B6070 BACnet/IP to Utility Meters

User Manual

1   Chapter 1

1.1   Introduction to the Pulse Meter

The idea of a pulse meter is to measure Consumption and Demand and timed or aggregated measures derived from these. Consumption is known by various names in various domains - energy usage in electricity, steam usage for steam, water usage for water. Demand is known by various names in various domains – average power in electricity, average flow for steam, average flow for water.

These basic measures themselves are transformed from the basic pulse counting function of each channel input. Pulses are the rise and fall transition (full cycle) of the channel inputs. The current/voltage specification for driving the inputs is outlined elsewhere, but one can think of them as current limited LED sources which switch of/off an optically coupled transistor. They can be externally or internally excited (or both) given their passive nature. Our devices use DC-DC converters for excitation to allow one spurious reference voltage (which includes ground) to be present in the input circuit. These inputs have a natural timing limit of a few milliseconds, and are further rate limited by count software/logic which will only accept rates below 60 pulses per second.
The above being said about the inputs, they are perfectly suited to interface to dry contact form C relays or standard KYZ meter outputs (by attaching to KY or KZ).

The counting logic is designed at its core to be non-volatile. The logic under power will miss no pulses. The logic at power loss detection will store away the pulse count in a non-volatile fashion before power is completely lost. Thus the pulse count is non-volatile and changed only by incoming pulses. The pulse count cannot be reset. NOTE again the pulse count cannot be reset and will forever increment until it rolls over at the end of its 32bit range.

Given a very large 32bit count and the limits of floating point analog values and scale factors, precision loss is a concern. Precision compensation is obtained by setting the variable Pulse-offset. Consumption is calculated from pulse-delta times the Scale Factor.
These are configurable under ….

So Consumption = (Pulse – Pulse-offset) * Scale Factor

The four variables in the above equation are the primary data available from a meter channel
Pulse – changes only with incoming pulse
Pulse-offset – configurable (viewable but not a settable object)
Scale Factor – configurable (viewable but not a settable object)
Consumption – result

Then the other four measures are derived from the above along with timing as configured under overall meter configuration….

Demand is the rate of consumption during the demand window period (the time factor in the

rate can be deduced from the units exhibited and is set in a fixed fashion to avoid mistakes). This is measured (up to jitter the cycle times of the processor and granularity of the pulses) over the Demand Window Period.

So if we get the change in Consumption value over the demand window period and divide by that period, we get Demand or going back to the basic inputs…

Demand = (deltaPulse*Scale_factor * units_Scale) / Demand_Window
    where   Demand_Window = "Demand window width"*60 (converted to seconds)
deltaPulse= Current_Pulse - Pulse_Demand_window_width_Ago
units_Scale = 3600 - for KWH and LBS_MASS_PER_HOUR
          = 60 - for CUBIC_FEET_PER_MINUTE and
                 US_GALLONS_PER_MINUTE

Demand is updated every "Demand window slide period".
Note that when "Demand Window Slide Period" is equal to "Demand Window" (is equal to N), then effectively we are getting what is often called "Demand on N time intervals". This is sometimes what is desired, but many consumers want more granular and timely information every "Demand Window Slide Period", so this option for more frequent Demand calculation is present.

Then we have three other derived measures for each channel which are effectively controlled by resets. Resets are initiated by the Reset command. One derived measure is a variable until a reset occurs and the other two are calculated at reset. The variable is Peak Demand since Reset. It is simply the MAX of the Demand (which is calculated every "Demand Window Slide Period"). This is a running MAX that just keeps getting larger whenever the particular Demand measurement is larger.

When a reset occurs two things happen:
The last two measures are computed:

Peak Demand of past period before Reset is computed by storing away Peak Demand since Reset. This is useful in comparing current demand to previous demand peaks.

Cumulative Demand is the sum of all Peak Demand of past period before Reset and the Peak Demand since Reset. Upon a little thought, this number corresponds to no real measure of anything. However it is extremely useful as a checksum against which logs of Peak Demand since Reset and the actual number of resets can be compared. Using this number, double resets, premature resets, malicious rests and other such anomalies can be discovered in the record.

And of course after the two measures are calculated when a reset occurs - Peak Demand since Reset is instantaneously set to zero in preparation for its next MAX recalculation at the next Demand Window Slide Period end.

1.2 Logging Into the B6070

Step 1: Access the B6070 configuration screen using your browser. Here is an explanation of how to do this.

Connect the B6070 Ethernet connector to an Ethernet hub, and run another Ethernet cable from that hub to your laptop or PC. Make sure that the laptop or PC is the *only* other unit in this small LAN. **NOTE:** If you do not have a hub, you can use a "crossover cable" to connect between the B6070 and your laptop.

Set your PC's IP address to **192.168.88.90** with a subnet mask of **255.255.255.252**.

Open your browser and enter the following URL: http://192.168.88.89/admin

You will be prompted to login:

User = admin   password = admin

For improved access security, you should change your password from the default values. **Make sure you SAVE your new password!** When you click on "Save and Reboot" and "confirm" the configuration process is completed. If you lose your password, Cimetrics **DOES NOT** have a default password.

Now disconnect your laptop and connect the B6070 into your BACnet networks.

Please note that the B6070 device is always available (does not matter if you have changed the IP address in the TCP/IP and BACnet Configuration page) at the above mentioned IP address.

2   Chapter 2

2.1   TCP/IP and BACnet Configuration

TCP/IP and BACnet Configuration

Parameter	Value	Description
IP address	10.1.2.225	IP address of device. (Default=192.168.0.22)
Network mask	255.255.0.0	Subnet mask for given subnet. (Default=255.255.255.0)
Default gateway	10.1.0.1	IP address of default gateway. (Default=192.168.0.1)
BACnet UDP port	47808	BACnet/IP UDP Port (Default = 47808). In some cases, e.g., a situation where it is desirable for two groups of BACnet devices to coexist independently on the same IP subnet, the UDP port may be configured locally to a different value.
BACnet Device #	1461104	Device ID is a numeric code [1-4194303] that is used to identify the BACnet Device. Default = 1461104 generated from MAC
BACnet Device Location	Cimetrics Lab	Location/application string (0-63 characters) to help user find the Device Object Name
☐ Enable Timid DHCP		If DHCP service is turned OFF, then an external direct connected PC used to configure this unit can no longer automatically get an IP address from this unit. The PC must in this case be manually set to 192.168.88.90, 255.255.255.252 in order to web browse http://192.168.88.89 to configure this unit.

OK   Reset to defaults (This page only)

IP Address:

This unit is shipped with a factory default IP address. Please change it to suit your Network. This is something usually assigned by a Network Administrator in your company.

Network Mask:

Please change the default value to something that matches your IP address. This is also typically assigned by a Network Administrator in your Company.

Default Gateway:

Please change the default value. This is also typically assigned by a Network Administrator in your Company.

BACnet UDP Port:

The default value is 47808. This is the port number that the BACnet protocol typically uses. DO not change this unless you are sure that your BACnet Network uses something different.

BACnet Device #:

This is the BACnet Device instance number. Please provide a UNIQUE instance number for the B6070. Please note that this number has to be unique throughout he entire BACnet Network.

Enable Timid DHCP:

The B6070 has a timid DHCP server. This serves out an IP address of 192.168.88.90 to any machine connected to the B6070.

If you uncheck the above option, the B6070's DHCP server will be turned off. In this situation, if you would like to access the B6070 at its default IP address of 192.168.88.89, you will need to manually configure your PC/Laptop to an IP address of 192.168.88.90 with a subnet mask of 255.255.255.252

If the above option is checked, and you would like to access the B6070 at its default IP address of 192.168.88.89, your PC or Laptop will be automatically assigned an IP address (provided your PC or laptop is set to to use DHCP) of 192.168.88.90.

OK:

After making changes, clicking on "OK" followed by "Save and Reboot" followed by clicking on "Conform" will save your changes.

Reset to Default:

Clicking on this will result in the configuration of this page being set to factory defaults.

3   Chapter 3

3.1   Meter Configuration

Meter Configuration

Parameter	Value	Description
Demand window width	15	Minutes. Range: [1-60]. Default=15
Demand window slide period	1	Minutes. Range: [1-60]. Default=1. Slide period must divide evenly into Demand window width.

Channel 1 Configuration

Meter Type	None	"None" means that objects for this ch will NOT be available for discovery and reading.
Scale factor	1.00000	Units per pulse. Default=1.0
Pulse offset	0	Subtracted from, and not to exceed, the non-volatile count before scaling (**4294967295**)
Description		Short description of the channel (0-63 characters).

Demand window width :

Time over which pulses are summed to get a Demand/Rate measurement.

Demand window slide period:

Control of method/period used for summation. Slide period must divide evenly into Demand window width AND cannot be larger than the Demand window.

Channel 1 Configuration

Meter Type:
Choices are:

1. kilowatt-hours/kilowatts meter
2. btus/btus-per-hour meter
3. cubic-feet/cubic-feet-per-minute meter
4. cubic-meters/cubic-meters-per-hour meter
5. us-gallons/us-gallons-per-minute meter
6. liters/liters-per-hour meter
7. pounds-mass/pounds-mass-per-hour meter
8. kilograms/kilograms-per-hour meter
9. no-units/per-second meter (this is useful for counting unitized entities like people, animals, events and such. We could have used Hertz, but this is confusing for some applications)

"None" means that objects for this channel will NOT be available for discovery and reading. The commodity measured is up to the user to describe in the description. We have chosen common units and their most commonly used/associated units/time. Metric and English units are represented.

Scale factor and Pulse Offset:

Pulse offset **0** Subtracted from, and not to exceed, the non-volatile count before scaling (x) . Because the counters are non-volatile and impossible to reset, this is used to allow a reasonable starting position in cases where a meter may already have accumulated a significant number of counts in its lifetime. This can be used as an accumulation reset if the number is is set to the current count =x (as shown in the ()) Note the pulse subtraction is done BEFORE the scaling.

Description:

Here the user describes what the meter is doing/measuring. This description is used in the BACnet Object description, and helps identify location and commodity metered.

4 Chapter 4

4.1 Show/Change Date&Time

Show/Change Date&Time

Click the "Set Date&Time" immediately after the Date&Time are specified.

Parameter	Value	Description
Current Date(dd-mm-yy)	01 - 01 - 00	Example: 31-12-07 to set date 31-December-2007
Current Time(hh:mm:ss)	00 : 00 : 00	Example: 18:30:59

| Set Date&Time | Refresh | Cancel |

Users can set the Date and Time parameters for the B6070 device on this page.

The Date format is DD-MM-YY

DD is for the Date, MM is for the Month and the YY is for the year.

The Time format is HH-MM-SS

Please note that you will need to enter the "CURRENT" time here.

HH is for the Hour, MM is for the minute and SS for the Seconds.

Once you have entered your values, click on the button "Set Date&Time" immediately. This will save your Date and Time

5 Chapter 5

5.1 BACnet Objects Status

Objects Status

Configuration: IP=10.1.2.225/255.255.0.0; Default gateway=10.1.0.1; BACnet port=47808

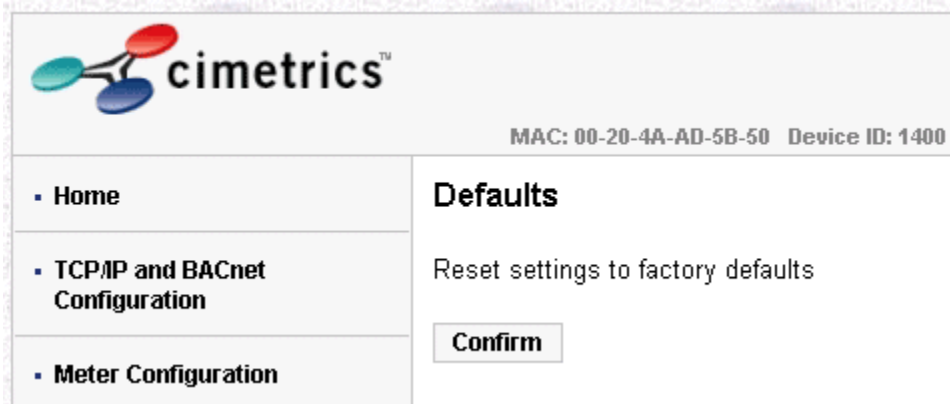| Name	Units	Date/Time	Value	Description
Cimetrics Production Lab-B6070-1400	-	00/01/01,00:00:00	reboots=4	
DEMAND_INTERVAL	seconds	-	900.0000	Integration period for demand calculation
CHAN-1/COUNT_RAW	-	unused	0xFFFFFFFF	Magnitude of raw count
CHAN-1/COUNT_OFFSET	-	unused	0	Magnitude of value subtracted from raw count to get delta
CHAN-1/COUNT_DELTA	-	unused	0xFFFFFFFF	Magnitude of difference between 32-bit count and 32-bit offset
CHAN-1/OVERFLOW	-	unused	Overflow	Whether Delta is too large (need to change Offset)
CHAN-1/SCALE	-	unused	1.0000	Units per pulse
CHAN-1/CONSUMPTION	-	unused	4294967040.0000	Consumption
CHAN-1/DEMAND	per-second	unused	0	Rate of consumption
CHAN-1/DEMAND_PEAK_TIME	-	unused	No	Whether MAX Demand contains valid value
CHAN-1/DEMAND_PEAK	per-second	unused	0	MAX Demand since Reset
CHAN-1/DEMAND_PEAK_OLD	per-second	unused	0	MAX Demand of past period before Reset
CHAN-1/CUMULATIVE_DEMAND	per-second	unused	0	Total of maximum Demand during the preceding periods
CHAN-1/RESET	-	unused	Inactive	On WRITE: resets DEMAND params, if current state is INACTIVE. On READ: ACTIVE state means that next reset will be ignored within Min_On_Time

6 Chapter 6

6.1 Defaults

Clicking on the "Confirm" button here will reset the B6070 Device to factory settings. All configurations will be reset to the factory defaults.
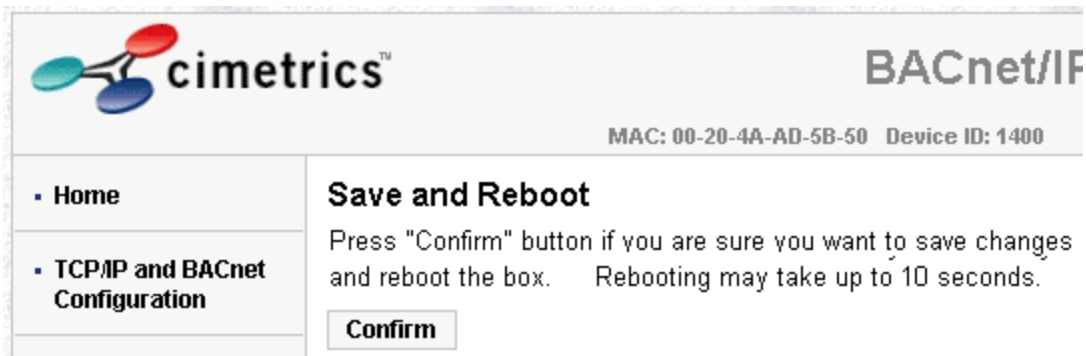
7 Chapter 7

7.1 Authorization Settings

Users can change the default username and password here.

Please keep in mind that once you change the username and password, you will need to remember it as Cimetrics **does not** have a backdoor password

8 Chapter 8

8.1 Save and Reboot

Once changes are made to the configuration, click on the "OK" button (is at the end of each configuration page). Once that is done, clicking on "Save and Reboot" followed by clicking on "Confirm" saves your changes. This will result in a soft reboot of the device.

9 Chapter 9

9.1 Using BACnet Explorer

If you do not already have the Cimetrics BACnet Explorer, please download the trial version from www.cimetrics.com/explorer
Please be clear to follow the instructions in the installation folder. Once the program has been installed on a machine that is connected to the network with the B6070 device, you will be able to see all the BACnet Objects of the B6070 Device.

The picture below shows what the B6070 and its objects look like in the Cimetrics BACnet Explorer.
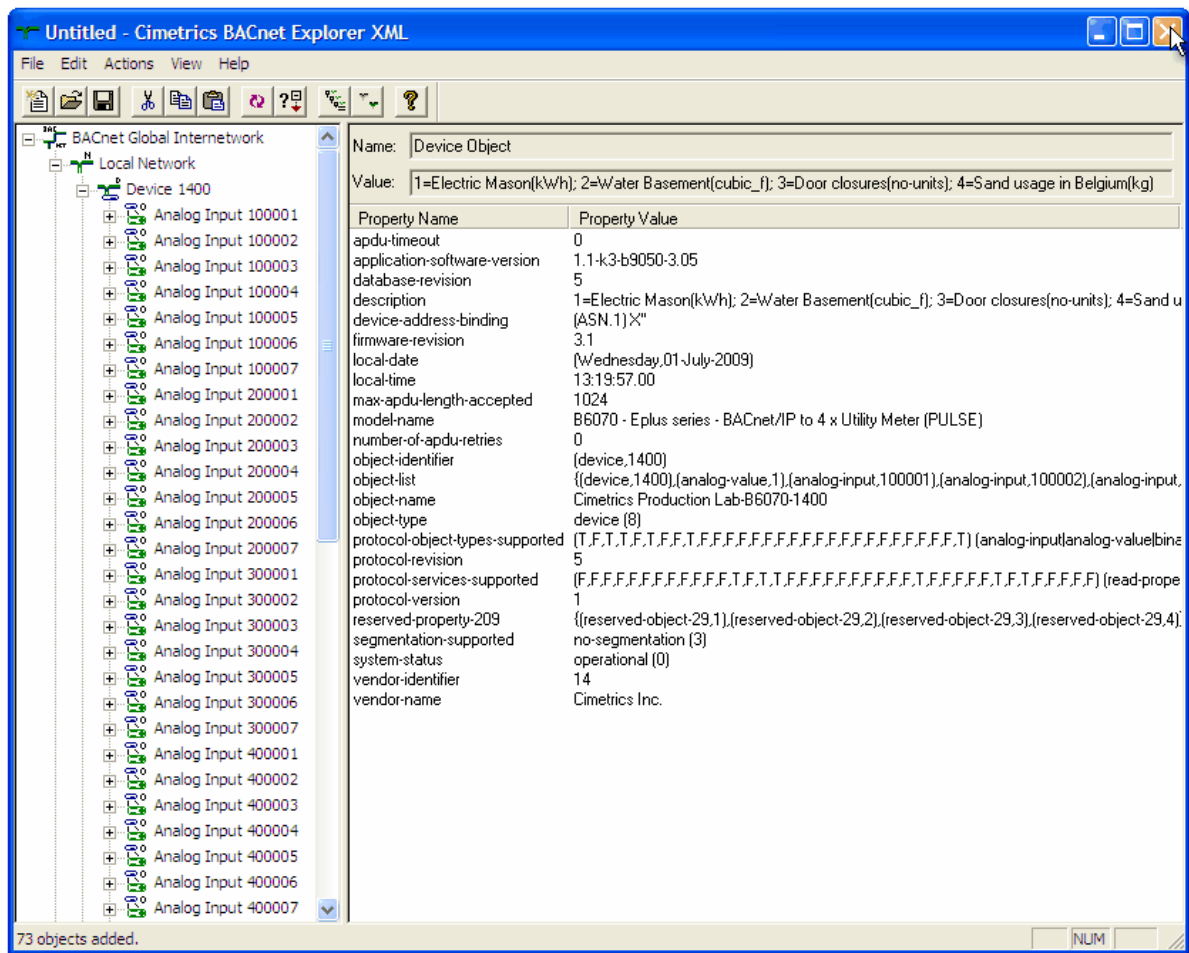
Clicking on any one of the BACnet Objects in the left pane will reveal all its properties and values in the right.

Troubleshooting the Installation of the Explorer to access the B6070 Device. In order to successfully discover the B6070 using the Explorer, the following conditions need to be met

- Install the Explorer on a Win2K or WinXP machine
- Configure the BACstac protocol to use BACnet/IP. Please follow the instructions in the installation folder of the BACnet Explorer to do this.
- Ensure that the IP Address of your PC (using the Explorer) and the IP address of the B6070 (the address configured under TCP/IP and BACnet Configuration) are in the same IP Subnet.
- Once the above conditions are met, you will be able to access the B6070.

10 Chapter 10

10.1 PIC Statement

Product Description:

The Cimetrics E+B/IP to 4channel Utility Meter is an Application specific controller that can be used to interface and control pulse meters. A BACnet/IP compliant client could control this.

BACnet Standardized Device Profile (Annex L):

o **BACnet Operator Workstation (B-OWS)**
o **BACnet Building Controller (B-BC)**
o **BACnet Advanced Application Controller (B-AAC)**
☑ **BACnet Application Specific Controller (B-ASC)**
o **BACnet Smart Sensor (B-SS)**
o **BACnet Smart Actuator (B-SA)**

List all BACnet Interoperability Building Blocks Supported (Annex K):
 (DS-RP-B), (DS-RPM-B), (DS-WP-B), (DM-DDB-B), (DM-TS-B)

Segmentation Capability:

o Segmented requests supported   Window Size _____ _____
o Segmented responses supported   Window Size _____ _____

Standard Object Types Supported:

Object-Type	Supported	Dynamically Creatable	Dynamically Deletable	Optional Properties Supported
Analog Input	o	o	o	Description Device_Type, Reliability, Update_Interval, Min_Pres_Value, Max_Pres_Value, Resolution, COV_Increment, Time_Delay, Notification_Class,

				High_Limit, Low_Limit, Deadband, Limit_Enable, Event_Enable, Acked_Transitions, Notify_Type, Event_Time_Stamps
Analog Output	o	o	o	Description Device_Type, Reliability, Min_Pres-Value, Max_Pres_Value, Resolution, COV_Increment, Time_Delay, Notification_Class, High_Limit, Low_Limit, Deadband, Limit_Enable, Event_Enable, Acked_Transitions, Notify_Type, Event_Time_Stamps
Analog Value	☑	o	o	Description Reliability, COV_Increment, Time_Delay, Notification_Class, High_Limit, Low_Limit, Deadband, Limit_Enable, Event_Enable, Acked_Transitions, Notify_Type, Priority_Array, Relinquish_Default, Event_Time_Stamps
Averaging	☑	o	o	Description,

				Minimum_Value_Time_Stamp, Variance_Value, Maximum_Value_Time_Stamp
Binary Input	o	o	o	Description Device_Type, Reliability, Inactive_Text, Active_Text, Change_of_State_Time, Change_of_State_Count, Time_of_State_Count_Reset, Elapsed_Active_Time, Time_of_Active_Time_Reset, Time_Delay, Notification_Class, Alarm_Value, Event_Enable, Acked_Transitions, Notify_Type, Event_Time_Stamps
Binary Output	o	o	o	Description Device_Type, Reliability, Inactive_Text, Active_Text, Change_of_State_Time, Change_of_State_Count, Time_of_State_Count_Reset, Elapsed_Active_Time, Time_of_Active_Time_Reset, Minimum_off_Time, Minimum_on_Time, Time_Delay, Notification_Class, Feedback_Value, Event_Enable, Acked_Transitions, Notify_Type, Event_Time_Stamps
Binary	☑	o	o	Description,

Value				Reliability, Inactive_Text, Active_Text, Change_of_State_Time, Change_of_State_Count, Time_of_State_Count_Reset, Elapsed_Active_Time, Time_of_Active_Time_Reset, Minimum_off_Time, Minimum_on_Time, Priority_Array, Relinquish_Default, Time_Delay, Notification_Class, Alarm_Value, Event_Enable, Acked_Transitions, Notify_Type, Event_Time_Stamps
Calendar	o	o	o	Description
Command	☑	o	o	Description Action_Text
Device	☑	N/A	N/A	Description Location, Local_Time, Local_Date, Daylight_Savings_Status, VT_Classes_Supported, Active_VT_Sessions, UTC_Offset, List_of_Session_Keys, Time_Synchronization_Recipients, Max_Master, Max_Info_Frames
Event Enrollment	o	o	o	Description, Notification_Class, Recipient, Process_Identifier, Priority,

				Issue_Confirmed_Notifications
File	o	o	o	Description Record_Count
Group	o	o	o	Description
Loop	o	o	o	Description Reliability, Update_Interval, Proportional_Constant, Proportional_Constant_Units, Integral_Constant, Integral_Constant_Units, Derivative_Constant, Derivative_Constant_Units, Bias, Maximum_Output, Mininum_Output, COV_Increment, Time_Delay, Notification_Class, Error_Limit, Event_Enable, Acked_Transitions, Notify_Type, Event_Time_Stamps
Life safety point	o	o	o	Description Device_Type, Tracking_Value, Life_Safety_Alarm_Values, Alarm_Values, Fault_Values, Time_Delay, Notification_Class, Notify_Type, Event_Time_Stamps, Setting, Maintenance_Required, Direct_reading, Units, Event_Enable,

				Acked_Transitions, Member_Of, Profile_Name
Life safety zone	o	o	o	Description Device_Type, Tracking_Value, Life_Safety_Alarm_Values, Alarm_Values, Fault_Values, Time_Delay, Notification_Class, Notify_Type, Event_Time_Stamps, Setting, Maintenance_Required, Direct_Reading, Units, Event_Enable, Acked_Transitions, member-of, Profile-name
Multi-state Input	☑	o	o	Description Device_Type, Reliability State_Text, Time_Delay, Notification_Class, Alarm_Values, Fault_Values, Event_Enable, Acked_Transitions, Notify_Type, Event_Time_Stamps
Multi-state Output	o	o	o	Description Device_Type, Reliability, State_Text Time_Delay, Notification_Class, Feedback_Value, Event_Enable, Acked_Transitions, Notify_Type,

				Event_Time_Stamps
Multi-state Value	o	o	o	Description, Reliability, State_Text Priority_Array Relinquish_Default Time_Delay Notification_Class Alarm_Values Fault_Values Event_Enable Acked_Transitions Notify_Type Event_Time_Stamps
Notification Class	o	o	o	Description
Program	o	o	o	Description_of_Halt Reason_for_halt, Program_Location, Description, Instance_of, Reliability
Schedule	o	o	o	Description, Weekly_Schedule, Exception_Schedule
Trend Log	o	o	o	Description, Start_Time, Stop_Time, Log_Device_Object_Property, Log_Interval, COV_Resubscription_Interval Client_COV_Increment Notification_Threshold Records_Since_Notification Previous_Notify_Time Current_Notify_Time, Notification_Class, Event_Enable, Acked_Transitions,

				Notify_Type, Event_Time_Stamps

Data Link Layer Options:

☑ BACnet IP, (Annex J)
o BACnet IP, (Annex J), Foreign Device
o ISO 8802-3, Ethernet (Clause 7)
o ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
o ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) _____
o MS/TP master (Clause 9), baud rate(s): _____
o MS/TP slave (Clause 9), baud rate(s): _____
o Point-To-Point, EIA 232 (Clause 10), baud rate(s):_____
o Point-To-Point, modem, (Clause 10), baud rate(s): _____
o LonTalk, (Clause 11), medium: _____
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.) o Yeso   No

Networking Options:

o Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
o Annex H, BACnet Tunneling Router over IP
o BACnet/IP Broadcast Management Device (BBMD)
Does the BBMD support registrations by Foreign Devices? o   Yes ☑ No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

þ ANSI X3.4   o IBMÔ /MicrosoftÔ DBCS   o ISO 8859-1
o ISO 10646 (UCS-2)   o ISO 10646 (UCS-4)   o JIS C 6226

If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:

No, this product is not a communications gateway.