

Interface Description

for

WRF04 BACnet MS/TP RS485

and

FTW04 BACnet MS/TP RS485

1 Version Index

1.1 Document / Interface Description

Version	Date	Description
A	17.05.2013	First issue

1.2 Firmware

Version	Description
1.0.0	Initial release

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2 Introduction

The present document describes the functions of the room operating units WRF04 BACnet and FTW04 BACnet with MS/TP RS485 interface.

Further information and definitions on BACnet can be obtained under: www.bacnet.org.

3 Hardware Installation

The transceiver can be connected to the bus by means of a twisted-pair wire (line resistance 120 Ohm). It is recommended to use a shielded cable. For detailed information on installation and mounting please refer to the product data sheet of the WRF04 BACnet and FTW04 BACnet as well as the data sheet wiring_rs485_network.pdf.

3.1 RS485 Transceiver

The maximal number of bus participants without the use of a repeater is defined by the RS485 transceiver. The used transceiver only enables 32 devices per bus segment at maximum. Via a jumper a bus terminating resistor of 120 ohm can be connected.

3.2 Protocol

The protocol used is the internationally standardized BACnet/MS/TP protocol. This enables the connection to a corresponding distant end, such as an automation station or a DDC, supporting the BACnet MS/TP protocol. The transmitting parameters are defined to 8N1 (8 data bites, no parity, 1 stop bit) according to the standard. The baud rate can be field selected (9600, 19200, 38400, 57600, 76800) and adjusted via a dip switch.

3.2.1 BACnet Configuration Tools

The room operating unit WRF04 BACnet / FTW04 BACnet are always operated together with other BACnet automation stations or control technologies such as the BACnet operating work station. For the installation of such a BACnet network the tools of the corresponding manufacturers of the automation stations or control technologies are used.

4 BACnet

4.1 BACnet Device Profile and BIBBs

The device works with the device profile BACnet Smart Actuator (B-SA).

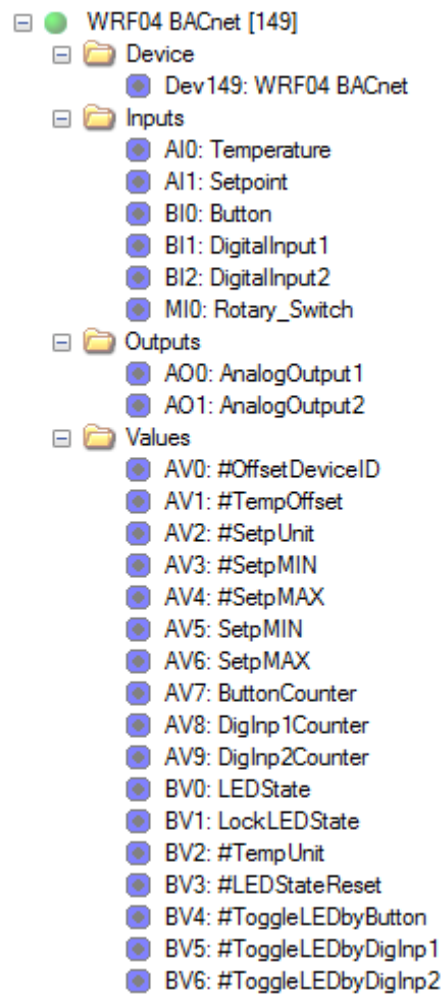
The following BIBBs are implemented :

DS-RP-B	Data Sharing-ReadProperty-B
DS-WP-B	Data Sharing-WriteProperty-B

4.2 WRF04 - BACnet Objects

WRF04 disposes of 26 BACnet objects in total.

The objects marked with a rhomb (#) are configuration properties which keep their values after a device reset.



Device (WRF04)

Object	Value	Function
WRF04_BACnet	Device Object Offset-Device-ID+MAC-Address	The Device-Object makes features for the characterization of the device in the BACnet network available. Among others the object list, the manufacturer and the software version are displayed. In addition, basic settings such as e.g. MAX-Master are feasible.

Analogue Inputs (WRF04)

Object	Value	Function
Temperature (AI0)	0...50°C / 32...122°F (unit selectable via BV2)	Room temperature measured by WRF04
Set point ¹⁾ (AI1)	Set point / potentiometer setting unit and range selectable via AV2...AV6	

Binary Inputs (WRF04)

Object	Value	Function
Button ²⁾ (BI0)	Inactive Active	Status of WRF04 button
DigitalInput1 (BI1)	Inactive Active	Status of digital input 1 of WRF04
DigitalInput2 (BI2)	Inactive Active	Status of digital input 2 of WRF04

Multistate Inputs (WRF04)

Object	Value	Function
RotarySwitch ³⁾ (MI0)	1...5	Status of WRF04 rotary switch

Analogue Outputs (WRF04)

Object	Value	Function
AnalogOutput1 (AO0)	0...100%	Output value for analogue output 1 (0...100% = 0...10V)
AnalogOutput2 (AO1)	0...100%	Output value for analogue output 2 (0...100% = 0...10V)

Analogue Values (WRF04)

Object	Value	Function
#DeviceOffsetID (AV0)	0...4194176	This value plus set MAC (0-127= corresponds to Device-ID (Writeable 0 – 4194200), after writing, reset and new initialization
#TempOffset (AV1)	-50...+50°C/°F	Default temperature correction (temperature offset)
#SetpUnit ¹⁾ (AV2)	0 = no unit 1 = % (factory setting) 2 = °C 3 = °F 4 = Celvin 5 = % relative humidity 6 = ° angle	Selection of unit of set point object
#SetpMIN ¹⁾ (AV3)	Lower set point limit after device reset Factory setting: 0	
#SetpMAX ¹⁾ (AV4)	Upper set point limit after device reset Factory setting: 100	
SetpMIN ¹⁾ (AV5)	Lower set point limit After a device reset it is loaded with the value of AV3. It can be changed in running operation, e.g. to realize a set point limit and lowering.	
SetpMAX ¹⁾	Upper set point limit.	

(AV6)	After a device reset it is loaded with the value of AV4. It can be changed in running operation, e.g. to realize a set point limit and lowering.	
ButtonCounter ²⁾ (AV7)	0...65535	Counter value WRF04 button, is increased by 1 with every button actuation.
DigInp1Counter (AV8)	0...65535	Counter value for digital input 1. Counter value is increased by 1 with every increasing flank.
DigInput2Counter (AV9)	0...65535	Counter value for digital input 2. Counter value is increased by 1 with every increasing flank.

Binary Values (WRF04)

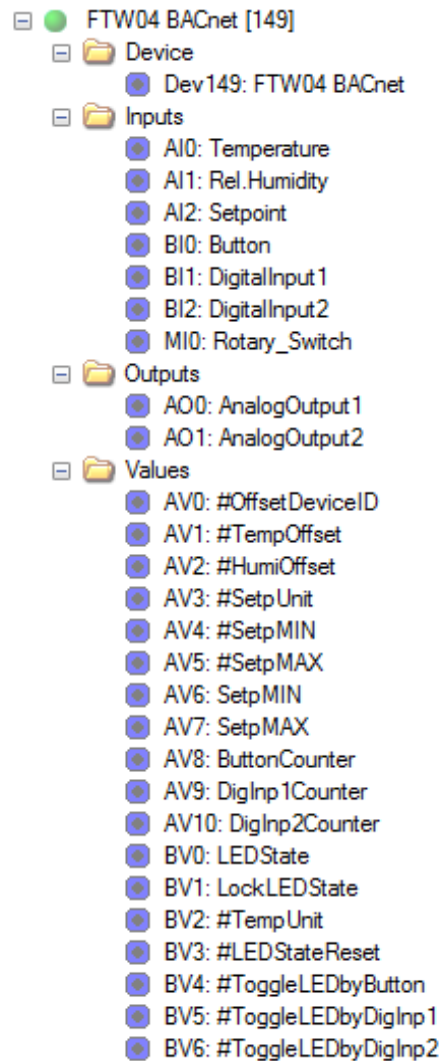
Objekt	Value	Function
LEDState ⁴⁾ (BV0)	Inactive Active	Default LED status
LockLEDState ^{2) 4)} (BV1)	Inactive Active	Active: LED toggle function via button and locking digital inputs
#TempUnit (BV2)	Inactive (factory setting) Active	Inactive: °C Active: °F
#LEDStateReset ⁴⁾ (BV3)	Inactive (factory setting) Active	Default LED status after device reset
#ToggleLEDbyButton ^{2) 4)} (BV4)	Inactive (factory setting) Active	Configuration property: Active: With every button actuation the status of the LED is reversed/inverted.
#ToggleLEDbyDigInput1 ⁴⁾ (BV5)	Inactive (factory setting) Active	Configuration property: Active: With every increasing flank at the digital input DI1 the status of the LED is reversed/inverted.
#ToggleLEDbyDigInput2 ⁴⁾ (BV6)	Inactive (factory setting) Active	Configuration property: Active: With every increasing flank at the digital input DI2 the LED status is reversed/inverted.

- 1) Only applicable for devices with integrated set point potentiometer
- 2) Only applicable for devices with integrated button
- 3) Only applicable for devices with integrated rotary switch
- 4) Only applicable for devices with integrated LED

4.3 FTW04 - BACnet Objects

FTW04 disposes of 28 BACnet objects in total.

The objects marked by a rhomb (#) are configuration properties which keep their values after a device reset.



Device (FTW04)

Object	Value	Function
FTW04_BACnet	Device Object Offset-Device-ID+MAC-Address	The Device-Object makes features for the characterization of the device in the BACnet network available. Among others the object list, the manufacturer and the software version are displayed. In addition, basic settings such as e.g. MAX-Master are feasible.

Analogue Inputs (FTW04)

Object	Value	Function
Temperature (AI0)	0...50°C / 32...122°F (unit selectable via BV2)	Room temperature measured by FTW04
Rel.Humidity (AI1)	0...100% relative humidity	Relative humidity measured by FTW04
Set point ¹⁾ (AI2)	Set point/ potentiometer setting unit and value adjustable via AV2...AV6	

Binary Inputs (FTW04)

Object	Value	Function
Button ²⁾ (BI0)	Inactive Active	Status FTW04 button
DigitalInput1 (BI1)	Inactive Active	Status of digital input 1 of FTW04
DigitalInput2 (BI2)	Inactive Active	Status of digital input 2 of FTW04

Multistate Inputs (FTW04)

Object	Value	Function
RotarySwitch ³⁾ (MI0)	1...5	Status of FTW04 rotary switch

Analogue Outputs (FTW04)

Object	Value	Function
AnalogOutput1 (AO0)	0...100%	Output value for analogue output 1 (0...100% = 0...10V)
AnalogOutput2 (AO1)	0...100%	Output value for analogue output 2 (0...100% = 0...10V)

Analogue Values (FTW04)

Object	Value	Function
#DeviceOffsetID (AV0)	0...4194176	This value plus adjusted MAC (0-127= corresponds to Device-ID (Writeable 0 – 4194200), after writing, reset and new initialization
#TempOffset (AV1)	-50...+50°C/°F	Default temperature correction (temperature offset)
#HumiOffset (AV2)	-100...+100% rF	Default humidity correction (humidity offset)
#SetpUnit ¹⁾ (AV3)	0 = no unit 1 = % (factory setting) 2 = °C 3 = °F 4 = Celvin 5 = % relative humidity 6 = ° angle	Unit selection of set point object
#SetpMIN ¹⁾ (AV4)	Lower set point limit after device reset Factory setting: 0	
#SetpMAX ¹⁾ (AV5)	Upper set point limit after device reset Factory setting: 100	

SetpMIN ¹⁾ (AV6)	Lower set point limit. After a device reset it is loaded with the value AV3. Can be changed in running operation e.g. to realize the set point limit and lowering.	
SetpMAX ¹⁾ (AV7)	Upper set point limit. After a device restart it is loaded with the value AV4. Can be changed in running operation e.g. to realize the set point limit and lowering.	
ButtonCounter ²⁾ (AV8)	0...65535	Counter value for FTW04 button. Counter value is increased by 1 with every button actuation.
DigInp1Counter (AV9)	0...65535	Counter value for digital input 1. Counter value is increased by 1 with every increasing flank.
DigInput2Counter (AV10)	0...65535	Counter value for digital input 2. Counter value is increased by 1 with every increasing flank.

Binary Values (FTW04)

Object	Value	Function
LEDState ⁴⁾ (BV0)	Inactive Active	Default LED status
LockLEDState ^{2) 4)} (BV1)	Inactive Active	Active: LED toggle function via button and locking of digital inputs
#TempUnit (BV2)	Inactive (factory setting) Active	Inactive: °C Active: °F
#LEDStateReset ⁴⁾ (BV3)	Inactive (factory setting) Active	Default LED status after device restart
#ToggleLEDbyButton ^{2) 4)} (BV4)	Inactive (factory setting) Active	Configuration property: Active: With every button actuation the status of the LED is reversed/inverted.
#ToggleLEDbyDigInput1 ⁴⁾ (BV5)	Inactive (factory setting) Active	Configuration property: Active: With every increasing flank at the digital input DI1 the status of the LED is reversed/inverted.
#ToggleLEDbyDigInput2 ⁴⁾ (BV6)	Inactive (factory setting) Active	Configuration property: Active: With every increasing flank at the digital input DI2 the status of the LED is reversed/inverted.

- 1) Only applicable for devices with integrated set point potentiometer
- 2) Only applicable for devices with integrated button
- 3) Only applicable for devices with integrated rotary switch
- 4) Only applicable for devices with integrated LED

4.3.1 BACnet Device Object

4.3.1.1 Device object -> MAX-Master property

This feature can be written between 1 to 127 and determines up to which address further participants in the BUS are polled (PolledForMaster). This is a MS/TP-specific feature.

4.3.1.2 Device object-> Object identifier

In a BACnet network every BACnet device requires a clear device ID. The device offers two possibilities to adjust the ID. The device ID is assembled of the MAXC-address, supplied by the address dip switch and a device ID offset. The offset is described by a BACnet object. Upon delivery, the default value for this object is 100. By changing the device address or the offset, the device identifier can be set between 0 to 4194303. After having changed the MAC address or the offset the device is newly started and initialized.

4.3.1.3 Device object-> object name, description

Both features are writable. They may have a maximal text length of 64 signs.

5 Inputs/Outputs and Operating Elements

5.1 Set Point Potentiometer

The value of the set point potentiometer can be read out via the analogue input „setpoint“. The value range as well as the unit of this object can be adjusted via the analogue values „SetpUnit“, „#SetpMIN“, „#SetpMAX“, „SetpMIN“ and „SetpMAX“.

Example: The set point shall be configured from 18...22°C

The following values must be written:

„SetpUnit“: 2 (2=°C)

„#SetpMIN“: 18.0

„#SetpMAX“: 22.0

What is the difference between „#Setp...“ and „Setp...“?

„Setp...“ are the actual set point limits, that is to say the range in which the set point can be adjusted via the potentiometer.

„#Setp...“ is the value with which the set point limits can be pre-loaded after a device reset.

The objects „Setp...“ are loaded with the values of „#Setp...“ after a restart.

5.2 Button

The button can be read via the binary input „Button“.

To prevent that button actuations get lost by the polling, the frequency of button actuations is additionally counted in the analogue value „ButtonCounter“.

Furthermore the button can be connected with the status of the LED (if available) via the binary value „ToggleLEDbyButton“. Thus, the LED is immediately switched on/off with every button actuation without the need to transfer this action via the bus.

5.3 Rotary Switch

The status of the rotary switch can be read out via the multistate input „RotarySwitch“.

5.4 Inputs

Both digital inputs can be read via the binary inputs „DigitalInput1“ and „DigitalInput2“.

Furthermore the inputs can be connected to the status of the LED (if available) via the binary values „ToggleLEDbyDigInput1“ and „ToggleLEDbyDigInput2“. Thus, the LED is immediately switched on/off with every increasing flank at the input without the need to transfer this action via the bus.

The LED can be triggered via the binary value „LEDState“. Moreover, a direct connection of the LED with the integrated button or the two digital inputs via the binary values „ToggleLEDbyButton“, „ToggleLEDbyDigInput1“ and „ToggleLEDbyDigInput2“ is possible..

5.5 Outputs

Both analogue 0...10V outputs can be triggered via the analogue outputs „AnalogOutput1“ and „AnalogOutput2“ (0...10V = 0...100%).

6 PICS

BACnet Protocol Implementation Conformance Statement

Vendor Name: Thermokon Sensortechnik GmbH (Vendor ID: 396)
Product Name: WRF04-BACnet / FTW04-BACnet
Product Model Number: WRF04-BACnet / FTW04-BACnet
Application Software Version: 1.0.0
Firmware Revision: 1.0.0

Product Description: "Multi-function Room Operating Panel with interface BACnet MS/TP RS485, for temperature detection and integrated operation of HVAC."

BIBBs Supported:

Supported BIBBS	BIBB Name
DS-RP-B	Data Sharing-Read Property-B
DS-WP-B	Data Sharing-Write Property-B

BACnet Standard Application Services Supported:

ReadProperty
WriteProperty
WhoIs

Standard Object Types Supported:

Object-Type	Dynamically Creatable Deleteable	Optional Properties supported	Writable Properties	Property Range Restrictions
Analog Input		Description		
Analog Value		Description	Present_Value	
Binary Input		Description Inactive_Text Active_Text		
Binary Value		Description Inactive_Text Active_Text	Present_Value	
Device		Description Max-Info-Frames Max-Master localTime localDate	Object name Description Max_Master	
Multi-state Input		Description State Text		

Data Link Layer Option:

MS/TP master. Baud rate(s): [9600,19200,38400,57600,76800]

Device Address Binding:

Is static device binding supported?

Yes ☐ No ☒

Character Sets Supported:

ANSI X3.4

Special Functionality:

Maximum APDU size in octets: 480