

Interface Description
for
WRF07 BACnet MS/TP RS485

1 Version Index

1.1 Document / Interface Description

Version	Date	Description
A	15.01.2014	First issue

1.2 Firmware

Version	Description
1.0.0	Initial release

Table of Contents

1	Version Index	1
1.1	Document / Interface Description	1
1.2	Firmware	1
2	Introduction.....	3
3	Hardware Installation	3
3.1	RS485 Transceiver	3
3.2	Protocol	3
3.2.1	BACnet Configuration Tools.....	3
4	BACnet.....	4
4.1	BACnet Device Profile and BIBBs.....	4
4.2	WRF07 - BACnet Objects	5
4.2.1	BACnet Device Object	9
5	Inputs/Outputs and Operating Elements	10
5.1	Set Point Potentiometer.....	10
5.2	Button.....	10
5.3	Inputs.....	10
5.4	LED	11
5.5	Outputs	11
6	PICS	12

2 Introduction

The present document describes the functions of the room operating units WRF07 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 WRF07 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 WRF07 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 WRF07 - BACnet Objects

WRF07 disposes of 38 (type 4DI) or 36 (type AO2V) BACnet objects in total.

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

Device #111 "Thermokon_WRF07_BACnet" / "Description"

Analog-Input #0 "Temperature" / "Temperature"
Analog-Input #1 "Setpoint" / "Setpoint"
Analog-Value #0 "#OffsetDeviceID" / "#OffsetDeviceID"
Analog-Value #1 "#TempOffset" / "#TempOffset"
Analog-Value #2 "#SetpUnit" / "#SetpUnit"
Analog-Value #3 "#SetpMIN" / "#SetpMIN"
Analog-Value #4 "#SetpMAX" / "#SetpMAX"
Analog-Value #5 "SetpMIN" / "SetpMIN"
Analog-Value #6 "SetpMAX" / "SetpMAX"
Analog-Value #7 "Button1Counter" / "Button1Counter"
Analog-Value #8 "Button2Counter" / "Button2Counter"
Analog-Value #9 "Button3Counter" / "Button3Counter"
Analog-Value #10 "Button4Counter" / "Button4Counter"
Analog-Value #11 "Button5Counter" / "Button5Counter"
Analog-Value #12 "DigInp1Counter" / "DigInp1Counter"
Analog-Value #13 "DigInp2Counter" / "DigInp2Counter"
Analog-Value #14 "DigInp3Counter" / "DigInp3Counter"
Analog-Value #15 "DigInp4Counter" / "DigInp4Counter"
Binary-Input #0 "Button1" / "Button1"
Binary-Input #1 "Button2" / "Button2"
Binary-Input #2 "Button3" / "Button3"
Binary-Input #3 "Button4" / "Button4"
Binary-Input #4 "Button5" / "Button5"
Binary-Input #5 "DigitalInput1" / "DigitalInput1"
Binary-Input #6 "DigitalInput2" / "DigitalInput2"
Binary-Input #7 "DigitalInput3" / "DigitalInput3"
Binary-Input #8 "DigitalInput4" / "DigitalInput4"
Binary-Value #0 "LED1State" / "LED1State"
Binary-Value #1 "LED2State" / "LED2State"
Binary-Value #2 "LED3State" / "LED3State"
Binary-Value #3 "LED4State" / "LED4State"
Binary-Value #4 "LED5State" / "LED5State"
Binary-Value #5 "#TempUnit" / "#TempUnit"
Binary-Value #6 "#LED1StateReset" / "#LED1StateReset"
Binary-Value #7 "#LED2StateReset" / "#LED2StateReset"
Binary-Value #8 "#LED3StateReset" / "#LED3StateReset"
Binary-Value #9 "#LED4StateReset" / "#LED4StateReset"
Binary-Value #10 "#LED5StateReset" / "#LED5StateReset"

Overview BACnet Objects WRF07 BACnet 4DI

Device #111 "Thermokon_WRF07_BACnet" / "Description"

Analog-Input #0 "Temperature" / "Temperature"
Analog-Input #1 "Setpoint" / "Setpoint"
Analog-Output #0 "AnalogOutput1" / "AnalogOutput1"
Analog-Output #1 "AnalogOutput2" / "AnalogOutput2"
Analog-Value #0 "#OffsetDeviceID" / "#OffsetDeviceID"
Analog-Value #1 "#TempOffset" / "#TempOffset"
Analog-Value #2 "#SetpUnit" / "#SetpUnit"
Analog-Value #3 "#SetpMIN" / "#SetpMIN"
Analog-Value #4 "#SetpMAX" / "#SetpMAX"
Analog-Value #5 "SetpMIN" / "SetpMIN"
Analog-Value #6 "SetpMAX" / "SetpMAX"
Analog-Value #7 "Button1Counter" / "Button1Counter"
Analog-Value #8 "Button2Counter" / "Button2Counter"
Analog-Value #9 "Button3Counter" / "Button3Counter"
Analog-Value #10 "Button4Counter" / "Button4Counter"
Analog-Value #11 "Button5Counter" / "Button5Counter"
Analog-Value #12 "DigInp1Counter" / "DigInp1Counter"
Analog-Value #13 "DigInp2Counter" / "DigInp2Counter"
Binary-Input #0 "Button1" / "Button1"
Binary-Input #1 "Button2" / "Button2"
Binary-Input #2 "Button3" / "Button3"
Binary-Input #3 "Button4" / "Button4"
Binary-Input #4 "Button5" / "Button5"
Binary-Input #5 "DigitalInput1" / "DigitalInput1"
Binary-Input #6 "DigitalInput2" / "DigitalInput2"
Binary-Value #0 "LED1State" / "LED1State"
Binary-Value #1 "LED2State" / "LED2State"
Binary-Value #2 "LED3State" / "LED3State"
Binary-Value #3 "LED4State" / "LED4State"
Binary-Value #4 "LED5State" / "LED5State"
Binary-Value #5 "#TempUnit" / "#TempUnit"
Binary-Value #6 "#LED1StateReset" / "#LED1StateReset"
Binary-Value #7 "#LED2StateReset" / "#LED2StateReset"
Binary-Value #8 "#LED3StateReset" / "#LED3StateReset"
Binary-Value #9 "#LED4StateReset" / "#LED4StateReset"
Binary-Value #10 "#LED5StateReset" / "#LED5StateReset"

Overview BACnet Objects WRF07 BACnet AO2V

Device

Object	Value	Function
WRF07_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

Object	Value	Function
Temperature (AI0)	0...50°C / 32...122°F (unit selectable via BV2)	Room temperature measured by WRF07
Set point ¹⁾ (AI1)	Set point / potentiometer setting unit and range selectable via AV2...AV6	

Binary Inputs

Object	Value	Function
Button1 ²⁾ (BI0)	Inactive Active	Status of WRF07 button 1
Button2 ²⁾ (BI1)	Inactive Active	Status of WRF07 button 2
Button3 ²⁾ (BI2)	Inactive Active	Status of WRF07 button 3
Button4 ²⁾ (BI3)	Inactive Active	Status of WRF07 button 4
Button5 ²⁾ (BI4)	Inactive Active	Status of WRF07 button 5
DigitalInput1 (BI5)	Inactive Active	Status of digital input 1 of WRF07
DigitalInput2 (BI6)	Inactive Active	Status of digital input 2 of WRF07
Type 4DI only:		
DigitalInput3 (BI7)	Inactive Active	Status of digital input 3 of WRF07
DigitalInput4 (BI8)	Inactive Active	Status of digital input 4 of WRF07

Analogue Outputs (type AO2V only)

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

Object	Value	Function
#DeviceOffsetID (AV0)	0...4194176	This value plus set MAC (0-127= corresponds to Device-ID (Writeable 0 – 4194200)
#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⁾ (AV6)	Upper set point limit. 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.	
Button1Counter ²⁾ (AV7)	0...65535	Counter value button 1, is increased by 1 with every button actuation.
Button2Counter ²⁾ (AV8)	0...65535	Counter value button 2, is increased by 1 with every button actuation.
Button3Counter ²⁾ (AV9)	0...65535	Counter value button 3, is increased by 1 with every button actuation.
Button4Counter ²⁾ (AV10)	0...65535	Counter value button 4, is increased by 1 with every button actuation.
Button5Counter ²⁾ (AV11)	0...65535	Counter value button 5, is increased by 1 with every button actuation.
DigInput1Counter (AV12)	0...65535	Counter value for digital input 1. Counter value is increased by 1 with every increasing flank.
DigInput2Counter (AV13)	0...65535	Counter value for digital input 2. Counter value is increased by 1 with every increasing flank.
Type 4DI only:		
DigInput3Counter (AV14)	0...65535	Counter value for digital input 3. Counter value is increased by 1 with every increasing flank.
DigInput4Counter (AV15)	0...65535	Counter value for digital input 4. Counter value is increased by 1 with every increasing flank.

Binary Values

Objekt	Value	Function
LED1State ³⁾ (BV0)	Inactive Active	Default LED 1 status
LED2State ³⁾ (BV1)	Inactive Active	Default LED 2 status

LED3State ³⁾ (BV2)	Inactive Active	Default LED 3 status
LED4State ³⁾ (BV3)	Inactive Active	Default LED 4 status
LED5State ³⁾ (BV4)	Inactive Active	Default LED 5 status
#TempUnit (BV5)	Inactive (factory setting) Active	Inactive: °C Active: °F
#LED1StateReset ³⁾ (BV6)	Inactive (factory setting) Active	Default LED 1 status after device reset
#LED2StateReset ³⁾ (BV7)	Inactive (factory setting) Active	Default LED 2 status after device reset
#LED3StateReset ³⁾ (BV8)	Inactive (factory setting) Active	Default LED 3 status after device reset
#LED4StateReset ³⁾ (BV9)	Inactive (factory setting) Active	Default LED 4 status after device reset
#LED5StateReset ³⁾ (BV10)	Inactive (factory setting) Active	Default LED 5 status after device reset

- 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 LED

4.2.1 BACnet Device Object

4.2.1.1 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.

4.2.1.2 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.

4.2.1.3 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.

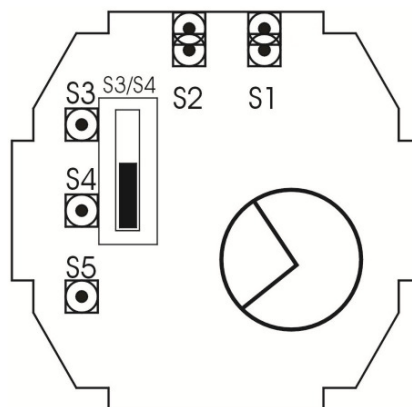
The objects „Setp...“ are loaded with the values of „#Setp...“ after a restart.

5.2 Button

The buttons can be read via the binary inputs „ButtonX“.

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

The number of buttons, and their arrangement depends on the specific device design - see figure below.



5.3 Inputs

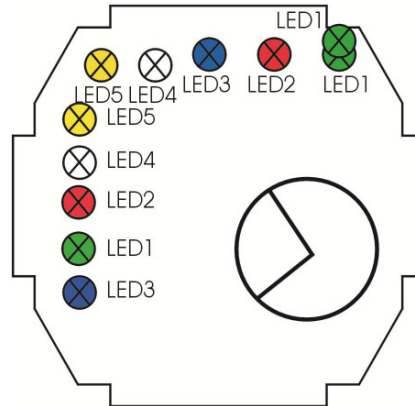
The digital inputs can be read via the binary inputs „DigitalInput1“... „DigitalInput4“ (input 3 & input 4 are available on type 4DI only).

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

5.4 LED

The LEDs can be triggered via the binary values „LED1State“ ... „LED5State“.

The number of LEDs, and their arrangement depends on the specific device design - see figure below.



5.5 Outputs

Both analogue 0...10V outputs can be triggered via the analogue outputs „AnalogOutput1“ and „AnalogOutput2“ (0...10V = 0...100%) – please note: analogue outputs are available on type AO2V only.

6 PICS

BACnet Protocol Implementation Conformance Statement

Vendor Name: Thermokon Sensortechnik GmbH (Vendor ID: 396)
Product Name: WRF07-BACnet
Product Model Number: WRF07-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