



GREYSTONE
ENERGY SYSTEMS INC

G03 Series Horticulture Sensor

SETUP GUIDE BACnet[®] COMMUNICATION



1.1 BACnet Specification

Object Type	Object Identifier	Object Name	Description	Default
Device	381001	CDD CO2 001		
Analog Input	AI 1 AI 2 AI 3	CO2 Temperature Relative Humidity	0 to 20,000 ppm 0 to 50.0 °C or 32.0 to 122.0 °F 0 to 100.0 %RH	
Analog Value	AV 1 AV 2 AV 3 AV 4 AV 5 AV 6	Altitude Relay Setpoint Relay Hysteresis Relay On Delay Temperature Offset RH Offset	0 to 5000 ft 500 to 5000 / 500 to 15,000 ppm 25 to 200 / 25 to 500 ppm 0 to 255 seconds -5.0 to 5.0 Δ°C or -10 to 10 Δ°F -10 to 10 %RH	0 ft 1000 ppm 50 ppm 15 seconds 0 Δ°C 0 %RH
Binary Value	BV 1 BV 2	Temperature Units Auto Cal Enable	0 = °C, 1 = °F 0 = Disable, 1 = Enable	°C 1
Binary Input	BI 1	Relay Status	0 = Inactive, 1 = Active	0

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

Property	Default Value	Property Data Type	Access
Object Identifier	381001	BACnetObjectIdentifier(numeric)	Read / Write
Object Name	CDD CO2 001	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	CDD	CharacterString	Read
Firmware Revision	1.0	CharacterString	Read
Application Software Version	V1.0	CharacterString	Read
Location	150 English Drive, Moncton, NB	CharacterString (32)	Read / Write
Description	Greystone CO2 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 381001, where 381 is the vendor ID and 001 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 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 “CDD CO2 001” where CDD CO2 is the device model name and 001 is the default network address. Can be written with a new string of maximum length of 32 characters and the value is saved. The “001” is the MAC address 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, readPropertyMultiple, writeProperty, deviceCommunicationControl, who-Has, who-Is
Binary bit string = {00000000 00001011 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 1), (Analog Input, Instance 1), (Analog Input, Instance 2), (Analog Input, Instance 3), (Analog Value, Instance 1), (Analog Value, Instance 2), (Analog Value, Instance 3), (Analog Value, Instance 4), (Analog Value, Instance 5), (Analog Value, Instance 6), (Binary Value, Instance 1), (Binary Value, Instance 2), (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 1 to 127.

Database Revision Value is 0 to 255.

The analog input BACnet objects allow reading of sensor values. Analog input object properties are shown below.

Analog Input Object **CO2** (Present_Value is current CO2 sensor reading in ppm, resolution is 1 ppm)

Property	Default Value	Property Data Type	Access
Object Identifier	AI1 (Analog Input 1)	BACnetObjectIdentifier	Read
Object Name	CO2	CharacterString (32)	Read
Object Type	ANALOG_INPUT (0)	BACnetObjectType	Read
Present Value	current reading	Real	Read
Description	CO2	CharacterString (32)	Read
Device Type	CO2 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	parts-per-million (96)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: 0 <= Present_Value <= 20,000 ppm

Analog Input Object **Temperature** (Present_Value is current temperature sensor reading in °C or °F, 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	AI2 (Analog Input 2)	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	Temperature 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	degrees-Celsius (62) or degrees-Fahrenheit (64)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: 0.0 °C <= Present_Value <= 50.0 °C
32.0 °F <= Present_Value <= 122.0 °F

Analog Input Object **Relative Humidity** (Present Value is current RH sensor reading in %RH, resolution is 0.1%)

Property	Default Value	Property Data Type	Access
Object Identifier	AI3 (Analog Input 3)	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	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

Rules are enforced: 0.0 %RH <= Present_Value <= 100.0 %RH

The analog value BACnet Objects allow sensor calibration, alarm setpoint configuration and parameter setting. Analog value object properties are shown below.

Analog Value Object **Altitude** (Present Value defaults to 0 feet. Can be set from 0 to 5000 feet, resolution is 1 ft)

Property	Default Value	Property Data Type	Access
Object Identifier	AV1 (Analog Value 1)	BACnetObjectIdentifier	Read
Object Name	Altitude	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	0	Real	Read / Write
Description	Altitude	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	feet (33)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: 0 ft <= Present_Value <= 5000 ft

Analog Value Object **Relay Setpoint** (Present Value defaults to 1000 ppm. Can be set from 500 to 5000/15000 ppm, resolution is 1 ppm)

Property	Default Value	Property Data Type	Access
Object Identifier	AV2 (Analog Value 2)	BACnetObjectIdentifier	Read
Object Name	Relay Setpoint	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	1000	Real	Read / Write
Description	Relay Setpoint	CharacterString (32)	Read
Status Flags	{ false, false, false, false } (0000) or (1100) if no relay	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no relay	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	parts-per-million (96)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: 500 ppm <= Present_Value <= 5000 ppm, auto-cal sensor
500 ppm <= Present_Value <= 15000 ppm, dual-beam sensor

Analog Value Object **Relay Hysteresis** (Present Value defaults to 50 ppm. Can be set from 25 to 200/500 ppm, resolution is 1 ppm)

Property	Default Value	Property Data Type	Access
Object Identifier	AV3 (Analog Value 3)	BACnetObjectIdentifier	Read
Object Name	Relay Hysteresis	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	50	Real	Read / Write
Description	Relay Hysteresis	CharacterString (32)	Read
Status Flags	{ false, false, false, false } (0000) or (1100) if no relay	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no relay	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	parts-per-million (96)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: 25 ppm <= Present_Value <= 200 ppm, auto-cal sensor
25 ppm <= Present_Value <= 500 ppm, dual-beam sensor

Analog Value Object (Present Value defaults to 15 seconds. Can be set from 0 to 255 seconds, resolution is 1 second)
Relay On Delay

Property	Default Value	Property Data Type	Access
Object Identifier	AV4 (Analog Value 4)	BACnetObjectIdentifier	Read
Object Name	Relay On Delay	CharacterString (32)	Read
Object Type	ANALOG_VALUE (2)	BACnetObjectType	Read
Present Value	15	Real	Read / Write
Description	Relay On Delay	CharacterString (32)	Read
Status Flags	{false, false, false, false} (0000) or (1100) if no relay	BACnetStatusFlags	Read
Event State	NORMAL (0) or FAULT (1) if no relay	BACnetEventState	Read
Out of Service	FALSE (0)	Boolean	Read
Units	seconds (73)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: 0 seconds <= Present_Value <= 255 seconds

Analog Value Object (Present Value defaults to 0 for no offset. Can be set from -10 to +10 Δ°F or -5 to +5 Δ°C)
Temperature Offset (Units depend on the device units, either °C or °F), (°C resolution = 1, °F resolution = 1)

Property	Default Value	Property Data Type	Access
Object Identifier	AV5 (Analog Value 5)	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	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	delta-degrees-Fahrenheit (120) or Δ°C (121)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: -5 Δ°C <= Present_Value <= +5 Δ°C, resolution = 1 Δ°C
-10 Δ°F <= Present_Value <= +10 Δ°F, resolution = 1 Δ°F

Analog Value Object (Present Value defaults to 0 for no offset. Can be set from -10 to +10 %RH, resolution = 1)
RH Offset

Property	Default Value	Property Data Type	Access
Object Identifier	AV6 (Analog Value 6)	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	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	percent-relative-humidity (29)	BACnetEngineeringUnits	Read
Property List		BACnetArray	Read

Rules are enforced: -10 %RH <= Present_Value <= +10 %RH, resolution = 1 %RH

The binary value BACnet objects allow configuration of the device. Binary value object properties are shown below.

Binary Value Object **Temperature Units** (Present Value defaults to 0 (INACTIVE) for Celsius. Can be set to 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) 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
Property List		BACnetArray	Read

Binary Value Object **Auto Cal Enable** (Present Value defaults to 1 (ACTIVE) for Enable. Can be set to 0 (INACTIVE) for Disable)

Property	Default Value	Property Data Type	Access
Object Identifier	BV2 (Binary Value 2)	BACnetObjectIdentifier	Read
Object Name	Auto Cal Enable	CharacterString (32)	Read
Object Type	BINARY_VALUE (5)	BACnetObjectType	Read
Present Value	ACTIVE (1)	BACnetBinaryPV	Read / Write
Description	Auto Cal Enable	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
Property List		BACnetArray	Read

Rules are enforced: This object is only active if the auto-cal CO2 sensor is installed

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

Binary Input Object **Relay Status** (Present Value defaults to 0 (INACTIVE). Will change to 1 (ACTIVE) if the relay is energized)

Property	Default Value	Property Data Type	Access
Object Identifier	BI1 (Binary Input 1)	BACnetObjectIdentifier	Read
Object Name	Relay Status	CharacterString (32)	Read
Object Type	BINARY_INPUT (3)	BACnetObjectType	Read
Present Value	INACTIVE (0)	BACnetBinaryPV	Read
Description	Relay Status	CharacterString (32)	Read
Device Type	Indicates Relay On/Off Status	CharacterString (32)	Read
Status Flags	{false, 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
Polarity	Normal (0)	BACnetPolarity	Read
Property List		BACnetArray	Read

Rules are enforced: This object is only active if the relay is installed