BACnet/IP Driver

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BACnet/IP Driver

Help version 1.069

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Overview

The BACnet/IP Driver provides a reliable way to connect BACnet/IP devices to OPC Client applications, including HMI, SCADA, Historian, MES, ERP, and countless custom applications. It provides connectivity to equipment using the BACnet protocol over Ethernet (which is often referred to as "BACnet" or "Annex J").

BACnet Resources

The official BACnet specification, *ANSI/ASHRAE Standard 135-2012 BACnet A Data Communication Protocol for Building Automation and Control Networks*, describes all aspects of the BACnet protocol. It is recommended that users be familiar with the standard BACnet objects and properties discussed in Clause 12 of the specification. Users should also be familiar with the particulars of BACnet/IP outlined in Annex J of the specification. The specification document is available along with many other useful resources through the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) or the official BACnet website www.bacnet.org.

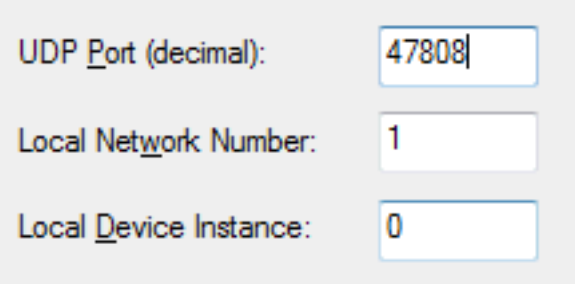
Channel Setup

For more information on configuring a channel in the BACnet/IP Driver, select a link from the list below.

Network Settings
Foreign Device
Advanced Settings
Device Discovery

Network Settings

The network settings are common to all devices on a channel.



Descriptions of the parameters are as follows:

- **UDP Port:** This parameter specifies the local UDP port that the driver will bind to for all communications on the channel. It is also the remote port to which all messages sent to devices on this channel will be addressed. The default setting is 47808 (0xBAC0).
  Note: Typically, all BACnet/IP devices on an Ethernet network use the same port.
- **Local Network Number:** This parameter specifies the local BACnet/IP network number on which the driver will be located. It should be set to the same network number as the local devices. The local network number may range from 1 to 65534. The default setting is 1.
- **Local Device Instance:** This parameter specifies the local BACnet/IP device instance number. Each device on a BACnet internetwork is uniquely identified by its network number and device object instance. This local device number is returned in an "I-Am" service response to a "Who-Is" service request. The valid range is 0 to 4194302. The default setting is 0.
  Note: Do not duplicate numbers across the network.

Foreign Device

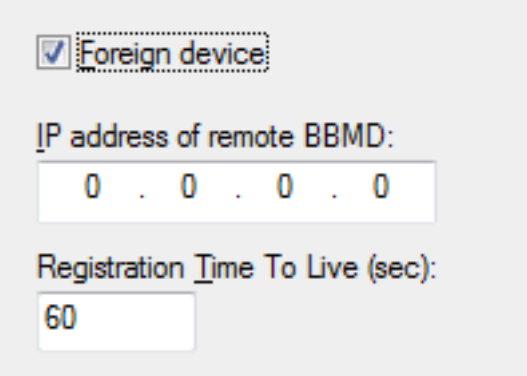
A foreign device is a BACnet/IP device (or software application) that resides on an IP subnet that is not part of a BACnet/IP network. BACnet/IP subnets are considered part of a larger BACnet/IP network if both directed and broadcasted messages can be forwarded to and from the other subnets by IP routers and BACnet Broadcast Management Devices (BBMD).

A foreign device may need to take special measures to discover devices on a BACnet network. For example, if the broadcast Who-Is/I-Am messages normally used for discovery will not be forwarded to and from the foreign device's subnet, the foreign device must work directly with a BBMD on the remote network to discover devices. The foreign device will send broadcast Who-Is messages for the BBMD to then broadcast throughout its BACnet network. I-Am messages broadcasted on the BACnet network will be forwarded back to the foreign device if it has registered with the BBMD.

A channel using this driver becomes a foreign device if the selected network interface is not connected to a BACnet/IP subnet. The settings on the channel's Foreign Device must be set to permit the discovery of devices on (or accessible from) a remote BACnet/IP network.

Note: If none of the devices configured on the channel will be using the driver's Device Discovery feature, ignore the Foreign Device settings.

See Also: **Discovery** and **Configuring Multiple Channels**.

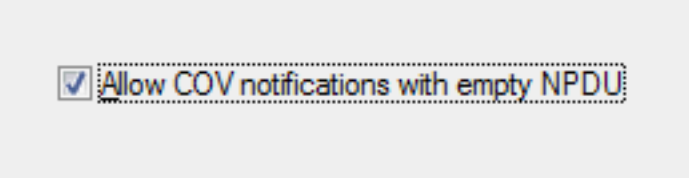


Descriptions of the parameters are as follows:

- **Foreign Device:** When checked, this parameter will enable the Device Discovery functionality. This box should be checked if the channel is not connected to a BACnet/IP subnet.
- **IP Address of Remote BBMD:** This parameter specifies the IP address of the remote BBMD with which the driver will work during Device Discovery.
- **Registration Time to Live (Sec):** This parameter specifies the length of time the BBMD should forward broadcast messages to the driver. The driver only requires an active registration during Device Discovery, and will automatically renew the registration as needed. Users should specify a time long enough for the driver to discover all configured devices (to eliminate the need for renewals and optimize startup performance). A few seconds is generally sufficient unless import on startup is enabled or discovery timeouts are anticipated. Very long times should be avoided to reduce the load on the driver and BBMD after discovery is complete. The valid range is 10 to 3600 seconds. The default setting is 60.

Note: For more information, refer to Connection Timeout under **Device Setup**.

Advanced Settings



Description of the parameter is as follows:

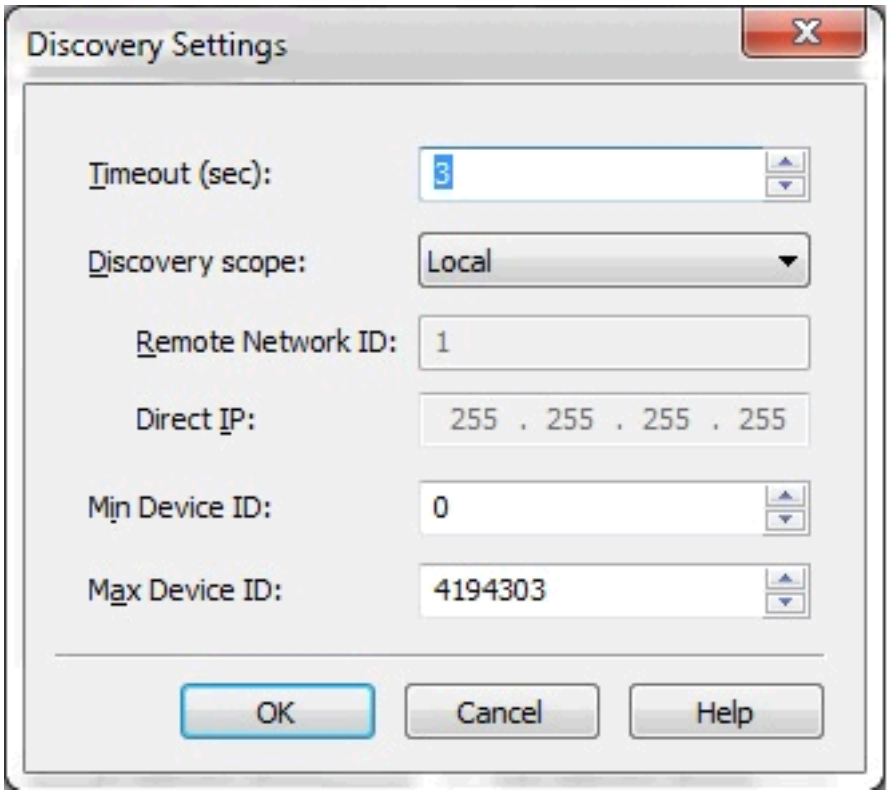
- **Allow COV notifications with empty NPDU:** When checked, this parameter allows COV notifications to be processed from a BACnet device on a different BACnet network (whose NPDUs do not contain the source address). The default setting is unchecked.

  Note: This setting is not commonly used, and may decrease performance on BACnet networks with many COV notifications and/or broadcast requests.

Device Discovery

This channel-level dialog is used to specify parameters for locating devices on the network. Once devices are found, they may be added to the channel. The maximum number of devices that can be discovered at once is 65535. For more information on device discovery, refer to the server help file.

Discovery Settings



Descriptions of the parameters are as follows:

- **Timeout:** This parameter specifies the length of time that the driver waits for all "I-Am" responses to the initial "Who-Is" discovery request. It is also used to timeout non-responsive devices when requesting device names. The default setting is 3 seconds.
- **Discovery Scope:** This parameter controls how the driver broadcasts "Who-Is" messages. It can also be used to limit the list of devices discovered. Options include Local, Global, Remote, and Direct. The default setting is Local. Descriptions of the options are as follows:
    - **Local:** When selected, "Who-Is" messages are broadcast over the local Ethernet subnet. Devices on remote Ethernet subnets cannot see these messages. BACnet gateways visible from local subnets can forward these messages to non-BACnet/IP subnets.
    - **Global:** When selected, "Who-Is" messages are broadcast over the entire Ethernet network. Devices on remote Ethernet subnets see these messages unless network routers are configured to block broadcasts between subnets. In this case, a BBMD must be placed on each Ethernet subnet to forward broadcast BACnet messages.
    - **Remote:** When selected, "Who-Is" messages are sent with the global broadcast IP 255.255.255.255, but contain information so that BACnet routers and BBMDs forward them to a single destination network. The destination BACnet network is given in the Remote Network ID.
    - **Direct:** When selected, "Who-Is" messages are sent directly to the IP address specified in the Direct IP field.
- **Remote Network ID:** This parameter specifies the remote Network ID to be used for remote discovery scope. The default setting is disabled. When enabled, the default value is 1.
- **Direct IP**: This parameter specifies the IP address to be used for direct discovery scope.
- **Min. Device ID:** This parameter specifies the lower range for device discovery. It is used to reduce the number of discovered devices. The valid range is 0 to 4191302. The default setting is 0.
  Note: The specified value must be lower than the Max. Device ID.

- **Max. Device ID:** This parameter specifies the upper range for device discovery. It is used to reduce the number of discovered devices. The valid range is Min Device ID +1 to 4194303. The default setting is 4194303.
  Note: The specified value must be higher than the Min. Device ID.

Device Setup

Supported Devices

The BACnet/IP Driver can be used successfully with devices that use the BACnet protocol, are visible on an Ethernet network, and support the objects, properties, and services supported by this driver. For more information, refer to the Protocol Implementation Conformance Statement (PICS) that is available from the hardware vendor. Conformance data for this driver is provided in **Supported Objects and Services**.

Communications Protocol

BACnet/IP (Annex J)

Note: This driver requires Winsock V1.1 or higher.

Maximum Number of Channels and Devices

The maximum number of channels supported by this driver is 128. The maximum number of devices is 128.

Connection Timeout

For this driver, a connection is the process of verifying the presence of a BACnet/IP device on the network and successfully reading some basic communications parameters from its device object. This is accomplished by sending a "Who-Is" service request, and then processing the "I-Am" response. Since UDP is used, this does not involve the actual creation of a socket connection. The connection timeout setting is the amount of time that the driver will wait for the I-Am response. If an I-Am message is not received during this time, the driver will assume the local communications settings. Communication with the device may still be possible if the Who-Is/I-Am exchange fails. The valid range is 1 to 30 seconds. The default setting is 3 seconds. For more information, refer to **APDU Settings**.

Request Timeout

This parameter specifies the time that the driver will wait for an expected response from the device before retrying or going on to the next request. The valid range is 100 to 9999 milliseconds. The default setting is 1000 milliseconds.

Retry Attempts

This parameter specifies the number of times that the driver will retry a confirmed request before giving up. The valid range is 1 to 10. The default setting is 3 retries.

Device ID

Each device on a BACnet inter-network is uniquely identified by its network number and device object instance. The Device ID has the form *<network number>.<device instance>*. For example, to communicate with device 100 on network 1, users would enter "1.100". The network number may range from 1 to 65534 and the device instance may range from 0 to 4194303. The IP address of the device or BACnet gateway/router device is discovered on communications startup by a Who-Is/I-Am exchange and is transparent to the user.

Note: Although each device on a channel must have a unique Device ID, users may address the same device from separate channels. If a device is configured with the same Device ID as another device already on that channel, a message box similar to the one shown below will be displayed. For more information, refer to **Configuring Multiple Channels**.

If an invalid Device ID is written to the "_DeviceId" device System Tag, this message will not be received. Such configuration changes will cause communications with that device to fail.

Supported Objects and Services

The following summarizes the portions of the BACnet protocol that are supported by this driver. It should be compared with the hardware's Protocol Implementation Conformance Statement (PICS) that is available from the hardware vendor.

Supported Objects

Supported Services

BACnet Service	BIBB*	Initiate	Execute
Who-Is	DM-DDB-A DM-DDB-B	X	 X
I-Am	DM-DDB-A DM-DDB-B	 X	X
ReadProperty	DS-RP-A DS-RP-B	X	 X
ReadPropertyMultiple	DS-RPM-A DS-RPM-B	X	 X
WriteProperty	DS-WP-A	X	
WritePropertyMultiple	DS-WPM-A	X	
SubscribeCOV	DS-COV-A	X	
SubscribeCOVProperty	DS-COVP-A	X	
ConfirmedCOVNotification	DS-COV-A		X
UnconfirmedCOVNotification	DS-COV-A		X
ConfirmedEventNotification Supported Event Types: • Change-of-state • Change-of-value • Command-failure • Out-of-range • Unsigned-range	AE-N-A		X
UnconfirmedEventNotification Supported Event Types: • Change-of-state • Change-of-value • Command-failure • Out-of-range • Unsigned-range	AE-N-A		X

***Note:** The BACnet Interoperability Building Block (BIBB) describes the services supported by a BACnet/IP device or application. For more information, refer to Annex K of the BACnet specification.

Data Link Layer Support

BACnet/IP (Annex J)

Segmentation Support

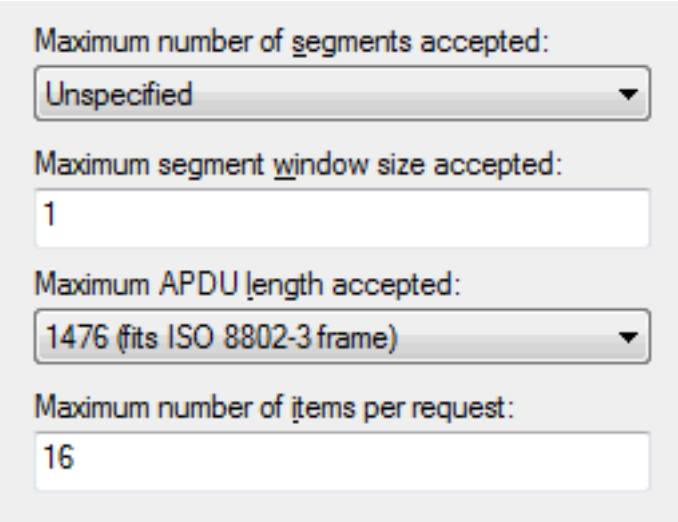
The BACnet/IP Driver supports both segmented requests and segmented responses. Both requests and responses support window sizes between 1 and 127 bytes.

Character Set Support

ISO 10646 (UTF-8)
IBM®/Microsoft® DBCS
ISO 10646 (UCS-2)
ISO 8859-1

APDU Settings

The Application Protocol Data Unit (APDU) settings affect message segmentation. These limits will be imposed by the driver, not the target device. Lower values will automatically be used if so constrained by the target device. It is generally beneficial to send messages using the largest frame and the fewest segments possible. In most cases, the default settings are acceptable.



Descriptions of the parameters are as follows:

- **Maximum number of segments accepted:** Although the driver is not limited in the number of response message segments it can handle, it must specify a limit when making requests. Options include 2, 4, 8, 16, 32, 64, Unlimited, and Unspecified. The default setting is Unspecified.
- **Maximum segment window size accepted:** This parameter specifies the number of message segments that can be sent before a segment acknowledge message must be returned by the receiving party. The sender proposes a window size, and the receiver determines the actual size (which will be no larger than the proposed size). The driver uses this setting as the proposed window size for requests, and as the actual window size limit for responses from the device. Larger settings will likely increase performance on a reliable network, though smaller settings will allow communications problems to be detected earlier and corrected with fewer segments being resent. The valid range is 1 to 127.
- **Maximum APDU length accepted:** This parameter specifies the overall length or number of bytes of message segments that the driver will accept. The largest value is generally the best choice. The driver will attempt to read the maximum APDU length allowed by the target device on startup, and will use the smallest of the local or remote limits when sending requests. A smaller setting may be needed to accommodate the limitations of hardware between the driver and target device. The driver will not attempt to determine the framing limits of intermediate network devices such as routers and gateways. Options include 50, 128, 206 (fits LonTalk frame), 480 (fits ARCNET frame), 1024, and 1476 (fits ISO 8803-3 frame). The default setting is 1476 bytes, which is the largest length allowed for BACnet/IP.
- **Maximum number of items per request:** This parameter limits the number of items that can be packed into read property multiple and write property multiple service requests. The actual number of items packed into a request can vary depending on how many items are due for reads or writes at a given time. Generally, the higher the value, the better the performance. For large requests or responses, however, performance gain may be diminished by message segmentation. Unfortunately, there are no general rules for determining the optimum setting. To refine a particular application, users should experiment with this setting. Devices that do not support read property multiple or write property multiple services should be set to 1. The valid range is 1 to 16. The default setting is 16.

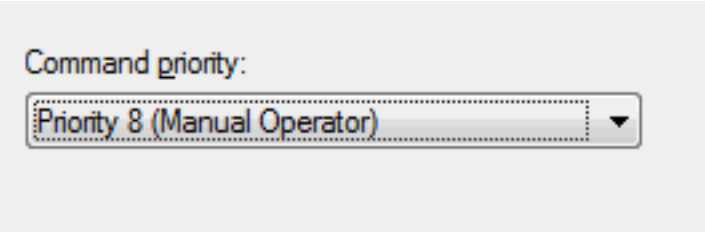
Note: For supported services, refer to the device's PICS statement.

Command Settings

BACnet/IP devices prioritize write requests to certain properties of commandable objects according to a command priority. Once a write to a commandable property has been executed, the sending application acquires command over that property. Write requests from other applications using a lower priority are not be executed until the commanding application relinquishes command over the property. Writes from applications using a higher priority are executed and command is transferred to the higher-priority application.

Control of a supported standard commandable present value property can be relinquished by writing to the PresentValueRel tag. The PresentValueRel tag with present value address and RELINQUISH modifier is created for supported standard commandable objects on automatic tag generation.

This driver supports device-level and object-level prioritization for supported standard commandable objects. Device-level priority is set in the Device Properties. Object-level priority can be set for a supported standard commandable object by writing to its PresentValuePriority tag. The PresentValuePriority tag with present value address and PRIORITY modifier is created for supported standard commandable objects on automatic tag generation. *For more information on creating special tags, refer to* ***Address Descriptions****.*



Command Priority

This setting specifies the priority level of write commands to the device. The priority level can range from 1 (highest) to 16 (lowest). The default setting is 8. The following priority levels have accepted uses as outlined in the BACnet specification:

- **Priority 1:** Manual-Life Safety
- **Priority 2:** Automatic-Life Safety
- **Priority 5:** Critical Equipment Control
- **Priority 6:** Minimum On/Off
- **Priority 8:** Manual Operator

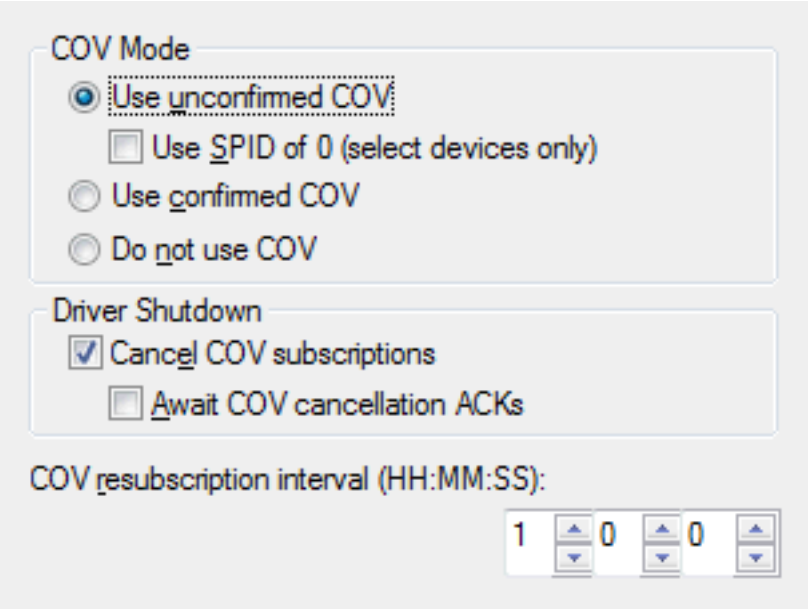
Standard Commandable Properties and Objects

Object	Commandable Property
Analog Output	Present Value
Analog Value	Present Value
Binary Output	Present Value
Binary Value	Present Value
Multi-state Output	Present Value
Multi-state Value	Present Value

Note: Devices may implement additional commandable properties. For more information, refer to the hardware's PICS statement.

COV Settings

BACnet allows applications to subscribe to change of value (COV) event notification for many properties. When COV notifications are used, the BACnet/IP Driver does not have to continuously poll the device for the current value of these properties. This reduces network traffic and the communications processing load. This driver can be configured to utilize this capability on a per-device level. For more information, refer to **COV Notifications**.



COV Mode

This setting tells the driver to subscribe to COV notifications for all properties that have implicit and explicit COV support. Descriptions of the parameters are as follows:

- **Use Unconfirmed COV:** When selected, this option specifies that the driver will receive COV notifications from the device. The device will not expect acknowledgment of those notifications. The default setting is checked.
- **Use SPID of 0 (select devices only):** When checked, this parameter sets the Subscriber Process Identifier (SPID) for all COV items to 0. When unchecked, a unique SPID will be used for each subscription. The default setting is unchecked. It is only available for **Use Unconfirmed COV** mode.

  Note: ALC devices consider all subscriptions with an SPID of 0 to be one subscription.

  Important: This option does not follow the ASHRAE Standard, and should only be used by select devices. For information on whether a specific device supports this option, refer to the device manufacturer.
- **Use Confirmed COV:** When selected, the driver will receive COV notifications and will acknowledge each one.
- **Do Not Use COV:** When selected, all of the device properties will be polled even if the COV address modifier is present.

Note: For more information, refer to **Address Descriptions**.

Driver Shutdown

Descriptions of the parameters are as follows:

- **Cancel COV Subscriptions:** When selected, the driver will send messages to the device on driver shutdown to cancel each of its COV subscriptions. Although this may slightly delay the driver's shutdown, it can be important if the device has limited resources for subscriptions (and if the subscription lifetime is long or permanent). The default setting is enabled.
- **Await COV Cancellation ACKs:** When selected, this option will cancel subscriptions one at a time. It will wait for the device to reply with an acknowledgment before canceling the next subscription. It also prevents the Runtime from shutting down until all COV subscriptions have been canceled. This option is only available when **Cancel COV subscriptions** is enabled. It may be helpful for a device that cannot

process multiple subscription cancellations at once.

Note: In large projects, this option may appear to hang the Runtime. The Runtime will recover once all subscriptions have been canceled.

COV Resubscription Interval (HH:MM:SS)

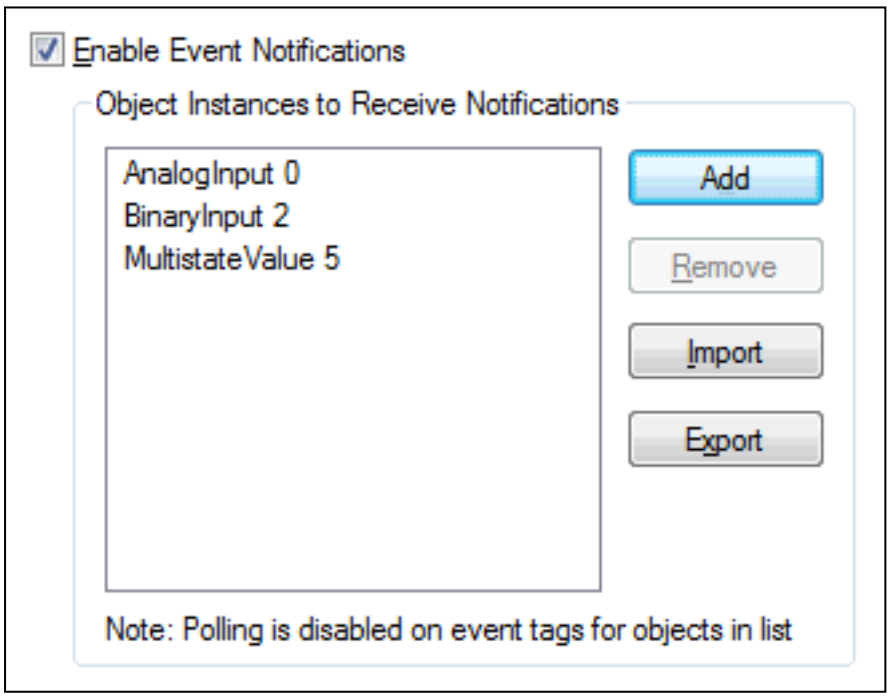
An application can subscribe to COV notifications on a temporary or permanent basis. If 00:00:00 is specified, the driver will request permanent subscriptions. In this case, users should check **Cancel COV Subscriptions** to make sure the device can immediately reclaim resources that are no longer needed. Users may elect to subscribe to temporary subscriptions with a lifetime specified ranging from 1 second to 24 hours. One second prior to the end of the subscription, the driver will automatically renew the subscription for active tags.

Notes:

1. If a COV subscription request fails for any reason, the driver polls the device for the associated properties. A message is be placed in the server Event Log indicating when this occurs.
2. Synchronous and asynchronous reads on properties that are configured to rely on COV notifications always read from the cache updated by COV notifications. No direct communication with the device occurs as the result of a synchronous or asynchronous read.

Event Notification Settings

BACnet allows devices to have objects configured with event reporting to detect and report OffNormal, Fault, or Normal conditions. When an event-initiating object detects the condition, the device sends a confirmed or unconfirmed event notification service request to the configured recipient list. The information provided in these event notifications can be used to update **event-related properties** of the event-initiating intrinsic object or the algorithmically monitored object and the event-initiating event enrollment object. The BACnet/IP Driver does not need to continuously poll the device for the current value of these properties, which reduces network traffic and the communications processing load. This driver can be configured to utilize this capability on a per-object level.



Descriptions of the parameters are as follows:

- **Enable Event Notifications**: This setting notifies the driver that some objects are configured with event reporting, which sends confirmed and/or unconfirmed event notification service requests for condition changes. When checked, polling no longer occurs on the **event-related properties** of the object instances listed in this property window because these properties are updated by the event notifications. The default setting is unchecked.
- **Object Instances to Receive Notifications**: Object instances in this list should be configured with

event reporting in the device as one of the following:
- an event-initiating intrinsic object instance
- an event-initiating Event Enrollment object instance
- an algorithmically monitored object instance

Valid object types are those listed under **Supported Objects Types**. The range for the object instance is 0 – 4194302.
Note: When algorithmic reporting is configured, the EventEnrollment object instance and its Object Property Reference (to prevent polling the PresentValue and StatusFlags properties) must both be in this list.

- **Add**: When clicked, this button launches the Add Object Instances dialog, which is used to configure an object type and instance to be added to the Object Instances to Receive Notifications list. *For more information, refer to **Add Object Instances***.
- **Remove**: When clicked, this button removes the selected object instance from the list.
- **Import**: This button launches the Import from CSV dialog. This option allows users to load a CSV file and replace the object instances in the Object Instances to Receive Notifications list. *For more information, refer to **CSV Import/Export***.
- **Export**: This button launches the Export from CSV dialog. This option allows users to save the Object Instances to Receive Notifications list to a CSV file. *For more information, refer to **CSV Import/Export***.

Note: Synchronous and asynchronous reads on event-related properties always read from the cache updated by event notifications. No direct communication with the device occurs for those properties as a result of synchronous or asynchronous reads.

Caution: When **Enable Event Notifications** is checked and an object instance is in the list, polling does not occur for that object's **event-related properties**. To receive updates for those tags after the initial read, event reporting must be properly configured in both the physical device and the BACnet/IP Driver. Confirm the tags are updated when events occur to prove the device is configured to send event notifications for that object instance. If the BACnet/IP Driver is expected to receive confirmed event notifications, the Channel Local Device Number or IP Address must be correctly added as a recipient for the event in a Notification Class of the device, otherwise the device may broadcast those notifications. While the BACnet/IP Driver does respond to confirmed event notifications with a Simple-ACK, the device may not accept a response to confirmed event notifications that it has broadcast.

See Also:
Optimizing BACnet Communications
CSV Import/Export

Event-Related Properties

EventTimeStamps, EventState, StatusFlags, and whatever the *Monitored Value Parameter* is for the object are referred to as the event-related properties. Within an object, the *Monitored Value Parameter* is monitored for conditions that trigger notifications. For most objects, the *Monitored Value Parameter* is PresentValue. However, the Accumulator object *Monitored Value Parameter* is PulseRate.

Intrinsic Reporting

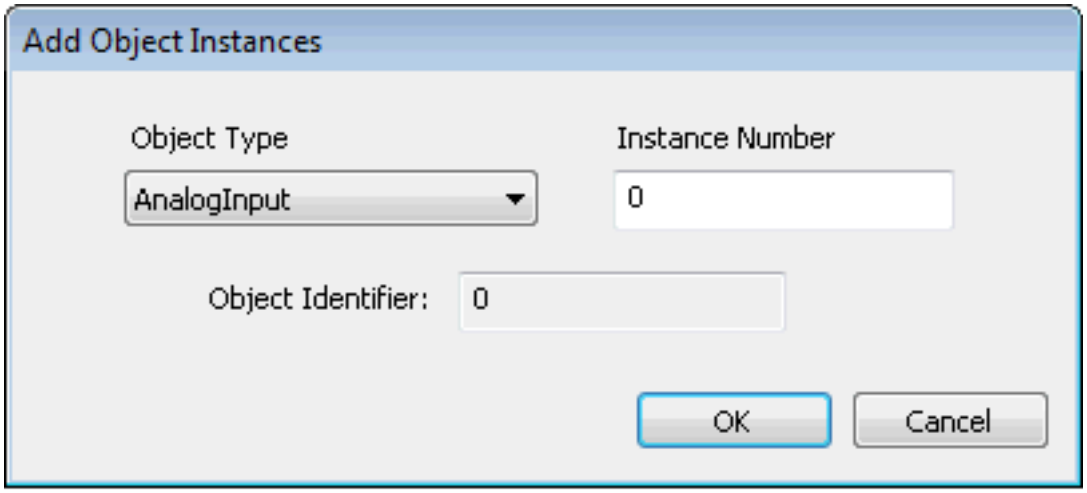
The EventTimeStamps, EventState, StatusFlags, and *Monitored Value Parameter* event-related properties all belong to the event-initiating object reported in the event notification from an intrinsically configured event.

Algorithmic Reporting

The EventState and EventTimeStamps event-related properties belong to the event-initiating Event Enrollment object reported in the event notification from an algorithmically configured event. The StatusFlags and *Monitored Value Parameter* event-related properties belong to the object instance configured as the Event Enrollment object instance Object Property Reference.

Add Object Instances

The object identifier is comprised of a BACnet object type and an instance number, as defined in the BACnet specification. Add an event-initiating intrinsic object or an algorithmically monitored object and the event-initiating event enrollment object to the Object Instances to Receive Notifications list to prevent polling on the event-related properties of these objects.



Descriptions of the parameters are as follows:

- **Object Type**: Select the BACnet object type of the object identifier that is configured with intrinsic or algorithmic event reporting or is configured as the object property referenced in an event enrollment object. The default selection is AnalogInput.
- **Instance Number**: Specify the instance of the object identifier that is configured with event reporting. The default instance number is 0. The valid range is 0 – 4194302.
- **Object Identifier**: This read-only parameter displays the BACnet object identifier comprised of the configured BACnet object type and instance number, as defined in the BACnet specification.

See Also:
Supported Object Types for Event Notifications

Supported Object Types for Event Notifications

0 - Analog-input
1 - Analog-output
2 - Analog-value
3 - Binary-input
4 - Binary-output
5 - Binary-value
9 - Event-enrollment
13 - Multi-state-input
14 - Multi-state-output
19 - Multi-state-value
23 - Accumulator

CSV Import / Export

Object Instances to Receive Notifications List

Configuration of this list in the **Device Properties | Event Notifications** tab, is possible through the property window user-interface or through the import of a Comma-Separated Variable (CSV) file.

To jump to a specific section, select a link from the list below.
Creating a Template
Exporting an Object Instance List
Importing an Object Instance List
CSV File Format

Creating a Template

The easiest way to create and import a CSV file is to create a template.

1. To start, click the **Add** button to add at least one object instance to the Object Instances to Receive Notifications list.

2. Next, click **Export** to generate the CSV file with the correct headers and object instance information.
3. Use this template in a spreadsheet application that supports CSV files and then modify the file as desired by adding, removing, or changing the object instance information.

Note: The resulting CSV file saved to disk and may be re-imported into the server as long as it conforms to the CSV file format expected. See the CSV File Format below for more information on the structure of this file.

Exporting an Object Instance List

Exporting a server tag list generates a .CSV text file that contains a heading record followed by a record for each object instance to be defined in the Object Instances to Receive Notifications list. See the CSV File Format below for more information on the structure of this file.

1. To export a CSV file of the configured Object Instances to Receive Notifications list, click on the Export button in the property page. This brings up a dialog to save the file to disk.
2. Enter a name for the CSV file and choose a known location on disk to save the file.
3. Click **Save**.

Importing an Object Instance List

1. To import a list of the object instances that are configured with event reporting, click on the Import button on the property page. This brings up a dialog box to specify the CSV file to import.
2. After locating the file, click **Open**. If the contents of the file are in the correct format, the existing Object Instances to Receive Notifications list is completely replaced with the new list. If the contents of the file are not correctly formatted, an error message indicating the issue is posted and the list is not replaced.

Note: Duplicate Object Type, Object Instance entries in a CSV file are ignored. Blank lines and lines that begin with a semi-colon (;) are ignored during the import and can be used for clarity and commenting in the file. *See the **CSV File Format** for more information on the structure of this file.*

CSV File Format

The format of the CSV file requires the header and the records to each have two fields. The first field is the Object Type and the second field is the Object Instance.

- **ObjectType**: This references the type of event-reporting object the user has configured in the BACnet device. The format of the object type string for the notification list should not include any dash characters. For example, instance 100 of the analog input should be represented in the CSV file as "AnalogInput, 100". The object type strings are not case sensitive. Valid object types are those listed under **Supported Objects Types for Event Notifications**.
- **ObjectInstance**: The instance number for the event-reporting object defined in the device. Valid object instances range from 0 to 4194302, inclusively.

Example CSV Format

```
 ; This is an example of the format for the CSV file.

 ; The list should include only those object instances that are configured for
event reporting.
 ; Polling on the event-related property tags no longer occurs for objects in
this list.


 ; The object type must be in the Supported Object Types for Event Notifications
list.
 ; The range for the object instance is 0 - 4194302 inclusive.
 ; These are the objects that have event reporting configured.
 ; This next line is the header and is required.
   ObjectType, ObjectInstance
   BinaryInput, 5000
```

```
BinaryInput, 5001
BinaryInput, 5002
AnalogOutput, 8123
MultistateInput, 2045
AnalogInput, 1
```

See Also:
Event Notification Settings
Optimizing BACnet Communications

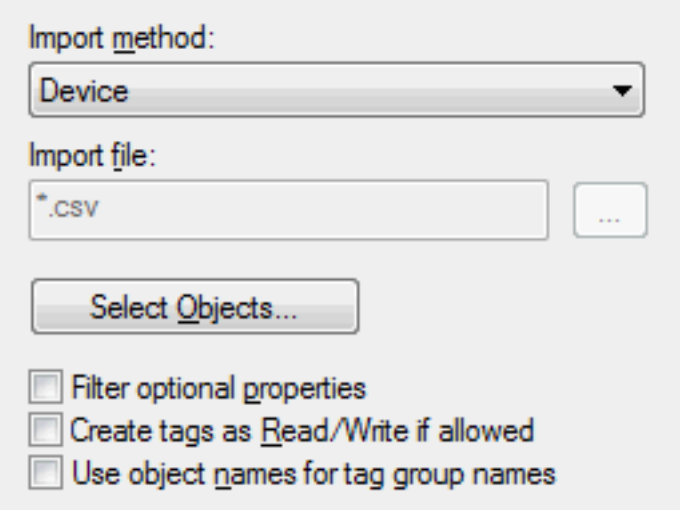
Tag Import Settings

This driver has the ability to automatically create tags for almost all of the supported device properties. The import (tag generation) can be from a device or from a Cimetrics OPC Server export file. The Tag Import tab can be used to specify the object types that tags will be generated in addition to other tag generation options. For information on creating a tag database from the device, refer to the instructions below.

Note: The Database Creation settings control when the automatic tag database generation occurs. For more information, refer to the server's help documentation.

1. Leave the default settings on the **Database Creation** tab.
2. Click **Tag Import**.
3. Select the desired **Tag Import Options**, and then click **Apply**.
4. Return to the **Database Creation** tab and click **Auto Create** to generate tags for the selected device immediately. For this to succeed, the device must be online and network visible to the driver.

Note: Tags must be generated for each device individually using this method. If there is large number of devices or if the configuration of the devices changes, users should specify one of the **Generate on startup** options on the Database Creation tab.



Descriptions of the parameters are as follows:

- **Import Method:** Tags can be imported in one of the following ways.

    1. Select **Device** to import tags from the device. The device must be online (and network visible to the driver) at the time of import.

2. Select **Cimetrics OPC Server CSV export file** to import tags exported to a CSV file from the Cimetrics OPC Server. Although export files may contain data for multiple devices, the driver will only import data for this device.

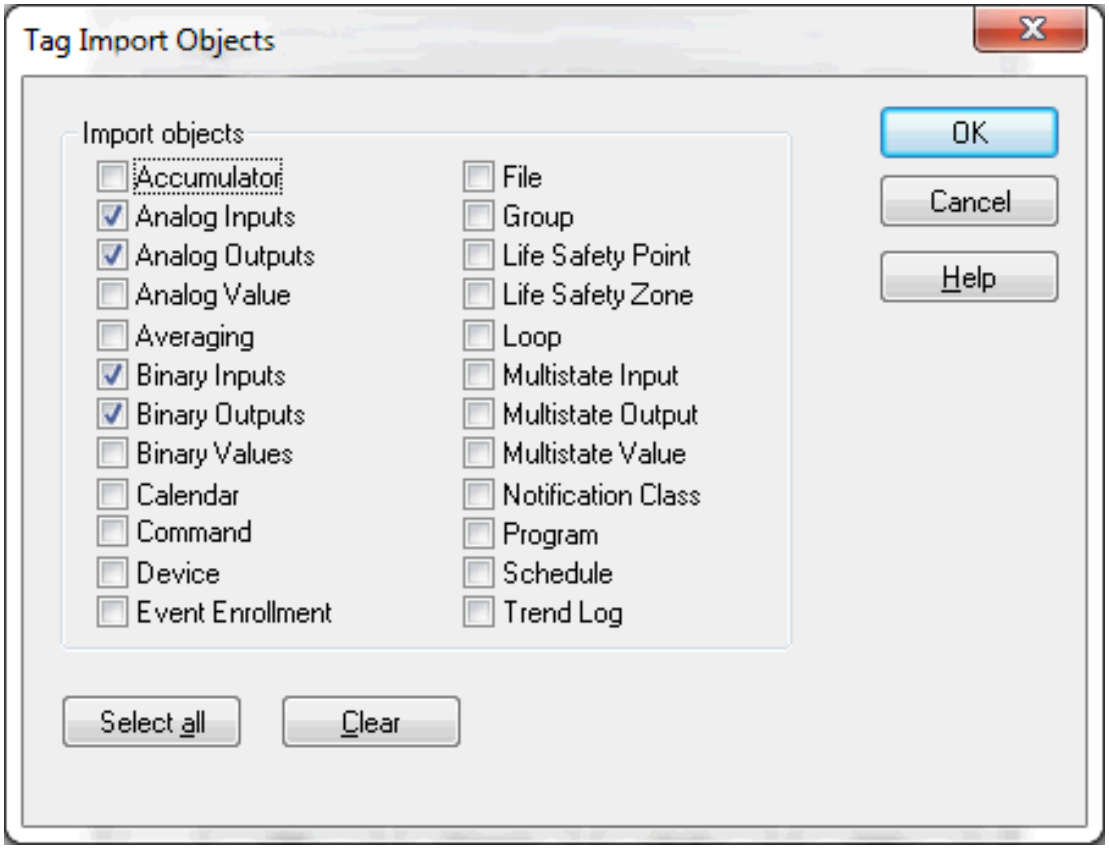
- **Import file:** This parameter is used to specify the import file's path and file name. To browse for the import file, click on the Browse button (**...**).

  Note: This parameter will be disabled if Device is the chosen the import method.
- **Select Objects:** When clicked, this button will invoke the **Tag Import Objects** dialog.
- **Filter Optional Properties:** When left at the default unchecked setting, the driver will generate tags for all the supported properties imported. This could result in a very large number of tags, many of which may not be needed. To reduce the number of tags that are generated, check **Filter Optional Properties** to generate tags for properties that are required by the BACnet specification only. Required properties are those with conformance code **R** (readable) or **W** (writable). Tags for non-standard properties and properties with conformance code **O** (optional) will not be generated.
- **Create Tags as Read/Write If Allowed:** Tags will be generated with read-only access for properties with a conformance code of **R**, or with Read/Write access if the conformance code is **W**. The default access for properties with a conformance code of **O** depends on the nature of the data. Some BACnet/IP devices allow writes to properties that are described as Read Only in the BACnet specification. The BACnet specification does not specifically forbid this for most properties. All tags may be generated with full Read/Write access to accommodate these non-standard implementations. For more information, refer to **Address Descriptions**.

  Note: This parameter will be disabled if **Cimetrics OPC Server CSV Export File** has been selected as the import method, because the access level will be given in the file.
- **Use Object Names for Tag Group Names:** New tag groups will be given the name of the corresponding BACnet object. If the object name is not defined or is not unique, the driver will assign a default name to the group.

  Note: This parameter will be disabled if **Cimetrics OPC Server CSV Export File** has been selected as the import method, because the name was not given in the file.

Tag Import Objects

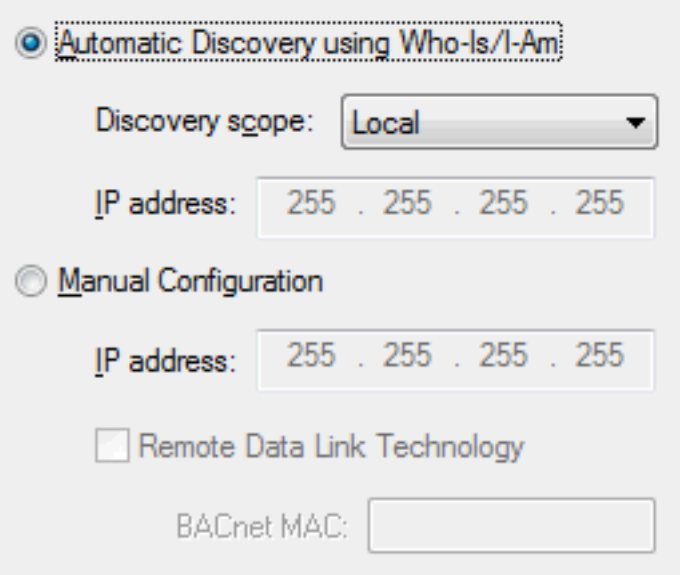


Descriptions of the parameters are as follows:

- **Import Objects:** The driver supports most properties of all of the standard BACnet object types. Select the object types for the driver to generate tags. The basic I/O object types are selected by default.
- **Select All:** When clicked, this button will automatically check all of the boxes. It does no harm to check an object type that does not exist in the device at the time of tag import.
- **Clear:** When clicked, this button will uncheck all of the selected boxes.

Discovery

The device ID (set under the General tab in Device Properties) is sufficient to uniquely identify a device on a BACnet network. This driver requires additional information to establish communication with a device; such as IP address of the device or router, framing constraints, and the BACnet MAC (Medium Access Control) address of the device. The Discovery tab of Device Properties controls how the driver obtains the necessary communication parameters.



Automatic Discovery Using Who-Is/I-Am

This setting allows the driver to automatically discover the required device properties. This is the default selection.

- **Discovery Scope:** controls how the driver broadcasts Who-Is messages. Four options are available:
  - **Local**: Who-Is messages are broadcast over the local Ethernet subnet. Devices on remote Ethernet subnets cannot see these messages. BACnet gateways visible from a local subnet can forward these messages to non-BACnet/IP subnets.
  - **Global**: Who-Is messages are broadcast over the entire Ethernet network. Devices on remote Ethernet subnets see these messages unless network routers have been configured to block broadcasts between subnets. In this fairly common scenario, a BBMD must be placed on each Ethernet subnet to forward broadcast BACnet messages.
  - **Remote**: Who-Is messages are sent with the global broadcast IP (255.255.255.255), but contain information for BACnet routers and BBMDs to forward them to a single destination network. The destination BACnet network is set in the device ID.
  - **Direct**: Who-Is messages are sent directly to a specified IP address. A BACnet gateway at the specified IP address can forward these messages to non-BACnet/IP subnets.
- **IP Address**: defines the network nodes to which the driver sends messages and from which it accepts responses. This is the IP address of the device if that device is on the local Ethernet network. If the destination device is on a remote network, this setting must be the IP address of the local router through which communications are conducted.

Manual Configuration

This option should be selected if the device does not support the I-Am and Who-Is services or if broadcasting messages on the network is undesired.

- **IP Address**: defines the network nodes to which the driver sends messages and from which it accepts responses. This is the IP address of the device if that device is on the local Ethernet network. If the destination device is on a remote network, this setting must be the IP address of the local router through which communications are conducted.
- **Remote Data Link Technology**: controls whether the driver automatically calculates the BACnet MAC for a BACnet/IP device, or if the driver uses a hex string in BACnet MAC. If a device is on a remote subnet that the uses a Data Link Technology that is not BACnet/IP (such as MS/TP, LonTalk, ARCNET); the BACnet

MAC must be entered manually and the checkbox should be checked. The default setting is unchecked.

BACnet MAC: Although the driver communicates using the BACnet/IP protocol, it is possible to communicate with devices using other Data Link Technologies (such as MS/TP, LonTalk, ARCNET) if the driver is communicating through a gateway. In this case, the BACnet MAC of the underlying device must be entered. The BACnet MAC is a hex string.

Example:

An MS/TP device is connected to a gateway. The MS/TP has an MAC listed in the web configuration as 10. Since the web configuration displays the value in decimal, the value entered in "BACnet MAC" should be "0a".

Note: If the Network Interface selected for the channel is not connected to a BACnet/IP network, configure the channel to operate as a foreign device to discover devices. *For more information, refer to Foreign Device.*

See Also:
Configuring Multiple Channels

Optimizing BACnet/IP Communications

Use Multiple Channels

Although this driver has been designed to service read and write requests to multiple devices simultaneously, all pending requests on a channel must be completed before the next set of requests for that channel's devices can be issued. If one device is slow or not responding, it will degrade the performance of all devices on that channel. Each channel operates independently; therefore, it is recommended that users separate devices into several channels for optimum performance. *For more information on the special system requirements for a multi-channel configuration, refer to* ***Configuring Multiple Channels***.

Maximize Frame Size

Messages will be sent in multiple segments if necessary. To reduce the overhead incurred by message segmentation, use the largest frame size possible. Before the driver begins reading and writing data to a device, it will read the APDU length limit of that device. From that point on, the driver will use its maximum APDU length or the devices maximum APDU length, whichever is smallest. Selecting the largest APDU length option on the APDU Settings Device Properties will result in the optimum frame size. However, the driver does not try to see if any network hardware between it and the device (such as BACnet routers and gateways) has more restrictive limits. It may be necessary to reduce the driver's limit to accommodate.

Maximize Window Size

The window size is the number of message segments that can be sent before the receiving party must return a segment acknowledgment. The sender must wait for this acknowledgment before sending the next series of message segments. Maximizing the window size will reduce the amount of time consumed waiting for acknowledgments; however, this must be done with the knowledge that communication errors will not be detected as quickly and that more data will have to be resent to correct the problem. For more information on configuring the driver's window size, refer to **APDU Settings**.

Utilize ReadPropertyMultiple and WritePropertyMultiple Services

Packing multiple Read/Write operations into a single request can greatly improve performance by reducing the number of transactions required for a given number of tag reads or writes. Check the hardware's PICS document to see if these services are supported. As more items are added to a request, the larger the request and/or response messages will become. Large messages may need to be segmented. While it is unlikely that the increased overhead required to send segmented messages would completely negate the performance advantage of using multiple property requests, it is a consideration. Also, when using multiple property requests, the frame and window size issues described above become more relevant. *For more information on how to enable multiple property requests, refer to* ***APDU Settings***.

Use COV Reporting

The amount of network traffic and request processing load can be reduced by using Change Of Value (COV) reporting wherever possible. *For more information, refer to* ***COV Notifications***.

Use Event Reporting

The amount of network traffic and request processing load can be reduced by using event reporting where applicable. With event notifications enabled, tags that rely on event notification updates (**event-related properties**) refresh the data from cache, which is updated from event notifications. Therefore, the driver does not issue read requests, which allows these tags to be scanned quickly for incoming event notifications. Tags that require polling the device for updates can be set with a scan rate more realistic to the expected rate of change. *For more information, refer to* ***Event Notification Settings***.

Use Watchdog Tags in Conjunction with COV or Event Reporting

The OPC quality of tags updated by event and COV notifications may be GOOD, even if the device has momentarily gone offline. Polled tags, by comparison, can quickly reveal a communications problem when an expected read response fails to arrive. When a poll fails, the driver flags the device as being in an error state. The driver uses the device error state to set the quality of event and COV tags. To monitor just event or COV properties, consider polling one additional property in the device to monitor the device communications.

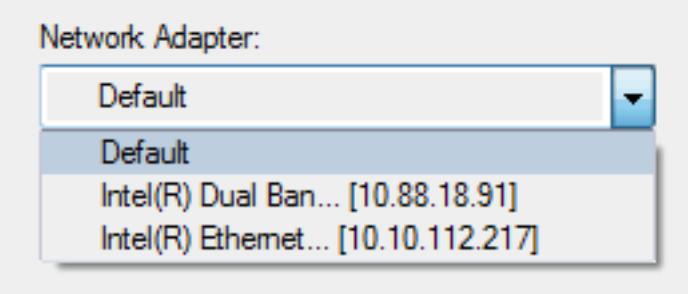
Combining COV Reporting with Event Reporting

When the condition configured to trigger sending an event notification requires the Monitored Value or StatusFlags property of the monitored object to transition from a normal to an off-normal state, the change in value of those properties is not updated while within the normal range. One option, where applicable, is to configure COV on the object as well. In this case, any change in the value is also sent via COV notifications. *For more information, refer to* ***Event Notification Settings***, ***COV Settings***, *and* ***COV Notifications***.

Configuring Multiple Channels

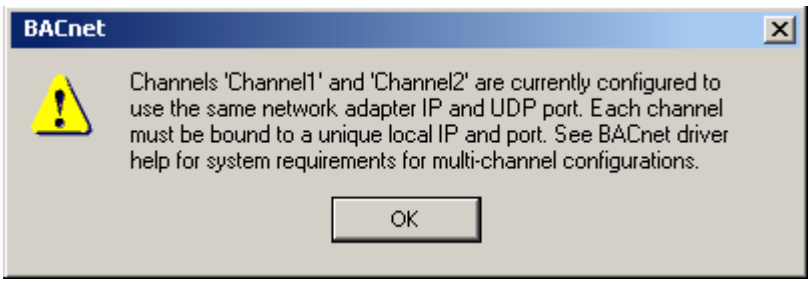
Multiple channels can increase the driver's performance; however, unlike most Ethernet drivers for the OPC server, the BACnet/IP Driver requires that each channel bind to a unique local address. The address is the combination of IP and port. The local IP used is associated with a Network Adapter Card (NIC) installed on the system, and can be selected with the Network Interface. For more information on setting the local port, refer to **Network Settings**.

See Also: Optimizing Your BACnet Communications



Selecting **Default** will allow the driver to use the operating system's normal bind order to set the NIC that will be used. This is the recommended selection for a single channel BACnet/IP Driver project because it may be run on another computer without modification. For clarity of the actual local IP usage, it is not recommended that Default be selected in any of the channels in a multi-channel project.

Note: If a channel is configured with an IP and port combination that is already in use by another BACnet/IP Driver on the channel, a message will be displayed that is similar to the image below.



This message will not be displayed if an invalid adapter selection is written to the "_NetworkAdapter" channel System Tag; however, such configuration changes will cause communications with all devices on that channel to fail.

Using Multiple Local IP Addresses

To create a BACnet/IP Driver project with multiple channels while using the same UDP port on each, the project will need to be run on a multihomed computer, which is a computer that has multiple IP addresses associated with it. Each BACnet/IP Driver channel will then bind to a different local IP. A computer can be multihomed by installing multiple NICs, or by associating multiple IP addresses with a single NIC. The process of adding IP addresses to a single NIC system is easy, but differs slightly depending on the version of Windows being used.

Adding IP Addresses to a Single NIC on Windows NT

1. Click the **My Computer** icon and then select **Control Panel**.
2. Click the **Network** icon and then click on the **Protocols** tab.
3. Select **TCP/IP Protocol**.
4. Click **Properties** and then select the **IP Address** tab.
5. Click **Advanced** | **Add**.
6. Enter the additional IP address and subnet mask.

7. Click **OK**.
8. Restart the computer.

Adding IP Addresses to a Single NIC on Windows XP and 2003

1. Click the **My Computer** icon and then select **Control Panel**.
2. Click the **Network** and **Dial-Up Connections** icon.
3. Click the **Local Area Connection** icon (or other icon associated with NIC of interest).
4. Click the **Properties** button and then select **Internet Protocol (TCP/IP)**.
5. Click **Properties** | **Advanced**.
6. Select the **IP Settings** tab and then click **Add**.
7. Enter the additional IP address and subnet mask.
8. Click **OK**.

Adding IP Addresses to Windows Vista, 2008, and 7

1. Click **Start** and then open **Network Connections**.
2. Next, click **Control Panel** | **Network and Internet**. Then, select the connection that will be changed.
3. Click **Properties**, and then provide the administrator password or confirmation (if prompted).
4. Click the **Networking** tab. Beneath **This connection uses the following items**, click **Internet Protocol Version 4 (TCP/IPv4)**.
5. Next, click **Properties**. Ensure that the connection is set to use an IP address by clicking **Use the following IP address**.
6. Next, specify the IP address settings in the **IP Address**, **Subnet Mask**, and **Default Gateway** fields.
7. To add a second IP address click **Advanced** | **IP Settings**. Beneath **IP Address**, click **Add**. Then enter a new IP address and subnet mask.

Multihoming Notes

1. Multihoming is not supported under Windows 95 or 98.
2. Users can only multihome a network card that is configured to use static IP addresses.
3. Windows NT can be used to add up to five IP addresses for each NIC via the control panel. If more IP addresses are required, add them to the registry manually. To browse, look under **HEKY_LOCAL_ MACHINE\SYSTEM\CurrentControlSet\Services**. Select the service associated with the adapter card in question. Under the service, go to the **Parameters\TCPIP** subkey. Then add the IP addresses to **IPAddress**. Edit **SubnetMask** and add an entry for each new IP address.
4. Windows XP does not impose a limit on the number of IP addresses that may be added via the control panel.
5. Although there will be additional operating system overhead when running on a multihomed system, it will typically be negligible when compared to the performance gained from the use of multiple channels.

COV Notifications

BACnet provides for unsolicited Change Of Value (COV) reporting of critical properties. The advantage of COV is that the driver does not have to continuously poll the device for these values. Depending on the application, this can result in a significant reduction in network traffic as well as reducing the request processing load on the device and driver.

Implicit vs. Explicit COV

The BACnet specification requires that devices support COV reporting for certain properties. The device may also support COV reporting for other properties, depending on the implementation. Tag addresses to those properties that are required to support COV, are said to have implicit COV support. To take advantage of COV capability of other properties, if implemented, users must add the COV modifier to the tag's address. These tags are said to have explicit COV support. For more information on address syntax, refer to **Address Descriptions**.

COV Subscription

Before the driver can receive COV notifications for a particular property, it must first issue a COV subscription request. If the subscription request succeeds, the driver will receive the initial value of the property and COV notifications whenever necessary for as long as the subscription is in effect. The driver will re-subscribe as needed. If a subscription attempt fails, the driver will issue a message to that effect in the server's Event Log. Users may choose to configure the driver to begin polling that property if the subscription request fails. For configuration details, refer to **COV Settings**.

COV Mode

COV notifications can be confirmed or unconfirmed. Confirmed notifications require the driver to acknowledge the notification. Unconfirmed notifications are not acknowledged. The driver supports both modes of operations, along with a COV disabled mode where all tags are polled.

COV Watchdog Tags

The OPC quality of tags updated by COV notifications may be GOOD, even if the device has momentarily gone offline. Polled tags, by comparison, can quickly reveal a communications problem when an expected read response fails to arrive. When a poll fails, the driver will flag the device as being in an error state. The driver uses the device error state to set the quality of COV data. Therefore, users interested in monitoring just COV properties should consider polling for one additional property in the device. That polled tag will act as a watchdog for all COV data from that device.

Notes:

1. The BACnet SubscribeCOV service will be used for properties with implicit COV support. The BACnet SubscribeCOVProperty service will be used for all other properties addressed with the COV address modifier.
2. If a COV subscription request fails for any reason, the driver will poll the device for the associated properties. A message will be placed in the server's Event Log indicating when this occurs.

Data Types Description

Data Type	Description
Boolean	Single bit
Word	Unsigned 16-bit value bit 0 is the least significant bit bit 15 the most significant bit
Short	Signed 16-bit value bit 0 is the least significant bit bit 14 the most significant bit bit 15 is the sign bit
DWord	Unsigned 32-bit value bit 0 is the least significant bit bit 31 the most significant bit
Long	Signed 32 -bit value bit 0 is the least significant bit bit 30 the most significant bit bit 31 is the sign bit
Float	32-bit Floating point value bit 0 is the low bit bit 31 is the high bit
String	Null terminated ASCII string

Enumerated Data Types

This driver expresses property values with enumerated BACnet data types as integers. The standard enumeration definitions given in the BACnet protocol specification are displayed below.

Enumerated BACnet Data Types

BACnetAction
BACnetBackupState
BACnetBinaryPV
BACnetDeviceStatus
BACnetEngineeringUnits
BACnetEventState
BACnetEventType
BACnetFileAccessMethod
BACnetLifeSafetyMode
BACnetLifeSafetyOperation
BACnetLifeSafetyState
BACnetMaintenance
BACnetNotifyType
BACnetObjectType
BACnetPolarity
BACnetProgramError
BACnetProgramRequest
BACnetProgramState
BACnetReliability
BACnetSegmentation
BACnetSilencedState
BACnetVTClass

BACnetAction

Value	Action
0	Direct
1	Reverse

BACnetBackupState

Value	Event Type
0	Idle
1	Preparing for backup
2	Preparing for restore
3	Performing a backup
4	Performing a restore
5	Backup failure
6	Restore failure

BACnetBinaryPV

Value	Binary Present Value
0	Inactive
1	Active

BACnetDeviceStatus

Value	Device Status
0	Operational
1	Operational-Read Only
2	Download-required
3	Download-in-progress
4	Non-operational
5	Backup-in-progress

BACnetEngineeringUnits

Acceleration

Value	Unit
166	Meters-per-second-per-second

Area

Value	Unit
0	Square-meters
1	Square-feet
115	Square-inches
116	Square-centimeters

Currency

Value	Unit
105	Currency1
106	Currency2
107	Currency3
108	Currency4
109	Currency5
110	Currency6
111	Currency7
112	Currency8
113	Currency9
114	Currency10

Electrical

Value	Unit
2	Milliamperes
3	Amperes
4	Ohms
5	Volts

Value	Unit
6	Kilo-volts
7	Mega-volts
8	Volt-amperes
9	Kilo-volt-amperes
10	Mega-volt-amperes
11	Volt-amperes-reactive
12	Kilo-volt-amperes-reactive
13	Mega-volt-amperes-reactive
14	Degrees-phase
15	Power-factor
122	Kilohms
123	Megohms
124	Millivolts
145	Milliohms
167	Amperes-per-meter
168	Amperes-per-square-meter
169	Ampere-square-meters
170	Farads
171	Henrys
172	Ohm-meters
173	Siemens
174	Siemens-per-meter
175	Teslas
176	Volts-per-degree-Kelvin
177	Volts-per-meter
178	Webers

Energy

Value	Unit
16	Joules
17	Kilojoules
18	Watt-hours
19	Kilowatt-hours
20	BTUs
21	Therms
22	Ton-hours
125	Kilojoules-per-kilogram
126	Megajoules
146	Megawatt-hours
147	Kilo-BTUs
148	Mega-BTUs

Enthalpy

Value	Unit
23	Joules-per-kilogram-dry-air
24	BTUs-per-pound-dry-air
117	BTUs-per-pound
149	Kilojoules-per-kilogram-dry-air
150	Megajoules-per-kilogram-dry-air

Entrophy

Value	Unit
127	Joules-per-degree-Kelvin
128	Joules-per-kilogram-degree-Kelvin
151	Kilojoules-per-degree-Kelvin

Value	Unit
152	Megajoules-per-degree-Kelvin

Force

Value	Unit
153	Newton

Frequency

Value	Unit
25	Cycles-per-hour
26	Cycles-per-minute
27	Hertz
129	Kilohertz
130	Megahertz
131	Per-hour

Humidity

Value	Unit
28	Grams-of-water-per-kilogram-dry-air
29	Percent-relative-humidity

Length

Value	Unit
30	Millimeters
31	Meters
32	Inches
33	Feet
118	Centimeters

Light

Value	Unit
34	Watts-per-square-foot
35	Watts-per-square-meter
36	Lumens
37	Luxes
38	Foot-candles
179	Candelas
180	Candelas-per-square-meter

Mass

Value	Unit
39	Kilograms
40	Pounds-mass
41	Tons

Mass Flow

Value	Unit
42	Kilograms-per-second
43	Kilograms-per-minute
44	Kilograms-per-hour
45	Pounds-mass-per-minute
46	Pounds-mass-per-hour
119	Pounds-mass-per-second
154	Grams-per-second
155	Grams-per-minute
156	Tons-per-hour

Power

Value	Unit
47	Watts
48	Kilowatts
49	Megawatts
50	BTUs-per-hour
51	Horsepower
52	Tons-refrigeration
132	Milliwatts
157	Kilo-BTUs-per-hour

Pressure

Value	Unit
53	Pascals
54	Kilopascals
55	Bars
56	Pounds-force-per-square-inch
57	Centimeters-of-water
58	Inches-of-water
59	Millimeters-of-mercury
60	Centimeters-of-mercury
61	Inches-of-mercury
133	Hectopascals
134	Millibars

Temperature

Value	Unit
62	Degrees-Celsius
63	Degrees-Kelvin
64	Degrees-Fahrenheit
65	Degree-days-Celsius
66	Degree-days-Fahrenheit
120	Delta-Degrees-Fahrenheit
121	Delta-Degrees-Kelvin
181	Kelvins-per-hour
182	Kelvins-per-minute

Time

Value	Unit
67	Years
68	Months
69	Weeks
70	Days
71	Hours
72	Minutes
73	Seconds
158	Hundredths-seconds
159	Milliseconds

Torque

Value	Unit
160	Newton-meters

Velocity

Value	Unit
74	Meters-per-second

Value	Unit
75	Kilometers-per-hour
76	Feet-per-second
77	Feet-per-minute
78	Miles-per-hour
161	Millimeters-per-second
162	Millimeters-per-minute
163	Meters-per-minute
164	Meters-per-hour

Volume

Value	Unit
79	Cubic-feet
80	Cubic-meters
81	Imperial-gallons
82	Liters
83	Us-gallons

Volumetric Flow

Value	Unit
84	Cubic-feet-per-minute
85	Cubic-meters-per-second
86	Imperial-gallons-per-minute
87	Liters-per-second
88	Liters-per-minute
89	Us-gallons-per-minute
135	Cubic-meters-per-hour
136	Liters-per-hour
142	Cubic-feet-per-second
165	Cubic-meters-per-minute

Other

Value	Unit
90	Degrees-angular
91	Degrees-Celsius-per-hour
92	Degrees-Celsius-per-minute
93	Degrees-Fahrenheit-per-hour
94	Degrees-Fahrenheit-per-minute
95	No-units
96	Parts-per-million
97	Parts-per-billion
98	Percent
99	Percent-per-second
100	Per-minute
101	Per-second
102	Psi-per-Degree-Fahrenheit
103	Radians
104	Revolutions-per-minute
137	Kilowatt-hours-per-square-meter
138	Kilowatt-hours-per-square-foot
139	Megajoules-per-square-meter
140	Megajoules-per-square-foot
141	Watts-per-square-meter-Degree-Kelvin
143	Percent-obscuration-per-foot
144	Percent-obscuration-per-meter
183	Joule-seconds

Value	Unit
185	Square-meters-per-Newton
186	Kilogram-per-cubic-meter
187	Newton-seconds
188	Newtons-per-meter
189	Watts-per-meter-per-degree-Kelvin

BACnetEventState

Value	Event State
0	Normal
1	Fault
2	Off-normal
3	High-limit
4	Low-limit
5	Life-safety-alarm

BACnetEventType

Value	Event Type
0	Change-of-bitstring
1	Change-of-state
2	Change-of-value
3	Command-failure
4	Floating-limit
5	Out-of-range
6	Complex-event-type
7	Deprecated
8	Change-of-life-safety
9	Extended
10	Buffer-ready
11	Unsigned-range
12	Reserved for future addenda
13	Access-event
14	Double-out-of-range
15	Signed-out-of-range
16	Unsigned-out-of-range
17	Change-of-characterstring
18	Change-of-status-flags
19	Change-of-reliability
20	None

BACnetFileAccessMethod

Value	Access Method
0	Record-access
1	Stream-access

BACnetLifeSafetyMode

Value	Life Safety Mode
0	Off
1	On
2	Test
3	Manned
4	Unmanned
5	Armed
6	Disarmed
7	Prearmed

Value	Life Safety Mode
8	Slow
9	Fast
10	Disconnected
11	Enabled
12	Disabled
13	Automatic-release-disabled
14	Default

BACnetLifeSafetyOperation

Value	Life Safety Operation
0	None
1	Silence
2	Silence-audible
3	Silence-visible
4	Reset
5	Reset-alarm
6	Reset-fault
7	Unsilence
8	Unsilence-audible
9	Unsilence-visual

BACnetLifeSafetyState

Value	Life Safety State
0	Quiet
1	Pre-alarm
2	Alarm
3	Fault
4	Fault-pre-alarm
5	Fault-alarm
6	Not-ready
7	Active
8	Tamper
9	Test-alarm
10	Test-active
11	Test-fault
12	Test-fault-alarm
13	Holdup
14	Duress
15	Tamper-alarm
16	Abnormal
17	Emergency-power
18	Delayed
19	Blocked
20	Local-alarm
21	General-alarm
22	Supervisory
23	Test-supervisory

BACnetMaintenance

Value	Maintenance
0	None
1	Periodic-test
2	Need-service-operational
3	Need-service-inoperative

BACnetNotifyType

Value	Notify Type
0	Alarm
1	Event
2	Ack-notification

BACnetObjectType

Value	Object Type
0	Analog-input
1	Analog-output
2	Analog-value
3	Binary-input
4	Binary-output
5	Binary-value
6	Calendar
7	Command
8	Device
9	Event-enrollment
10	File
11	Group
12	Loop
13	Multi-state-input
14	Multi-state-output
15	Notification-class
16	Program
17	Schedule
18	Averaging
19	Multi-state-value
20	Trend-log
21	Life-safety-point
22	Life-safety-zone
23	Accumulator

BACnetPolarity

Value	Polarity
0	Normal
1	Reverse

BACnetProgramError

Value	Program Error
0	Normal
1	Load-failed
2	Internal
3	Program
4	Other

BACnetProgramRequest

Value	Program Request
0	Ready
1	Load
2	Run
3	Halt
4	Restart
5	Unload

BACnetProgramState

Value	Program State
0	Idle
1	Loading
2	Running
3	Waiting
4	Halted
5	Unloading

BACnetReliability

Value	Reliability
0	No-fault-detected
1	No-sensor
2	Over-range
3	Under-range
4	Open-loop
5	Shorted-loop
6	No-output
7	Unreliable-other
8	Process-error
9	Multi-state-fault
10	Configuration-error
12	Communication-failure
13	Member-fault
14	Monitored-object-fault
15	Tripped

BACnetSegmentation

Value	Segmentation
0	Segmented-both
1	Segmented-transmit
2	Segmented-receive
3	No-segmentation

BACnetSilencedState

Value	Silenced State
0	Unsilenced
1	Audible-silenced
2	Visible-silenced
3	All-silenced

BACnetVTClass

Value	VT Class
0	Default-terminal
1	ANSI-x3-64
2	Dec-vt52
3	Dec-vt100
4	Dec-vt220
5	Hp-700-94
6	IBM-3130

Address Descriptions

All addresses have three required files consisting of object type, object instance, and property identifier. Additional fields may be required for some properties. Many addresses may take optional fields.

Basic Addresses (Primitive Data Types)

Properties with primitive data types are addressed using the following format:

<object type>.<object instance>.<property identifier>

- The **object type** field contains a mnemonic from the list of supported BACnet objects.
- The **object instance** field is the numerical object instance. Object instances may range from 0 to 4194303.
- The **property identifier** field contains the mnemonic for a property that is a member of the selected object type.

See Also: BACnet/IP Objects

BACnet Array and List Addresses

Elements of arrays and lists are addressed using the following format:

<object type>.<object instance>.<property identifier>[index]

This data exists in array or list form in the BACnet/IP device, and not the OPC server. One tag must be configured for each array or list element. The data will not be presented to the OPC clients in array form because BACnet array and list elements may not have primitive data types. The driver will attempt to optimize reads of array data, meaning that it will generally read data for all referenced elements in a single transaction. BACnet lists must be read in their entirety, regardless of the number of elements needed. Element indices start at 1. The upper limit depends on both the property for arrays and the device configuration for lists.

Complex Addresses (Structured Data Types)

Elements of structured data types are addressed using the following format:

<object type>.<object instance>.<property identifier>.<sub property 1>.<sub property 2> ...

- The **sub property n** fields are one of the mnemonics given in the links from the supported object types. For more information, refer to **BACnet/IP Objects**.

Address Modifiers

Optional address modifiers may be added to alter the behavior of the driver. The property address and modifier must be separated by a single space character. The available address modifiers are as follows:

- **COV:** If this modifier is present, the driver will attempt to subscribe to change of value (COV) notifications for the addressed property. Use of COV notifications over polling can greatly reduce network traffic. The BACnet specification requires that certain properties must support COV, but does not demand that others cannot. A particular device may offer COV support for any property. This modifier is primarily for these non-standard COV properties. The driver can be configured to assume COV is to be used for certain standard COV properties, regardless of the presence of this modifier. This behavior can be turned on or off with the COV mode device setting. For more information, refer to the device's PICS statement.
- **RELINQUISH:** BACnet requires that a device execute writes according to a command priority. Once a write has been executed, the issuing application retains "command" over that property. That is, no other application can write to that property unless it uses a higher priority, or the "commanding" application "relinquishes" its command over the property. A tag with this address modifier can be used to relinquish command over the addressed property. Such tags are Write Only, and have a default data type of Boolean. The driver will issue a relinquish command request when any value is written to this tag. Command over other properties will not be affected.
- **PRIORITY:** This modifier, when appended to a tag address for the present value property of a standard commandable object, provides object-level priority for this commandable object. A write to this tag, valid in the range of 0 – 16 inclusively, sets the object's command priority. A value of 0 indicates this object is defaulting to the device-level priority. Other valid values specify the object-level priority. Tags with this address and modifier are read/write and have a default data type of Short. Writes to this tag are managed by the driver and persist in memory until the runtime shuts down. Tags with this address default to 0.

See Also: BACnet/IP Objects

Addressing Examples

The following examples assume an analog value object with instance number 100. *For more information on the object, refer to* ***Analog Value****.*

1. **AnalogValue.100.PresentValue** addresses the **Present Value** property. Since this property has "implicit COV," the driver may subscribe to COV notifications of this property or continuously poll for its current value.
2. **AnalogValue.100.OutOfService COV** addresses the **Out Of Service** property. The COV address modifier is used to tell the driver that COV reporting can be used for this property, even though this property does not normally support COV.
3. **AnalogValue.100.PresentValue RELINQUISH** address is used to create a Write Only tag for relinquishing the driver's command over the **Present Value** property. *For more information, refer to* ***Command Settings****.*
4. **AnalogValue.100.PresentValue PRIORITY** address is used to create a Read/Write tag for setting object-level priority for a standard commandable object. *For more information, refer to* ***Command Settings****.*
5. **AnalogValue.100.PriorityArray [4]** addresses element 4 of the **Priority Array**.
6. **AnalogValue.100.EventEnable.ToFault** addresses the **To Fault** element of the **Event Enable** bit string property.
7. **AnalogValue.100.EventEnable** addresses all bits of the Event Enable bit string property, packed as Word value. Only the lowest 3 bits of the Word will be meaningful in this case. These will be **ToOffNormal**, **ToFault**, and **ToNormal** respectively.
8. **AnalogValue.100.ObjectIdentifier.ObjectInstance** addresses the **Object Instance** member of the **Object Identifier** property structure.
9. **AnalogValue.100.ObjectIdentifier**addresses the Object Identifier property structure, and packs its member values into a single DWord value. The high 10 bits will be the **Object Type** member, and the low 22 bits will be the Object Instance member.

Note: *For more information on enabling COV in the* BACnet/IP Driver*, refer to* ***COV Notifications*** *and* ***COV Settings****.*

BACnet/IP Objects

For more information on a specific BACnet/IP object, select a link from the list below.

Accumulator
Analog Input
Analog Output
Analog Value
Averaging
Binary Input
Binary Output
Binary Value
Calendar
Command
Device
Event Enrollment
File
Group
Life Safety Point
Life Safety Zone
Loop
Multi-State Input
Multi-State Output
Multi-State Value
Notification Class
Program

Schedule
Trend Log

Accumulator

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of Timestamp	**String**	Read Only[3]	No
HighLimit	Unsigned Integer	**DWord**, Long	Read Only	No
LimitEnable[1] .HighLimitEnable .LowLimitEnable	BACnetLimitEnable	**Word**, Short Boolean Boolean	Read/Write	No
LimitMonitoringInterval	Unsigned Integer	**DWord**, Long	Read/Write	No
LowLimit	Unsigned Integer	**DWord**, Long	Read Only	No
MaxPresValue	Unsigned Integer	**DWord**, Long	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
Prescale[5]	BACnetPrescale	**String**	Read/Write	No
PresentValue	Unsigned Integer	**DWord**, Long	Read/Write	No
ProfileName	CharacterString	**String**	Read Only	No
PulseRate	Unsigned Integer	**DWord**, Long	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
Scale[6]	BACnetScale	**String**	Read/Write	No
StatusFlags[1] .Fault .InAlarm .OutOfService	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean	Read Only	No

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
.Overridden		Boolean		
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
Units	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No
ValueBeforeChange	Unsigned Integer	**DWord**, Long	Read Only	No
ValueChangeTime	BACnetDateTime	**String**	Read Only[3]	No
ValueSet	Unsigned Integer	**DWord**, Long	Read Only	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
5. For more information, refer to the **Prescale String Format**.
6. For more information, refer to the **Scale String Format**.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Analog Input

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
COVIncrement	REAL	**Float**	Read/Write	No
Deadband	REAL	**Float**	Read/Write	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of Timestamp	**String**	Read Only[3]	No
HighLimit	REAL	**Float**	Read Only	No
LimitEnable[1] .HighLimitEnable .LowLimitEnable	BACnetLimitEnable	**Word**, Short Boolean Boolean	Read/Write	No
LowLimit	REAL	**Float**	Read Only	No
MaxPresValue	REAL	**Float**	Read Only	No
MinPresValue	REAL	**Float**	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	REAL	**Float**	Read/Write	Yes
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
Resolution	REAL	**Float**	Read Only	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
Units	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No
UpdateInterval	Unsigned Integer	**DWord**, Long	Read/Write	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Analog Output

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
COVIncrement	REAL	**Float**	Read/Write	No
Deadband	REAL	**Float**	Read/Write	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimestamps[3]	Array of Timestamp	**String**	Read Only[3]	No
HighLimit	REAL	**Float**	Read Only	No
LimitEnable[1] .HighLimitEnable .LowLimitEnable	BACnetLimitEnable	**Word**, Short Boolean Boolean	Read/Write	No

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
LowLimit	REAL	**Float**	Read Only	No
MaxPresValue	REAL	**Float**	Read Only	No
MinPresValue	REAL	**Float**	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	REAL	**Float**	Read/Write	Yes
PriorityArray[16]	Array of BACnetPriorityArray	**String**	Read Only[3]	No
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
RelinquishDefault	REAL	**Float**	Read/Write	No
Resolution	REAL	**Float**	Read Only	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
Units	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Analog Value

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: Address Descriptions

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
COVIncrement	REAL	**Float**	Read/Write	No
Deadband	REAL	**Float**	Read/Write	No
Description	CharacterString	**String**	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[3]	No
HighLimit	REAL	**Float**	Read Only	No
LimitEnable[1] .HighLimitEnable .LowLimitEnable	BACnetLimitEnable	**Word**, Short Boolean Boolean	Read/Write	No
LowLimit	REAL	**Float**	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	REAL	**Float**	Read/Write	Yes
PriorityArray[16]	Array of BACnetPriorityArray	**String**	Read Only[3]	No
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
RelinquishDefault	REAL	**Float**	Read/Write	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
Units	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements
Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Averaging
The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
AttemptedSamples	Unsigned Integer	**DWord**, Long	Read Only
AverageValue	REAL	**Float**	Read Only
Description	CharacterString	**String**	Read Only
MaximumValue	REAL	**Float**	Read Only
MaximumValueTimestamp	BACnetDateTime	**String**	Read Only[1]
MinimumValue	REAL	**Float**	Read Only
MinimumValueTimestamp	BACnetDateTime	**String**	Read Only[1]
ObjectIdentifier[2] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[1]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[1]
ProfileName	CharacterString	**String**	Read Only
ValidSamples	Unsigned Integer	**DWord**, Long	Read Only
VarianceValue	REAL	**Float**	Read Only
WindowInterval	Unsigned Integer	**DWord**, Long	Read/Write
WindowSamples	Unsigned Integer	**DWord**, Long	Read/Write

Notes:

1. May not be made writable.
2. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.

Priority Array Elements
Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Binary Input

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
ActiveText	CharacterString	**String**	Read Only	No
AlarmValue	**BACnetBinaryPV**[2]	**Boolean**	Read/Write	No
ChangeOfStateCount	Unsigned Integer	**DWord**, Long	Read/Write	No
ChangeOfStateTime	BACnetDataTime	**String**	Read Only[3]	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
ElapsedActiveTime	Unsigned Integer	**DWord**, Long	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[3]	No
InactiveText	CharacterString	**String**	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
Polarity	**BACnetPolarity**[2]	**Boolean**	Read/Write	No
PresentValue	**BACnetBinaryPV**[2]	**Boolean**	Read/Write	Yes
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
TimeOfActiveTimeReset	BACnetDateTime	**String**	Read Only[3]	No
TimeOfStateCountReset	BACnetDateTime	**String**	Read Only[3]	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Binary Output

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
ActiveText	CharacterString	**String**	Read Only	No
ChangeOfStateCount	Unsigned Integer	**DWord**, Long	Read/Write	No
ChangeOfStateTime	BACnetDateTime	**String**	Read Only[2]	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
ElapsedActiveTime	Unsigned Integer	**DWord**, Long	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[3]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[2]	No
FeedbackValue	**BACnetBinaryPV**[3]	**Boolean**	Read/Write	No
InactiveText	CharacterString	**String**	Read Only	No
MinimumOffTime	Unsigned Integer	**DWord**, Long	Read Only	No
MinimumOnTime	Unsigned Integer	**DWord**, Long	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[3]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[2]	No

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[2]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
Polarity	**BACnetPolarity**[3]	**Boolean**	Read/Write	No
PresentValue	**BACnetBinaryPV**[3]	**Boolean**	Read/Write	Yes
PriorityArray[16]	Array of BACnetPriorityArray	**String**	Read Only[2]	No
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[3]	**DWord**, Long	Read Only	No
RelinquishDefault	**BACnetBinaryPV**[3]	**Boolean**	Read/Write	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
TimeOfActiveTimeReset	BACnetDateTime	**String**	Read Only[2]	No
TimeOfStateCountReset	BACnetDateTime	**String**	Read Only[2]	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. May not be made writable.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Binary Value

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
ActiveText	CharacterString	**String**	Read Only	No
AlarmValue	**BACnetBinaryPV**[2]	**Boolean**	Read/Write	No
ChangeOfStateCount	Unsigned Integer	**DWord**, Long	Read/Write	No
ChangeOfStateTime	BACnetDateTime	**String**	Read Only[3]	No
Description	CharacterString	**String**	Read Only	No
ElapsedActiveTime	Unsigned Integer	**DWord**, Long	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[3]	No
InactiveText	CharacterString	**String**	Read Only	No
MinimumOffTime	Unsigned Integer	**DWord**, Long	Read Only	No
MinimumOnTime	Unsigned Integer	**DWord**, Long	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	**BACnetBinaryPV**[2]	**Boolean**	Read/Write	Yes
PriorityArray[16]	Array of BACnetPriorityArray	**String**	Read Only[3]	No
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
RelinquishDefault	**BACnetBinaryPV**[2]	**Boolean**	Read/Write	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
TimeOfActiveTimeReset	BACnetDateTime	**String**	Read Only[3]	No
TimeOfStateCountReset	BACnetDateTime	**String**	Read Only[3]	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Calendar

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
DateList[N]	CalendarEntry	**String**	Read Only[1]
DateList[2]	List of CalendarEntry	**String**	Read/Write
Description	CharacterString	**String**	Read Only
ObjectIdentifier[3] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[1]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[4]	**DWord**, Long	Read Only[1]
PresentValue	Boolean	**Boolean**	Read/Write
ProfileName	CharacterString	**String**	Read Only

Notes:

1. May not be made writable.
2. When without an array specifier, the DateList property represents the entire DateList as a formatted string. When with an array specifier, the DateList property is deprecated and included for legacy server project support. New projects should use the DateList property without an array specifier. For more information, refer to **DateList String Format**.
3. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
4. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Command

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified

by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: Address Descriptions

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
ActionText[N]	Array of CharacterString	**String**	Read/Write
AllWritesSuccessful	Boolean	**Boolean**	Read Only
Description	CharacterString	**String**	Read Only
InProcess	Boolean	**Boolean**	Read Only
ObjectIdentifier[1] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[2]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[2]
PresentValue	Unsigned Integer	**DWord**, Long	Read/Write
ProfileName	CharacterString	**String**	Read Only

Notes:

1. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
2. May not be made writable.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Device

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: Address Descriptions

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
APDUSegmentTimeout	Unsigned Integer	**DWord**, Long	Read/Write
APDUTimeout	Unsigned Integer	**DWord**, Long	Read/Write
ApplicationSoftwareVersion	CharacterString	**String**	Read Only
BackupFailureTimeout	Unsigned Integer	**Word**, Short	Read Only

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
ConfigurationFiles[N]	Array of ObjectIdentifier	**DWord**, Long	Read Only
DatabaseRevision	Unsigned Integer	**DWord**, Long	Read Only
DaylightSavingsStatus	Boolean	**Boolean**	Read Only
Description	CharacterString	**String**	Read Only
FirmwareRevision	CharacterString	**String**	Read Only
LastRestoreTime	BACnetDateTime	**String**	Read Only[1]
LocalDate	Date	**String**	Read Only[1]
LocalTime	Time	**String**	Read Only[1]
Location	CharacterString	**String**	Read Only
MaxAPDULengthAccepted	Unsigned Integer	**DWord**, Long	Read/Write
MaxInfoFrames	Unsigned Integer	**DWord**, Long	Read Only
MaxMaster	Unsigned Integer	**DWord**, Long	Read Only
MaxSegmentsAccepted	Unsigned Integer	**DWord**, Long	Read Only
ModelName	CharacterString	**String**	Read Only
NumberOfAPDURetries	Unsigned Integer	**DWord**, Long	Read/Write
ObjectIdentifier[2] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[1]
ObjectList[N]	Array of ObjectIdentifier	**DWord**, Long	Read Only[1]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[1]
ProfileName	CharacterString	**String**	Read Only
ProtocolRevision	Unsigned Integer	**DWord**, Long	Read Only
ProtocolVersion	Unsigned Integer	**DWord**, Long	Read Only
SegmentationSupported	**BACnetSegmentation**[3]	**DWord**, Long	Read Only
SystemStatus	**BACnetDeviceStatus**[3]	**DWord**, Long	Read/Write
UTCOffset	INTEGER	**Long**, Word	Read Only
VendorIdentifier	Unsigned Integer	**Word**, Short	Read Only
VendorName	CharacterString	**String**	Read Only

Notes:

1. May not be made writable.
2. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Event Enrollment

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends

on the BACnet device. For more information, refer to **Addressing Examples**.

2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only
Description	CharacterString	**String**	Read Only
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[3]
EventType	**BACnetEventType**[2]	**DWord**, Long	Read Only
IssueConfirmedNotifications	Boolean	**Boolean**	Read/Write
NotificationClass	Unsigned Integer	**Word**, Short	Read Only
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]
Priority	Unsigned Integer	**DWord**, Long	Read Only
ProcessIdentifier	Unsigned Integer	**DWord**, Long	Read/Write
ProfileName	CharacterString	**String**	Read Only

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

File

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
Archive	Boolean	**Boolean**	Read Only
Description	CharacterString	**String**	Read Only
FileAccessMethod	**BACnetFileAccessMethod**[1]	**DWord**, Long	Read Only
FileSize	Unsigned Integer	**DWord**, Long	Read Only
FileType	CharacterString	**String**	Read Only
ModificationDate	BACnetDateTime	**String**	Read Only[2]
ObjectIdentifier[3] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[2]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[1]	**DWord**, Long	Read Only[2]
ProfileName	CharacterString	**String**	Read Only
ReadOnly	Boolean	**Boolean**	Read Only
RecordCount	Unsigned Integer	**DWord**, Long	Read/Write

Notes:

1. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
2. May not be made writable.
3. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Group

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
Description	CharacterString	**String**	Read Only
ObjectIdentifier[1] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[2]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[2]
ProfileName	CharacterString	**String**	Read Only

Notes:

1. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
2. May not be made writable.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Life Safety Point

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AcceptedModes	List of **BACnetLifeSafetyMode**	**DWord**, Long	Read Only[1]	No
AckedTransitions[2] .ToFault .ToNormal .ToOffNormal	BACnetEventTansitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
AlarmValues	List of **BACnetLifeSafetyState**	**DWord**, Long	Read Only[1]	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
DirectReading	REAL	**Float**	Read Only	No
EventEnable[2] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[3]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[1]	No
FaultValues	List of **BACnetLifeSafetyState**	**DWord**, Long	Read Only[1]	No
LifeSafetyAlarmValues	List of **BACnetLifeSafetyState**	**DWord**, Long	Read Only[1]	No

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
MaintenanceRequired	**BACnetMaintenance**[3]	**DWord**, Long	Read/Write	No
Mode	**BACnetLifeSafetyMode**[3]	**DWord**, Long	Read/Write	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[3]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[1]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[1]	No
OperationExpected	**BACnetLifeSafetyOperation**[3]	**DWord**, Long	Read Only	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	**BACnetLifeSafetyState**[3]	**DWord**, Long	Read/Write	Yes
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[3]	**DWord**, Long	Read Only	No
Setting	Unsigned Integer	**Byte**, Char	Read/Write	No
Silenced	**BACnetSilencedState**[3]	**DWord**, Long	Read Only	No
StatusFlags[2] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
TrackingValue	**BACnetLifeSafetyState**[3]	**DWord**, Long	Read Only	No
Units	**BACnetEngineeringUnits**[3]	**DWord**, Long	Read Only	No

Notes:

1. May not be made writable.
2. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Life Safety Zone

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AcceptedModes	List of **BACnetLifeSafetyMode**	**DWord**, Long	Read Only[1]	No
AckedTransitions[2] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
AlarmValues	List of **BACnetLifeSafetyState**	**DWord**, Long	Read Only[1]	No
Description	CharacterString	String	Read Only	No
DeviceType	CharacterString	String	Read Only	No
EventEnable[2] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[3]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[1]	No
FaultValues	List of **BACnetLifeSafetyState**	**DWord**, Long	Read Only[1]	No
LifeSafetyAlarmValues	List of **BACnetLifeSafetyState**	**DWord**, Long	Read Only[1]	No
MaintenanceRequired	Boolean	Boolean	Read/Write	No
Mode	**BACnetLifeSafetyMode**[3]	**DWord**, Long	Read/Write	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[3]	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[1]	No
ObjectName	CharacterString	String	Read Only	No
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[1]	No
OperationExpected	**BACnetLifeSafetyOperation**[3]	**DWord**, Long	Read Only	No
OutOfService	Boolean	Boolean	Read/Write	No
PresentValue	**BACnetLifeSafetyState**[3]	**DWord**, Long	Read/Write	Yes
ProfileName	CharacterString	String	Read Only	No
Reliability	**BACnetReliability**[3]	**DWord**, Long	Read Only	No
Silenced	**BACnetSilencedState**[3]	**DWord**, Long	Read Only	No
StatusFlags[2] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
TrackingValue	**BACnetLifeSafetyState**[3]	**DWord**, Long	Read Only	No

Notes:

1. May not be made writable.
2. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Loop

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
Action	**BACnetAction**[2]	**DWord**, Long	Read Only	No
Bias	REAL	**Float**	Read/Write	No
ControlledVariableUnits	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No
ControlledVariableValue	REAL	**Float**	Read Only	Yes
COVIncrement	REAL	**Float**	Read/Write	No
DerivativeConstant	REAL	**Float**	Read/Write	No
DerivativeConstantUnits	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No
Description	CharacterString	**String**	Read Only	No
ErrorLimit	REAL	**Float**	Read/Write	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[3]	No
IntegralConstant	REAL	**Float**	Read/Write	No
IntegralConstantUnits	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No
MaximumOutput	REAL	**Float**	Read Only	No
MinimumOutput	REAL	**Float**	Read Only	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	BACnetNotifyType	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
OutputUnits	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No
PresentValue	REAL	**Float**	Read Only	Yes
PriorityForWriting	Unsigned Integer	**DWord**, Long	Read/Write	No
ProfileName	CharacterString	**String**	Read Only	No

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
ProportionalConstant	REAL	**Float**	Read/Write	No
ProportionalConstantUnits	**BACnetEngineeringUnits**[2]	**DWord**, Long	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
Setpoint	REAL	**Float**	Read/Write	Yes
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No
UpdateInterval	Unsigned Integer	**DWord**, Long	Read/Write	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Multi-State Input

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
AlarmValues	List of Unsigned Integers	**DWord**, Long	Read Only[2]	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
EventEnable[1] .ToFault .ToNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean	Read/Write	No

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
.ToOffNormal		Boolean		
EventState	BACnetEventState[3]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[2]	No
FaultValues	List of Unsigned Integers	**DWord**, Long	Read Only[2]	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	BACnetNotifyType[3]	**DWord**, Long	Read Only	No
NumberOfStates	Unsigned Integer	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[2]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	BACnetObjectType[3]	**DWord**, Long	Read Only[2]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	Unsigned Integer	**DWord**, Long	Read/Write	Yes
ProfileName	CharacterString	**String**	Read Only	No
Reliability	BACnetReliability[3]	**DWord**, Long	Read Only	No
StateText[N]	Array of CharacterString	**String**	Read/Write	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. May not be made writable.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Multi-State Output

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
Description	CharacterString	**String**	Read Only	No
DeviceType	CharacterString	**String**	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[2]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[3]	No
FeedbackValue	Unsigned Integer	**DWord**, Long	Read/Write	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[2]	**DWord**, Long	Read Only	No
NumberOfStates	Unsigned Integer	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[2]	**DWord**, Long	Read Only[3]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	Unsigned Integer	**DWord**, Long	Read/Write	Yes
PriorityArray[16]	Array of BACnetPriorityArray	**String**	Read Only[3]	No
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[2]	**DWord**, Long	Read Only	No
RelinquishDefault	Unsigned Integer	**DWord**, Long	Read/Write	No
StateText[N]	Array of CharacterString	**String**	Read/Write	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
3. May not be made writable.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Multi-State Value

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only	No
AlarmValues	List of Unsigned Integers	**DWord**, Long	Read Only[2]	No
Description	CharacterString	**String**	Read Only	No
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTransitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write	No
EventState	**BACnetEventState**[3]	**DWord**, Long	Read Only	No
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[2]	No
FaultValues	List of Unsigned Integers	**DWord**, Long	Read Only[2]	No
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only	No
NotifyType	**BACnetNotifyType**[3]	**DWord**, Long	Read Only	No
NumberOfStates	Unsigned Integer	**DWord**, Long	Read Only	No
ObjectIdentifier[4] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[2]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[2]	No
OutOfService	Boolean	**Boolean**	Read/Write	No
PresentValue	Unsigned Integer	**DWord**, Long	Read/Write	Yes
PriorityArray[16]	Array of BACnetPriorityArray	**String**	Read Only[2]	No
ProfileName	CharacterString	**String**	Read Only	No
Reliability	**BACnetReliability**[3]	**DWord**, Long	Read Only	No
RelinquishDefault	Unsigned Integer	**DWord**, Long	Read/Write	No
StateText[N]	Array of CharacterString	**String**	Read/Write	No
StatusFlags[1] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only	Yes
TimeDelay	Unsigned Integer	**DWord**, Long	Read/Write	No

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property

fields.

2. May not be made writable.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
4. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Notification Class

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
AckRequired[1] .ToFault .ToNormal .ToOffNormal	BACnetEvnetTransitionBits	**Word**, Short Boolean Boolean Boolean	Read Only
Description	CharacterString	String	Read Only
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only
ObjectIdentifier[2] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[3]
ObjectName	CharacterString	String	Read Only
ObjectType	**BACnetObjectType**[4]	**DWord**, Long	Read Only[3]
Priority[3]	Array of Unsigned Integers	**DWord**, Long	Read Only[3]
ProfileName	CharacterString	String	Read Only

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
3. May not be made writable.

4. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Program

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
Description	CharacterString	**String**	Read Only
DescriptionOfHalt	CharacterString	**String**	Read Only
InstanceOf	CharacterString	**String**	Read Only
ObjectIdentifier[1] .ObjectInstance .ObjectType	BACnetObjectIdentifier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[2]
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[3]	**DWord**, Long	Read Only[2]
OutOfService	Boolean	**Boolean**	Read/Write
ProfileName	CharacterString	**String**	Read Only
ProgramChange	**BACnetProgramRequest**[3]	**DWord**, Long	Read Only
ProgramLocation	CharacterString	**String**	Read Only
ProgramState	**BACnetProgramState**[3]	**DWord**, Long	Read Only
ReasonForHalt	**BACnetProgramError**[3]	**DWord**, Long	Read Only
Reliability	**BACnetReliability**[3]	**DWord**, Long	Read Only
StatusFlags[4] .Fault .InAlarm .OutOfService .Overridden	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only

Notes:

1. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
2. May not be made writable.
3. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.

4. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Schedule

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise. The COV column specifies whether the driver considers the property to have implicit Change Of Value (COV) notification capability; that is, whether the BACnet specification requires the property to support COV. For some properties, COV support depends on implementation. The "COV" modifier must be added to the tag's address for use. For more information, refer to **COV Settings**.

Note: The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access	COV
Description	CharacterString	**String**	Read Only	No
EffectivePeriod	BACnetDateRange	**String**	Read Only[1]	No
ExceptionSchedule[2]	BACnetARRAY[N] of BACnetSpecialEvent	**String**	Read/Write	No
ObjectIdentifier[3] .ObjectInstance .ObjectType	BACnetObjectIdentier	**DWord**, Long **DWord**, Long **DWord**, Long	Read Only[1]	No
ObjectName	CharacterString	**String**	Read Only	No
ObjectType	**BACnetObjectType**[4]	**DWord**, Long	Read Only[1]	No
PresentValue	Any	**Float**	Read/Write	No
PriorityForWriting	Unsigned Integer	**DWord**, Long	Read/Write	No
ProfileName	CharacterString	**String**	Read Only	No
ScheduleDefault	Real	Float	Read Only	No
StatusFlags[5] .InAlarm .Fault .Overridden .OutofService	BACnetStatusFlags	**Word**, Short Boolean Boolean Boolean Boolean	Read Only[1]	Yes
Reliability	**BACnetReliability**	**DWord**, Long	Read Only[1]	No
OutofService WeeklySchedule[6]	Boolean BACnetARRAY[7] of BACnetDailySchedule	**Boolean** **String**	Read/Write Read/Write	No No

Notes:

1. May not be made writable.
2. For more information, refer to **ExceptionSchedule String Format**.

3. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.
4. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
5. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
6. For more information, refer to **WeeklySchedule String Format**.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

Trend Log

The following table describes the object's supported properties. The Access column specifies the default access permission for tags. To accommodate non-standard implementations of BACnet, tags may be given Read/Write access unless noted otherwise.

Notes:

1. The length of the array property will be specified by *[m]*, where m is the number of supported elements (according to the BACnet specification). The BACnet array properties that do not have a length specified by the BACnet standard will be designated by *[N]*. This means the length of the property array depends on the BACnet device. For more information, refer to **Addressing Examples**.
2. Implicit Change of Value (COV) notifications are not supported for this object. For more information on devices with explicit COV support, refer to **COV Notifications**.

See Also: **Address Descriptions**

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
AckedTransitions[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTansitionBits	**Word**, Short Boolean Boolean Boolean	Read Only
BufferSize	Unsigned Integer	**DWord**, Long	Read Only
COVResubscriptionInterval	Unsigned Integer	**DWord**, Long	Read/Write
CurrentNotifyTime[2]	BACnetDateTime	**String**	Read Only[3]
Description	CharacterString	**String**	Read Only
EventEnable[1] .ToFault .ToNormal .ToOffNormal	BACnetEventTansitionBits	**Word**, Short Boolean Boolean Boolean	Read/Write
EventState	**BACnetEventState**[4]	**DWord**, Long	Read Only
EventTimeStamps[3]	Array of TimeStamp	**String**	Read Only[3]
LastNotifyRecord[5]	Unsigned Integer	**DWord**, Long	Read Only
LogEnable	Boolean	**Boolean**	Read/Write
LogInterval	Unsigned Integer	**DWord**, Long	Read/Write
NotificationClass	Unsigned Integer	**DWord**, Long	Read Only
NotificationThreshold	Unsigned Integer	**DWord**, Long	Read Only
NotifyType	**BACnetNotifyType**[4]	**DWord**, Long	Read Only
ObjectIdentifier[6]	BACnetObjectIdentifier	**DWord**, Long	Read Only[3]

Property Mnemonic	BACnet Data Type	OPC Data Type	Access
.ObjectInstance .ObjectType		**DWord**, Long **DWord**, Long	
ObjectName	CharacterString	**String**	Read Only
ObjectType	**BACnetObjectType**[4]	**DWord**, Long	Read Only[3]
PreviousNotifyTime[2]	BACnetDateTime	**String**	Read Only[3]
ProfileName	CharacterString	**String**	Read Only
RecordCount	Unsigned Integer	**DWord**, Long	Read/Write
RecordsSinceNotification	Unsigned Integer	**DWord**, Long	Read Only
StartTime	BACnetDateTime	**String**	Read Only[3]
StopTime	BACnetDateTime	**String**	Read Only[3]
StopWhenFull	Boolean	**Boolean**	Read/Write
TotalRecordCount	Unsigned Integer	**DWord**, Long	Read Only

Notes:

1. Bit string types may be viewed as a packed Word value, whose actual number of meaningful bits will depend on specific property. They may also be viewed as individual bits using optional sub-property fields.
2. This has been removed from the BACnet 2004 Specification. Support is available for legacy devices only.
3. May not be made writable.
4. Properties with enumerated BACnet Data Types are expressed as integer values. For standard interpretations, refer to **Enumerated Data Types**.
5. The LastNotifyRecord property replaced the PreviousNotifyTime and CurrentNotifyTime properties in the BACnet 2004 Specification. Devices that support LastNotifyRecord may not support the CurrentNotifyTime and LastNotifyTime properties.
6. Object Identifier may be viewed as a packed DWord value (high 10 bits are the object type and low 22 bits are the object instance) or as individual tags for object type and instance using optional sub-property fields.

Priority Array Elements

Priority Array elements may be "NULL" or the numerical command value currently in effect. The array element index may range from 1 to 16, inclusive.

DateList String Format

The format of the Calendar Object's DateList property string is as follows:

- Entry;Entry;Entry;...Entry;
  - **Date Entry Format:** *0,dDDMMYYYY*, where:
    - *d* is the day of the week, where:
      - 1 to 7 is Monday to Sunday
      - * is unspecified
    - *DD* is the day of the month, where:
      - 01 to 31 is the day of the month
      - 32 is the last day of the month
      - 33 is odd days of the month
      - 34 is even days of the month
      - ** is any day of the month
    - *MM* is the month, where:
      - 01 to 12 is January to December
      - 13 is odd months
      - 14 is even months
      - ** is any month
    - *YYYY* is the year, where:
      - 1900 to 2255 is the year
      - **** is any year
  - **Date Range Entry Format:** *1,dDDMMYYYY,dDDMMYYYY*, where:
    - *d* is the day of the week, where:
      - 1 to 7 is Monday to Sunday
      - * is unspecified
    - *DD* is the day of the month, where:
      - 01 to 31 is the day of the month
      - 32 is the last day of the month
      - 33 is odd days of the month
      - 34 is even days of the month
      - ** is any day of the month
    - *MM* is the month, where:
      - 01 to 12 is January to December
      - 13 is odd months
      - 14 is even months
      - ** is any month
    - *YYYY* is the year, where:
      - 1900 to 2255 is the year
      - **** is any year
  - **Week And Day Entry Format:** *2,MMWd*, where:
    - *MM* is the month, where:
      - 01 to 12 is January to December
      - 13 is odd months

- 14 is even months
- ** is any month

- *W* is the week, where:
  - 1 to 5 is the first week (days 1 to 7) to the fifth week (days 29 to 31) of the month
  - 6 is the last 7 days of the month
  - * is any week in the month
- *d* is the day of the week, where:
  - 1 to 7 is Monday to Sunday
  - * is any day of the week

Example
Given the following three entries:

- **Date:** Wednesday, January 1, 2014
- **Date Range:** Monday, February 17, 2014 to Friday, February 21, 2014
- **Week And Day:** Any Month, Last 7 days, Friday

The DateList string would be "0,301012014;1,117022014,521022014;2,**65;".

ExceptionSchedule String Format

The format of the Calendar Object's ExceptionSchedule property string is as follows:

- Entry;Entry;Entry;...Entry;
  - **Entry Format:** *Period,Priority,Time,Datatype,Length,Value,Time,Datatype,Length,Value,...* where:
    - *Period* is:
      - A Date Entry, Date List Entry, or Week and Day Entry per the **DateList String Format**
      - A Calendar Reference Entry with the format *3,CalRef*, where:
        - *CalRef* is the calendar reference's Object ID
    - *Priority* is the BACnet priority (1 to 16)
    - *Time* is in the format *HHmmsshh*, where:
      - *HH* is the hour (0 to 23)
      - *mm* is the minute (0 to 59)
      - *ss* is the seconds (0 to 59)
      - *hh* is hundredths of a second (0 to 99)

      Note: All fields may be replaced by ** to mean "any".
    - *Datatype* is any BACnet primitive data type, including:
      - 0 is NULL
      - 1 is Boolean
      - 2 is Unsigned Integer
      - 3 is Signed Integer
      - 4 is Real
      - 5 is Double
      - 6 is Octet String
      - 7 is Character String
      - 8 is Bit String

- 9 is Enumeration
- 10 is Date. For more information, refer to **DateList String Format**.
- 11 is Time. For more information, refer to *Time* above.
- 12 is Object Identifier, where the format is:
    - *<ObjectType>.<Instance>* where *<ObjectType>* is one of the following:
        - AnalogInput
        - AnalogOutput
        - AnalogValue
        - BinaryInput
        - BinaryOutput
        - BinaryValue
        - Calendar
        - Command
        - Device
        - EventEnrollment
        - File
        - Group
        - Loop
        - MultistateInput
        - MultistateOutput
        - NotificationClass
        - Program
        - Schedule
        - Averaging
        - MultistateValue
        - TrendLog
        - LifeSafetyPoint
        - LifeSafetyZone
        - Accumulator
        - PulseConverter
        - EventLog
        - GlobalGroup
        - TrendLogMultiple
        - LoadControl
        - StructuredView
        - AccessDoor
        - AccessCredential
        - AccessPoint
        - AccessRights
        - AccessUser
        - AccessZone
        - CredentialDataInput
        - NetworkSecurity
        - BitStringValue
        - CharacterStringValue
        - DatePatternValue
        - DateValue
        - DateTimePatternValue
        - DateTimeValue
        - IntegerValue

- LargeAnalogValue
- OctetStringValue
- PositiveIntegerValue
- TimePatternValue
- TimeValue
- NotificationForwarder
- AlertEnrollment
- Channel
- LightingOutput

- *Length* is *n*, where *n* is the number of characters in the value
- *Value* is any primitive data type

Example
Given the following four entries:

- **Date:** Wednesday, January 1, 2014, Priority 16, 01:02:03.00 AM Real "1.23"
- **Date Range:** Monday, February 17, 2014 to Friday, February 21, 2014, Priority 16, 04:05:06.00 AM Real "4.56"
- **Week and Day:** Any Month, Last 7 days, Friday, Priority 16, 07:08:09.00 AM Real "6.78"
- **Calendar Reference:** Calendar Object ID 1, Priority 16, 10:11:12.00 AM Real "9.01"

The ExceptionSchedule string would be
"0,301012014,16,01020300,4,8,1.230000;1,117022014,521022014,16,04050600,4,8,4.560000;2,**65,16-,07080900,4,8,6.780000;3,1,16,10111200,4,8,9.010000;".

Prescale String Format

Prescale presents the coefficients used to convert the pulse signals generated by the measuring instrument into the value displayed by PresentValue. This conversion factor is expressed as a ratio of integers – counts out : pulses in.

The format of the Accumulator Object's Prescale property string is as follows:

Multiplier,ModuloDivide
where:
Multiplier = The numerator or counts out; and
ModuloDivide = The denominator or pulses in.

Examples:

- For every 1 pulse in, the present value shows 1 count out. This 1:1 conversion factor has both the multiplier and modulodivide of 1. The string format is: 1,1.
- For every 100 pulses in, the present value shows 1 count out. This 1:100 conversion factor has a multiplier of 1 and a modulodivide of 100. The string format is: 1,100.
- For every 1000 pulses in, the present value shows 10 counts out. This 10:1000 conversion factor has a multiplier of 10 and a modulodivide of 1000. The string format is: 10,1000.

Scale String Format

The format of the Accumulator Object's Scale property string is as follows:

Choice,Value
where:
Choice = Either 0 for float scale or 1 for integer scale; and
Value = The real or integer value depending on the choice.

Examples:

- The string format for a float scale of 1.5 is: 0,1.5.
- The string format for a float scale of 10 is: 0,10.

- The string format for an integer scale of 1 is: 1,1.
- The string format for an integer scale of 10: 1,10.

WeeklySchedule String Format

The format of the Schedule Object's WeeklySchedule property string is as follows:

- Entry;Entry;Entry;Entry;Entry;Entry;Entry;
    - **Entry Format:** *Time,Datatype,Length,Value,Time,Datatype,Length,Value,...* , where:
        - *Time* is in the format *HHmmsshh*, where:
            - *HH* is the hour (0 to 23)
            - *mm* is the minute (0 to 59)
            - *ss* is the seconds (0 to 59)
            - *hh* is hundredths of a second (0 to 99)

            Note: All fields may be replaced by ** to mean "any".
        - *Datatype* is any BACnet primitive data type, including:
            - 0 is NULL
            - 1 is Boolean
            - 2 is Unsigned Integer
            - 3 is Signed Integer
            - 4 is Real
            - 5 is Double
            - 6 is Octet String
            - 7 is Character String
            - 8 is Bit String
            - 9 is Enumeration
            - 10 is Date. For more information, refer to **DateList String Format**.
            - 11 is Time. For more information, refer to *Time* above.
            - 12 is Object Identifier, where the format is:
                - <*ObjectType*>.<*Instance*> where <*ObjectType*> is one of the following:
                    - AnalogInput
                    - AnalogOutput
                    - AnalogValue
                    - BinaryInput
                    - BinaryOutput
                    - BinaryValue
                    - Calendar
                    - Command
                    - Device
                    - EventEnrollment
                    - File
                    - Group
                    - Loop
                    - MultistateInput
                    - MultistateOutput
                    - NotificationClass
                    - Program

- Schedule
- Averaging
- MultistateValue
- TrendLog
- LifeSafetyPoint
- LifeSafetyZone
- Accumulator
- PulseConverter
- EventLog
- GlobalGroup
- TrendLogMultiple
- LoadControl
- StructuredView
- AccessDoor
- AccessCredential
- AccessPoint
- AccessRights
- AccessUser
- AccessZone
- CredentialDataInput
- NetworkSecurity
- BitStringValue
- CharacterStringValue
- DatePatternValue
- DateValue
- DateTimePatternValue
- DateTimeValue
- IntegerValue
- LargeAnalogValue
- OctetStringValue
- PositiveIntegerValue
- TimePatternValue
- TimeValue
- NotificationForwarder
- AlertEnrollment
- Channel
- LightingOutput

- *Length* is *n*, where *n* is the number of characters in the value.
- *Value* is any primitive data type.

Example
Given the following weekly schedule:

- **Monday:** 12:35:50.00 AM Null, 11:59:59.99 PM Boolean "0"
- **Tuesday:** 05:06:07.00 AM Unsigned Integer "12345", 12:22:34.00 PM Signed Integer "-9876"
- **Wednesday:** 12:27:33.00 PM Real "1.234568", 12:28:03.00 PM Double "9.876543"
- **Thursday:** Empty.
- **Friday:** 12:28:45.00 PM Octet String "0123456789ABCDEF", 12:29:11.00 PM Character String "Hello World!"
- **Saturday:** 12:30:51.00 PM Bit String "10,0101010101", 12:32:15.00 PM Enumeration "42"
- **Sunday:** 12:31:46.00 PM Date "03/28/2014", 12:32:15.00 PM Time "12:32:15.00 PM", 12:33:22.00 Object Reference "AnalogInput 12"

The weekly schedule string would be "00355000,0,0,,23595999,1,1,0;05060700,2,5,12345,12223400,3,5,-9876;12273300,4,8,1.234568,12280300,5,8,9.876543;;12284500,6,16,0123456789ABCDEF,12291100,7,1-2,Hello

World!;12305100,8,10,0101010101,12321500,9,2,42;12314600,10,9,*28032014,12321500,11,8,1232150-0,12332200,12,14,AnalogInput,12;".

VBA Scripts for String Parsing and Construction

The Visual Basic for Applications (VBA) code below will convert strings that conform to the **DateList**, **ExceptionSchedule**, and **WeeklySchedule** formats into VBA structures. It will also convert the VBA structures back into appropriately-formatted strings. This can serve as a starting point for Human Machine Interfaces (HMIs) that need to access the BACnet string data in the server and support the use of VBA for scripting.

Note: The following are not supported by this sample script:

- Wildcards ('*') in any BACnetDate or BACnetDateRange contained in a DateList.
- Wildcards ('*') in any BACnetDate or BACnetDateRange that is used to specify the period for an ExceptionSchedule.

```
' ------------------------------------------------------------------------

' KepBacNetApi

'

' Code for converting KEPServerEX BACnet/IP DateList, WeeklySchedule, and

' ExceptionSchedule tag strings to VBA types, and back.

'

' Copyright (c) Kepware Technologies, Inc

' ------------------------------------------------------------------------



' Types & Constants ----------------------------------------------------



' Define constants for the date-list entry type indexes

Public Enum DateEntryTypes

        DateType = 0

        DateRangeType = 1

        WeekNDayType = 2

        CalendarType = 3

End Enum



Type BacNetDate

        CalendarDate As Date

        DayOfWeek As String

End Type
```

```
Type BacNetDateRange

        StartDate As BacNetDate

        EndDate As BacNetDate

End Type


Type BacNetWeekNDay

        Month As String

        Week As String

        Day As String

End Type


Type BacNetDateListEntry

        BDateType As DateEntryTypes

        BDate As BacNetDate

        BDateRange As BacNetDateRange

        BWeekNDay As BacNetWeekNDay

        BCalRef As Integer

End Type


Type BacNetTimeValuePair

        BTime As String

        BDataType As Integer

        BData As String

End Type


Type BacNetDailySchedule

        BTimeValuePairs() As BacNetTimeValuePair

End Type


Type BacNetException
```

```
        BPeriod As BacNetDateListEntry
        BPriority As Integer
        BTimeValuePairs() As BacNetTimeValuePair
End Type

' ----------------------------------------------------------------------
' Main API Functions
' ----------------------------------------------------------------------

' DATE LIST ------------------------------------------------------------

' Parses the input string and populates an array of Date-List entries
Public Function DateListFromKepString(ByVal inputString As String, _
        ByRef InputArray() As BacNetDateListEntry)

        Dim index As Integer, arrayIndex As Integer
        Dim entry As BacNetDateListEntry

        ' Initialize indices that track the string and array positions
        index = 1
        arrayIndex = 0

        ' Clear the input array
        Erase InputArray

        ' Iterate over the entire input string
        While index <= Len(inputString)
                ' Initialize the current date-list entry object
                entry = DateListEntryFromKepString(inputString, index)
                index = index + 1
```

```
                ' Add space for the new array element
                ReDim Preserve InputArray(0 To arrayIndex)

                ' Add the entry to the array, and increment the index
                InputArray(arrayIndex) = entry
                arrayIndex = arrayIndex + 1
        Wend
End Function

' Returns a KEPServerEX DateList string representing the data in a Date-List
Public Function DateListToKepString( _
        ByRef InputArray() As BacNetDateListEntry) As String

        Dim kepString As String, entryKepString As String
        Dim i As Integer, size As Integer

        kepString = ""
        size = 0

        ' Check the size of the array, on error: skip to the next line of code
        On Error Resume Next
                size = UBound(InputArray) + 1

        ' If the array isn't empty
        ' convert each date-list entry to its KEPServerEX string format
        If size > 0 Then
                ' Iterate through each date-list entry
                For i = LBound(InputArray) To (UBound(InputArray))
                        ' Append the entry string and a delimiting semicolon
```

```
                        kepString = kepString & _
                                DateListEntryToKepString(InputArray(i)) & ";"
                Next
        End If

        ' Return the overall string
        DateListToKepString = kepString
End Function

' WEEKLY SCHEDULE ------------------------------------------------------------

' Parses the input string and populates the provided Weekly-Schedule
Public Function WeeklyScheduleFromKepString(ByVal inputString As String, _
        ByRef InputArray() As BacNetDailySchedule)

        Dim dailySchedule As BacNetDailySchedule
        Dim index As Integer, arrayIndex As Integer

        ' Initialize indices that track the string and array positions
        index = 1
        arrayIndex = 0

        ' Clear the input array
        Erase InputArray

        ' Iterate through the entire input string
        While index <= Len(inputString)
                ' Populate the dailySchedule's array of time-value pairs
                TimeValuePairsFromKepString inputString, index, _
                        InputArray:=dailySchedule.BTimeValuePairs
```

```
                index = index + 1

                ' Add a space in the array of daily-schedules for the current entry
                ReDim Preserve InputArray(0 To arrayIndex)

                ' Add the entry to the array, and increment the index
                InputArray(arrayIndex) = dailySchedule
                arrayIndex = arrayIndex + 1
        Wend
End Function

' Returns a KEPServerEX WeeklySchedule string representing the data in the
' provided Weekly-Schedule
Public Function WeeklyScheduleToKepString( _
        ByRef InputArray() As BacNetDailySchedule) As String

        Dim kepString As String

        kepString = ""

        ' Iterate through all of the daily-schedule entries in the array
        For i = LBound(InputArray) To (UBound(InputArray))
                ' Append the current daily-schedule KEPServerEX string and a
                ' delimiting semicolon to the overall string
                kepString = kepString & _
                        TimeValuePairsToKepString(InputArray(i).BTimeValuePairs) & ";"

        Next
```

```
        ' Return the overall string
        WeeklyScheduleToKepString = kepString
End Function

' EXCEPTION SCHEDULE ----------------------------------------------------

' Parses the input string and populates the provided Exception-Schedule
Public Function ExceptionScheduleFromKepString( _
        ByVal inputString As String, ByRef InputArray() As BacNetException)

        Dim exception As BacNetException
        Dim priorityTemp As String
        Dim index As Integer, arrayIndex As Integer
        Dim comma() As Variant, commaAndSemi() As Variant

        ' Kepware string delimiters
        comma = Array(",")
        commaAndSemi = Array(",", ";")

        ' Initialize indices that track the string and array positions
        index = 1
        arrayIndex = 0

        ' Clear the input array
        Erase InputArray

        ' Iterate through the entire input string
        While index <= Len(inputString)
                ' Parse the date-list entry at the start of the current exception
                exception.BPeriod = DateListEntryFromKepString(inputString, index)
```

```
                index = index + 1


                ' Parse the priority of the current exception
                priorityTemp = ReadUntilAny(inputString, index, commaAndSemi)
                index = index + Len(priorityTemp)
                exception.BPriority = CInt(priorityTemp)


                ' Parse and populate current exception's array of time-value pairs
                TimeValuePairsFromKepString inputString, index, _
                InputArray:=exception.BTimeValuePairs


                index = index + 1


                ' Add a space in the array of exceptions for the current entry
                ReDim Preserve InputArray(0 To arrayIndex)


                ' Add the entry to the array, and increment the index
                InputArray(arrayIndex) = exception
                arrayIndex = arrayIndex + 1
        Wend
End Function


' Returns a KEPServerEX ExceptionSchedule string representing the data in
' the provided Exception-Schedule
Public Function ExceptionScheduleToKepString( _
        ByRef InputArray() As BacNetException) As String


        Dim kepString As String
        Dim size As Integer
        Dim tvp As String
```

```
kepString = ""
size = 0

' Check the size of the array, on error: skip to the next line of code
On Error Resume Next
        size = UBound(InputArray) + 1

' If the array isn't empty, then convert each time-value pair to its
' KEPServerEX string format
If size > 0 Then
        ' Iterate through all of the exception entries in the array
        For i = LBound(InputArray) To (UBound(InputArray))
                ' Append the current date-list entry and priority
                kepString = kepString & _
                        DateListEntryToKepString(InputArray(i).BPeriod) & "," & _
                        InputArray(i).BPriority

                ' If the time-value pair string isn't empty,
                ' append it to the overall string
                tvp = TimeValuePairsToKepString(InputArray(i).BTimeValuePairs)
                If Len(tvp) <> 0 Then
                        kepString = kepString & "," & tvp
                End If

                ' add the delimiting semicolon
                kepString = kepString & ";"
        Next
End If
```

```
        ' Return the overall string

        ExceptionScheduleToKepString = kepString

End Function


' ------------------------------------------------------------------------

' INTERNAL FUNCTIONS

' ------------------------------------------------------------------------


' DATE CONVERSION ---------------------------------------------------------


' Parses the input string and returns a BACnet Date type variable

Private Function DateFromKepString(ByVal inputString As String) _

        As BacNetDate


        Dim DayOfWeek As String

        Dim Day As Integer, Month As Integer, year As Integer

        Dim BDate As BacNetDate


        ' Kepware BACnet string format for a date is: dDDMMYYYY

        ' Extract the segments of the date string

        DayOfWeek = Left(inputString, 1)

        Day = CInt(Mid(inputString, 2, 2))

        Month = CInt(Mid(inputString, 4, 2))

        year = CInt(Right(inputString, 4))


        ' Set the object properties

        BDate.CalendarDate = DateSerial(year, Month, Day)

        BDate.DayOfWeek = DayOfWeek


        ' Return the date type
```

```
        DateFromKepString = BDate
End Function


' Returns a KEPServerEX style string that represents the data in the
' provided BACnet Date variable
Private Function DateToKepString(BDate As BacNetDate) As String
        DateToKepString = DateEntryTypes.DateType & "," & _
                DateToKepStringNoId(BDate)


End Function


' Returns a KEPServerEX style string that represents the data in the
' provided BACnet Date variable.
' The Date type ID is not included in the returned string
Private Function DateToKepStringNoId(BDate As BacNetDate) As String
        DateToKepStringNoId = BDate.DayOfWeek & _
                Format(BDate.CalendarDate, "ddmmyyyy")


End Function


' DATE RANGE CONVERSION ------------------------------------------------


' Parses the input string and returns a BACnet Date-Range type variable
Private Function DateRangeFromKepString(ByVal inputString As String) As _
        BacNetDateRange


        Dim BDateRange As BacNetDateRange


        ' Kepware string format for a date range is: dDDMMYYYY,dDDMMYYYY
        ' Set the start and end date properties
```

```
        BDateRange.StartDate = DateFromKepString(Left(inputString, 9))
        BDateRange.EndDate = DateFromKepString(Right(inputString, 9))

        ' Return the date-range type
        DateRangeFromKepString = BDateRange
End Function

' Returns a KEPServerEX style string that represents the data in the
' provided BACnet Date-Range variable
Private Function DateRangeToKepString(BDateRange As BacNetDateRange) _
        As String

        DateRangeToKepString = DateEntryTypes.DateRangeType & "," & _
                DateToKepStringNoId(BDateRange.StartDate) & "," & _
                DateToKepStringNoId(BDateRange.EndDate)

End Function

' WEEK-AND-DAY CONVERSION ------------------------------------------------

' Parses the input string and returns a BacNetWeekNDay type
Private Function WeekNDayFromKepString(ByVal inputString As String) _
        As BacNetWeekNDay

        Dim BWeekNDay As BacNetWeekNDay

        ' Kepware string format for a week-and-day is: MMWd
        ' Set the object properties by extracting data from the string
        BWeekNDay.Month = Left(inputString, 2)
        BWeekNDay.Week = Mid(inputString, 3, 1)
```

```
        BWeekNDay.Day = Right(inputString, 1)


        ' Return the week-and-day type
        WeekNDayFromKepString = BWeekNDay
End Function

' Returns a KEPServerEX style string that represents the data in the
' provided BACnet Week-and-Day variable
Private Function WeekNDayToKepString(BWeekNDay As BacNetWeekNDay) As String
        WeekNDayToKepString = DateEntryTypes.WeekNDayType & "," & _
                BWeekNDay.Month & BWeekNDay.Week & BWeekNDay.Day


End Function

' CALENDAR REFERENCE CONVERSION ------------------------------------------

' Parses the input string and returns a BACnet Calendar object ID
Private Function CalendarReferenceFromKepString( _
        ByVal inputString As String) As Integer


        CalendarReferenceFromKepString = CInt(inputString)
End Function

' Returns a KEPServerEX style string that represents a BACnet Calendar
' Reference, using the supplied integer value as the calendar ID
Private Function CalendarReferenceToKepString(BCalRef As Integer) As String
        CalendarReferenceToKepString = DateEntryTypes.CalendarType & "," & _
                Format(BCalRef, "0")
End Function
```

```
' DATE LIST ENTRY CONVERSION ---------------------------------------------


' Parses the input string starting at the specified index and returns a

' BacNetDateListEntry

Private Function DateListEntryFromKepString(ByVal inputString As String, _

        ByRef stringIndex As Integer) As BacNetDateListEntry


        Dim date1 As String, date2 As String

        Dim comma() As Variant, commaAndSemi() As Variant

        Dim entry As BacNetDateListEntry


        ' Kepware string delimiters

        comma = Array(",")

        commaAndSemi = Array(",", ";")


        ' Get the date-list entry type

        entry.BDateType = CInt(Mid(inputString, stringIndex, 1))

        stringIndex = stringIndex + 2


        ' Based on the entry type from above, populate the appropriate variable

        ' inside the BacNetDateListEntry

        Select Case entry.BDateType

                ' EntryType is a Date

                Case DateEntryTypes.DateType

                        date1 = ReadUntilAny(inputString, stringIndex, commaAndSemi)

                        stringIndex = stringIndex + Len(date1)

                        entry.BDate = DateFromKepString(date1)


                ' EntryType is a Date Range

                Case DateEntryTypes.DateRangeType
```

```
                        date1 = ReadUntilAny(inputString, stringIndex, comma)
                        stringIndex = stringIndex + Len(date1) + 1
                        date2 = ReadUntilAny(inputString, stringIndex, commaAndSemi)
                        stringIndex = stringIndex + Len(date2)
                        entry.BDateRange = DateRangeFromKepString(date1 & "," & date2)

                ' EntryType is a Week-And-Day
                Case DateEntryTypes.WeekNDayType
                        date1 = ReadUntilAny(inputString, stringIndex, commaAndSemi)
                        stringIndex = stringIndex + Len(date1)
                        entry.BWeekNDay = WeekNDayFromKepString(date1)

                ' EntryType is a Calendar Reference
                Case DateEntryTypes.CalendarType
                        date1 = ReadUntilAny(inputString, stringIndex, commaAndSemi)
                        stringIndex = stringIndex + Len(date1)
                        entry.BCalRef = CalendarReferenceFromKepString(date1)
        End Select

        ' Return the date-list entry
        DateListEntryFromKepString = entry
End Function

' Returns a date-list entry in its KEPServerEx string format
Private Function DateListEntryToKepString(entry As BacNetDateListEntry) _
        As String

        Select Case entry.BDateType
                Case DateEntryTypes.DateType
                        DateListEntryToKepString = DateToKepString(entry.BDate)
```

```
                Case DateEntryTypes.DateRangeType

                        DateListEntryToKepString = _

                                DateRangeToKepString(entry.BDateRange)


                Case DateEntryTypes.WeekNDayType

                        DateListEntryToKepString = WeekNDayToKepString(entry.BWeekNDay

                Case DateEntryTypes.CalendarType

                        DateListEntryToKepString = _

                                CalendarReferenceToKepString(entry.BCalRef)


        End Select

End Function


' TIME VALUE PAIR CONVERSION ----------------------------------------------


' Parses the input string and populates the array of time-value pairs

Private Function TimeValuePairsFromKepString(ByVal raw As String, _

        ByRef stringIndex As Integer, ByRef InputArray() As BacNetTimeValuePair)


        Dim tvp As BacNetTimeValuePair

        Dim comma() As Variant, commaAndSemi() As Variant

        Dim lengthTemp As String, typeTemp As String

        Dim arrayIndex As Integer


        ' Initialize index that tracks the array position

        arrayIndex = 0


        ' Kepware string delimiters

        comma = Array(",")

        commaAndSemi = Array(",", ";")
```

```
'Reset the input array
Erase InputArray

' Loop through the input string until the end of the string, or the
' current character is a semicolon
While (stringIndex < Len(raw) And Mid(raw, stringIndex, 1) <> ";")
        ' Skip over the time-value-pair separating comma
        If Mid(raw, stringIndex, 1) = "," Then
                stringIndex = stringIndex + 1
        End If

        ' Get the time (VBA doesn't support hundredths of seconds, so the
        ' time is stored as a string)
        tvp.BTime = Mid(raw, stringIndex, 8)
        stringIndex = stringIndex + 9

        ' Get data type
        typeTemp = ReadUntilAny(raw, stringIndex, comma)
        stringIndex = stringIndex + Len(typeTemp) + 1
        tvp.BDataType = CInt(typeTemp)

        ' Get data length
        lengthTemp = ReadUntilAny(raw, stringIndex, comma)
        stringIndex = stringIndex + Len(lengthTemp) + 1

        ' Get the data value
        tvp.BData = Mid(raw, stringIndex, CInt(lengthTemp))
        stringIndex = stringIndex + Len(tvp.BData)
```

```
                ' Add space for the array element
                ReDim Preserve InputArray(0 To arrayIndex)

                ' Add the new array element, and increment the array index
                InputArray(arrayIndex) = tvp
                arrayIndex = arrayIndex + 1
        Wend
End Function

' Return a time-value pair in its KEPServerEX string format
Private Function TimeValuePairToKepString(tvp As BacNetTimeValuePair) _
        As String

        TimeValuePairToKepString = tvp.BTime & "," & tvp.BDataType & "," & _
                Len(tvp.BData) & "," & tvp.BData
End Function

' Return a array of time-value pairs in its KEPServerEX string format
Private Function TimeValuePairsToKepString( _
        ByRef InputArray() As BacNetTimeValuePair) As String

        Dim kepString As String
        Dim i As Integer, size As Integer

        kepString = ""
        size = 0

        ' Check the size of the array, if there is an error, skip to the next
        ' line of code
        On Error Resume Next
```

```
                size = UBound(InputArray) + 1


        ' If the array isn't empty, then convert each time-value pair to its
        ' KEPServerEX string format
        If size > 0 Then


                ' Loop through all of the time-value pairs
                For i = LBound(InputArray) To (UBound(InputArray))


                        ' Append the current time-value pair string to the overall '
                        ' string
                        kepString = kepString & TimeValuePairToKepString(InputArray(i)


                        ' Add a delimiting comma between time-value pairs
                        If i < UBound(InputArray) Then
                                kepString = kepString & ","
                        End If
                Next
        End If


        ' Return the overall string
        TimeValuePairsToKepString = kepString
End Function


' Build and return a sub-string by reading the input string until the first
' valid delimiter is found
Private Function ReadUntilAny(ByVal raw As String, ByVal start As Integer, _
        ByRef delimiters() As Variant)


        Dim closest, address As Integer
```

```
	Dim delimiter As Variant


	' Initialize the closest delimiter location to past the last character
	' in the string
	closest = Len(raw) + 1


	If start > Len(raw) Or start <= 0 Then
		' Return an empty string if the start address is less than 0, or
		' past the end of the string
		ReadUntilAny = ""
	Else
		' Iterate through the specified delimiters
		For Each delimiter In delimiters
			' Get the address of the closest instance for the current
			' delimiter
			address = InStr(start, raw, delimiter)


			' if the address of the current delimiter is closer than
			' previously examined delimiters, save the address
			If address < closest And address > 0 Then
				closest = address - 1
			End If
		Next


		' return the section of the string from the start address to the
		' closest valid delimiter
		ReadUntilAny = Mid(raw, start, closest - start + 1)
	End If
End Function
```

VBA Scripts Usage Example

The example below demonstrates how the VBA scripts can be used.

```
        Public Function DateListExample()
        Dim DateList() As BacNetDateListEntry
        Dim data As String
        Dim kepString As String

        ' Sample date-list string
        data = "2,0135;"

        ' Populate the date-list (an array of date-list entries)
        DateListFromKepString data, InputArray:=DateList

        ' Convert the date-list back to a KEPServerEx string
        kepString = DateListToKepString(InputArray:=DateList)
End Function

Public Function WeeklyScheduleExample()
        Dim Weekly() As BacNetDailySchedule
        Dim data As String
        Dim kepString As String
n
        ' Sample weekly-schedule string
        data = "12345678,2,3,123;;;;;;;"

        ' Populate the weekly-schedule (an array of daily schedules)
        WeeklyScheduleFromKepString data, InputArray:=Weekly

        ' Convert the weekly-schedule back to a KEPServerEx string
```

```
        kepString = WeeklyScheduleToKepString(InputArray:=Weekly)
End Function

Public Function ExceptionScheduleExample()
        Dim ExceptionSchedule() As BacNetException
        Dim data As String
        Dim kepString As String

        ' Sample exception-schedule string
        data = "0,301012014,16,23595999,2,3,123;"

        ' Populate the exception-schedule (an array of exceptions)
        ExceptionScheduleFromKepString data, InputArray:=ExceptionSchedule

        ' Convert the exception-schedule back to a KEPServerEX string
        kepString = ExceptionScheduleToKepString( _
                InputArray:=ExceptionSchedule)
End Function
```

See Also: **VBA Scripts for String Parsing and Construction**

Error Descriptions

Click on the link for a list of abort and reject reasons, error classes and codes, or error messages.

Abort Reasons

The following are standard abort reason codes as defined in the BACnet specification.

Code	Description
0	Other
1	Buffer overflow
2	Invalid APDU in this state
3	Preempted by higher priority task
4	Segmentation not supported

Reject Reasons

The following are standard reject reason codes defined in the BACnet specification.

Code	Description
0	Other
1	Buffer overflow
2	Inconsistent parameters
3	Invalid parameter data type
4	Invalid tag
5	Missing required parameter
6	Parameter out of range
7	Too many arguments
8	Unidentified enumeration
9	Unrecognized service

Error Classes and Codes

The following are standard error classes and codes defined in the BACnet specification.

BACnet Error Classes

Class	Description
0	Device
1	Object
2	Property
3	Resources
4	Security
5	Services
6	Virtual Terminal
7	Communication

BACnet Error Codes

Code	Description
0	Other
1	Authentication Failed
2	Configuration In Progress
3	Device Busy
4	Dynamic Creation Not Supported
5	File Access Denied

Code	Description
6	Incompatible Security Levels
7	Inconsistent Parameters
8	Inconsistent Selection Criteria
9	Invalid Data Type
10	Invalid File Access Method
11	Invalid File Start Position
12	Invalid Operator Name
13	Invalid Parameter Data Type
14	Invalid Time Stamp
15	Key Generation Error
16	Missing Required Parameter
17	No Objects Of Specified Type
18	No Space For Object
19	No Space To Add List Element
20	No Space To Write Property
21	No VT Sessions Available
22	Property Is Not A List
23	Object Deletion Not Permitted
24	Object Identifier Already Exists
25	Operational Problem
26	Password Failure
27	Read Access Denied
28	Security Not Supported
29	Service Request Denied
30	Timeout
31	Unknown Object
32	Unknown Property
33	--Enumeration Removed--
34	Unknown VT Class
35	Unknown VT Session
36	Unsupported Object Type
37	Value Out Of Range
38	VT Session Already Closed
39	VT Session Termination Failure
40	Write Access Denied
41	Character Set Not Supported
42	Invalid Array Index
43	COV Subscription Failed
44	Not COV Property
45	Optional Functionality Not Supported
46	Invalid Configuration Data
47	Data Type Not Supported
48	Duplicate Name
49	Duplicate Object ID
50	Property is Not an Array
51	Abort Buffer Overflow
52	Abort Invalid APDU in this State
53	Abort Preempted by Higher Priority Task
54	Abort Segmentation Not Supported
55	Abort Proprietary
56	Abort Other
57	Invalid Tag
58	Network Down
59	Reject Buffer Overflow

Code	Description
60	Reject Inconsistent Parameters
61	Reject Invalid Parameter Data Type
62	Reject Invalid Tag
63	Reject Missing Required Parameter
64	Reject Parameter Out of Range
65	Reject Too Many Arguments
66	Reject Undefined Enumeration
67	Reject Unrecognized Service
68	Reject Proprietary
69	Reject Other
70	Unknown Device
71	Unknown Route
72	Value Not Initialized
73	Invalid Event State
74	No Alarm Configured
75	Log Buffer Full
76	Logged Value Purged
77	No Property Specified
78	Not Configured For Triggered Logging
79	--Reserved for Future Use--
80	Parameter Out of Range
81	--Reserved for Future Use--
82	Busy
83	Communication Disabled

Error Messages

The following messages may be generated. They are listed here in alphabetical order. Click on the link for a description of the message.

Address <address> is out of range for the specified device or register.
Connection failed - could not read max APDU length from remote device <device>.
Connection failed - could not read protocol services supported from remote device <device>.
Connection failed - could not read segmentation supported from remote device <device>.
Connection failed - could not register as foreign device for discovery of remote device <device>.
Connection failed - did not get I-Am from remote device <device>.
COV subscription failed for tag <tag> on device <device> (Class: <class>, Code: <code>).
CSV import failure for notification object identifier list on device <device>. <reason>.
Data type <type> is not valid for device address <address>.
Device <device> is not responding.
Device address <address> contains a syntax error.
Device address <address> is not supported by model <model name>.
Device address <address> is read only
Error parsing write data for tag <tag name> on device <device>. Data does not match DateList format.
Error parsing write data for tag <tag name> on device <device>. Data does not match Prescale format.
Error parsing write data for tag <tag name> on device <device>. Data does not match Scale format.
Error parsing write data for tag <tag name> on device <device>. Data does not match ExceptionSchedule format.
Error parsing write data for tag <tag name> on device <device>. Data does not match WeeklySchedule format.
Error reading object list from device <device> (Class: <class>, Code: <code>).
Error reading property list from device <device>, Object type: <type>, instance: <instance> (Class: <class>, Code: <code>).
Error reading segmentation supported from remote device <Device Name>. Segmentation will not be supported.
Error reading tag <tag> on device <device> (Class: <class>, Code: <code>).
Error writing tag <tag> on device <device> (Class: <class>, Code: <code>).

Address <address> is out of range for the specified device or register.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically references a location that is beyond the range of supported locations for the device.

Solution:
Verify the address is correct; if it is not, re-enter it in the client application.

Connection failed - could not read max APDU length from remote device <device>.

Error Type:
Serious

Possible Cause:
The IP address entered in the Discovery Device Properties may be incorrect.

Solution:

1. Verify the IP address of the device.
2. Enable Device Discovery.

See Also:
Discovery

Connection failed - could not read protocol services supported from remote device <device>.

Error Type:
Serious

Possible Cause:
The IP address entered in the Discovery Device Properties may be incorrect.

Solution:

1. Verify the IP address of the device.
2. Enable Device Discovery.

See Also:
Discovery

Connection failed - could not read segmentation supported from remote device <device>.

Error Type:
Serious

Possible Cause:
The IP address entered in the Discovery Device Properties may be incorrect.

Solution:

1. Verify the IP address of the device.
2. Enable Device Discovery.

See Also:
Discovery

Connection failed - could not register as foreign device for discovery of remote device <device>.

Error Type:
Serious

Possible Cause:

1. The network connection between the device and the host PC is broken.
2. The BBMD IP specified on the Foreign Device Channel Properties is not correct.
3. The BBMD and driver are not network-visible to each other.

Solution:

1. Verify the cabling between the PC and the PLC device.
2. Verify the IP of the BBMD.
3. Ping the BBMD from the driver's host computer. Make sure the host and BBMD have the correct default gateway IP configured and that an IP router has been configured to join the subnets.

See Also:
Foreign Device

Connection failed - did not get I-Am from remote device <device>.

Error Type:
Serious

Possible Cause:

1. The network connection between the device and the host PC is broken.
2. The communications parameters configured for the device and driver do not match.

Solution:

1. Verify the cabling between the PC and the PLC device.
2. Verify that the specified communications parameters match those of the device.

COV subscription failed for tag <tag> on device <device> (Class: <class>, Code:).

Error Type:
Serious

Possible Cause:
See the given error class and code.

Solution:
The device may not support COV for the given item or not have the resources to service the request at the time it was issued. Consider polling the property.

Note:
For a complete listing of standard BACnet error types, refer to **Error Classes and Codes**.

See Also:
COV Settings

CSV import failure for notification object identifier list on device <device>: <reason>.

Error Type:
Error

Possible Cause:
Importing the notification object identifier list from a CSV file failed due to: no valid records in file, incorrect field count, incorrect header, missing object type, invalid object type, or invalid object instance.

Solution:

1. Ensure that the CSV file has at least one valid record or add one.
2. Locate the record that has an incorrect number of fields and add or remove as necessary.
3. Correct the CSV file header.
4. Locate and correct the record with the missing object type.
5. Locate and correct the record with the invalid object type.
6. Locate and correct the record with the invalid object instance.

Data type <type> is not valid for device address <address>.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically has been assigned an invalid data type.

Solution:
Modify the requested data type in the client application.

Device <device> is not responding.

Error Type:

Serious

Possible Cause:

1. The network connection between the device and the host PC is broken.
2. The communications parameters configure for the device and driver do not match.
3. The response from the device took longer to receive than the amount of time specified in the "Request Timeout" device setting.

Solution:

1. Verify the cabling between the PC and the PLC device.
2. Verify that the specified communications parameters match those of the device.
3. Increase the Request Timeout setting so that the entire response can be handled.

Device address <address> contains a syntax error.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically contains one or more invalid characters.

Solution:
Re-enter the address in the client application.

Device address <address> is not supported by model <model name>.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically references a location that is valid for the communications protocol but not supported by the target device.

Solution:

1. Verify that the address is correct; if it is not, re-enter it in the client application.
2. Verify that the selected model name for the device is correct.

Device address <address> is read only.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically has a requested access mode that is not compatible with what the device supports for that address.

Solution:
Change the access mode in the client application.

Error parsing write data for tag <tag name> on device <device>. Data does not match DateList format.

Error Type:
Serious

Possible Cause:
The data for the attempted write is not formatted properly as a DateList string.

Solution:
Update the DateList string so that it is in the correct format.

Note:
In the case of a multiple tag write, if the write value for a DateList Tag fails to parse, then none of the tags will be written to the device.

See Also:
DateList String Format

Error parsing write data for tag <tag name> on device <device>. Data does not match ExceptionSchedule format.

Error Type:
Serious

Possible Cause:
The data for the attempted write is not formatted properly as an ExceptionSchedule string.

Solution:
Update the ExceptionSchedule string so that it is in the correct format.

Note:
In the case of a multiple tag write, if the write value for an ExceptionSchedule Tag fails to parse, then none of the tags will be written to the device.

See Also:
ExceptionSchedule String Format

Error parsing write data for tag <tag name> on device <device>. Data does not match Prescale format.

Error Type:
Serious

Possible Cause:
The data for the attempted write is not formatted properly as a Prescale string.

Solution:
Update the Prescale string so that it is in the correct format.

Note:
In the case of a multiple tag write, if the write value for a Prescale Tag fails to parse, then none of the tags will be written to the device.

See Also:
Prescale String Format

Error parsing write data for tag <tag name> on device <device>. Data does not match Scale format.

Error Type:
Serious

Possible Cause:
The data for the attempted write is not formatted properly as a Scale string.

Solution:
Update the Scale string so that it is in the correct format.

Note:
In the case of a multiple tag write, if the write value for a Scale Tag fails to parse, then none of the tags will be written to the device.

See Also:
Scale String Format

Error parsing write data for tag <tag name> on device <device>. Data does not match WeeklySchedule format.

Error Type:
Serious

Possible Cause:
The data for the attempted write is not formatted properly as a WeeklySchedule string.

Solution:
Update the WeeklySchedule string so that it is in the correct format.

Note:
In the case of a multiple tag write, if the write value for a WeeklySchedule Tag fails to parse, then none of the tags will be written to the device.

See Also:
WeeklySchedule String Format

Error reading object list from device <device> (Class: <class>, Code: <code>).

Error Type:
Warning

Possible Cause:

1. Message corrupted.
2. Segmentation not supported by device.
3. Incorrect BACnet implementation.

Solution:

1. No corrective actions may be needed if subsequent request retries succeed.
2. If the request was sent in multiple segments and the device does not support request message segmentation, reconfigure the driver to exclude segment requests.
3. If this particular request never succeeds, and the above possibilities have been eliminated, note the error class and code, and perform a diagnostics capture of transaction (if possible). Refer to the OPC server's main help documentation and also contact Technical Support.

Note:
The hardware vendor should be able to supply a PICS document that details the device's supported properties.

See Also:
Error Classes and Codes
APDU Settings

Error reading property list from device <device>, Object type: <type>, instance: <instance> (Class: <class>, Code: <code>).

Error Type:
Warning

Possible Cause:

1. Device does not support the ReadPropertyMultiple service or "All" property used by driver to acquire list of properties implemented in object.
2. Message corrupted.
3. Segmentation not supported by device.
4. Incorrect BACnet implementation.

Solution:

1. The driver will generate a default list of tags if it failed to acquire a list of implemented properties.
2. No corrective actions may be needed if subsequent request retries succeed.
3. If the request was sent in multiple segments, and the device does not support request message segmentation, reconfigure the driver to not segment requests.
4. If this particular request never succeeds, and the above possibilities have been eliminated, note the error class and code, and perform a diagnostics capture of transaction (if possible.) Refer to the OPC Server's main help documentation and also contact Technical Support.

Note:
The hardware vendor should be able to supply a PICS document that details the device's supported properties.

See Also:
Error Classes and Codes
APDU Settings

Error reading segmentation support from remote device <Device Name>. Segmentation will not be supported.

Error Type:
Warning

Possible Cause:

1. The Device ID is incorrect.
2. The device does not allow reading segmentation support.

Solution:

1. Ensure that the correct Device ID is being used.
2. Enable the Discovery property "Discover device using Who-Is/I-Am".

Error reading tag <tag> on device <device> (Class: <class>, Code: <code>).

Error Type:
Serious

Possible Cause:

1. Message corrupted.
2. Segmentation not supported by device.
3. ReadPropertyMultiple service not supported by device.
4. Incorrect BACnet implementation.

Solution:

1. No corrective actions may be needed if subsequent request retries succeed.
2. If the request was sent in multiple segments, and the device does not support request message segmentation, reconfigure the driver to not segment requests.
3. If the driver has been configured to allow multiple item requests, and the device does not support the ReadPropertyMultiple service, reconfigure the driver to use single item requests.
4. If this particular request never succeeds, and the above possibilities have been eliminated, note the error class and code, and perform a diagnostics capture of transaction (if possible). Refer to the OPC Server's main help documentation and also contact Technical Support.

Note:
The hardware vendor should be able to supply a PICS document that details the device's supported properties.

See Also:
Error Classes and Codes
APDU Settings

Error writing tag <tag> on device <device> (Class: <class>, Code: <code>).

Error Type:
Serious

Possible Cause:

1. Message corrupted.
2. Segmentation not supported by device.
3. WritePropertyMultiple service not supported by device.
4. Incorrect BACnet implementation.

Solution:

1. No corrective actions may be needed if subsequent request retries succeed.
2. If the request was sent in multiple segments, and the device does not support request message segmentation, reconfigure the driver to not segment requests.
3. If the driver has been configured to allow multiple item requests, and the device does not support the WritePropertyMultiple service, reconfigure the driver to use single item requests.
4. If this particular request never succeeds, and the above possibilities have been eliminated, note the error class and code and perform a diagnostics capture of transaction (if possible). Refer to the OPC Server's main help documentation and also contact Technical Support.

Note:
The hardware vendor should be able to supply a PICS document that details the device's supported properties.

See Also:
Error Classes and Codes
APDU Settings

Failed to initialize BACnet client for device <channel.device>. Possible duplicate device ID.

Error Type:
Serious

Possible Cause:
Each device that is network visible from the driver must have a unique combination of network number and device instance.

Solution:
Verify device configurations and resolve any conflicts.

See Also:
Device Setup

Imported tag database may be incomplete due to communication error.

Error Type:
Warning

Possible Cause:
The driver did not receive a response from the device at some point during the tag import procedure.

Solution:
Retry import. If problem persists, check network hardware.

Imported tag database may be incomplete. Could not discover device.

Error Type:
Warning

Possible Cause:
The driver did not receive an I-Am from the device or could not read required communications properties from the device at the start of the import procedure.

Solution:
Verify the driver and device configuration.

Missing address.

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically has no length.

Solution:
Re-enter the address in the client application.

No data for device instance <instance> found in import file.

Error Type:
Warning

Possible Cause:
The import file specified in the Tag Import page did not contain data for the device specified in the General device page.

Solution:

1. Check the import file name on the Tag Import page and the Device ID on the General device page to verify that they are correct.
2. Check the import file to make sure that expected data was exported to the file.

See Also:
Tag Import
General Device

Polling COV item <tag> on device <device>.

Error Type:
Warning

Possible Cause:
Request to subscribe to COV update notifications for the given tag failed. The driver will poll the device for this property instead. The device may not support the SubscribeCOV service (for properties with implicit COV support) or the SubscribeCOVProperty service (for all other properties.) The device may not support the addressed property.

Solution:
Check the device PICS statement for supported properties and services. There is no harm in polling for the data. COV may need to be disabled for the property or entire device to prevent this error.

See Also:
COV Notifications

Request aborted by device <device>.

Error Type:
Serious

Possible Cause:
See the given reason code.

Solution:
This may indicate a BACnet implementation problem. If this particular request never succeeds, note the abort reason and perform a diagnostics capture of transaction (if possible). Refer to the OPC Server's main help documentation and also contact Technical Support.

Note:
For a complete listing of standard BACnet abort reasons, refer to **Abort Reasons**.

Request rejected by device <device>.

Error Type:
Serious

Possible Cause:
See the given reason code.

Solution:

This may indicate a BACnet implementation problem. If this particular request never succeeds, note the reject reason and perform a diagnostics capture of transaction (if possible). Refer to the OPC Server's main help documentation and also contact Technical Support.

Note:
For a complete listing of standard BACnet reject reasons, refer to **Reject Reasons**.

Tag generation complete - no objects found on device <device>.

Error Type:
Warning

Possible Cause:
The device does not have any objects of the type specified on the Tag Import Objects dialog instantiated at the time of import.

Solution:
Check the tag import settings and verify that the objects intended to generate tags exist in the device.

See Also:
Tag Import Settings

Tag import terminated. Could not parse file record <line number>.

Error Type:
Warning

Possible Cause:
The data at the specified line number in the import file could not be parsed due to an unexpected syntax or record length.

Solution:

1. Verify that the correct import file was specified and that the file was generated by the specified application.
2. Verify that the import file is not corrupted.
3. Edit or recreate the file if necessary.

See Also:
Tag Import Settings

Unable to bind to local address (IP: xxx.xxx.xxx.xxx, Port: x).

Error Type:
Serious

Possible Cause:

1. More than one BACnet/IP Driver channel has been configured to use the same IP and port.
2. There is another application running on the system that has already acquired the indicated IP and port for exclusive use.

Solution:

1. Select another local IP address for one of the offending channels. The computer may need to be multihomed.
2. Shut down the other application.

See Also:

[Configuring Multiple Channels]

Unable to generate a tag database for device <device>.

Error Type:
Warning

Possible Cause:
No objects of the types specified in the Tag Import Settings currently exist in the device.

Solution:
Make sure the object selections are correct.

See Also:
[Tag Import Settings]

Unable to write to <address> on device <device>.

Error Type:
Serious

Possible Cause:

1. The network connection between the device and the host PC is broken.
2. The communications parameters configure for the device and driver do not match.

Solution:

1. Verify the cabling between the PC and the PLC device.
2. Verify that the specified communications parameters match those of the device.

Winsock initialization failed (OS Error = n).

Error Type:
Fatal

OS Error	Possible Solution
10091	Indicates that the underlying network subsystem is not ready for network communication. Wait a few seconds and restart the driver.
10067	Limit on the number of tasks supported by the Windows sockets implementation has been reached. Close one or more applications that may be using Winsock and restart the driver.

Winsock V1.1 or higher must be installed to use the BACnet/IP Driver.

Error Type:
Fatal

Possible Cause:
The version number of the Winsock DLL found on the system is less than 1.1.

Solution:
Upgrade Winsock to version 1.1 or higher.

PIC Statement

Overview

Date	3May16
Vendor Name	Kepware Technologies
Product Name	KEPServerEX
Product Model Number	BACnet/IP Driver
Application Software Version	5.20
Firmware Revision	N/A
BACnet Protocol Revision	135-2012

Product Description

The KEPServerEX server platform, paired with the BACnet Driver, has several primary use cases:

- Managing non-BACnet devices within a BACnet system. For example, a number of non-BACnet PLCs controlling existing air handling and lighting equipment can feed information into a BACnet SCADA for monitoring systems, analyzing data, and triggering actions based on events.
- Pushing BACnet data into a non-BACnet SCADA. For example, a very large plant-wide or smart city-wide non-BACnet SCADA controlling and monitoring a myriad of operations can use the BACnet Driver to feed BACnet information into the non-BACnet SCADA.
- Accessing BACnet data through the server's IoT Gateway. For example, device data from building automation systems can be sent across web interfaces that utilize standard web connectivity protocols and take advantage of the associated security to then be utilized and combined in an IoT environment.

BACnet Standardized Device Profile (Annex L)

*The server's functionality is not covered by the standard definitions within the BACnet specification's Annex L Descriptions and Profiles of Standardized BACnet devices. The server's primary function is as a gateway for BACnet data among a variety of non-BACnet networks and protocols.

- ☐ BACnet Operator Workstation (B-OWS)
- ☐ BACnet Advanced Operator Workstation (B-AWS)
- ☐ BACnet Operator Display (B-OD)
- ☐ BACnet Building Controller (B-BC)*
- ☐ BACnet Advanced Application Controller (B-AAC)
- ☐ BACnet Application Specific Controller (B-ASC)
- ☐ BACnet Smart Sensor (B-SS)
- ☐ BACnet Smart Actuator (B-SA)

BACnet Interoperability Building Blocks Supported (BIBBs)

BIBB*	BACnet Service	Initiate	Execute
DM-DDB-A	Who-Is	X	
DM-DDB-B	Who-Is		X
DM-DDB-A	I-Am		X
DM-DDB-B	I-Am	X	
DS-RP-A	ReadProperty	X	
DS-RP-B	ReadProperty		X
DS-RPM-A	ReadPropertyMultiple	X	
DS-RPM-B	ReadPropertyMultiple		X
DS-WP-A	WriteProperty	X	
DS-WPM-A	WritePropertyMultiple	X	
DS-COV-A	SubscribeCOV	X	
DS-COVP-A	SubscribeCOVProperty	X	
DS-COV-A	ConfirmedCOVNotification		X
DS-COV-A	UnconfirmedCOVNotification		X

BIBB*	BACnet Service	Initiate	Execute
AE-N-A	ConfirmedEventNotification Supported Event Types: • Change-of-state • Change-of-value • Command-failure • Out-of-range • Unsigned-range		X
AE-N-A	UnconfirmedEventNotification Supported Event Types: • Change-of-state • Change-of-value • Command-failure • Out-of-range • Unsigned-range		X

Standard Object Types Supported

*The server supports the objects in the table below, but not in the traditional sense of the Object existing on a device. Although the server does have a BACnet device ID, it is actually a gateway that passes BACnet data through. Therefore, all of the supported Objects are vehicles for passing data for that object on a device to a consuming system. The objects are not dynamically creatable or deletable from the server.

Supported Object	Creatable	Deletable
Accumulator		
Analog Input		
Analog Output		
Analog Value		
Averaging		
Binary Input		
Binary Output		
Binary Value		
Calendar		
Command		
Device		
Event Enrollment		
File		
Group		
Life Safety Point		
Life Safety Zone		
Loop		
Multi-State Input		
Multi-state Value		
Notification Class		
Program		
Schedule		
Trend Log		

Segmentation Capability

X	Able to transmit segmented messages, Window Size 1-127 bytes
X	Able to receive segmented messages, Window Size 1-127 bytes

Data Link Layer Options

X	BACnet IP, (Annex J)
X	BACnet IP, (Annex J), Foreign Device

[ ] ISO 8802-3, Ethernet (Clause 7)
[ ] ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
[ ] ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s): ___
[ ] MS/TP master (Clause 9), baud rate(s): ___
[ ] MS/TP slave (Clause 9), baud rate(s): ___
[ ] Point-To-Point, EIA 232 (Clause 10), baud rate(s): ___
[ ] Point-To-Point, modem, (Clause 10), baud rate(s): ___
[ ] LonTalk, (Clause 11), medium: ___
[ ] BACnet/ZigBee (ANNEX O)
[ ] Other: _____

Device Address Binding

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)

[ ] Yes
[X] No

Networking Options

[ ] Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
[ ] Annex H, BACnet Tunneling Router over IP
[ ] BACnet/IP Broadcast Management Device (BBMD)

Does the BBMD support registrations by Foreign Devices?	[ ]	Yes	N/A	No
Does the BBMD support network address translation?	[ ]	Yes	N/A	No

Network Security Options

[X] Non-Secure Device - is capable of operating without BACnet Network Security
[ ] Secure Device - is capable of using BACnet Network Security (NS-SD BIBB)
[ ] Multiple Application-Specific Keys
[ ] Supports Encryption (NS-ED BIBB)
[ ] Key Server (NS-KS BIBB)

Character Sets Supported

[X]	ISO 10646 (UTF-8)	[X]	IBM™/Microsoft™ DBCS	[X]	ISO 8859-1
[X]	ISO 10646 (UCS-2)	[ ]	ISO 10646 (UCS-4)	[ ]	JIS X 0208

Communication Gateway Protocol Support

The server's primary function is as a gateway for BACnet data across a variety of non-BACnet networks and protocols.

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