG_PIPE

v1.1.3 (2016-04-25)

- Enabled keep-alive in TCP server mode

v1.2.0 (2016-10-18)

- Added support of two simultaneously working ports
- Removed unnecessary options

v1.2.1 (2016-11-10)

- Fixed bug in uart read loop

v1.3.0 (2017-01-27)

- Added option Reject new connections
- Added option Inactivity Timeout

v1.4.0 (2017-07-10)

- Added MWAN IPv4 address into MODBUS registers
- Fixed reading of MAC address

v1.5.0 (2018-04-23)

- Added option "None" to serial device selection

v1.6.0 (2018-09-27)

- Added support of ttyUSB
- Fixed file descriptor leaks (in ModulesSDK)

v1.6.1 (2018-09-27)

- Added expected ranges of values to JavaSript error messages

v1.7.0 (2020-10-01)

- Updated CSS and HTML code to match firmware 6.2.0+
- Changed limit for "Reply Timeout" to 1..1000000 ms

v1.8.0 (2022-03-03)

- Added additional values related to MWAN status

v1.9.0 (2022-08-12)

- Added additional device configuration CRC32 value

v1.10.0 (2022-11-03)

- Reworked license information

v1.10.1 (2023-02-28)

- Linked statically with zlib 1.2.13

1.11.0 (2023-06-09)

- Added support for additional binary input and output GPIO pins

2. Description

Router app *Protocol MODBUS TCP2RTU* is not contained in the standard router firmware. Uploading of this router app is described in the Configuration manual (see Chapter Related Documents).

Modbus TCP2RTU router app provides the conversion of MODBUS TCP protocol to MODBUS RTU protocol, which can by used on the serial line. RS232 or RS485/422 interface can be used for serial communication in the Advantech router.

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.

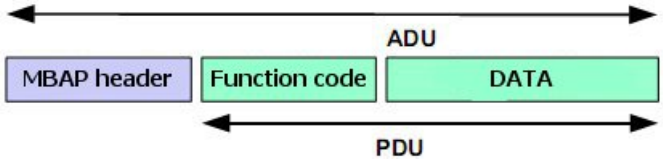

Figure 1: Modbus message on TCP/IP

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.

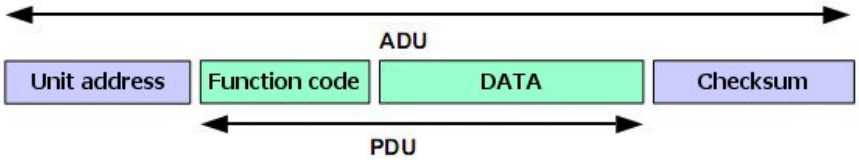

Figure 2: Modbus message on serial line

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 [2]).

3. Interface

Web interface is accessible by pressing the module name on the *Router apps* page of the router Web interface.

The left part menu of the Web interface contains these sections: *Status*, *Configuration* and *Customization*. Status section contains *Stats* which shows statistical information and *System Log* which shows the same log as in the router's interface. Configuration section contains *Port 1*, *Port 2* and *USB* items and Customization contains only menu section switches back from the module's web page to the router's web configuration pages. The main menu of module's GUI is shown on Figure 1.

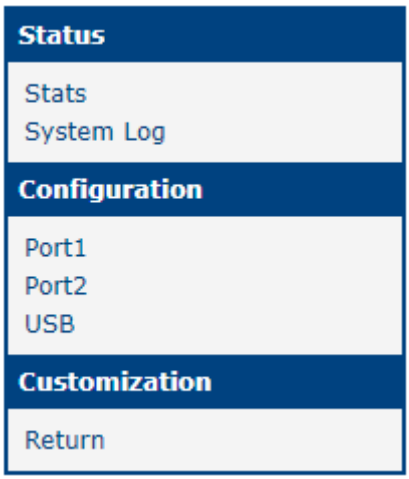

Figure 3: Menu

4. Configuration

4.1 Port Configuration

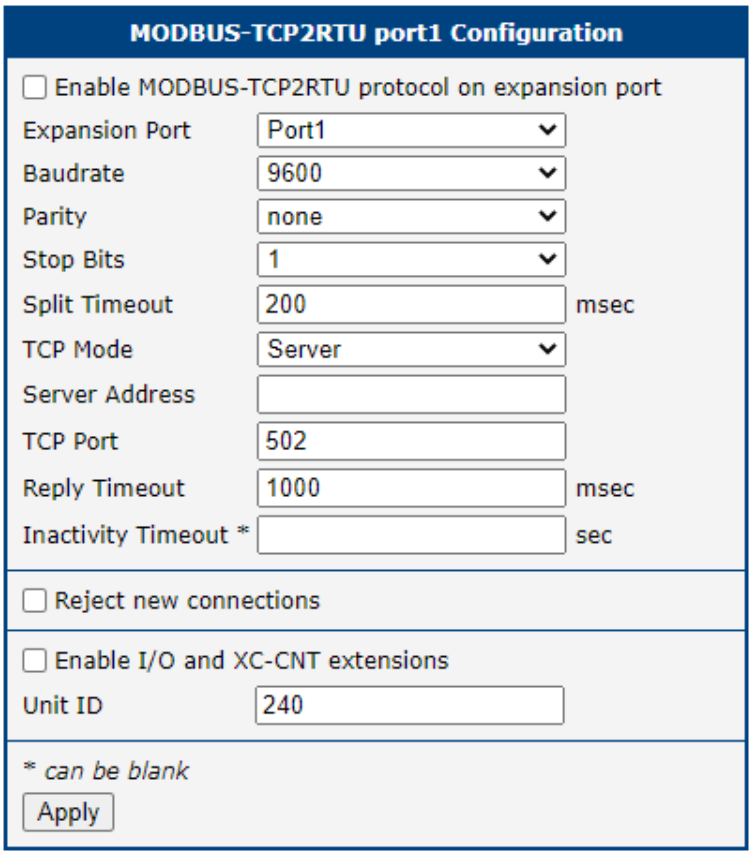

Figure 4: Port Configuration

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 5.2.
Baudrate	Applied communication speed

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Item	Description
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.
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	This option enables direct communication with router. **I/O** (binary inputs and outputs on the router) and internal registers (mentioned in chapter 5.2) works on all platforms (v2, v2i, v3 and v4). **XC-CNT** is expansion board for v2 routers. This form of communication works on v2 platform only.
Unit ID	ID for direct communication with router. Values can be 1 to 255. The value 0 is also accepted to communicate directly to a MODBUS/TCP or MODBUS/UDP devices. Default value is 240.

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.

4.2 USB Configuration

USB Configuration has nearly the same configuration items as PORT1 and PORT2. Only difference is missing *Enable I/O and XC-CNT extensions* and *Unit ID* items.

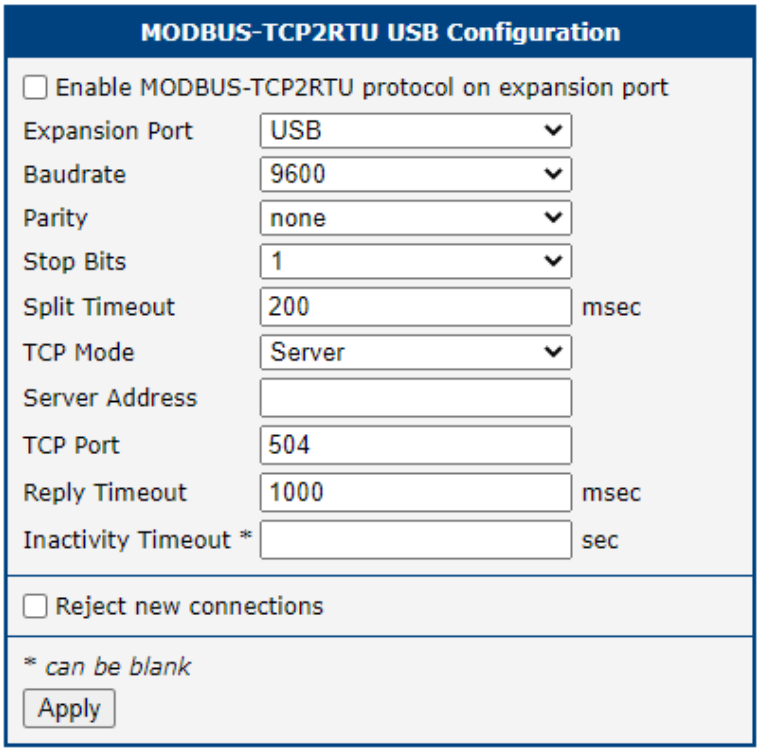

Figure 5: USB Configuration

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

5.1 Basic Characteristic

I/O protocol and XC-CNT MODBUS TCP server is one of the router communication protocol with a *Modbus TCP2RTU* router app 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. Messages with different codes (e.g., 0x6 for writing value of a single register) are not supported.

5.2 Address Space of Router

Addresses in the table start from 0. If the implementation uses register numbers starting from 1, the register address needs to be increased by 1.

Address	Access	Description
0x0400	R/-	upper 16 bits of temperature in router [°C] (with sign)
0x0401	R/-	upper 16 bits of temperature in router [°C] (with sign)
0x0402	R/-	upper 16 bits of the supply voltage [mV]
0x0403	R/-	upper 16 bits of the supply voltage [mV]
0x0404	R/-	state of upper 16 bits of BIN2, always 0
0x0405	R/-	state of lower 16 bits of BIN2
0x0406	R/-	state of upper 16 bits of BIN3, always 0
0x0407	R/-	state of lower 16 bits of BIN3
0x0408	R/-	state of upper 16 bits of BIN0, always 0
0x0409	R/-	state of lower 16 bits of BIN0: • bit 0 – level at the input BIN0 • bits 1 to 15 – not used, always 0
0x040A	R/-	state of upper 16 bits of BOUT0, always 0
0x040B	R/W	state of lower 16 bits of BOUT0: • bit 0 – level at the output BOUT0 • bits 1 to 15 – not used, always 0
0x040C	R/-	state of upper 16 bits of BIN1, always 0
0x040D	R/-	state of lower 16 bits of BIN1: • bit 0 – level at the input BIN1 • bits 1 to 15 – not used, always 0
0x040E	R/-	state of upper 16 bits of BOUT1, always 0
0x040F	R/W	state of lower 16 bits of BOUT1: • bit 0 – level at the output BOUT1 • bits 1 to 15 – not used, always 0

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Address	Access	Description

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/-	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
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/-	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
0x0437	R/-	number of active SIM

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Address	Access	Description
0x0438	R/-	1st and 2nd byte of MWAN Rx Data
0x0439	R/-	3rd and 4th byte of MWAN Rx Data
0x043A	R/-	5th and 6th byte of MWAN Rx Data
0x043B	R/-	7th and 8th byte of MWAN Rx Data
0x043C	R/-	1st and 2nd byte of MWAN Tx Data
0x043D	R/-	3rd and 4th byte of MWAN Tx Data
0x043E	R/-	5th and 6th byte of MWAN Tx Data
0x043F	R/-	7th and 8th byte of MWAN Tx Data
0x0440	R/-	1st and 2nd byte of MWAN Uptime
0x0441	R/-	3rd and 4th byte of MWAN Uptime
0x0442	R/-	5th and 6th byte of MWAN Uptime
0x0443	R/-	7th and 8th byte of MWAN Uptime
0x0444	R/-	MWAN Registration
0x0445	R/-	MWAN Technology
0x0446	R/-	MWAN PLMN
0x0447	R/-	MWAN Cell
0x0448	R/-	MWAN Cell
0x0449	R/-	MWAN LAC
0x044A	R/-	MWAN TAC
0x044B	R/-	MWAN Channel
0x044C	R/-	MWAN Band
0x044D	R/-	MWAN Signal Strength
0x044E	R/-	CRC32 value of router configuration
0x044F	R/-	CRC32 value of router configuration

Table 5: Other information

Notes:

- Serial number on addresses 0x0430 and 0x0431 are present only in case of 7 digit serial number, otherwise are values on those addresses empty.
- 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 router app.
- 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.
- Reading values from register address range 0x0437 - 0x044D works on all router platforms.

6. Related Documents

[1] Advantech Czech: **Expansion Port RS232 – User Manual** (MAN-0020-EN)
[2] Advantech Czech: **Expansion Port RS485/422 – User Manual** (MAN-0025-EN)
[3] Advantech Czech: **Expansion Port CNT – User Manual** (MAN-0028-EN)

You can obtain product-related documents on *Engineering Portal* at *icr.advantech.cz* address.

To get your router's *Quick Start Guide*, *User Manual*, *Configuration Manual*, or *Firmware* go to the *Router Models* page, find the required model, and switch to the *Manuals* or *Firmware* tab, respectively.

The *Router Apps* installation packages and manuals are available on the *Router Apps* page.

For the *Development Documents*, go to the *DevZone* page.