



GREYSTONE
ENERGY SYSTEMS INC

NTRC Series

Temperature/Humidity Sensor

SETUP GUIDE BACnet® COMMUNICATION



BACnet Protocol

Using the BACnet system software, only map the point objects that are installed and required. Excessive point mapping will lower the network performance. Some objects will not be available if the hardware option is not installed. For example, AI 3 will not be available if there is no Fan Speed control installed. This could also be the case if the device has no RH, setpoint or relay options.

This can be determined via BACnet by checking the Reliability, Event State or Status Flags properties of the optional objects.

If the hardware is not installed, the Reliability property will return NO_SENSOR and the Event_State property will indicate FAULT if the related hardware is not installed. To reduce network traffic, these points should not be polled.

The device has several BACnet objects to identify the device, read current values, configure the device and calibrate the sensors. There are five standard supported BACnet object types as shown below.

Object Type	Dynamically Creatable	Dynamically Deletable	Object Identifier	Object Name
Device	No	No	381003	STAT 003
Analog Input	No	No	AI 1 AI 2 AI 3	Temperature Relative Humidity Fan Speed
Analog Value	No	No	AV 1 AV 2 AV 3 AV 4 AV 5 AV 6 AV 7 AV 8 AV 9	Setpoint Temperature Offset RH Offset Setpoint Minimum Setpoint Maximum Display Mode Override Mode Override Mode Time Temperature Resolution
Binary Value	No	No	BV 1 BV 2 BV 3 BV 4 BV 5 BV 6	Temperature Units OCC Enable Override Status Relay Enable Setpoint Mode Setpoint Resolution
Binary Input	No	No	BI 1	DI On

The BACnet Device object allows configuration of the device. Device object properties are shown below.

Property	Default Value	Property Data Type	Access
Object Identifier	381003	BACnetObjectIdentifier(numeric)	Read / Write
Object Name	STAT 003	CharacterString (32)	Read / Write
Object Type	DEVICE (8)	BACnetObjectType	Read
System Status	OPERATIONAL (0)	BACnetDeviceStatus	Read
Vendor Name	Greystone Energy Systems	CharacterString	Read
Vendor Identifier	381	Unsigned16	Read
Model Name	STAT	CharacterString	Read
Firmware Revision	1.3	CharacterString	Read
Application Software Version	V1.0	CharacterString	Read
Location	150 English Drive, Moncton, NB	CharacterString (32)	Read / Write
Description	Greystone Temperature Sensor	CharacterString (32)	Read / Write
Protocol Version	1	Unsigned	Read
Protocol Revision	14	Unsigned	Read
Protocol Services Supported	See description below	BACnetServicesSupported	Read
Protocol Object Types Supported	See description below	BACnetObjectTypesSupported	Read
Object List	See description below	BACnetArray	Read
Maximum APDU Length Accepted	50, B'0000'	Unsigned	Read
Segmentation Supported	NO_SEGMENTATION (3)	BACnetSegmentation	Read
APDU Timeout	6,000	Unsigned	Read / Write
Number of APDU Retries	3	Unsigned	Read / Write
Max Master	127	Unsigned	Read / Write
Max Info Frames	1	Unsigned	Read
Device Address Binding	empty	BACnetAddressBinding	Read
Database Revision	0	Unsigned	Read
Property List		BACnetArray	Read

Object Identifier Initial default number is 381003, where 381 is the vendor ID and 003 is the default network MAC address. When the MAC address is initially changed the value is updated and saved. For example, if the MAC address is set to 50 via the Setup Menu for startup, then the device instance will be set to 381050. This property is also writable via BACnet. If the Device:Object_Identifier is written to via BACnet then the MAC address is no longer appended to the vendor ID to create this value.

Object Name Initial string is “ STAT 003” where STAT is the device model name and 003 is the default network address. Can be written with a new string of maximum length of 32 characters and the value is saved. The “003” is the MAC address as set by the menu and is automatically changed if the MAC address is changed. Once written to via BACnet, the MAC address no longer gets appended to the value.

Protocol Services Supported readProperty, writeProperty, deviceCommunicationControl, who-Has, who-Is
Binary bit string = {00000000 00001001 01000000 00000000 01100000 0}

Protocol Object Types Supported Analog_Input, Analog_Value, Binary_Value, Binary_Input, Device
Binary bit string = {10110100 10000000 00000000 00000000 00000000 00000000 00000000}

Object List ((Device, Instance 3), (Analog Input, Instance 1, 2 and 3), (Analog Value, Instance 1, 2, 3, 4, 5, 6, 7, 8 and 9), Binary Value, Instance 1, 2, 3, 4, 5 and 6), (Binary Input, Instance 1))

APDU Timeout Value is 6,000. Can be modified from 1 to 10,000.

Number Of APDU Retries Value is 3. Can be modified from 1 to 10.

Max Master Value is 127. Value is saved. Can be modified from 0 to 127.

Database Revision Value is 0 to 255.

The analog input BACnet objects allow reading of sensor values and indicate which options are present via the Reliability property. Analog input object properties are shown below.

Analog Input Object Temperature (Present Value is current temperature sensor reading in °F or °C, resolution is 0.1°)
(The temperature units default to °C but can be changed to °F using BV1)

Property	Default Value	Property Data Type	Access
Object Identifier	AI1 (Analog Input 1)	BACnetObjectIdentifier	Read
Object Name	Temperature	CharacterString (32)	Read
Object Type	ANALOG_INPUT (0)	BACnetObjectType	Read
Present Value	current reading	Real	Read
Description	Temperature	CharacterString (32)	Read
Device Type	Space Temperature Sensor	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000)	BACnetStatusFlags	Read
Event State	NORMAL (0)	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Units	degrees-Fahrenheit (64) or degrees-Celsius (62)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Analog Input Object Relative Humidity (Present Value is current RH sensor reading in %RH, resolution is 1%)
(If this option is not installed, the Status Flags, Event State and Reliability property values change)

Property	Default Value	Property Data Type	Access
Object Identifier	AI2 (Analog Input 2)	BACnetObjectIdentifier	Read
Object Name	Relative Humidity	CharacterString (32)	Read
Object Type	ANALOG_INPUT (0)	BACnetObjectType	Read
Present Value	current reading	Real	Read
Description	Relative Humidity	CharacterString (32)	Read
Device Type	0-100 %RH Sensor	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no sensor	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no sensor	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0) or NO_SENSOR (1)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Units	Percent-relative-humidity (29)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Analog Input Object Fan Speed (Present Value is current fan speed switch setting, Auto=0, Off=1, Low=2, Med=3, High=4)
(If this option is not installed, the Status Flags, Event State and Reliability property values change)

Property	Default Value	Property Data Type	Access
Object Identifier	AI3 (Analog Input 3)	BACnetObjectIdentifier	Read
Object Name	Fan Speed	CharacterString (32)	Read
Object Type	ANALOG_INPUT (0)	BACnetObjectType	Read
Present Value	current reading	Real	Read
Description	Fan Speed	CharacterString (32)	Read
Device Type	Auto/Off/Low/Med/High Fan Speed	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no sensor	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no sensor	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0) or NO_SENSOR (1)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Units	no-units (95)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

The analog value BACnet objects allow device configuration, sensor offset calibration and indicate which options are present via the Event State and Status Flags properties. Analog value object properties are shown below.

Analog Value Object (Default Present Value is current value from 5-50°C. Resolution is 1°)
Setpoint (If this option is not installed, the Status Flags and Event State property values change)

Property	Default Value	Property Data Type	Access
Object Identifier	AV1 (Analog Value 1)	BACnetObjectIdentifier	Read
Object Name	Setpoint	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	Current reading	Real	Read / Write
Description	Setpoint Value	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no sensor	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no sensor	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	°C (62) or °F (64) or %RH (29)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

The Setpoint object can be configured in various ways as required by the application:

- Use BV6 to configure the Setpoint Mode to either Temperature or RH.
- Use AV4 to configure the Setpoint Minimum value.
- Use BV7 to set the Setpoint Resolution (for Temperature Setpoint Mode only).

Note that the Temperature Setpoint Mode units are the same as the Temperature Analog Input (AI1) units as controlled by BV1 (Temperature Units).

See the descriptions for AV4, AV5, BV6, and BV7 for more details.

If installed, the factory default setpoint operations is 5 to 50°C or 41 to 122°F in 1° increments

Analog Value Object (Present Value defaults to 0 for no offset. Can be set from -10 to +10 Δ°F or -5.0 to +5.0 Δ°C)
Temperature Offset (Units depend on the device units, either °C or °F), (°C resolution = 0.5, °F resolution = 1)

Property	Default Value	Property Data Type	Access
Object Identifier	AV2 (Analog Value 2)	BACnetObjectIdentifier	Read
Object Name	Temperature Offset	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	0	Real	Read / Write
Description	Temperature Offset Calibration	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000)	BACnetStatusFlags	Read
Event State	NORMAL (0)	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	delta-degrees-Fahrenheit (120) or Δ°C (121)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

**Analog Value Object
RH Offset**

(Present Value default to 0 for no offset. Can be set from -10 to +10 %RH, resolution =1)
(If the setpoint option is not installed, the Status Flags and Event State property values change)

Property	Default Value	Property Data Type	Access
Object Identifier	AV3 (Analog Value 3)	BACnetObjectIdentifier	Read
Object Name	RH Offset	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	0	Real	Read / Write
Description	RH Offset Calibration	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no RH sensor	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no RH sensor	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	percent-relative-humidity (29)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

**Analog Value Object
Setpoint Maximum**

(Present Value default changes depending on the Setpoint Mode and Temperature Units settings)
(If the setpoint option is not installed, the Status Flags and Event State property values change)

Property	Default Value	Property Data Type	Access
Object Identifier	AV4 (Analog Value 4)	BACnetObjectIdentifier	Read
Object Name	Setpoint Maximum	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	** See notes below	Real	Read / Write
Description	Setpoint Maximum Value	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no setpoint	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no setpoint	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	°C (62) or °F (64) or %RH (29)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

- * Notes
- The factory default Setpoint Mode is Temperature and either 5 to 50°C or 41-122°F with 1° increments.
 - Factory default Setpoint Minimum is 5 °C, 41 °F or 40 %RH.
 - The Setpoint Mode can be set to either Temperature or RH using BV6.
 - In Temperature mode, Setpoint Minimum : Present Value may be set from 5.0 to 20.0 °C or 41.0 to 68.0 °F.
 - In RH mode, Setpoint Minimum : Present Value may be set from 10 to 60 %RH.
 - The temperature setpoint resolution may be changed from 1° to 0.5° using BV7.

**Analog Value Object
Setpoint Maximum**

(Present Value defaults change depending on the device hardware configuration)
(If the setpoint option is not installed, the Status Flags and Event State property values change)

Property	Default Value	Property Data Type	Access
Object Identifier	AV5 (Analog Value 5)	BACnetObjectIdentifier	Read
Object Name	Setpoint Maximum	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	** See notes below	Real	Read / Write
Description	Setpoint Maximum Value	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no setpoint	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) is no setpoint	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	°C (62) or °F (64) or %RH (29)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

** Notes
The factory default Setpoint Mode is Temperature and either 5-50°C or 41-122°F with 1° increments.
Factory default Setpoint Maximum is 50°C, 122°F or 60 %RH.
The Setpoint Mode can be set to either Temperature or RH using BV6.
In Temperature mode, Setpoint Maximum : Present Value may be set from 20.0 to 50.0°C or 68.0 to 86.0°F.
In RH mode, Setpoint Maximum : Present Value may be set from 30 to 80 %RH.
The temperature setpoint resolution may be changed from 1° to 0.5° using BV7.

*** Notes
The following setpoint conditions are enforced:
Setpoint Maximum must be > Setpoint Minimum.
For Temperature Setpoint Mode, the minimum span (Setpoint Maximum – Setpoint Minimum) = 4°C/°F.
For RH Setpoint Mode, the minimum span = 10 %RH.
Wiring to BV1 (Temperature Units) or BV6 (Setpoint Mode) always resets Setpoint Min and Ma to the factory defaults, so configure these values first.

**Analog Value Object
Display Mode**

(Present Value defaults change depending on the device hardware configuration)

Property	Default Value	Property Data Type	Access
Object Identifier	AV6 (Analog Value 6)	BACnetObjectIdentifier	Read
Object Name	Display Mode	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	* See note below	Real	Read / Write
Description	LCD Display Mode	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000)	BACnetStatusFlags	Read
Event State	NORMAL (0)	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	no-units (95)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

* Notes
This object controls the information that is displayed on the LCD in the normal operating mode.
The available settings are: 0 = no display, no backlight (menu and backlight will still display for setup)
(setpoint and backlight will still display if UP or DOWN pressed, if installed)
1 = Temperature value only displayed
2 = RH value only displayed
3 = Temperature and RH values toggle every 5 seconds
A temperature only device will not have options 2 or 3 (the default = 1).
A temperature plus RH device has default = 3.

**Analog Value Object
Override Mode**

(If the override option is not installed, the Status Flags and Event State properties change)

Property	Default Value	Property Data Type	Access
Object Identifier	AV7 (Analog Value 7)	BACnetObjectIdentifier	Read
Object Name	Override Mode	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	*See note below	Real	Read / Write
Description	Override Switch Mode	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no override	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no override	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	no-units (95)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

- * Notes
- This object controls the way that the front panel override switch functions.
The available settings are: 0 = LATCH, reset the override by writing 0 to Override Status (Bv4)
(this is the default value)
- 1 = TOGGLE, the override status changes state whenever the switch is pressed
(there is a minimum time of 10 sec enforced between state changes)
- 2 = MOMENTARY, the override status self-resets after a time period
(the time period is set with AV8)

**Analog Value Object
Override Mode Time**

(If the override option is not installed, the Status Flags and Event State properties change)
(Present_value defaults to 1 minute. Can be set from 1 to 60 minutes. Resolution is 1 min)

Property	Default Value	Property Data Type	Access
Object Identifier	AV8 (Analog Value 8)	BACnetObjectIdentifier	Read
Object Name	Override Mode Time	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	1	Real	Read / Write
Description	Override Mode Time	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no override	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no override	BACnetEventState	Read
Reliability	FAULT (0)	Boolean	Read
Out of Service	Minutes (72)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

*Notes: AV8 only has effect if AV7 is set to 2 = MOMENTARY. In this case, the Override Status value will reset to 0 after AV8 has expired.

Analog Value Object

Temperature Resolution (Present_value defaults to 1C. Can be set to 0.5C or 0.1C)

Property	Default Value	Property Data Type	Access
Object Identifier	AV9 (Analog Value 9)	BACnetObjectIdentifier	Read
Object Name	Temperature Resolution	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	* See note below	Real	Read / Write
Description	Temperature Resolution	CharacterString (32)	Read
Status Flags	{ false, false, false, false } (0000)	BACnetStatusFlags	Read
Event State	NORMAL (0)	BACnetEventState	Read
Reliability	FAULT (0)	Boolean	Read
Out of Service	°C (62) or °F (64)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

This object controls the resolution of temperature that is displayed on the LCD in the normal operating mode.

The available settings are:
 0 = 1°C resolution on LCD (Default)
 1 = 0.5°C resolution on LCD
 2 = 0.1°C resolution on LCD

The binary value BACnet objects allow configuration of the device, override switch status and relay control. The Event State, Status Flags and Reliability properties will indicate which options are present. Binary value object properties are shown below.

Binary Value Object Temperature Units

(Present Value defaults to 0 (INACTIVE) for Celsius or 1 (ACTIVE) for Fahrenheit)

Property	Default Value	Property Data Type	Access
Object Identifier	BV1 (Binary Value 1)	BACnetObjectIdentifier	Read
Object Name	Temperature Units	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read / Write
Description	Celsius (0) or Fahrenheit (1)	CharacterString (32)	Read
Status Flags	{ false, false, false, false } (0000)	BACnetStatusFlags	Read
Event State	NORMAL (0)	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Property List		BACnetArray	Read

Binary Value Object Temperature Resolution

(Present Value defaults to 0 (INACTIVE) for 1°. Can be set to 1 (ACTIVE) for 0.5°)

Property	Default Value	Property Data Type	Access
Object Identifier	BV2 (Binary Value 2)	BACnetObjectIdentifier	Read
Object Name	Temperature Resolution	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read / Write
Description	1 Degree (0) or 0.5 Degree (1)	CharacterString (32)	Read
Status Flags	{ false, false, false, false } (0000)	BACnetStatusFlags	Read
Event State	NORMAL (0)	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Property List		BACnetArray	Read

* Notes The default temperature resolution is 1°. This applies to the LCD temperature display only.

For example: The LCD will display 22, 23, 24 °C for the temperature reading.
The resolution can be changed to 0.5° for the LCD temperature reading.
For example: The LCD will display 22.0, 22.5, 23.0 °C for the temperature reading.
This setting has no effect on the AI1 (Temperature) object value which has a 0.1° resolution.
This setting has no effect on the setpoint display resolution which is set independently.

Binary Value Object OCC Enable (Present Value defaults to 0 (INACTIVE) for OCC Off. Can be set to 1 (ACTIVE) for OCC On)
(This controls the OCC segment display on the LCD, OCC will not display if Display Mode = 0)

Property	Default Value	Property Data Type	Access
Object Identifier	BV3 (Binary Value 3)	BACnetObjectIdentifier	Read
Object Name	OCC Enable	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read / Write
Description	OCC Off (0) or OCC On (1)	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000)	BACnetStatusFlags	Read
Event State	NORMAL (0)	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Property List		BACnetArray	Read

Binary Value Object Override Status (Present Value is normally 0, changes to 1 if the override switch has been pressed)
(If the override option is not installed, the Status Flags, Event State and Reliability properties change)

Property	Default Value	Property Data Type	Access
Object Identifier	BV4 (Binary Value 4)	BACnetObjectIdentifier	Read
Object Name	Override Status	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read / Write *
Description	Override Switch	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no switch	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no switch	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0) or NO_SENSOR (1)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Property List		BACnetArray	Read

* Notes Present Value changes to 1 (ACTIVE) if the override switch has been pressed.

The Override Status has three operating modes as set by AV7 (Override Mode).
It can be either manually reset by writing 0(INACTIVE) back to BV4 Present Value, or
it can be toggled with the override switch (press ON, press OFF), or
it can be self-resetting after a time period as set by AV8 (Override Mode Time).

If AV7 is set for toggle (AV7 Present Value = 1) or momentary (AV7 Present Value = 2) operation, then
BV4 Present Value is set to Read only.

**Binary Value Object
Relay Enable**

(Present Value defaults to 0 (INACTIVE) for Relay Off. Can be set to 1 (ACTIVE) for Relay On)
(This controls the optional relay, some properties change if the relay is not installed)

Property	Default Value	Property Data Type	Access
Object Identifier	BV5 (Binary Value 5)	BACnetObjectIdentifier	Read
Object Name	Relay Enable	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read / Write
Description	Relay Off (0) or Relay On (1)	CharacterString (32)	Read
Status Flags	{false, false, false} (0000) or (1100) if no relay	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no relay	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0) or NO_SENSOR (1)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Property List		BACnetArray	Read

**Binary Value Object
Setpoint Mode**

(Present Value defaults to 0 (INACTIVE) for Temperature. Can be set to 1 (ACTIVE) for %RH)
(If the setpoint option is not installed, the Status Flags, Event State and Reliability properties change)

Property	Default Value	Property Data Type	Access
Object Identifier	BV6 (Binary Value 6)	BACnetObjectIdentifier	Read
Object Name	Setpoint Mode	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read / Write
Description	Temperature (0) or %RH (1)	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no setpoint	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no setpoint	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0) or NO_SENSOR (1)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Property List		BACnetArray	Read

* Notes This object determines if the front panel setpoint controls will be used to control Temperature or Relative Humidity within limits set by the Setpoint Minimum and Setpoint Maximum objects. The Setpoint AV1 object values and LCD display will change depending on the setting.

**Binary Value Object
Setpoint Resolution**

(Present Value defaults to 0 (INACTIVE) for 1°. Can be set to 1 (ACTIVE) for 0.5°)
(If the setpoint option is not installed, the Status Flags, Event State and Reliability properties change)

Property	Default Value	Property Data Type	Access
Object Identifier	BV7 (Binary Value 7)	BACnetObjectIdentifier	Read
Object Name	Setpoint Resolution	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read / Write
Description	1 Degree (0) or 0.5 Degree (1)	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no setpoint	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no setpoint	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0) or NO_SENSOR (1)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Property List		BACnetArray	Read

* Notes The default setpoint resolution is 1°. This applies to the setpoint temperature display and Setpoint object only.
For example: The LCD will display 22, 23, 24 °C for the setpoint setting.
The resolution can be changed to 0.5° for the setpoint display and value.
For example: The LCD will display 22.0, 22.5, 23.0 °C for the setpoint.
This setting has no effect on the AI1 (Temperature) object value or temperature display.

The binary input BACnet object allows reading of the digital input status. Binary input object properties are shown below.

Note: This object is only available for models with the Digital Input feature.

Binary Input Object (Present Value is 1 (ACTIVE) if the DI is activated (pulled to common).

DI On (Present Value is 0 (INACTIVE) if the DI is not activated (floating).

Property	Default Value	Property Data Type	Access
Object Identifier	B11 (Binary Input 1)	BACnetObjectIdentifier	Read
Object Name	DI On	CharacterString (32)	Read
Object Type	BINARY_INPUT (3)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read
Description	DI Status	CharacterString (32)	Read
Device Type	Indicates On/Off Status of DI	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no DI	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no DI	BACnetEventState	Read
Reliability	NO_FAULT_DETECTED (0) or NO_SENSOR (1)	BACnetReliability	Read
Out of Service	FALSE (0)	Boolean	Read
Polarity	Normal (0)	BACnetPolarity	Read
Property List		BACnetArray	Read

BACnet Trouble-shooting

This network device operates as a slave. It will not communicate unless a master is connected to the network and sends a request for information, then the slave will answer. If the device does not communicate properly, first check that the communication wires are not reversed. Then check communication parameters set in the menu.

The default BACnet MAC address is 3 and each device must have a unique address to communicate properly. Use the Setup menu to change the MAC address to a unique number for each unit. Ensure the device object name and device object identifier are unique on the entire BACnet network, not just on the MS/TP sub-network. Both of these properties are writable in the device object.

The device automatically selects a device object name for itself using the format STAT_003, where 003 is the MS/TP MAC address (000 to 127) as set in the menu. If this name is changed by writing to the device Object_Name property via BACnet, then the MAC number will no longer be appended to the object name.

The device also automatically selects a device object identifier for itself using the format 381xxx, where xxx is the MS/TP MAC address (000 to 127) as set by the menu. If this ID is changed by writing to the device Object_Identifier property via BACnet, then the MAC number will no longer be appended to the object ID.

The default BACnet baud rate is 9600. Use the Setup menu to change the baud rate to the correct setting.

Ensure the application software (graphical interface) is not set to poll the devices too frequently. For example, if the software is polling the devices every 500 mS, the network could be heavily congested with the network traffic and may not operate reliably. A slower polling rate such as 5 to 10 seconds will usually produce better results on a typical network segment.

Use care when setting the MS/TP MAC address (via the menu) and the device object Max_Master property since both can have a significant effect on the network efficiency. Some MAC address and Max_Master combinations will operate more efficiently than others. MAC addresses should be selected sequentially, starting at the lowest possible value.

For example, on a five node segment, the device MAC addresses should be set to 1, 2, 3, 4 and 5. In this case, if the Max_Master property value is left at the 127 default, then there will be a lot of wasted time on the network polling for masters that are not present. In this example, the five nodes should be set such that Max_Master is equal to 5. The Max_Master value initially defaults to 127 so that any master can be found when the device first starts.

BACnet Protocol Implementation Conformance Statement (PICS)

Date : Oct 4, 2017
Vendor Name : Greystone Energy Systems Inc.
Product Name : RH/T Network Sensor
Product Model Number : NTRC Series
Application Software Version : 1.3
Firmware Revision : 1.3
BACnet Protocol Revision : 14

Product Description : The Greystone RH/T Network Sensor is a smart room sensor with native BACnet MS/TP protocol for network communication. It measures room temperature levels and reports this value back to a building automation system (BAS). The device may also be configured with a relative humidity (RH) sensor to measure room %RH, a setpoint control, an override switch, an alarm relay output, a digital input and a fan speed switch.

BACnet Standardized Device Profile (Annex L) : BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K) : DS-RP-B, DS-WP-B,
 DM-DDB-B, DM-DOB-B
 DM-DCC-B

Segmentation Capability : Not supported

Standard Object Types Supported :

Object Type	Dynamically Creatable	Dynamically Deletable	Optional Properties Supported	Writable Properties
Device	No	No	Location, Description, Max_Master, Max_Info_Frames	Object_Identifier, Object_Name, Location, Description, APDU_Timeout, Max_Master, Number_Of_APDU_Retries
Analog Input	No	No	Description, Reliability, Device_Type	
Analog Value	No	No	Description	Present_Value
Binary Value	No	No	Description, Reliability	Present_Value
Binary Input	No	No		

Data Link Layer Options : MS/TP master (Clause 9), baud rates : 9600, 19200, 38400, 76800

Device Address Binding : Not supported

Networking Options : None

Character Set Supported : ISO 10646 (UTF-8)