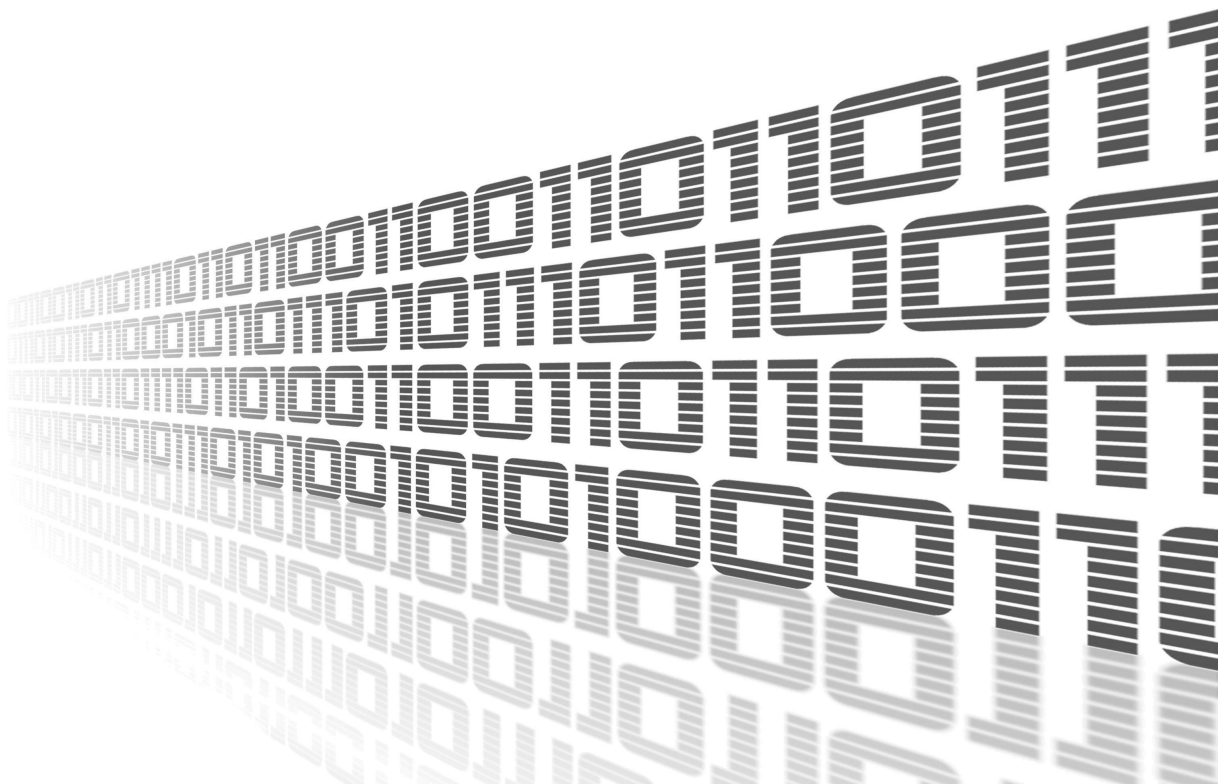




User Module

Modbus TCP2RTU

APPLICATION NOTE



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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1. Description



User module *Modbus TCP2RTU* is not contained in the standard router firmware. Uploading of this user module is described in the Configuration manual (see Chapter [Related Documents](#)).

Modbus TCP2RTU user module provides the conversion of MODBUS TCP protocol to MODBUS RTU protocol, which can be 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.

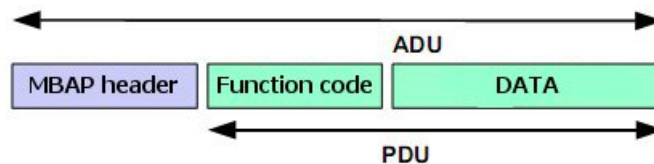


Figure 1: Modbus message on TCP/IP

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.

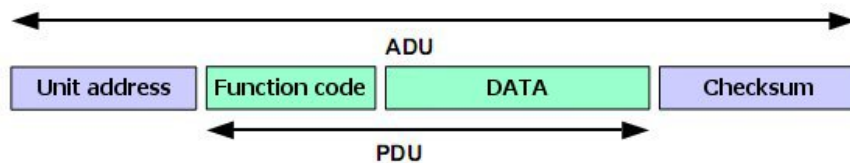


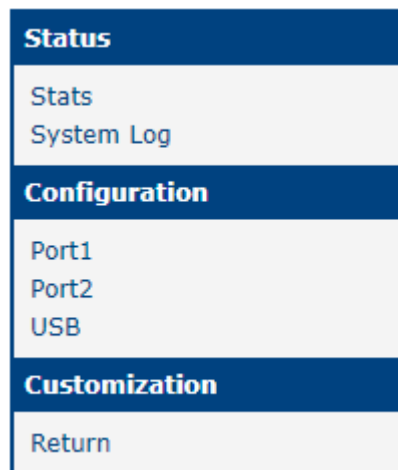
Figure 2: Modbus message on serial line

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]).

2. Interface

Web interface 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 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.



| |
|----------------------|
| Status |
| Stats |
| System Log |
| Configuration |
| Port1 |
| Port2 |
| USB |
| Customization |
| Return |

Figure 3: Menu

3. Configuration

3.1 Port Configuration

MODBUS-TCP2RTU port1 Configuration

Enable MODBUS-TCP2RTU protocol on expansion port

Expansion Port ▼

Baudrate ▼

Parity ▼

Stop Bits ▼

Split Timeout msec

TCP Mode ▼

Server Address

TCP Port

Reply Timeout msec

Inactivity Timeout * sec

Reject new connections

Enable I/O and XC-CNT extensions

Unit ID

** can be blank*

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 4.2. |

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| Item | Description |
|----------------------------------|--|
| Baudrate | Applied communication speed |
| Parity | Control parity bit: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Server – TCP server • Client – TCP client |
| Server Address | Defines server address when selected mode is <i>Client</i> (in <i>TCP Mode</i> 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: <ul style="list-style-type: none"> • <i>0A</i> – Transmission path unavailable <i>Gateway is not able to allocate internal transmission path from the input port to the output port. It is probably overloaded or incorrectly set.</i> • <i>0B</i> – The target device doesn't response <i>The target device doesn't response, may not be available.</i> |
| 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 4.2) 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. |

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| Item | Description |
|---------|--|
| 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.

3.2 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.

| MODBUS-TCP2RTU USB Configuration | |
|---|-----------|
| <input type="checkbox"/> Enable MODBUS-TCP2RTU protocol on expansion port | |
| Expansion Port | USB ▼ |
| Baudrate | 9600 ▼ |
| Parity | none ▼ |
| Stop Bits | 1 ▼ |
| Split Timeout | 200 msec |
| TCP Mode | Server ▼ |
| Server Address | |
| TCP Port | 504 |
| Reply Timeout | 1000 msec |
| Inactivity Timeout * | sec |
| <input type="checkbox"/> Reject new connections | |
| * can be blank | |
| <input type="button" value="Apply"/> | |

Figure 5: USB Configuration

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

4.1 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.

4.2 Address Space of Router

| Address | Register No. | Access | Description |
|---------|--------------|--------|---|
| 0x0400 | 0x0401 | R/- | upper 16 bits of temperature in router [°C] (with sign) |
| 0x0401 | 0x0402 | R/- | lower 16 bits of temperature in router [°C] (with sign) |
| 0x0402 | 0x0403 | R/- | upper 16 bits of the supply voltage [mV] |
| 0x0403 | 0x0404 | R/- | lower 16 bits of the supply voltage [mV] |
| 0x0404 | 0x0405 | R/- | not used, always 0 |
| 0x0405 | 0x0406 | R/- | not used, always 0 |
| 0x0406 | 0x0407 | R/- | not used, always 0 |
| 0x0407 | 0x0408 | R/- | not used, always 0 |
| 0x0408 | 0x0409 | R/- | state of upper 16 binary inputs: <ul style="list-style-type: none"> bits 0 to 15 – not used, always 0 |
| 0x0409 | 0x040A | R/- | state of lower 16 binary inputs: <ul style="list-style-type: none"> bit 0 – level at the input BIN0 bits 1 to 15 – not used, always 0 |
| 0x040A | 0x040B | R/W | state of upper 16 binary outputs: <ul style="list-style-type: none"> bits 0 to 15 – not used, always 0 |
| 0x040B | 0x040C | R/W | state of lower 16 binary outputs: <ul style="list-style-type: none"> bit 0 – level at the output BOUT0 bits 1 to 15 – not used, always 0 |
| 0x040C | 0x040D | R/- | not used, always 0 |
| 0x040D | 0x040E | R/- | not used, always 0 |
| 0x040E | 0x040F | R/- | not used, always 0 |
| 0x040F | 0x0410 | R/- | not used, always 0 |

Table 2: I/O

| Address | Register No. | Access | Description |
|---------|--------------|--------|---|
| 0x0410 | 0x0411 | R/- | upper 16 bits of AN1 value, always 0 |
| 0x0411 | 0x0412 | R/- | lower 16 bits of AN1 value, value from 12-bit A-D converter |
| 0x0412 | 0x0413 | R/- | upper 16 bits of AN2 value, always 0 |
| 0x0413 | 0x0414 | R/- | lower 16 bits of AN2 value, value from 12-bit A-D converter |
| 0x0414 | 0x0415 | R/W | upper 16 bits of CNT1 |
| 0x0415 | 0x0416 | R/W | lower 16 bits of CNT1 |
| 0x0416 | 0x0417 | R/W | upper 16 bits of CNT2 |
| 0x0417 | 0x0418 | R/W | lower 16 bits of CNT2 |
| 0x0418 | 0x0419 | R/- | state of upper 16 binary inputs: <ul style="list-style-type: none"> • bits 0 to 15 – not used, always 0 |
| 0x0419 | 0x041A | R/- | state of lower 16 binary inputs: <ul style="list-style-type: none"> • 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 | 0x041B | R/W | state of upper 16 binary outputs: <ul style="list-style-type: none"> • bits 0 to 15 – not used, always 0 |
| 0x041B | 0x041C | R/W | state of lower 16 binary outputs: <ul style="list-style-type: none"> • bit 0 – level at the output BOUT1 • bits 1 to 15 – not used, always 0 |
| 0x041C | 0x041D | R/- | not used, always 0 |
| 0x041D | 0x041E | R/- | not used, always 0 |
| 0x041E | 0x041F | R/- | not used, always 0 |
| 0x041F | 0x0420 | R/- | not used, always 0 |

Table 3: XC-CNT – PORT1

| Address | Register No. | Access | Description |
|---------|--------------|--------|---|
| 0x0420 | 0x0421 | R/- | upper 16 bits of AN1 value, always 0 |
| 0x0421 | 0x0422 | R/- | lower 16 bits of AN1 value, value from 12-bit A-D converter |
| 0x0422 | 0x0423 | R/- | upper 16 bits of AN2 value, always 0 |
| 0x0423 | 0x0424 | R/- | lower 16 bits of AN2 value, value from 12-bit A-D converter |
| 0x0424 | 0x0425 | R/W | upper 16 bits of CNT1 |
| 0x0425 | 0x0426 | R/W | lower 16 bits of CNT1 |
| 0x0426 | 0x0427 | R/W | upper 16 bits of CNT2 |
| 0x0427 | 0x0428 | R/W | lower 16 bits of CNT2 |
| 0x0428 | 0x0429 | R/- | state of upper 16 binary inputs: <ul style="list-style-type: none"> • bits 0 to 15 – not used, always 0 |
| 0x0429 | 0x042A | R/- | state of lower 16 binary inputs: <ul style="list-style-type: none"> • 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 | 0x042B | R/W | state of upper 16 binary outputs: <ul style="list-style-type: none"> • bits 0 to 15 – not used, always 0 |
| 0x042B | 0x042C | R/W | state of lower 16 binary outputs: <ul style="list-style-type: none"> • bit 0 – level at the output BOUT1 • bits 1 to 15 – not used, always 0 |
| 0x042C | 0x042D | R/- | not used, always 0 |
| 0x042D | 0x042E | R/- | not used, always 0 |
| 0x042E | 0x042F | R/- | not used, always 0 |
| 0x042F | 0x0430 | R/- | not used, always 0 |

Table 4: XC-CNT – PORT2

| Address | Register No. | Access | Description |
|---------|--------------|--------|---|
| 0x0430 | 0x0431 | R/- | upper 16 bits of serial number |
| 0x0431 | 0x0432 | R/- | lower 16 bits of serial number |
| 0x0432 | 0x0433 | R/- | 1 st and 2 nd byte of MAC address |
| 0x0433 | 0x0434 | R/- | 3 rd and 4 th byte of MAC address |
| 0x0434 | 0x0435 | R/- | 5 th and 6 th byte of MAC address |
| 0x0435 | 0x0436 | R/- | 1 st and 2 nd byte of IP address MWAN |
| 0x0436 | 0x0437 | R/- | 3 rd and 4 th byte of IP address MWAN |
| 0x0437 | 0x0438 | R/- | number of active SIM |
| 0x0438 | 0x0439 | R/- | 1 st and 2 nd byte of MWAN Rx Data |
| 0x0439 | 0x043A | R/- | 3 rd and 4 th byte of MWAN Rx Data |
| 0x043A | 0x043B | R/- | 5 th and 6 th byte of MWAN Rx Data |
| 0x043B | 0x043C | R/- | 7 th and 8 th byte of MWAN Rx Data |
| 0x043C | 0x043D | R/- | 1 st and 2 nd byte of MWAN Tx Data |
| 0x043D | 0x043E | R/- | 3 rd and 4 th byte of MWAN Tx Data |
| 0x043E | 0x043F | R/- | 5 th and 6 th byte of MWAN Tx Data |
| 0x043F | 0x0440 | R/- | 7 th and 8 th byte of MWAN Tx Data |
| 0x0440 | 0x0441 | R/- | 1 st and 2 nd byte of MWAN Uptime |
| 0x0441 | 0x0442 | R/- | 3 rd and 4 th byte of MWAN Uptime |
| 0x0442 | 0x0443 | R/- | 5 th and 6 th byte of MWAN Uptime |
| 0x0443 | 0x0444 | R/- | 7 th and 8 th byte of MWAN Uptime |
| 0x0444 | 0x0445 | R/- | MWAN Registration |
| 0x0445 | 0x0446 | R/- | MWAN Technology |
| 0x0446 | 0x0447 | R/- | MWAN PLMN |
| 0x0447 | 0x0448 | R/- | MWAN Cell |
| 0x0448 | 0x0449 | R/- | MWAN Cell |
| 0x0449 | 0x044A | R/- | MWAN LAC |
| 0x044A | 0x044B | R/- | MWAN TAC |
| 0x044B | 0x044C | R/- | MWAN Channel |
| 0x044C | 0x044D | R/- | MWAN Band |
| 0x044D | 0x044E | R/- | MWAN Signal Strength |
| 0x044E | 0x044F | R/- | CRC32 value of router configuration |
| 0x044F | 0x0450 | 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 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.
- Reading values from register address range 0x0437 - 0x044D works on all router platforms.

5. 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.