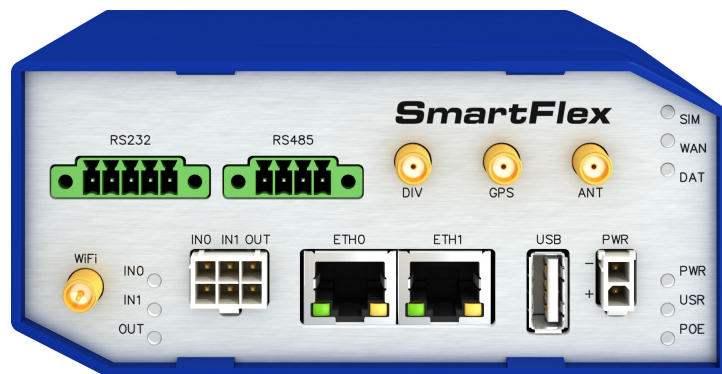


User module

Operational Hours Counter

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.



Example – example of function, command or script.

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1. Description of User Module



This user module is not a part of the standard router's firmware. See the *Configuration Manual* [1] for the description of uploading an user module to the router.



This user module is compatible with Advantech routers of v2 and v3 platforms only.

Operational Hours Counter user module allows to run one resettable and one non-resettable time counter for each binary input of the router. It works for both, router's built-in binary inputs and also binary inputs on expansion *Advantech CNT* card, if installed.

The time counters are triggered by state on appropriate binary input. The counters are running if the state of the binary input is in *On* state. Please note, that the logic and voltages may vary for different Advantech routers, for details see relevant *User Manual* [2] of the router.

Current time values of all triggers can be obtained from the router using *Modbus TCP* protocol. This protocol can also be used for resetting of resettable triggers. For more details about Modbus TCP communication see chapter 3.

This user module has a web interface that can be used for module configuration and its status observation, see chapter 2 for more information.

2. Web interface

2.1 Main menu

For configuration of the *Operational Hours Counter* user module a web interface is available. It can be invoked by pressing the module name on the *User modules* page of the router's web interface.

The main menu of module web interface contains *Operation Hours* section with *Status* and *Configuration* pages, see figure 1. *Customization* section contains only the *Return* link, which will switch back to the main router's web interface.

Operation Hours
Status Configuration MODBUS TCP
Customization
Return

Figure 1: Main menu

2.2 Status

Status of all available time counters can be observed on *Status* page, see figure 2. There is one line for each of the binary input containing actual state of non-resettable (fixed) and resettable time counter. The mask of displayed time is hhhh:mm:ss (h=hours, m = minutes, s=seconds).

Status		
On board BIN		
Port	Fixed	Resettable
BIN0	00001:10:37	00000:00:00
BIN1	00004:00:05	00000:00:05

Figure 2: Counters status

2.3 Configuration

Module activation and its configuration can be done on *Configuration* page, see figure 3. Module is activated by ticking the *Enable* checkbox. The resettable counters can be reseted by ticking the *BINx reset* checkbox. Once configured the *Apply* button must be pressed to proceed with the new configuration.

Configuration	
<input type="checkbox"/> Enable	
On board BIN	
BIN0 reset	<input type="checkbox"/>
BIN1 reset	<input type="checkbox"/>
<input type="button" value="Apply"/>	

Figure 3: Module configuration

Prior to usage of the *Modbus TCP* communication the protocol must be enabled first. This can be done on *Modbus TCP* configuration page by ticking the *Enable* checkbox, see figure 4. The default port is set to 502 and can be customized in the *Port* field. Once configured the *Apply* button must be pressed to proceed with the new configuration.

MODBUS TCP	
<input type="checkbox"/> Enable	
Port	<input type="text" value="502"/> 0..65535
<input type="button" value="Apply"/>	

Figure 4: Modbus TCP configuration

3. Modbus TCP communication

3.1 Address mapping

Values of resettable counters are stored in *Holding Registers* and of non-resettable counters are stored in *Input Registers* (*Modbus* terminology). Address mapping of stored counters values is listed in table 1 and table 2. Each counter occupies two *Modbus* registers with total size of 4 bytes. The data are stored in big-endian format which means that the most significant byte, which is the byte containing the most significant bit, is stored in register with lower address.

As first are mapped router's built-in binary inputs, for *Advantech* routers typically one or two ports, IN0 and IN1. Follow binary ports on expansion *Advantech CNT* card, if installed.

Input Registers - non-resettable counters

Counter no.	Register no.	Data Address	Access	Binary Input	Description
1	30001	0x00	R/-	BIN1 (IN0)	Two MSB bytes.
1	30002	0x01	R/-	BIN1 (IN0)	Two LSB bytes.
2	30003	0x02	R/-	BIN2 (IN1/CNTx)	Two MSB bytes.
2	30004	0x03	R/-	BIN2 (IN1/CNTx)	Two LSB bytes.
3	30005	0x04	R/-	BIN3 (CNTy)	Two MSB bytes.
3	30006	0x05	R/-	BIN3 (CNTy)	Two LSB bytes.
...

Table 1: Non-resettable counters address mapping

Holding Registers - resettable counters

Counter no.	Register no.	Data Address	Access	Binary Input	Description
1	40001	0x00	R/W	BIN1 (IN0)	Two MSB bytes.
1	40002	0x01	R/W	BIN1 (IN0)	Two LSB bytes.
2	40003	0x02	R/W	BIN2 (IN1/CNTx)	Two MSB bytes.
2	40004	0x03	R/W	BIN2 (IN1/CNTx)	Two LSB bytes.
3	40005	0x04	R/W	BIN3 (CNTy)	Two MSB bytes.
3	40006	0x05	R/W	BIN3 (CNTy)	Two LSB bytes.
...

Table 2: Resettable counters address mapping

3.2 Modbus functions

There is a few *Modbus* functions for reading and writing values from or to *Modbus* registers. This chapter describes *Modbus* functions supported by *Operational Hours Counter* module. For some examples of *Modbus* communication see chapter 3.3.

3.2.1 Reading counters

Table 3 lists *Modbus* functions for reading registers containing values for both types of counters.

Function code	Description
0x03	Read Holding register (resettable counters)
0x04	Read Input register (non-resettable counters)

Table 3: Available Modbus functions for reading

Execution of a *Modbus* function can be done on a client acting as a *Modbus master* device. Function syntax depends on specific SW implementation. All functions have minimally two parameters, data address and data length. In this implementation, both of these parameters has to be even numbers, otherwise an error is raised.

3.2.2 Resetting counters

Table 4 lists *Modbus* functions for writing to registers containing values of resettable counters. Writing a value to a register of resettable counter will lead to reset its content to zero regardless of what the sent value was. That means it is not possible to set the resettable counter to a nonzero value. The register value will be set to zero even if nonzero value was sent to be written into it.

Function code	Description
0x10	Write Holding register (resettable counters)

Table 4: Available Modbus functions for writing

3.3 Modbus communication examples

This chapter illustrates *Modbus* communication and data interpretation for counters in state as shown on figure 5.

Status		
On board BIN		
Port	Fixed	Resettable
BIN0	00001:11:02	00000:00:25
BIN1	00004:00:15	00000:00:10

Figure 5: Counters example state

Querying value of counter no. 1

Resettable counter

Query: function no. 0x03, start address 0, data length 2

Returned: 0x00000019 -> 0000:00:25

Non-resettable counter

Query: function no. 0x04, start address 0, data length 2

Returned: 0x000010A6 -> 00001:11:02

Querying value of counter no. 2

Resettable counter

Query: function no. 0x03, start address 2, data length 2

Returned: 0x0000000A -> 00:00:10

Non-resettable counter

Query: function no. 0x04, start address 2, data length 2

Returned: 0x0000384F -> 00004:00:15

Erasing resettable counter no. 1

Query: function no. 0x10, start address 0, data length 2, sent data 0x00000000

Value set to: 0x00000000 -> 00000:00:00

Erasing resettable counter no. 2

Query: function no. 0x10, start address 2, data length 2, sent data 0xFFFFFFFF

Value set to: 0x00000000 -> 00000:00:00

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: **ICR-3200 Configuration Manual** (MAN-0042-EN)



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