AVEVA™ Communication Drivers Pack – Standards – BACLITE Driver

User Guide

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Chapter 1

Getting Started with BACLITE Communication Driver

Introduction to the BACLITE Communication Driver

This document describes the technical specifications and configuration options for the BACLITE Communication Driver.

Note: This Communication Driver is hosted by the OI Server Manager, a Microsoft Management Console (MMC) snap-in, which is a part of the Operations Control Management Console (OCMC) suite of utilities. Many high-level functions and user-interface elements of the OI Server Manager are universal to all Communication Driver, and only the documentation for the OI Server Manager contains descriptions of those universal functions/UI elements. Therefore, reading the documentation for both the MMC and the OI Server Manager is critical to understanding this user's guide. To read the documentation about the MMC and OI Server Manager, right-click the OI Server Manager icon and select the Help menu. Both the MMC Help and theCommunication Drivers Pack Help are displayed.

Supported Hardware and Software

This Communication Driver connects over UDP/IP to all devices that are fully compatible with the BACnet/IP protocol. Also, it supports the following application services:

Conformance

The following hardware and software was used for conformance testing of this Communication Driver:

Equipment:

1. Metasys Trane BCU
2. NAE (Johnson Controls)
3. SCADA Engine BACnet Simulator
4. Cable: Ethernet

Note: Since the testing procedures are based on a device simulator which does not support writing all type of addresses, we cannot guarantee writing support to all the BACnet objects.

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Chapter 2

Configuring the BACLITE Communication Driver

Working with the BACLITE Communication Driver Configuration

Each server instance has its own hierarchy of objects, and each object has parameters that you need to configure in order to establish communication between the Communication Driver and individual devices on the network.

You can view configuration hierarchy of a BACLITE server instance under its Configuration node.

This section only describes how to configure object parameters for a BACLITE server instance. For more general information about adding and configuring objects, see "Configuring Your Communication Driver " in the Communication Drivers Pack Help.

Adding and Configuring Channel Selector Objects

The server-specific configuration portion of the BACLITE Communication Driver hierarchy tree under the OI Server Manager starts at the Channel Selector object. This object lets you set server parameters for communication with agents (devices) in the hierarchy tree.

Adding Channel Selector Object

To add a Channel Selector object to your BACnet hierarchy

- In the console tree, right-click **Configuration** and then click **Add Channel Selector Connection**. The "New_ChannelSelector_000" object appears in the hierarchy.

Edit the object name to appropriately describe components of your specific hardware environment. If you do not rename the object at this time, a numeric sequencing system is applied. You can rename the hierarchy entry later.

Configuring Communication Settings of a Channel

Configure the communication settings for a selected channel to ensure uninterrupted communication with the device network.

Link Type

The specific interface or protocol to be used. The only option at this time is BACnet/IP.

Device UDP Port

The specific UDP/IP port to be used. The valid values range from 1 to 65535. If no port is specified, it will default to port 47808 (BAC0h).

Null Placeholder: Block Size

This is actually two settings separated by a colon (:).

The first setting, **Null Placeholder**, is the value that you use to represent NULL in write operations. For some properties like PRESENT-VALUE and DESCRIPTION, when this value is encountered in a write operation, a special NULL marker is sent to the device. For example, if you use -333 for NULL in your BACnet application, specify that value. There is no default value for this setting, so if you do not specify a value, the NULL marker will never be sent. (An empty string is not an acceptable placeholder value.)

The second setting, **Block Size**, is the number of objects that can be requested in each message. It is a way to limit the size of the messages transmitted. If you do not specify a value, the default value is 30.

Advanced

Click this button to open the **Advanced Settings** dialog box, which provides access to additional communication settings such as timeouts, retries, and buffer sizes. You might need to change these settings if the Communication Driver behaves unexpectedly during run time, but the default settings should work for most network configurations. For more information about these settings, see "Advanced Settings" in Communication Driver Core Help.

Adding and Configuring Device Selector Objects

The BACLITE Communication Driver can connect to PLCs. These connections are modeled in the hierarchy by means of Device Selector objects, each of which models the end-point of the communications path.

From the **ChannelSelector** branch of the Communication Driver hierarchy, create the new **DeviceSelector** object.

To add a Device Selector connection to your BACLITE hierarchy

1. In the console tree, right-click the **ChannelSelector** object, and then click **Add DeviceSelector Connection**. The **New_DeviceSelector_000** object and associated **Parameters** configuration view appear.
2. Rename the object as needed to reflect the connection.
3. Configure the **Station** field.

   For more information see Setting the Station ID of a Device.
4. Configure **Device Groups** and **Device Items**.

Setting the Station ID of a Device

Set the station ID for a selected device so that the Communication Driver can identify and communicate with it on the network.

Syntax

In most cases, if you are using the standard BACnet/IP protocol, the station ID for a target device should use the following syntax:

```
<subnet>:<device ID>
```

If you are on a restricted network or if the target device cannot be discovered on the network, the station ID for the device should use one of the following syntaxes:

```
<IP address>:<subnet>:<device ID>
```

```
<IP address>:<subnet>:<device ID>:<MAC address>
```

When the Communication Driver sends a broadcast message to discover BACnet devices on the network, it uses the subnet mask 255.255.255.0. If you have devices that are not on the same network using this mask, the Communication Driver will not be able to discover them. To resolve this issue, include the MAC address of the device in the station ID.

The following syntax diagram shows all of the possible options:

{ | IP address: }subnet:device ID{ | :MAC address }

where,

IP address: The specific IP address of the target device.

subnet: The BACnet/IP virtual network number. This should be a decimal value.

device ID: The specific ID number of the target device. This should be a decimal value.

MAC address: The specific MAC address of the target device. This should be a hexadecimal value of either one byte (e.g., B8) or six bytes (e.g., B8098AC14A1F) in length, depending on how your BACnet program and network gateway are configured. For the BACnet/IP protocol, the MAC address is typically six bytes.

If MAC address is not specified, device ID is automatically encoded as an equivalent, six-byte hexadecimal value and included in the network protocol data unit (NPDU). This value is low-bytes first and padded with zeroes. For example, if device ID is 1024 (0x400), the equivalent hexadecimal value is 000400000000.

If MAC address is specified, make sure the number of bytes (1 or 6) matches the Destination MAC Layer Address Length (i.e., the bacnet.dlen field) in your BACnet program.

Examples

Examples of valid station IDs:

12:2

1111:12

1234:32

192.168.110.101:1111:12

192.168.110.101:1234:32

192.168.110.101:1111:12:B8098AC14A1F

Device Group Definitions

Use the **Device Groups** configuration view, to create, add, delete, and define device groups. You can also configure default update intervals for the objects and edit update intervals in this dialog box. To open the **Device Groups** dialog box, in the **Device Selector** configuration editor, click the **Device Groups** tab.

Note: When you select another part of the Communication Driver tree hierarchy, you are prompted to save the modifications to the configuration set.

To create or add device groups

1. Right-click anywhere in the table, and then click **Add**. A device group is added with a default name and update interval.
2. Enter a unique name up to 32 characters long for the device group.

To delete device groups

1. Right-click the device group to be deleted, and then click **Delete**.
2. Read the warning, and then click **Yes**.

To edit device groups

Use the **Edit** option from the **Device Groups** tab only for configuring the unsolicited message handling of the Communication Driver.

To configure default update intervals

To configure a default update interval for the object, right-click in the **Device Groups** box and then click **Config Default Update Interval**.

To edit update intervals

To edit the update interval for an object, double-click its value in the **Update Interval** column and make the edits.

or

Right-click its value in the **Update Interval** column and then click **Modify Update** Interval.

The update interval is the frequency, in milliseconds, that the BACLITE Communication Driver acquires data from the topics associated with that device group.

Different topics can be polled at different rates from a PLC by defining multiple device group names for the same PLC and setting a different update interval for each device group.

Device Item Definitions

The device item name is an is an “alias” or a label for the data in the device. It is an alternative name for the item reference, and ca be used instead of the item reference when you create the client application. Device item configuration is optional, but is strongly recommended.

To create or add device items

1. Right-click anywhere in the table, and then click **Add**.
2. In the **Name** column, type a unique item name. The maximum is 32 characters.

3. In the corresponding line, double-click the **Item Reference** column and enter the correlated item reference for the name you created.

To rename device items

Right-click the device item to be renamed and click **Rename**. Make the changes.

To delete device items

Right-click the device item to be deleted from the list and click **Delete**.

To clear all device items

Right-click in the **Device Items** box and click **Clear All**. All the device items listed are cleared after you confirm their deletion.

NOTE: You can import a .csv file containing your item definitions to help streamline configuration. See "Exporting and Importing CSV Files" in the Communication Drivers Pack Help.

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Chapter 3

BACLITE Communication Driver Reference

Item Reference Syntax

Use item references to access data stored in memory registers in connected devices, as well as to access standard system items in the Communication Driver itself.

This section only describes the item reference syntax and options for the BACLITE server. For more general information about item references, see "Managing Device Items" and "Item Reference Descriptions" in the Communication Drivers Pack Help.

Item references in this Communication Driver use the following syntax.

We can communicate with a specific PLC object instance and property using the following syntax:

```
<type>:<instance>:<property>:[priority array]
```

The following syntax diagram shows address options:

```
register type :instance : property { | :priority array }
```

where,

register type: The type of the register. Valid types are AI, AO, AV, BI, BO, BV, DEV, MSI, MSO, MSV, SCH, LSP, LSZ, ACC, AVR, CAL, CMD, EVT, LOP, NOT, PRG, PC, GRP, FO and TL.

Instance: The instance of the specified register type.

Property: The property of the specified register type and instance.

Priority array: The priority for writing. If no value is specified, the default value is 16.

Address Descriptions

The address descriptions consist of the register type, its item name and the allowable range of values, the default data type, allowable suffixes (if any), and allowable access methods.

Analog Input (AI)

Supported properties of the Analog Input object (AI)

Property	Value Format	Example
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:00
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity
DEVICE-TYPE	Integer	5
STATUS-FLAGS	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Integer	0
UPDATE-INTERNAL	Integer	0
UNITS	Integer	0
MIN-PRES-VALUE	Integer	0
MAX-PRES-VALUE	Integer	0
RESOLUTION	Float	0.1
COV-INCREMENT	Integer	0
TIME-DELAY	Integer	0
NOTIFICATION-CLASS	Integer	0
HIGH-LIMIT	Integer	0

LOW-LIMIT	Integer	0
DEADBAND	Integer	0
LIMIT-ENABLE	2 Boolean values (1 = true, 0 = false) encoded as a string {lowLimitEnable, highLimitEnable}	1
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
ACKED-TRANSITIONS	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
NOTIFY-TYPE	Integer	1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-1970 11:0:0.0;2|1-1-1970 11:0:0.0;2|1-1-1970 11:0:0.0
PROFILE-NAME	String	123-AI

Analog Output (AO)

Supported properties of the Analog Output object (AO)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity
DEVICE-TYPE	Integer	5

STATUS-FLAGS	4 Boolean values (1=true,0=false) encoded as a string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Integer	0
UNITS	Integer	0
MIN-PRES-VALUE	Integer	0

MAX-PRES-VALUE	Integer	0
RESOLUTION	Real	0.1
PRIORITY-ARRAY RELINQUISH-DEFAULT	16 values separated by pipes (|) and encoded as string. Each value can be one of the following data types: NULL, real, binary, integer. For more information, see BACnetPriorityArray. Real	NULL|NULL|NULL|NULL|NULL|NULL|12|NULL| NULL|NULL|NULL|NULL|NULL|NULL|NULL|NULL|NULL|25.000000 12.3
COV-INCREMENT	Integer	0
TIME-DELAY	Integer	0
NOTIFICATION-CLASS	Integer	0

HIGH-LIMIT	Integer	0
LOW-LIMIT	Integer	0
DEADBAND	Integer	0
LIMIT-ENABLE	2 Boolean values (1=true,0=false) encoded as a string {lowLimitEnable, highLimitEnable}	01
EVENT-ENABLE	3 Boolean values (1=true,0=false) encoded as a string {to-offnormal, to- fault, to-normal}	101
Property	Value Format	Example

ACKED-TRANSITIONS	3 Boolean values (1=true,0=false) encoded as a string {to-offnormal, to- fault, to-normal}	101
NOTIFY-TYPE	Integer	1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0
PROFILE-NAME	String	Test

Analog Value (AV)

Supported properties of the Analog Value object (AV)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity

STATUS-FLAGS EVENT-STATE	4 Boolean values (1=true,0=false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE} Integer	1010 0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Integer	0
UNITS	Integer	0
PRIORITY-ARRAY	Sequence of 16 values separated by pipes (|) and encoded as a string. The type of these values can be one of the following (Null, real, binary, integer) . For more information, see BACnetPriorityArray.	NULL|NULL|NULL|NULL|NULL|NULL|12|NULL| NULL|NULL|NULL|NULL|NULL|NULL|NULL|25.000000
RELINQUISH-DEFAULT	Real	12.3
COV-INCREMENT	Integer	0
TIME-DELAY	Integer	0
NOTIFICATION-CLASS	Integer	0
HIGH-LIMIT	Integer	0
LOW-LIMIT	Integer	0
DEADBAND	Integer	0
Property	Value Format	Example
LIMIT-ENABLE	2 Boolean values (1 = true, 0 = false) encoded as a string {lowLimitEnable, highLimitEnable}	01

EVENT-ENABLE ACKED-TRANSITIONS	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal} 3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101 101
NOTIFY-TYPE	Integer	1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0
PROFILE-NAME	String	Test

Binary Input(BI)

Supported properties of the Binary Input object (BI)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Integer	123
DESCRIPTION	String	This sensor monitors the core activity
DEVICE-TYPE	Integer	5

STATUS-FLAGS EVENT-STATE	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE} Integer	1010 0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Integer	0
POLARITY	Integer(normal=0,reverse=1)	1
INACTIVE-TEXT	String	test
ACTIVE-TEXT	String	Test
CHANGE-OF-STATE-TIME	Date and Time separated by a space character and encoded as a string. For more information look at BACnetDateTime type in the Data Type section	23-8-20119:42:44.64
CHANGE-OF-STATE-COUNT	Unsigned Integer	33
TIME-OF-STATE-COUNT-RESET	Date and Time separated by a space character and encoded as a string. For more information look at BACnetDateTime type in the Data Type section	23-8-20119:42:44.64
ELAPSED-ACTIVE-TIME	Date and Time separated by a space character and encoded as a string. For more information look at BACnetDateTime type in the Data Type section.	23-8-2011 9:42:44.64
TIME-OF-ACTIVE-TIME-RESET	Date and Time separated by a space character and encoded as a string. For more information look at	23-8-20119:42:44.64

	BACnetDateTime type in the Data Type section.	
TIME-DELAY	Unsigned Integer	10
NOTIFICATION-CLASS	Integer	0
ALARM-VALUE	Integer	1
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
ACKED-TRANSITIONS NOTIFY-TYPE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal} Integer	101 1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2|1-1-197011:0:0.0;2|1-1-197011:0:0.0
PROFILE-NAME	String	Test

Binary Output (BO)

Supported properties of the Binary Output object (BO)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	1:0 temperatureSensor_core

OBJECT-TYPE	Integer	0
PRESENT-VALUE	Integer	123
DESCRIPTION	String	This sensor monitors the core activity
DEVICE-TYPE	Integer	5
STATUS-FLAGS	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Integer	0
POLARITY	Integer(normal=0,reverse=1)	1
INACTIVE-TEXT	String	test
ACTIVE-TEXT	String	Test
CHANGE-OF-STATE-TIME	Date and Time separated by a space character and	23-8-20119:42:44.64

	encoded as a string. For more information look at BACnetDateTime type in the Data Type section.	
CHANGE-OF-STATE-COUNT	UnsignedInteger	33
TIME-OF-STATE-COUNT-RESET	Date and Time separated by a space character and encoded as a string. For more information look at BACnetDateTime type in the Data Type section.	23-8-20119:42:44.64
ELAPSED-ACTIVE-TIME	Unsigned Integer	12
TIME-OF-ACTIVE-TIME-RESET	Date and Time separated by a space character and encoded as a string. For more information look at BACnetDateTime type in the Data Type section.	23-8-20119:42:44.64
MINIMUM-OFF-TIME	Integer	0
MINIMUM-ON-TIME	Integer	0
PRIORITY-ARRAY	Sequence of 16 values separated by pipes (|) and encoded as a string. The type of these values can be one of the following (Null, real, binary, integer). For more information, see BACnetPriorityArray	NULL|NULL|NULL|NULL| NULL|NULL|12|NULL| NULL| NULL|NULL|NULL|NULL| NULL|NULL|25.000000
RELINQUISH-DEFAULT	Real	12.3
TIME-DELAY	Integer	0
NOTIFICATION-CLASS	Integer	0
FEEDBACK-VALUE	Integer(inactive=0,active=1)	1
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101

ACKED-TRANSITIONS	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
NOTIFY-TYPE	Integer	1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0
PROFILE-NAME	String	Test

Binary Value (BV)

Supported properties of the Binary Value object (BV)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Integer	123
DESCRIPTION	String	This sensor monitors the core activity
STATUS-FLAGS	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Integer	0
INACTIVE-TEXT	String	test
ACTIVE-TEXT	String	Test
CHANGE-OF-STATE-TIME	Date and Time separated by a space character and encoded as a string. For more information look	23-8-20119:42:44.64

	at BACnetDateTime type in the Data Type section.	
CHANGE-OF-STATE-COUNT	Unsigned Integer	33
TIME-OF-STATE-COUNT-RESET	Date and Time separated by a space character and encoded as a string. For more information look at BACnetDateTime type in the Data Type section	23-8-20119:42:44.64
ELAPSED-ACTIVE-TIME	Unsigned Integer	12
TIME-OF-ACTIVE-TIME-RESET	Date and Time separated by a space character and encoded as a string. For more information look at BACnetDateTime type in the Data Type section.	23-8-20119:42:44.64
MINIMUM-OFF-TIME	Integer	0
MINIMUM-ON-TIME	Integer	0
PRIORITY-ARRAY	Sequence of 16 values separated by pipes (|) and encoded as a string. The type of these values can be one of the following (Null, real, binary, integer) . For more information, see BACnetPriorityArray	NULL|NULL|NULL|NULL|NULL|NULL|12|NULL| NULL|NULL|NULL|NULL|NULL|NULL|NULL|25.000000
RELINQUISH-DEFAULT	Real	12.3
TIME-DELAY	Integer	0
NOTIFICATION-CLASS	Integer	0
ALARM-VALUE	Integer	1
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
ACKED-TRANSITIONS NOTIFY-TYPE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal} Integer	101 1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2|1-1-197011:0:0.0;2|1-1-197011:0:0.0
PROFILE-NAME	String	Test

Multi-State Input (MSI)

Supported properties of the Multi-State Input object (MSI)

Property	Value Format	Example
OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	1:0 temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity
DEVICE-TYPE	Integer	5
STATUS-FLAGS	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Boolean	0
NUMBER-OF-STATES	Unsigned Integer	2
STATE-TEXT	String	test
TIME-DELAY	Integer	0
NOTIFICATION-CLASS	Integer	0
ALARM-VALUES FAULT-VALUES	List of unsigned integers separated by pipes (|) and encoded as a string List of unsigned integers separated by pipes (|) and encoded as a string	1|1|2 1|3
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101

ACKED-TRANSITIONS NOTIFY-TYPE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal} Integer	101 1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0
PROFILE-NAME	String	Test

Multi-State Output (MSO)

Supported properties of the Multi-State Output object (MSO)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	1:0 temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity
DEVICE-TYPE	Integer	5
STATUS-FLAGS	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Boolean	0
NUMBER-OF-STATES	Unsigned Integer	2
STATE-TEXT	String	test
PRIORITY-ARRAY	Sequence of 16 values separated by pipes (|) and encoded as a string. The type of these values can be one of the following (Null,	NULL|NULL|NULL|NULL| NULL|NULL|12|NULL| NULL| NULL|NULL|NULL|NULL| NULL|NULL|25.000000

	real, binary, integer) . For more information, see BACnetPriorityArray	
RELINQUISH-DEFAULT TIME-DELAY	Real Integer	12.3 0
NOTIFICATION-CLASS	Integer	0
FEEDBACK-VALUE	Integer(inactive=0,active=1)	1
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
ACKED-TRANSITIONS NOTIFY-TYPE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal} Integer	101 1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2|1-1-197011:0:0.0;2|1-1-197011:0:0.0
PROFILE-NAME	String	Test

Multi-State Value (MSV)

Supported properties of the Multi-State Value object (MSV)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	1:0 temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity
STATUS-FLAGS	4 Boolean values (1 = true, 0 = false) encoded as string	1010

	{IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Boolean	0
NUMBER-OF-STATES	Unsigned Integer	2
STATE-TEXT	String	test
PRIORITY-ARRAY	Sequence of 16 values separated by pipes (|) and encoded as a string. The type of these values can be one of the following (Null, real, binary, integer) . For more information, see BACnetPriorityArray	NULL|NULL|NULL|NULL|NULL|NULL|12|NULL| NULL|NULL|NULL|NULL|NULL|NULL|NULL|NULL|NULL|25.000000
RELINQUISH-DEFAULT TIME-DELAY	Real Integer	12.3 0
NOTIFICATION-CLASS	Integer	0
ALARM-VALUES	List of unsigned integers separated by pipes (|) and encoded as a string	1|1|2
FAULT-VALUES	List of unsigned integers separated by pipes (|) and encoded as a string	1|3
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
ACKED-TRANSITIONS NOTIFY-TYPE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal} Integer	101 1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2|1-1-197011:0:0.0;2|1-1-197011:0:0.0
PROFILE-NAME	String	Test

Schedule (SCH)

Supported properties of the Schedule object (SCH)

Property	Value Format	Example
OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	1:0 temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity
EFFECTIVE-PERIOD	String	
WEEKLY-SCHEDULE	String	
EXCEPTION-SCHEDULE	String	
SCHEDULE-DEFAULT LIST-OF-OBJECT-PROPERTY-REFERENCES	StringBacnetTypeAny String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY-INDEX (Optional)] | [DEVICE- IDENTIFIER (Optional)]; [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY-INDEX(Optional)] | [DEVICE-IDENTIFIER (Optional)];…	2:12(See Datatype table for more information) This property specifies the Device Identifiers, Object Identifiers and Property Identifiers of the properties to be written with specific values at specific times on specific days. For example: 29,4194303|29|786| 30,4194303; 29,4194303|29|786| 30,4194303…
PRIORITY-FOR-WRITING	Unsigned Integer	
STATUS-FLAGS RELIABILITY	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE} Integer	1010 0
OUT-OF-SERVICE	Boolean	0
PROFILE-NAME	String	Test

Device (DEV)

Supported properties of the Device object (DEV)

Property	Value Format	Example
OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	1:0 temperatureSensor_core
OBJECT-TYPE	Integer	0
SYSTEM-STATUS	Integer {operational (0), operational-read-only (1), download-required (2), download-in-progress (3), non-operational (4), backup-in-progress (5)}	4
VENDOR-NAME	String	TEST
VENDOR-IDENTIFIER	Integer	12
MODEL-NAME	String	TEST
FIRMWARE-REVISION	String	TEST
APLICATION-SOFTWARE-VERSION	String	test
LOCATION	String	test
DESCRIPTION	String	This sensor monitors the core activity
PROTOCOL-VERSION	Unsigned Integer	4
PROTOCOL-REVISION	Unsigned Integer	4
PROTOCOL-SERVICES-SUPPORTED	See Bacnet Services Supported	
PROTOCOL-OBJECT-TYPES-SUPPORTED	See Bacnet Services Supported	
PROFILE-NAME	String	Test

Life Safety Point (LSP)

Supported properties of the Life Safety Point object (LSP)

Property	Value Format	Example
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
TRACKING-VALUE DESCRIPTION	Float(0–23) String	Reflects the non-latched state of the Life Safety Point object. This sensor monitors the core activity
DEVICE-TYPE STATUS-FLAGS	String 4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	This is a text description of the physical device that the Life Safety Point object represents. 1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Boolean	0
MODE	UnsignedInteger(0–14)	Shall convey the desired operating mode for the Life Safety Point object
ACCEPTED-MODES TIME-DELAY	String Integer	Shall specify all values the Mode property accepts when written to using BACnet services. For example:10|20|30|40|… 0
NOTIFICATION-CLASS	Integer	0
LIFE-SAFETY-ALARM-VALUES	String	This property is required if intrinsic reporting is supported by this object
ALARM-VALUES	List of unsigned integers separated by	1|2|3

	pipes (|) and encoded as a string	
FAULT-VALUES	List of unsigned integers separated by pipes (|) and encoded as a string	1|2|3
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to-fault, to-normal}	101
ACKED-TRANSITIONS	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to-fault, to-normal}	101
NOTIFY-TYPE	Integer	1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2|1-1-197011:0:0.0;2|1-1-197011:0:0.0
SILENCED OPERATION-EXPECTED	Unsigned Integer(0–3) Unsigned Integer(0–9)	Indicates the silenced state. Specifies the next operation expected by this object to handle a specific life safety situation.
MAINTENANCE-REQUIRED SETTING	Unsigned Integer(0–3) Unsigned Integer	Indicates the type of maintenance required for the life safety point. Shall be used to convey the desired setting of the input(s) or process used to determine the logical state of the Present Value.
DIRECT-READING	Float	Indicates an analog quantity that reflects the measured or calculated reading from an initiating device.
UNITS	Integer	0
MEMBER-OF	List separated by pipes (|) and encoded as a string	Shall indicate those Life Safety Zone objects of which this Life Safety Point object is considered to be a zone member.

		For example: 0:1,0:2|0:3,0:4|0:5,0:6|…
PROFILE-NAME	String	test

Life Safety Zone (LSZ)

Supported properties of the Life Safety Zone object (LSZ)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
TRACKING-VALUE	Float(0–23)	Reflects the non-latched state of the Life Safety Point object
DESCRIPTION	String	This sensor monitors the core activity
DEVICE-TYPE	String	This is a text description of the physical device that the Life Safety Point object represents
STATUS-FLAGS	4 Boolean values(1=true,0=false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	1010
EVENT-STATE	Integer	0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Boolean	0
MODE	Integer(0–14)	Shall convey the desired operating mode for the Life Safety Point object
ACCEPTED-MODES TIME-DELAY	String Integer	Shall specify all values the Mode property accepts when written to using BACnet services.

		For example: 10|20|30|40|… 0
NOTIFICATION-CLASS	Integer	0
LIFE-SAFETY-ALARM-VALUES	String	This property is required if intrinsic reporting is supported by this object.
ALARM-VALUES	List of unsigned integers separated by pipes (|) and encoded as a string	1|2|3
FAULT-VALUES	List of unsigned integers separated by pipes (|) and encoded as a string	1|2|3
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal} 3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101
ACKED-TRANSITIONS		101
NOTIFY-TYPE	Integer	1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0
SILENCED	Unsigned Integer(0–3)	Indicates the silenced state.
OPERATION-EXPECTED	Unsigned Integer(0–9)	Specifies the next operation expected by this object to handle a specific life safety situation
MAINTENANCE-REQUIRED ZONE-MEMBERS	Unsigned Integer(0–3) List separated by pipes(|)and encoded as a string	Indicates the type of maintenance required for the life safety point. (0:1,0:2|0:3,0:4|0:5,0:6|...)
MEMBER-OF	List separated by pipes(|)and encoded as a string	Shall indicate those Life Safety Zone objects of which this Life Safety Point object is considered to be a zone member.

		For example: 0:1,0:2|0:3,0:4|0:5,0:6|…
PROFILE-NAME	String	test

Accumulator (ACC)

Supported properties of the Accumulator object (ACC)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	temperatureSensor_core
OBJECT-TYPE	Integer	0
PRESENT-VALUE	Float	123.2
DESCRIPTION	String	This sensor monitors the core activity For example: Description: Event Enrollment
DEVICE-TYPE	String	This read only property, of type BACnetEventType, indicates the type of event algorithm that is to be used to detect the occurrence of events and report to enrolled devices
STATUS-FLAGS EVENT-STATE	4 Boolean values (1=true,0=false) encoded as string4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE} Integer	1010 0
RELIABILITY	Integer	0
OUT-OF-SERVICE	Boolean	0
SCALE	Integer/Float/String	Indicates the conversion factor to be multiplied with the value of the

		Present Value property to provide a value in the units indicated by Units. For example:3.14
UNITS	String	0
PRESCALE	List of integers separated by semicolons (;) and encoded as a string	Presents the coefficients that are used for converting the pulse signals generated by the measuring instrument into the value displayed by Present Value For example:-3413;-1119
MAX-PRES-VALUE	Integer	0
VALUE-CHANGE-TIME	Timestamp encoded as a string	This read-only property, of type BACnetDateTime, shall be present if the Present_Value property is adjustable by writing to the Value Before Change or Value Set properties For example: 25-10-201315:39:23.27
VALUE-BEFORE-CHANGE	Integer	This property, of type Unsigned, indicates the value of the Present_Value property just prior to the most recent write to the Value Set or Value Before Change properties. For example:100
VALUE-SET	Integer	This property, of type Unsigned, indicates the value of the Present_Value property after the most recent write to the Value Set or Value Before Change properties. For example:786
PULSE-RATE	Integer	This property, of type Unsigned, shall indicate the number of input pulses received during the most recent period specified by Limit Monitoring Interval For example:0

HIGH-LIMIT	Integer	0
LIMIT-MONITORING-INTERVAL	Integer	This property, of type Unsigned, specifies the monitoring period in seconds for determining the value of Pulse Rate For example:500
NOTIFICATION-CLASS	Integer	0
TIME-DELAY	Integer	0
LIMIT-ENABLE EVENT-ENABLE	2 Boolean values (1 = true, 0 = false) encoded as a string {lowLimitEnable, highLimitEnable} 3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	01 101
ACKED-TRANSITIONS	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	101

NOTIFY-TYPE	Integer	1
EVENT-TIME-STAMPS	Sequence of time stamps encoded as a string	2|1-1-197011:0:0.0;2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0
PROFILE-NAME	String	test

Averaging (AVR)

Supported properties of the Averaging object (AVR)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	Averaging Object
OBJECT-TYPE	Integer	18
MINIMUM-VALUE	Float	Shall reflect the lowest value contained within the buffer window for the most recent 'Window Samples' samples. For example:1.0
MINIMUM-VALUE-TIMESTAMP	String [Date] | [Time] Float	Indicatesthe date and time at which the value stored in Minimum Value was sampled. For example:[1-1-1970][11:0:0.0]
AVERAGE-VALUE		Shall reflect the average value contained within the buffer

		window for the most recent 'Window Samples' samples For example:1.0
VARIANCE-VALUE	Float	Shall reflect the average value contained within the buffer window for the most recent 'Window Samples' samples. For example:1.0
MAXIMUM-VALUE	Float	Shall reflect the average value contained within the buffer window for the most recent 'Window Samples' samples For example:1.0
MAXIMUM-VALUE-TIMESTAMP DESCRIPTION	String [Date] | [Time] String	Indicates the date and time at which the value stored in Maximum Value was sampled For example:[1-1-1970][11:0:0.0] This sensor monitors the core activity For example:Averaging Object
ATTEMPTED-SAMPLES	Integer	Indicates the number of samples that have been attempted to be collected for the current window For example:0
VALID-SAMPLES	Integer	Indicates the number of samples that have been attempted to be collected for the current window. For example:0
OBJECT-PROPERTY-REFERENCE WINDOW-INTERVAL	String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY-INDEX (Optional)] | [DEVICE-IDENTIFIER (Optional)] Integer	Shall identify the object and property whose value is to be sampled during the 'Window Interval'. For example: 29,4194303|29|786|30,4194303 Shall indicate the period of time in seconds over which the minimum, maximum and average values are calculated. For example: 50

WINDOW-SAMPLES	Integer	Shall indicate the number of samples to be taken during the period of time specified by the 'Window Interval' property For example:10
PROFILE-NAME	String	Averaging Profile

Calendar (CAL)

Supported properties of the Calendar object (CAL)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	Calendar Object
OBJECT-TYPE	Integer	6
DESCRIPTION PRESENT-VALUE	String Boolean	This sensor monitors the core activity For example: Calendar Object Indicates the current value of the calendar. For example: 1 (TRUE) if the current date is in the Date List and 0 (FALSE) if it is not
DATE-LIST	String [DATE]|[DATE-RANGE]|[MONTH/ WEEK-OF-MOMTH/DAY-OF-WEEK]…	This property is a List of BACnetCalendarEntry, each of which is either an individual date (Date), range of dates (BACnetDateRange), or month/ week-of- month/day-of-week specification (BACnetWeekNDay). For example: 11-2-1981|30-1-2013,11-2-2013|12✓4✓21…
PROFILE-NAME	String	Calendar Profile

Command Object (CMD)

Supported properties of the Command Object

Property	**Value Format**	**Example**

OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	1:0 Object:Command
OBJECT-TYPE	Integer	6
DESCRIPTION	String	This sensor monitors the core activity For example:Description:Command
PRESENT-VALUE	Unsigned Integer	Indicates which action the Command object is to take or has already taken For example:3.
IN-PROCESS	Boolean	Shall be set to TRUE when a value is written to the Present Value property. This TRUE value indicates that the Command object has begun processing one of a set of action sequences. Once all of the writes have been attempted by the Command object, the In_Process property shall be set back to FALSE. For example:1/0.
ALL-WRITES-SUCCESSFUL	Boolean	Indicates the success or failure of the sequence of actions that are triggered when the Present Value property is written to For example:1/0.
ACTION	String [Device_Identifier(Optional)], [Object_Identifier], [Property_Identifier], [Property_Array_Index(Optional)], [Property_Value], [Priority(1..16)(Optional)], [Post_Delay(Optional)],	This property, of type BACnetARRAY of BACnetActionList, specifies an array of "action lists." For example: ,5:0,85,,0,,,1,0|8:1,5:2,85,0,5,4,3,0,1;,5:0,85,,0,,,1,0|…

	[Quit_On_Failure], [Write_Successful]| [Device_Identifier(Optional)], [Object_Identifier], [Property_Identifier], [Property_Array_Index(Optional)], [Property_Value], [Priority(1..16)(Optional)], [Post_Delay(Optional)], [Quit_On_Failure], [Write_Successful]; [Device_Identifier(Optional)], [Object_Identifier], [Property_Identifier], [Property_Array_Index(Optional)], [Property_Value], [Priority(1..16)(Optional)], [Post_Delay(Optional)], [Quit_On_Failure], [Write_Successful]|…	
ACTION-TEXT	String [CharacterString]|[CharacterString]|...	This property, of type BACnetARRAY of CharacterString, shall be used to indicate a text string description for each of the possible values of the Present Value property. For example: Item 0|Item 1|... .
PROFILE-NAME	String	Profile:Command

Event Enrollment (EVT)

Supported properties of the Event Enrollment object (EVT)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	1:0
OBJECT-NAME	String	Object:EventEnrollment
OBJECT-TYPE	Integer	9

DESCRIPTION EVENT-TYPE	String Integer [Enumerated - {CHANGE_OF_BITSTRING, CHANGE_OF_STATE,CHANGE_OF_VALUE, COMMAND_FAILURE, FLOATING_LIMIT, OUT_OF_RANGE, BUFFER_READY, CHANGE_OF_LIFE_SAFETY, EXTENDED}].	This sensor monitors the core activity For example: Description: Event Enrollment This read only property, of type BACnetEventType, indicates the type of event algorithm that is to be used to detect the occurrence of events and report to enrolled devices. For example: 0
NOTIFY-TYPE	Integer	This property, of type BACnetNotifyType, shall convey whether the notifications generated by the monitoring algorithm specified by the Event_Type property should be Events or Alarms. For example: 2
EVENT-PARAMETERS	String [Choice]|[Time-Delay]|[Bitmask]|[List-Of- Bitstring-Values]	The Event_Parameters property, of type BACnetEventParameter, determines the algorithm used to monitor the referenced object and provides the parameter values needed for this algorithm. For example: COB|10|10101010|10101010;10101010;10101010
OBJECT-PROPERTY-REFERENCE EVENT-STATE	String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY-INDEX (Optional)] | [DEVICE-IDENTIFIER (Optional)] Integer	This property, of type BACnetDeviceObjectPropertyReference, designates the particular object and property referenced by this Event Enrollment object. The algorithm specified by the Event_Type property is applied to the referenced property in order to determine the Event_State of the event. For example: 29,4194303|29|786|30,4194303 This property, of type BACnetEventState, contains the current state of the event. For example: 0

EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	This property, of type BACnetEventTransitionBits, conveys three flags that determine whether notifications are enabled for TO-OFFNORMAL, TO-FAULT, and TO-NORMAL transitions. For example: 101
ACKED-TRANSITIONS	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal,to-fault,to-normal}	This property, of type BACnetEventTransitionBits, shall convey three separate flags that each indicate whether the most recent TO-OFFNORMAL, TO-FAULT, or TO- NORMAL event transitions have been acknowledged, if acknowledgment is required for that transition. For example: 111
NOTIFICATION-CLASS	Integer	This property, of type Unsigned, implicitly references a Notification Class object in the device containing the Event Enrollment object. For example: 0
EVENT-TIME-STAMPS PROFILE-NAME	Sequence of time stamps encoded as a string String	This property, of type BACnetARRAY[3] of BACnetTimeStamp, shall convey the times of the last event notifications for TO-OFFNORMAL, TO- FAULT, and TO-NORMAL events, respectively. For example: 2|1-1-1970 11:0:0.0;2|1-1-1970 11:0:0.0;2|1-1-1970 11:0:0.0 Profile: Event Enrollment

Loop (LOP)

Supported properties of the Loop object (LOP)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String	12:0

	[ObjectNumber]: [Instance Number]	
OBJECT-NAME	String	Object: Loop
OBJECT-TYPE	Integer	12
PRESENT-VALUE	Float	This property indicates the current output value of the loop algorithm in units of the Output Units property For example:100
DESCRIPTION STATUS-FLAGS	String 4Booleanvalues(1=true,0=false)encodedasstring4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE}	This sensor monitors the core activity For example:Description:Loop This property, of type BACnetStatusFlags, represents four Boolean flags that indicate the general "health" of the loop For example:1101
EVENT-STATE	String	The Event State property, of type BACnetEventState, is included in order to provide a way to determine if this object has an active event state associated with it. For example:1.0
RELIABILITY OUT-OF-SERVICE	Integer Boolean	The Reliability property, of type BACnetReliability, provides an indication of whether the Present Value of the loop in question is reliable as far as the BACnet Device or operator can determine and, if not, why. For example: 1 The Out Of Service property, of type BOOLEAN, is an indication whether (TRUE) or not (FALSE) the algorithm this object represents is or is not in service. For example: 1
UPDATE-INTERVAL	Integer	This property, of type Unsigned, indicates the interval in milliseconds at which the loop

		algorithm updates the output (Present Value property). For example: 150
OUTPUT-UNITS	Integer	This property, of type BACnetEngineeringUnits, indicates the engineering units for the output (Present Value property) of this control loop. For example: 13
MANIPULATED-VARIABLE-REFERENCE	String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY- INDEX (Optional)]	This property is of type BACnetObjectPropertyReference. The output (Present Value) of the control loop is written to the object and property designated by the Manipulated Variable Reference. For example: 29,4194303|29|786
CONTROLLED-VARIABLE-REFERENCE	String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY- INDEX (Optional)] Float	This property is of type BACnetObjectPropertyReference. The Controlled Variable Reference identifies the property used to set the Controlled Variable Value property of the Loop object. For example: 29,4194303|29|786
CONTROLLED-VARIABLE-VALUE		This property, of type REAL, is the value of the property of the object referenced by the Controlled Variable Reference property. This control loop compares the Controlled Variable Value with the Setpoint to calculate the error. For example: 0
CONTROLLED-VARIABLE-UNITS SETPOINT-REFERENCE	Integer String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY-INDEX (Optional)] | [DEVICE-IDENTIFIER (Optional)]	This property, of type BACnetEngineeringUnits, indicates the engineering units for the Controlled Variable Value property of this object. For example: 2 This property, of type BACnetSetpointReference, is a list of references that has a length of

		zero or one. A length of zero indicates that the setpoint for this control loop is fixed and is contained in the Setpoint property. For example: 8,0|85|15
SETPOINT ACTION	Float Integer	This property, of type REAL, is the value of the loop setpoint or of the property of the object referenced by the Setpoint Reference, expressed in units of the Controlled Variable Units property. For example: 10 This property, of type BACnetAction, defines whether the loop is DIRECT or REVERSE acting. For example: 1
PROPORTIONAL-CONSTANT PROPORTIONAL-CONSTANT-UNITS	Float Integer	This property, of type REAL, is the value of the proportional gain parameter used by the loop algorithm. It may be used to represent any of the various forms of gain for the proportional control mode, such as overall gain, throttling range, or proportional band. For example: 5 This property, of type BACnetEngineeringUnits, indicates the engineering units of the Proportional Constant property of this object. For example: 2
INTEGRAL-CONSTANT	Float	This property, of type REAL, is the value of the integral gain parameter used by the loop algorithm. For example: 1.2
INTEGRAL-CONSTANT-UNITS	Integer	This property, of type BACnetEngineeringUnits,

		indicates the engineering units of the Integral Constant property of this object. For example: 3
DERIVATIVE-CONSTANT	Float	This property, of type REAL, is the value of the derivative gain parameter used by the loop algorithm. For example: 4.5
PRIORITY-FOR-WRITING	Integer	Loop objects may be used to control the commandable property of an object. This property, of type Unsigned, provides a priority to be used by the command prioritization mechanism. It identifies the particular priority slot in the Priority Array of the Controlled Variable Reference that is controlled by this loop. It shall have a value in the range 1-16 For example: 27
COV-INCREMENT	Float	This property, of type REAL, shall specify the minimum change in Present Value that will cause a COVNotification to be issued to subscriber COV-clients. This property is required if COV reporting is supported by this object. For example: 1.44
TIME-DELAY	Integer	This property, of type Unsigned, shall specify the minimum period of time in seconds that the difference between the Setpoint and the Controlled Variable Value (the Error) must remain outside the band defined by the Error Limit property before a TO-OFFNORMAL event is generated or within the same band before a TO-NORMAL event is generated. This property is required if

		intrinsic reporting is supported by this object. For example: 17
NOTIFICATION-CLASS	Integer	This property, of type Unsigned, shall specify the notification class to be used when handling and generating event notifications for this object. For example: 0
ERROR-LIMIT	Float	This property, of type REAL, shall convey the absolute magnitude that the difference between the Setpoint and Controlled Variable Value (the Error) must exceed before a TO-OFFNORMAL event is generated. For example: 5
EVENT-ENABLE	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	This property, of type BACnetEventTransitionBits, shall convey three flags that separately enable and disable reporting of TO-OFFNORMAL, TO-FAULT, and TO-NORMAL events. This property is required if intrinsic reporting is supported by this object.
ACKED-TRANSITIONS	3 Boolean values (1 = true, 0 = false) encoded as a string {to-offnormal, to- fault, to-normal}	This property, of type BACnetEventTransitionBits, shall convey three flags that separately indicate the receipt of acknowledgments for TO-OFFNORMAL, TO-FAULT, and TO-NORMAL events. For example: 111
NOTIFY-TYPE	Integer	This property, of type BACnetNotifyType, shall convey whether the notifications generated by the object should be Events or Alarms. This property is required if intrinsic reporting is supported by this object For example:21

EVENT-TIME-STAMPS PROFILE-NAME	Sequence of time stamps encoded as a string String	This optional property, of type BACnetARRAY[3] of BACnetTimeStamp, shall convey the times of the last event notifications for TO-OFFNORMAL, TO- FAULT, and TO-NORMAL events, respectively. For example: 2|1-1-1970 11:0:0.0;2|1-1-1970 11:0:0.0;2|1-1-1970 11:0:0.0 Profile: Loop

Notification (NOT)

The supported properties of the Notification object (NOT) are as below:

Property	Value Format	Example
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	15:0
OBJECT-NAME	String	ObjectName:NotificationClass
OBJECT-TYPE	Integer	15
DESCRIPTION NOTIFICATION-CLASS	String Integer	This sensor monitors the core activity For example:Description:NotificationClass This property, of type Unsigned, shall indicate the numeric value of this notification class and shall be equal to the instance number of the Notification Class object. For example: 0
PRIORITY	String	This property, of type BACnetARRAY[3] of Unsigned, shall convey the priority to be used for event notifications for TOOFFNORMAL, TO- FAULT, and TO-NORMAL events, respectively. For example: 1|0|1
ACK-REQUIRED	String	This property, of type BACnetEventTransitionBits, shall convey three separate flags that represent whether acknowledgment

		shall be required in notifications generated for TO-OFFNORMAL, TO-FAULT, and TO-NORMAL event transitions, respectively. For example: 110
RECIPIENT-LIST	String	This property, of type List of BACnetDestination, shall convey a list of one or more recipient destinations to which notifications shall be sent when event-initiating objects using this class detect the occurrence of an event. For example: 1111000|15:21:35.0 0:0:0.0| 1,0,88 |0|0|010;1111000|0:0:0.0 0:0:0.0|0,0,0|0| 0|111;1111000|0:0:0.0 0:0:0.0|1,1,99 |0|0|111…
PROFILE-NAME	String	Profile Name:Notification Class

Program (PRG)

Supported properties of the Program object (PRG)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	16:0
OBJECT-NAME	String	ObjectName:Program Object Type(PRG)
OBJECT-TYPE	Integer	16
PROGRAM-STATE PROGRAM-CHANGE	Integer • 0-IDLE • 1-LOADING • 2-RUNNING • 3-WAITING • 4-HALTED • 5-UNLOADING Integer	This property, of type BACnetProgramState, reflects the current logical state of the process executing the application program this object represents. This property is Read-Only. For example: 3 This property, of type BACnetProgramRequest, is used to request changes to the operating

	• 0-READY • 1-LOAD • 2-RUN • 3-HALT • 4-RESTART • 5-UNLOAD	state of the process this object represents. The Program Change property provides one means for changing the operating state of this process. For example: 4
REASON-FOR-HALT	Integer • 0-NORMAL • 1-LOADFAILED • 2-INTERNAL • 3-PROGRAM • 4-OTHER	If the process executing the application program this object represents encounters any type of error that causes process execution to be halted, then this property shall reflect the reason why the process was halted. The Reason For Halt property shall be an enumerated type called BACnetProgramError. For example: 1
DESCRIPTION-OF-HALT	String	This property is a character string that may be used to describe the reason why a program has been halted. For example: ProgramA Halt
PROGRAM-LOCATION	String	This property is a character string that may be used by the application program to indicate its location within the program code, for example, a line number or program label or section name. The content of this string is a local matter. For example: ProgramA
DESCRIPTION	String	This property is a string of printable characters that may be used to describe the application being carried out by this process or other locally desired descriptive information. For example: Description: Program Object Type (PRG)
INSTANCE-OF	String	This property is a character string that is the local name of the

		application program being executed by this process. The content of this string is a local matter. For example: Program Object Type (PRG) Instance
STATUS-FLAGS	4 Boolean values (1=true,0=false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE} Integer	This property, of type BACnetStatusFlags, represents four Boolean flags that indicate the general "health" of the program. For example: 1010
RELIABILITY		The Reliability property, of type BACnetReliability, provides an indication of whether the application- specific properties of the program object or the process executing the application program are "reliable" as far as the BACnet Device can determine and, if not, why. For example: 9
OUT-OF-SERVICE	Boolean	The Out Of Service property, of type BOOLEAN, is an indication whether (TRUE) or not (FALSE) the process this object represents is not in service. For example: 1
PROFILE-NAME	String	Profile Name: Program Object Type (PRG)

Pulse Converter (PC)

Supported properties of the Pulse Converter object (PC)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	24:0
OBJECT-NAME	String	ObjectName:Pulse Converter Object Type(PC)
OBJECT-TYPE	Integer	24

DESCRIPTION	String	Description: Pulse Converter Object Type (PC)
INPUT-REFERENCE	String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY- INDEX (Optional)]	This optional property, of type BACnetObjectPropertyReference , indicates the object and property (typically an Accumulator object's Present Value property) representing the actual physical input that is to be measured and presented by the Pulse Converter object. For example: 29,4194303|29|786
PRESENT-VALUE	Float	This property, of type REAL, indicates the accumulated value of the input being measured. It is computed by multiplying the current value of the Count property by the value of the Scale Factor property For example:100
STATUS-FLAGS EVENT-STATE	4 Boolean values (1 = true, 0 = false) encoded as string {IN_ALARM, FAULT, OVERRIDDEN, OUT_OF_SERVICE} Integer	This property, of type BACnetStatusFlags, represents four Boolean flags that indicate the general "health" of a Pulse Converter. For example: 1101 The Event State property, of type BACnetEventState, is included in order to provide a way to determine if this object has an active event state associated with it. If the object supports intrinsic reporting, then the Event State property shall indicate the event state of the object. For example: 1
RELIABILITY OUT-OF-SERVICE	Integer Boolean	The Reliability property, of type BACnetReliability, provides an indication of whether the Present Value and/or Count

		properties or the operation of the physical input in question is "reliable" as far as the BACnet Device or operator can determine and, if not, why. For example: 5 The Out Of Service property, of type BOOLEAN, is an indication whether (TRUE) or not (FALSE) the input that the object directly represents, if any, is not in service. For example: 1
UNITS	Integer	This property, of type BACnetEngineeringUnits, indicates the measurement units of the Present Value property. See the BACnetEngineeringUnits ASN.1 production in Clause 21 for a list of engineering units defined by this standard. For example: 7
SCALE-FACTOR ADJUST-VALUE	Float Float	This property, of type BACnetStatusFlags, represents four Boolean flags that indicate the general "health" of a Pulse Converter. For example: 1101 The Event State property, of type BACnetEventState, is included in order to provide a way to determine if this object has an active event state associated with it. If the object supports intrinsic reporting, then the Event State property shall indicate the event state of the object. For example: 1
COUNT	Integer	This read-only property, of type Unsigned, indicates the count of the input pulses as acquired from the physical input or the

		property referenced by the Input Reference property. For example: 20
UPDATE-TIME	String	This read-only property, of type BACnetDateTime, reflects the date and time of the most recent change to the Count property as a result of input pulse accumulation and is updated atomically with the Count property. If no such change has yet occurred, this property shall have wildcard values for all date and time fields. For example: 29-5-2014 17:6:24.78
COUNT-CHANGE-TIME	String	This read-only property, of type BACnetDateTime, represents the date and time of the most recent occurrence of a write to the Adjust Value property. If no such write has yet occurred, this property shall have wildcard values for all date and time fields. For example: 29-5-2014 17:6:24.78
COUNT-BEFORE-CHANGE	Integer Float	This property, of type Unsigned, indicates the value of the Count property just prior to the most recent write to the Adjust Value properties. If no such write has yet occurred, this property shall have the value zero. For example: 0
COV-INCREMENT		This property, of type REAL, shall specify the minimum change in Present Value that will cause a COV notification to be issued to subscriber COV-clients. This property is required if COV reporting is supported by this object. For example: 30

NOTIFICATION-CLASS	Integer	This property, of type Unsigned, shall specify the notification class to be used when handling and generating event notifications for this object. For example: 25
LOW-LIMIT DEADBAND	Float Float	This property,of type REAL, shall specify a limit below which the Present Value must fall before an event is generated.This property is required if intrinsic reporting is supported by this object. For example:60 This property, of type REAL,shall specify a range between the HighLimit and LowLimit properties,which the Present Value must remain within for a TO- NORMAL event to be generated under these conditions: ▪ the Present Value must fall below the HighLimit minus Deadband,and ▪ the Present Value must exceed the LowLimit plus the Deadband,and ▪ the Present Value must remain within this range for a minimum period of time, specified in the Time Delay property,and

		▪ either the HighLimitEnable or LowLimitEnable flag must be set in the LimitEnable property,and the TO-NORMAL flag must be set in the EventEnable property This property is required if intrinsic reporting is supported by this object. For example:40
LIMIT-ENABLE	2 Boolean values(1=true,0=false) encoded as a string {lowLimitEnable, highLimitEnable}	This property, of type BACnetLimitEnable, shall convey two flags that separately enable and disable reporting of high limit and low limit offnormal events and their return to normal. This property is required if intrinsic reporting is supported by this object. For example: 10

EVENT-ENABLE ACKED-TRANSITIONS	3 Boolean values(1=true,0=false) encoded as a string {to-offnormal, to- fault, to-normal} 3 Boolean values (1=true,0=false) encoded as a string {to-offnormal, to- fault, to-normal}	This property, of type BACnetEventTransitionBits, shall convey three flags that separately enable and disable reporting of TO-OFFNORMAL, TO-FAULT, and TO- NORMAL events. In the context of Pulse Converter objects, transitions to the High Limit or Low Limit Event States are considered to be "offnormal" events. This property is required if intrinsic reporting is supported by this object. For example: 101 This property, of type BACnetEventTransitionBits, shall convey three flags that separately indicate the receipt of acknowledgements for TO-OFFNORMAL, TO-FAULT, and TO-NORMAL events. For example: 111

NOTIFY-TYPE EVENT-TIME-STAMPS	Integer Sequence of time stamps encoded as a string	This property, of type BACnetNotifyType, shall convey whether the notifications generated by the object should be Events or Alarms. This property is required if intrinsic reporting is supported by this object. For example: 2 This optional property, of type BACnetARRAY[3] of BACnetTimeStamp, shall convey the times of the last event notifications for TO-OFFNORMAL, TO- FAULT, and TO-NORMAL events, respectively. For example: 2|1-1-1970 11:0:0.0;2| 1-1-1970 11:0:0.0;2|1-1-1970 11:0:0.0
PROFILE-NAME	String	Profile Name: Pulse Converter Object Type (PC)

Group (GRP)

Supported properties of the Group object (GRP)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER OBJECT-NAME	String [ObjectNumber]: [Instance Number] String	11:0 ObjectName:GroupObject Type(GRP)
OBJECT-TYPE	Integer	11
DESCRIPTION	String	Description:GroupObjectType(GRP)

LIST-OF-GROUP-MEMBERS	String [OBJECT-IDENTIFIER]- [LIST-OF-PROPERTY- REFERENCES (Optional)]|…	This property is a list of one or more read access specifications, which defines the members of the group that shall be referenced when this object is specified in a protocol transaction. Each read access specification shall consist of two parts: 1) an Object Identifier and 2) a List Of Property References. For example: 0:0-0:10,0,0|0:0|0:0|0:0-0:10,5:25,0|0:0|0:0-2:30,3:30
PRESENT-VALUE PROFILE-NAME	String [OBJECT-IDENTIFIER]-[LIST- OF-RESULTS (Optional)]|… String	This property is a list that contains the values of all the properties specified in the List Of Group Members. This is a "read only" property; it cannot be used to write a set of values to the members of the group. For example: 0:0-0:10'2'50,0:111,0:111|0:0|0:0|0:0-0:10'2'50,5:25'2'32,0:111|0:0|0:0-2:30'2'32,3:30'2'32 Profile Name: Group Object Type (GRP)

File (FO)

Supported properties of the File object (FO)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String [ObjectNumber]: [Instance Number]	10:0
OBJECT-NAME	String	ObjectName:FileObject Type (FO)
OBJECT-TYPE	Integer	10
DESCRIPTION	String	Description:FileObjectType(FO)
FILE-TYPE FILE-SIZE	String Integer	This property, of type CharacterString,identifies the intended use of this file. For example:JPEG

		This property, of type Unsigned, indicates the size of the file data in octets. For example:-1
MODIFICATION-DATE	String	This property, of type BACnetDateTime,indicates the last time this object was modified.A File object shall be considered modified when it is created or written to. For example:29-5-201417:6:24.78
ARCHIVE	Boolean	This property,of type BOOLEAN,indicates whether the File object has been saved for historical or backup purposes. For example:1
READ-ONLY	Boolean	This property, of type BOOLEAN, indicates whether (FALSE) or not (TRUE) the file data may be changed through the use of a BACnet AtomicWriteFile service. For example:0
FILE-ACCESS-METHOD	Integer	This property, of type BACnetFileAccessMethod, indicates the type(s) of file access supported for this object. The possible values for File_Access_Method are: {RECORD_ACCESS, STREAM_ACCESS}. For example: 1
RECORD-COUNT	Integer	This property, of type Unsigned, indicates the size of the file data in records. For example:0
PROFILE-NAME	String	Profile Name:File Object Type (FO)

TrendLog(TL)

Supported properties of the Trend Log object (TL)

Property	**Value Format**	**Example**
OBJECT-IDENTIFIER	String	20:4194302

OBJECT-NAME	[ObjectNumber]: [Instance Number] String	ObjectName:TrendLogObject Type (TL)
OBJECT-TYPE	Integer	20
DESCRIPTION	String	Description:TrendLogObject Type(TL)
LOG-ENABLE	Boolean	This property,of type BOOLEAN, indicates and controls whether (TRUE) or not (FALSE) logging is enabled. For example:1
START-TIME	String	This property, of type BACnetDateTime, specifies the date and time at or after which logging shall be enabled by this property. For example:29-5-201417:6:24.78
STOP-TIME LOG-DEVICE-OBJECT-PROPERTY	String String [OBJECT-IDENTIFIER] | [PROPERTY-IDENTIFIER] | [PROPERTY-ARRAY-INDEX (Optional)] | [DEVICE-IDENTIFIER (Optional)]	This property, of type BACnetDateTime, specifies the date and time at or after which logging shall be disabled by this property. For example:29-5-201417:6:24.78 This property, of type BACnetDeviceObjectPropertyReference, specifies the Device Identifier, Object Identifier and Property Identifier of the property to be trend logged For example:29,4194303|29|786|30,4194303
LOG-INTERVAL COV-RESUBSCRIPTION-INTERVAL	Unsigned Integer Unsigned Integer	This property, of type Unsigned, specifies the periodic interval in hundredths of seconds for which the referenced property is to be logged For example:100 If the Trend Log is acquiring data from a remote device by COV

		subscription, this property, of type Unsigned, specifies the number of seconds between COV resubscriptions, provided that COV subscription is in effect For example:300
CLIENT-COV-INCREMENT	Float	If the Trend Log is acquiring COV data, this property, of type BACnetClientCOV, specifies the increment to be used in determining that a change of value has occurred. For example:1.44
STOP-WHEN-FULL	Boolean	This property, of type BOOLEAN, specifies whether (TRUE) or not (FALSE) logging should cease when the buffer is full. When logging ceases, Log Enable shall be set FALSE For example:1
BUFFER-SIZE	Unsigned Integer32	This property, of type Unsigned32, shall specify the maximum number of records the buffer may hold. If writable, it may not be written when Log Enable is TRUE. The disposition of existing records when Buffer Size is written is a local matter For example:20
RECORD-COUNT	Unsigned Integer32	This property, of type Unsigned32, shall represent the number of records currently resident in the log buffer. A write of the value zero to this property shall cause all records in the log buffer to be deleted and Records. Since Notification to be reset to zero. Upon completion, this event shall be reported in the log as the initial entry For example:20
TOTAL-RECORD-COUNT	Unsigned Integer32	This property, of type Unsigned32, shall represent the

		total number of records collected by the Trend Log object since creation. For example:72
NOTIFICATION-THRESHOLD	Unsigned Integer32	This property, of type Unsigned32, shall specify the value of Records Since Notification at which notification occurs. This property is required if intrinsic reporting is supported by this object. For example:100
RECORDS-SINCE-NOTIFICATION	Unsigned Integer32	This property, of type Unsigned32, represents the number of records collected since the previous notification, or since the beginning of logging if no previous notification has occurred. This property is required if intrinsic reporting is supported by this object. For example:72
LAST-NOTIFY-RECORD	Unsigned Integer32	This property, of type Unsigned32, represents the SequenceNumber associated with the most recently collected record whose collection triggered a notification. For example:0
EVENT-STATE	Integer	The Event State property, of type BACnetEventState, is included in order to provide a way to determine if this object has an active event state associated with it For example:0
NOTIFICATION-CLASS	Unsigned Integer	This property, of type Unsigned, shall specify the notification class to be used when handling and generating event notifications for this object. For example:0

EVENT-ENABLE	3 Boolean values (1=true,0=false) encoded as a string {to-offnormal, to- fault, to-normal}	This property, of type BACnetEventTransitionBits, shall convey three flags that separately enable and disable reporting of TO-FAULT and TO-NORMAL events. For example:010
ACKED-TRANSITIONS NOTIFY-TYPE	3Booleanvalues(1=true,0=false)encodedasastring {to-offnormal, to- fault, to-normal} Integer	This property, of type BACnetEventTransitionBits, shall convey three flags that separately indicate the receipt of acknowledgments for TO-OFFNORMAL, TO-FAULT and TO-NORMAL events For example:111 This property, of type BACnetNotifyType, shall convey whether the notifications generated by the object should be Events or Alarms. This property is required if intrinsic reporting is supported by this object. For example:2
EVENT-TIME-STAMPS PROFILE-NAME	Sequence of time stamps encoded as a string String	This optional property, of type BACnetARRAY [3] of BACnetTimeStamp, shall convey the times of the last event notifications for TO-OFFNORMAL, TO- FAULT, and TO-NORMAL events, respectively. For example:2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0;2| 1-1-197011:0:0.0 Profile Name:Trend Log Object Type(TL)

Note: This Communication Driver supports Read-Property-Multiple, Read-Property-Single, and Write-Property-Single application services.

Supported Data Types

The data type is specified as a suffix in the item syntax. This Communication Driver supports the following data types.

Enumerations

The enumerations are associated with textual values on the properties that use this data type. This Communication Driver returns the numeric value of these enumerations on the tags used to read them. The following enumerations are currently used. The BACnetEngineeringUnits enumeration is also used, on the UNITS property.

Enumeration	**Values**
BACnetEventState	• normal(0) • fault(1) • offnormal(2) • high-limit(3) • low-limit(4) • life-safety-alarm(5)
BACnetNotifyType	• alarm(0) • event(1) • ack-notification(2)
BACnetPolarity	• normal(0) • reverse(1)
BACnetBinaryPV	• inactive(0) • active(1)
Tag Number	• NULL(0) • Boolean(1) • Unsigned Integer(2) • Integer(3) • Real(4) • String(7) • Enumerated(9)

Dates

On this Communication Driver, single dates are always represented as a 3-part string with the following format

DD-MM-YYYY

where,

DD: is the number of the day (1 to 31)

MM: is the month number (1 to 12)

YYYY: is the year (1900 to 2154)

Dates might be composed to form ranges, and/or with times form a specific moment or range. Using values outside of the ranges specified here will produce unspecified behavior.

Times

On this Communication Driver, single times are always represented as a 4-part string with the following format:

HH:MM:SS.HS

where,

HH: hour (0 to 23)

MM: minute (0 to 59)

SS: isecond (0 to 59)

HS: hundredth of a second (0 to 99)

Dates might be composed to form ranges, and/ or with times form a specific moment or range. Using values outside of the ranges specified here will produce unspecified behavior.

Schedule Object

The schedule object has special properties that demand further explanations on its syntax. The effective period, weekly schedule and exception schedule are these properties, combining dates and times on ranges and periods.

Effective Period:

The tag must have a value complying to the following syntax:

<start date>|<end date>

where,

<start date>|<end date> is a date as specified before, on the data types section. As the effective period property implies a period, two dates must be supplied, separated by the | (pipe) character.

For example a period starting at Apr/12/2010 and ending at May/14/2010 shall be:

12-4-2010|14-5-2010

Weekly Schedule:

The weekly schedule is used to specify times and values for specific days. This property combines times with enumerations for types and values, onto an array of 7 elements (corresponding to the 7 days of a week). Each element of the array may also have multiple times. Starting with a single time instance, the following syntax is used:

<time instance> = <time>,<type>,<value>

where,

time: time as specified on data types section

type: one of the elements of the Tag Number enumeration

value: the value of <type> associated with this time

A single day may contain zero or more time instances. Those are divided by a semi-colon character, forming a daily schedule element:

<daily schedule> = [<time instance>;<time instance>;...]

This syntax means that each day might have any number of time configurations on the schedule, using a semi-colon to separate them. The following example clarifies this syntax:

Time 12h 25m 32s 500ms Type: Boolean(1) Value: True (1)

Value for the day: 12:25:32.50,1,1

Time 13h 40m 3s 20ms Type: Boolean (1) Value: False(0)

Value for the day: 13:40:3.2,1,0

It is important to notice that the above example was only for one day but it is necessary to specify the seven days even though some of them may not be defined. So, the complete syntax of a weekly-schedule is:

<monday>|<tuesday>|<wednesday>|<thursday>|<friday>|<saturday>|<sunday>|

Example:

The complete and valid value for the weekly-schedule:

12:34:56.99,4,5.12;22:10:0.0,2,135|||4:5:12.0,1,1|||1:2:3.4,7,sample string

In this example we have the seven days, with schedules for Monday, Thursday and Sunday, summarized on the table:

Day of Week	Time of Day	Type	Value
Monday	34:57.0	4 (Real)	5.12
Monday	10:00.0	2 (Uint)	135
Thursday	05:12.0	1 (Boolean)	TRUE
Sunday	02:03.4	7 (String)	sample string

The value configured on the schedule will be read on the PRESENT-VALUE address of the object on its time of activity.

Exception Scheduler

The Exception Scheduler values are built with a sequence of groups. Each group is composed of a date, a list of time and values and a priority value. The list of time_value are separated by a comma (,), whereas the parts of the group are separated by a semi-colon (;) character:

<group> = <date>;[<time_value>,< time_value>,...];<priority>

Notice that <date> syntax is specified on the data types section and the priority is an unsigned integer number. The <time_value> is composed of a time and a value separated by (/) . The value is composed of a datatype number (see datatype table) and a value separated by (:).

Example of a time 10:15:30.50.

Example of a value like unsigned integer 10 will be 2:10 (2 is the datatype number of the unsigned integer)Now the time_value for this will be 10:15:30.50/2:10

The first group differs from the others only by the date part:

<first group> = <start date>,<end date>;[<time_value>,<time_value>,...];<priority>

The complete syntax of the exception scheduler is composed of the first group and zero or more groups, divided by the | (pipe) character:

<first group>[|<group>|<group>|<group>...]

Example of an exception scheduler with one group:

26-02-2013;12:1:2.0/2:10;0

Example of a more complex exception scheduler with two groups:

6-2-2013;12:1:2.0/2:10;0|0-0-1900;0:0:0.0/0:NULL,0:0:0.0/1:0,0:0:0.0/7:BacneTest;0

Example of an exception scheduler with starting & ending date with one group:

16-11-2013,29-11-2013;3:10:0.0/1:1,11:0:0.0/1:0,14:50:0.0/1:1,23:59:59.0/1:0;2|

DataType Table

DataType Number	DataType Description	Example of usage with value
0	NULL	0:NULL
1	Boolean	1:1 (1 is true, 0 is false)
2	Unsigned	2:45
3	Signed	3:-34
4	Real	4:5.6
5	Double	5:5666
6	Octect String	6:12 23 34
7	String	7:Test
8	Bit String	8:10101010
9	Enumerated	9:1
10	Date	10:21-01-2013
11	Time	11:12:12:12.5
12	Object Identifier	12:1:1

		1:1 (analog output,instance 1) See table ObjectIdentifier definitions.

Object Identifier Definitions Reference

Object	**Identifier**
ACCUMULATOR	23
ANALOG_INPUT	0
ANALOG_OUTPUT	1
ANALOG_VALUE	2
AVERAGING	18
BINARY_INPUT	3
BINARY_OUTPUT	4
BINARY_VALUE	5
CALENDAR COMMAND	6 7
DEVICE	8
EVENT_ENROLLMENT	9
FILE	10
GROUP	11
LIFE_SAFETY_POINT	21
LIFE_SAFETY_ZONE	22
LOOP	12
MULTI_STATE_INPUT	13
MULTI_STATE_OUTPUT	14
MULTI_STATE_VALUE	19
NOTIFICATION_CLASS	15
PROGRAM	16
PULSE_CONVERTER	24
SCHEDULE	17
TREND_LOG	20

BACnetPriorityArray

The BacnetPriorityArray data type is represented as an array of 16 priority values. This Communication Driver supports NULL values and unsigned values on these fields.To write on a priority array data type you must write a Present-Value specifying the priority. The read operations can be performed directly on the property of this type.

The format for displaying this datatype is:

`<Value for Priority1>|< Value for Priority2>|< Value for Priority3>|. . .|< Value for Priority16>`

Example:

5|1|30|0|0|0|0|0|0|0|0|0|0|0|0|0

The meaning of each priority level is described on the table below.

Priority Level	**Application**
1	Manual-Life Safety
2	Automatic-Life Safety
3	Available
4	Available
5	Critical Equipment Control
6	Minimum On/Off
7	Available
8	Manual Operator
9	Available
10	Available
11	Available
12	Available
13	Available
14	Available
15	Available
16	Available

BACnetDateTime

The BacnetDateTime is represented as an date and a time, following this format:

dd-mm-yyyy hh:mm:ss.ms

Example:

12-12-2012 12:12:12.4

Examples of Item References

These are examples of valid item references for this Communication Driver. For more information about the referenced addresses, see the manufacturer's documentation for your device.

Device Address	**Item Reference**
AnalogInput0,ObjectName	AI:0:OBJECT-NAME
AnalogInput0,Present Value AnalogInput5,Present Value	AI:0:PRESENT-VALUE AI:5:PRESENT-VALUE
AnalogValue10,Description	AV:10:DESCRIPTION
Schedule1,Weekly	SCH:1:WEEKLY-SCHEDULE

Chapter 4

Troubleshooting the BACLITE Communication Driver

BACLITE Communication Driver Error Codes

The following tables describe the additional error codes that you might receive when poll/poke requests and operations fail.

Code	Description	Possible causes	Solution
0	OK	Communication without problems.	None.
1	Invalid operation	Invalid item reference.	Check the item reference.
2	Malformed packet	• Disconnected cables. • PLC is turned off, in stop mode, or in error mode. • Wrong station number.	• Check cable wiring. • Check PLC state. It must be RUN. • Check station number..
3 4	Wrong link Could not create receiver sink	Wrong link setting on the driver settings station Restart the driver.	Check the driver settings station Restart the driver.
5	Termination error	• Wrong station number. • Invalid value in Station field.	• Check the station number. • Check the Station field configuration.

6	Unsupported BVLL function	Disconnected cables. PLC turned off, or in Stop or Error mode. Wrong station number	Check the cable wiring Check the PLC state (it must be RUN) Check the station number
8	Unknown APDU type	Invalid request.	Use a different BACnet application service.
9	Object not found	The requested object is not found on the device.	Check on the device if the object exists.
10	Invalid station on driver settings	The format of the station is incorrect.	See the section of station to learn how to validate the station.
11	Invalid MAC on driver settings	The MAC specified on the driver settings is invalid.	
12	Invalid UDP Port on driver settings	Port number is invalid.	Check the port number of the driver.
13	Device is unavailable	Device is not accessible.	Check the device status.
14	Unknown object	The object does not exists.	Check the objects on the device.
15	Unknown property	The property does not exists.	Check the properties on the device.

16	Write denied	You are not allowed to write on the property	Check the property is it is really writable.
17	Write error	Error while writing.	Check the device status
18	Invalid format	The value typed is invalid.	Check the format of the value typed.
0	OK	Communicating without error.	None required.
-15	Timeout waiting for message to start	• Disconnected cables. • PLC is turned off, in stop mode, or in error mode. • Wrong station number. • Wrong parity (for serial communication). • Wrong RTS/CTS configuration (for serial communication).	• Check cable wiring. • Check the PLC mode — it must be RUN. • Check the station number. • Increase the timeout in the driver's advanced settings • Check the RTS/CTS configuration (for serial communication).