BACNET OPTION USER GUIDE

Chiller Control

IMPORTANT INFORMATION

PURPOSE

This document aims to provide an overview on the BACNET option implemented on chiller controller.

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BACNET User Guide	ECG-UG-18-011	January 2019

REFERENCES

The following list includes all documents that may be the source of reference for material discussed in this publication.

- IOM Control
- IOM Machine
- Service Guide
- BACnet A Data Communication Protocol for Building Automation and Control Networks ANSI/ASHRAE Standard 135-2010

CONVENTIONS

The following symbols are used to highlight important information in this document.

CAUTION

This symbol is used to indicate potentially hazardous situations and conditions.

IMPORTANT

This symbol is used to present information relevant to the topic.

INFORMATION

This symbol is used to provide some useful information.

REVISIONS HISTORY

REV	DATE	DESCRIPTION	DONE BY
Original	January 2019	• Original document	MG/ER
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ABBREVIATIONS

Abbreviation	Description
AV	Analog Value (BACnet object type)
B-AAC	BACnet Advanced Application Controller
BAS	Building Automation Systems
BMS	Building Management Systems
BTL	BACnet Test Laboratory
BV	Binary Value (BACnet object type)
CAL	Calendar (BACnet object type)
CCN	Proprietary Communication Protocol
COV	Change of Value
DST	Daylight Savings Time
EL	Event Log (BACnet object type)
ID	Identifier
IR	Intrinsic Reporting
MV	Multistate Value (BACnet object type)
NC	Notification Class (BACnet object type)
PIC	Product Integrated Controller
PRG	Program (BACnet object type)
PV	Present Value property
RTC	Real time clock
RO	Read-Only
RW	Read Write
SCH	Schedule (BACnet object type)
TL	Trend Log (BACnet object type)

CONTENTS

1 INTRODUCTION

1.1 Scope

This guide describes the BACnet option for chillers. It is intended for Building Management System (BMS) engineers.

The chiller controller supports the BACnet protocol over IP as B-AAC Equipment.

i   **The BACnet stack is BTL certified.**

1.2 BACnet

BACnet is *a data communication protocol for building automation and control networks.* It is based on a client-server model and BACnet messages are referred to as "service requests".

The client machine ("user interface") sends the request to the server machine ("field device") that reports the result.

2 HOW TO TRANSFORM A NON-BACNET CHILLER TO A BACNET CHILLER

2.1 Prerequisites

BACnet/IP (option 149) is an option which requires a Software Activation Key to be activated. This software-protected option can be factory-installed or installed on-site by the service technician or the customer.

2.2 Software activation key

The Software Activation Key is an individual license key based on machine MAC address.

To obtain the Software Activation Key

1. Please contact your local service representative.

2. Please beware that the controller **eth0/J15** MAC address will be requested in order to provide the correct Software Activation Key.

   o A **sticker** is present on the back of the panel (top right location) with J15 MAC. The address is coded using 12 digits: XX-XX-XX-XX-XX-XX

   o You may check the MAC address via the **user interface**.
   Go to the Configuration menu and select the *Add Options* menu (ADD_OPT).
   The MAC address will be displayed.
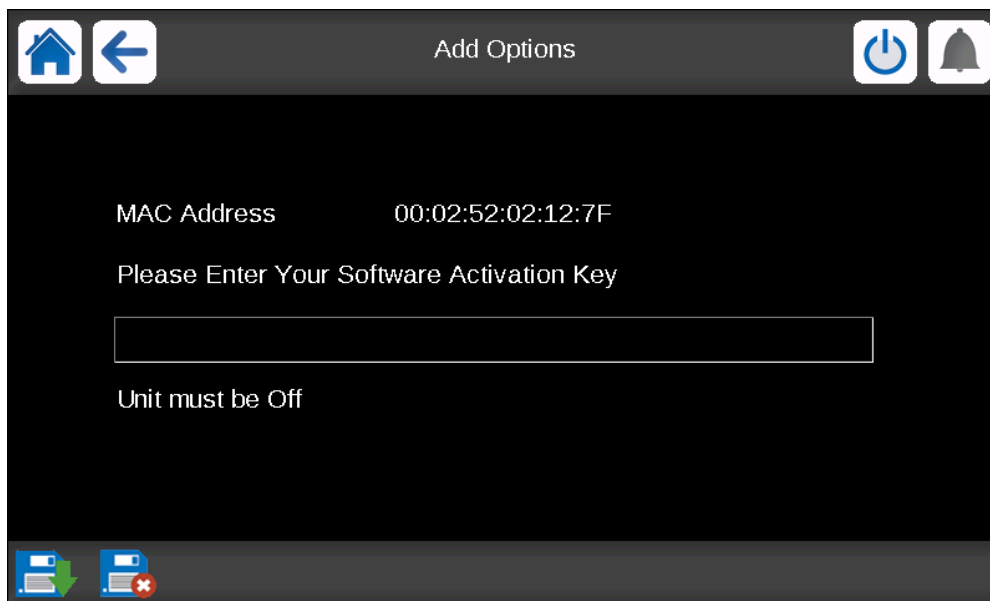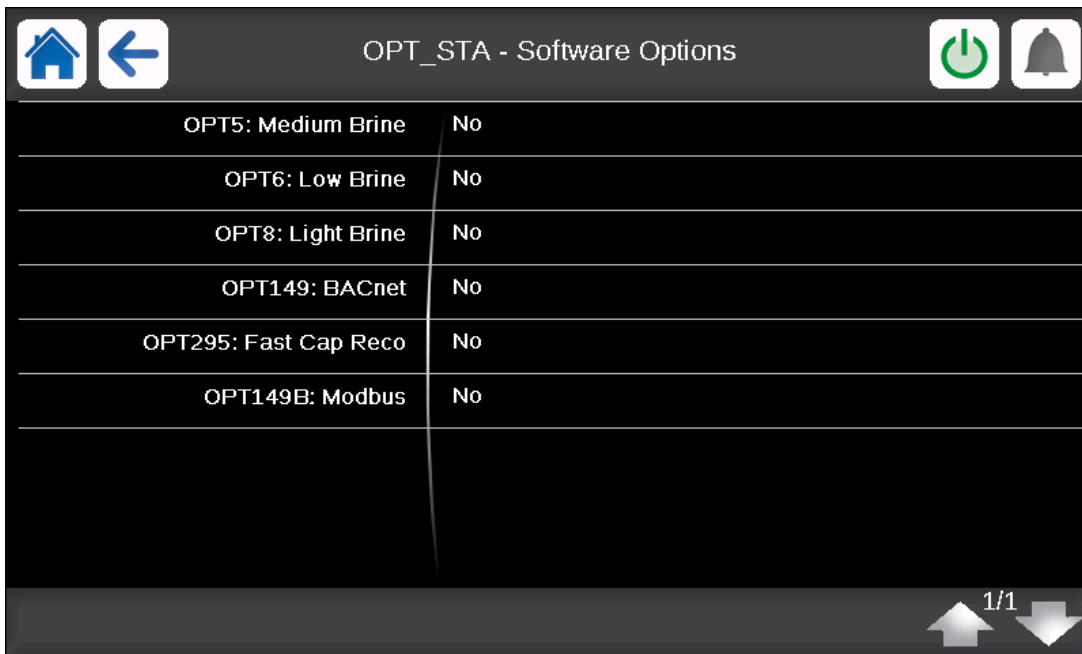
2.3 List of available software options

The list of currently available software options can be verified via the user interface.

To verify available software options

1. Go to the Main menu.
2. Select the *Software Options* menu (OPT_STA).
   - o The menu can be accessed when logged in (at least user-access level required).
3. If the status of the specific option is set to "Yes", it means that the Software Activation Key for this option is installed.
4. Verify the status of the "OPT149: BACnet" parameter.
   - o If the status of BACnet option is set to "No", please go to section **Error! Reference source not found. Error! Reference source not found.** to see how to activate the software option.

The Software Options menu is read-only. Once the Software Activation Key is installed, the status of the option that was installed will change to "yes".

In case the controller is replaced, the Software Activation Key must be installed again.
Please contact your local service representative for more information.

3   BACNET FOR CHILLER

3.1   BACnet settings

The BACnet communication option can be enabled/disabled on the Chiller controller through the user interface.

To modify BACnet parameters:
- The user must be logged in at user-access level.
- Software Activation Key for BACnet must be installed.

To enable/disable BACnet communication option

1. Go to the Main menu.

2. Navigate to the Configuration menu, and then the Network menu.

3. Select the *BACnet Parameters* menu (BACNET).

4. Set the "BACnet Enable" parameter to "enable".

   - After a power up, if BACnet communication is enabled ("BACnet Enable" = ENABLE), chiller objects will be created.

Table Name: BACNET		PIC Table Type: 13H	Instance: depends on equipment	//MAINMENU/CONFIG/Network	
	Point Name	**Displayed text***	**Status**	**Default**	**Unit**
1	bacena	BACnet Enable	disable / enable	disable	-
2	bacunit	Metric unit	no / yes	yes	-
3	network	Network	1 to 40000	1600	-
4	udpport	UDP Port Number	47808 to 47823	47808	-
5	bac_id	Device Id manual	1 to 4194302	1600001	-
6	auid_opt	Device Id Auto Option	disable / enable	disable	-
7	balmena	Alarm reporting	disable / enable	enable	-
8	mng_occ	BACnet Manage Occupancy	no / yes	no	-
9	conifnam	IP port interface name	0 to 1	0	-
10		0 = J15			
11		1 = J16			

*Displayed text may differ depending on the language selected. See also section 1.1 BACnet Parameters.

⚠ **Please note that changing parameters in the BACnet table will cause a software reboot.**

ⓘ **Use a BACnet device discovery tool, e.g. BDT, to verify communication with BACnet devices – Chiller must be discovered.**

⚠ **Updating configuration, including Network IP address, mask address, gateway address parameters MUST be followed by a user power cycle – in order to makes these changes effective in BACnet stack.**

3.2 BACnet Parameters (BACNET)

BACNET PARAMETERS (BACNET)	
BACnet enable	This parameter is used to enable BACnet communication.
Metric unit	**Metric units** and **Imperial units** are supported. By default, BACnet data will be displayed in metric units.
Network	The BACnet network value can be modified between 1 and 40000. By default, it is set to 1600.
UDP Port	The BACnet UDP port value can be modified between 47808 (BAC0) to 40823 (BACF). By default, it is set to 47808 (BAC0).
Device Id manual	By default, the manual deviceID set through the user interface is taken into account. The default value (1600001) is used to recognize the Chiller device on a BACnet network. The first two digits are the BACnet Vendor Id (16). The device ID MUST be unique over the BACnet bus. This parameter can be modified (from 1 to 4 194 302) if more than one Chiller is connected to the same BACnet network (or following the customer request). By default, the device Instance cannot be modified from BACnet Network.
Device Id Auto Option	This option is used to determine if the DeviceID is set from the user interface or from the BACnet network: **Disable (default setting):** Manual device ID from User Interface is taken into account. **Enable:** Device ID is set from the network. When Enabled, the current deviceID will be automatically set with the last deviceID value written from the BACnetNetwork.
Alarm reporting	This setting is used to determine if Alarm message can be sent to BMS or not. **Disable:** Alarm messages are not sent. **Enable (default setting):** Alarm messages are sent as Event notifications to BMS regarding properties of Notification class object.

BACnet Manage Occupancy	Chiller occupancy can be managed by either CCN or BACnet (they are totally independent). This "BACnet Manage Occupancy" parameter is used to select the Occupancy source (CCN or BACnet). **Yes:** If BACnet is selected [BACnet_mng_occ = Yes], then BACnet Occupancy Control [BACnet_occ_ctrl] allows for determining if Occupancy source is managed by BACnet Schedule and Calendar objects or through BMS writings to BACnet_BMS_OCC object. _Note about Schedule/calendar objects:_ _If "BACnet manage occupancy" is "YES", then if the calendar object PV value is False (today is not a holiday) then CHIL_OCC will be set by the schedule object output. If Today is a holiday (PV value = TRUE), then CHIL_OCC will be set to "NO"._ If BACnet manages occupancy then its output is written into GENUNIT_CHIL_OCC parameter.
IP port interface name	The 7-inch controller is equipped with 2 Ethernet ports. BACnet network is set to 1 ("eth1" / J16) by default, but for user convenience it may be changed to 0 ("eth0" / J15). _Note: This is not applicable to 4.3-inch controller which is equipped with only one Ethernet port ("eth1"(J5))._

⚠ **The Chiller Controller MUST BE in "Network" mode to be controlled from BACnet. Occupancy status from BACnet is ignored in "Local" mode.**

3.3 Device ID setting

In the equipment, <u>there are</u> **three mechanisms** <u>available</u> **to set the Device ID**:

1) Manual (default): The deviceID is set through the local user interface.
2) Not Auto-Generated: The deviceID is set through BACnet Network.
3) Auto-Generated: The deviceID is determined by equipment calculation.

The **"Device Id Auto Option"** is available only on the local user interface.

- By default, it is set to **"Disable"**.
  - o In this condition, the Manual Device ID set from the local User Interface is taken into account.
  - o The ObjectIdentifier property of the deviceObject is read-only.

- If the "Device Id Auto Option" is set to **"Enable"**, then the device Instance can be set from the BACnet Network.

  Warning: The deviceID will be instantaneously modified, so the equipment won't be accessible to its previous deviceID.

The additional proprietary property of the device object called "AUTO_IDENTITY_SCHEME" allows for determining the method to set deviceID (this property is also available on WebCtrl / i-Vu BMS through device driver "extras" page).

<u>Its value could be:</u>

- Not auto-generated (0 = default)
- Auto-generated: If the Value is "Auto Generated …", then proprietary mechanism is activated. The device ID will be equal to the value of "Auto Identify Base" property x 100 + CCN address.

⚠️ **Writing Device ID Base or changing CCN address won't cause a device reboot. It is necessary to reboot the chiller controller to take into account the auto-generated device ID.**

⚠️ **Device ID Base is written into Network Number and vice versa.**

⚠️ **For DeviceID calculation: If CCN address is greater than "99", then "1" will be used.**

Back to <u>Beginning of Chapter</u> – <u>Table of Contents</u>

4   BACNET OBJECTS

4.1   BACnet chiller objects

Depending on the chiller type, the BACnet stack may contain up to 1000 BACnet objects, including the following types:

- ANALOG_VALUE (**AV**)
- BINARY_VALUE (**BV**)
- MULTISTATE VALUE (**MV**)
- One (1) device object
- One (1) Notification Class object for alarm reporting (**NC**)
- One (1) calendar object to manage holidays (**CAL**)
- One (1) schedule object to manage weekly schedule (**SCH**)
- One (1) event log object (**EL**)
- One (1) program object
- Up to 50 Trend Log objects (**TL**)
- Eight (8) file objects

Objects' names are built from the concatenation of the menu name (table name) and the point name.

Example:

Menu name (table name)	Point name	Object name
GENCONF	off_on_d	GENCONF_off_on_d
General Configuration	*Unit Off to On Delay*	*Unit Off to On Delay*

4.2 Device object

The Device object type defines a standardized object whose properties represent the externally visible characteristics of a BACnet Device.

The Device object is referenced by its Object_Identifier property which is unique to the BACnet device and it is also unique throughout the BACnet internetwork.

> ⓘ **See BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

Additional Proprietary properties supported:

DST_OFFSET	3801	N/A Integer, in minutes and may be negative. Represents how much to change the time by.

ALLOW_LOCAL_SCHEDULE_EDIT	3803	Allows the user to determine whether the local display should allow the user to edit schedules or not.
		
		BOOL datatype:
		  0 = FALSE (WebCtrl can only edit Schedule)
		  1 = TRUE (Local UI can only edit Schedule):
		    Not applicable to controller application

EQUIPMENT_SERIAL_NUMBER	3820	N/A
RNET_ENABLE	3821	N/A
AUTO_IDENTITY_SCHEME	4149	ENUM datatype: 0 = Not Auto-Generated 1 = Auto-Generated and overrides device identifier
AUTO_IDENTITY_BASE	4150	UNS datatype: This value is used to calculate unique device identifier when it is auto-generated. The algorithm is: device instance = auto-identity-base*100 + CCN address. Example: device instance = 1600*100 + 11 = 160011.
CONTROLLER_SERIAL_NUMBER	4153	Returns Software P/N

4.3 Analog value object

The Analog Value object type defines a standardized object whose properties represent the externally visible characteristics of an analog value.

Properties supported

Mandatory properties are supported by each object. Optional properties required to support COV, CMD, proprietary LOCK may or may not be present depending on the object. Analog Value objects are classified by type, where each type supports mandatory properties and a set of optional properties.

See BACnet PICS (section 7), BACnet object list (section 9) and refer to BACnet ASHRAE specification for properties description.

See also COV (section 1.1), Commandable (section 0) and Lock option (section 4.16).

AV objects implementation does not support Intrinsic Reporting (IR) option.

4.4 Binary value object

The Binary Value object type defines a standardized object whose properties represent the externally visible characteristics of a binary value.

The "binary value" may have only one of two distinct states referred to as ACTIVE and INACTIVE.

Properties supported

Mandatory properties are supported by each object.

Optional properties required to support IR, CMD, proprietary LOCK may or may not be present depending on the object.

Binary Value objects are classified by type, where each type supports mandatory properties and a set of optional properties.

> *i* **See BACnet PICS (section 7), BACnet object list (section 9) and refer to BACnet ASHRAE specification for properties description.**

> *i* **See also Intrinsic Reporting (section 0), Commandable (section 0) and Lock option (section 4.16).**

> ! **BV objects implementation does not support Change of Value (COV) option.**

4.5 Multistate value object

The Multi-state Value object type defines a standardized object whose properties represent the externally visible characteristics of a multi-state value.

The Present_Value property is an unsigned integer representing the state.
The State_Text property associates a description with each state.

Properties supported

Mandatory properties are supported by each object. Optional properties required to support CMD, proprietary LOCK may or may not be present depending on the object.
Multistate Value objects are classified by type. Each type supports mandatory properties and a set of optional properties.

> *i* **The CCN value corresponding to the MV object shall always be equal to the MV object present value MINUS 1.**

> *i* **See BACnet PICS (section 7), BACnet object list (section 9) and refer to BACnet ASHRAE specification for properties description.**

> *i* **See also Commandable (section 0) and Lock option (section 4.16).**

> ! **MV objects implementation does not support Change of Value (COV) option.**
> **MV objects implementation does not support Intrinsic Reporting (IR) option.**

4.6 Notification class object

The Notification Class object is used to specify the handling and routing of events to one or more destinations. The Notification Class object defines the priorities to be used in event-notification messages, whether acknowledgment by an application process or human operator is required, and it also defines when during the week given destinations are to be used (at what time periods). For chiller application, there is only one notification class object. The object instance is 1.

Important

The following two first priorities are common to all recipients, the third one is dedicated to each recipient:
- Priority
- User Ack required
- Recipient List

The priority is used for event notifications. Priorities shall range from 0 to 255 inclusive. A lower number indicates a higher priority. Default value is 0.

The Ack required property represent whether user acknowledgment shall be required in notifications generated.

3 transitions can require user acknowledgement:
- TOOFFNORMAL
- TO-FAULT
- TO-NORMAL

The notification class object can contain up to 2 recipients. These devices are listed in the recipient list property of the object.

For each recipient, there is a set of parameters to configure:
- Recipient Identification
- Valid days
- From time to time
- Process Identifier
- Issue Notification
- Transitions

The recipient can be identified by their IP address or by their Device name.

- By default, the recipient is available all the week day long at any time. This can be modified if the recipient is not available a week day and or at a certain period of the day.
- The recipient can ask for a confirmed or unconfirmed notification. The confirmed notification shall require a communication acknowledgement from the recipient.
- The process identifier is 1 (default). This is the handle of the process within the recipient device that is to receive the event notification.

3 transitions can issue notification messages:
- TOOFFNORMAL
- TO-FAULT
- TO-NORMAL

See **BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

4.7 Event log object

The Event Log object records event notifications with timestamps and other pertinent data in an internal buffer for subsequent retrieval. Each timestamped buffer entry is called an event log "record".

For chiller application, there is only one event log object. The object instance is 1.

The Event Log object maintains an internal fixed-size buffer of 250 records. This buffer fills as event log records are added. If the buffer becomes full, the least recent records are overwritten when new records are added, or a collection may be set to stop.

- Logging may be enabled and disabled through the Enable property. Event Log enabling and disabling is recorded in the log buffer.
- When Enabled, logging may be started and stopped at dates and times specified by the Start_Time and Stop_Time properties.
- Logging starting or stopping is not recorded in the log buffer.

i **See BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

4.8 Trend log object

The Trend Log object monitors a property of a referenced object and, when predefined conditions are met, saves ("logs") the value of the property and a timestamp in an internal buffer for subsequent retrieval. The data may be logged periodically, or upon a change of value. Each timestamped buffer entry is called a trend log "record".

For the equipment, the property of the referenced objects resides in the same device as the Trend Log object and the Trend Log Instance is the instance of the referenced object. Up to 50 Trend Log objects may reside in the device.

The referenced property value may be recorded upon COV subscription or periodic poll according to "Logging Type" property (Triggered type is not supported).

Each Trend Log object maintains an internal, optionally fixed-size buffer of 250 records.

i **See BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

4.9 Schedule object

The Schedule object type defines a standardized object used to describe a periodic schedule that may recur during a range of dates, with optional exceptions at arbitrary times on arbitrary dates. The Schedule object also serves as a binding between these scheduled times and the writing of specified "values" to Chiller Occupancy at those times.

Schedules are divided into days, where there are two types of days: normal days within a week and exception days.

The current state of the Schedule object is represented by the value of its Present_Value property, which is calculated using the time/value pairs from the Weekly_Schedule and Exception_Schedule properties, with a default value for use when no schedules are in effect.

For the equipment, there is only one schedule object. The object instance is 1.

The status of the schedule & calendar objects is refreshed every minute (60 seconds).

Proprietary properties

The following proprietary properties are supported:

EXCEPTION_SCHEDULE_DESCRIPTION	554
NEXT_TRANSITION_TIME	3813 date and time values for next schedule transition
MINUTES_REMAINING	3814 minutes remaining for next schedule transition

> ℹ **See BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

How to enable BACnet schedule for the equipment

To be effective, the controller must be in "Network" mode and the "BACnet Manage Occupancy" parameter available in BACnet Parameters menu (BACNET) has to be set to "YES". If this parameter is equal to "NO", then the CCN Chiller schedule will be taken into account.

If the occupancy from schedule is selected (BACnet_BMS_OCC =2), then the Present Value indicates the current value of the schedule.

The normal calculation of the value of the Present_Value property is as follows:

1) Find the highest relative priority.
   Exception_Schedule array element that is in effect for the current day and whose current value (see method below) is not NULL, and assign that value to the Present_Value property.

2) If the Present_Value was not assigned in the previous step, then evaluate the current value of the Weekly_Schedule array element for the current day and if that value is not NULL, assign it to the Present_Value property.

3) If the Present_Value was not assigned in the previous steps, then assign the value of the Schedule_Default property to the Present_Value property. The method for evaluating the current value of a schedule (either exception or weekly) is to find the latest element in the list of BACnetTimeValues that occurs on or before the current time, and then use that element's value as the current value for the schedule. If no such an element is found, then the current value for the schedule shall be NULL.

These calculations are such that they can be performed at any time and the correct value of Present_Value property will result.

Notice that the Present_Value property will be assigned the value of the Schedule_Default property at 00:00 of any given day, unless there is an entry for 00:00 in effect for that day. If a scheduled event logically begins on one day and ends on another, an entry at 00:00 shall be placed in the schedule that is in effect for the second day, and for any subsequent days of the event's duration, to ensure the correct result whenever Present_Value is calculated.

If the occupancy from BACnet BMS is selected (BACnet_BMS_OCC = 0 or 1), then regarding the request:

- BACnet_BMS_OCC = 1 => BMS request = Occ => CHIL_OCC = YES
- BACnet_BMS_OCC = 0 => BMS request = Unocc => CHIL_OCC = NO

Up to 7 Weekly Schedules can be entered and saved.

- A Weekly schedule has no priority attached.
- The Schedule object supports 20 Exception Schedules.

There are 7 possible exception types*:

- Weekly (1)
- Date (1)
- Date Range (1)
- Date List (1 per date)
- Wild Card (1)
- Continuous (2)
- Dated weekly (1)

As given in brackets, this exception type may use more than entry to be saved.

The schedule proprietary property EXCEPTION_SCHEDULE_DESCRIPTION can be edited by iVu WebCTRL if the Device Object proprietary property ALLOW_LOCAL_SCHEDULE_EDIT is set to FALSE.

If the Device Object proprietary property ALLOW_LOCAL_SCHEDULE_EDIT is set to TRUE, then the schedule proprietary property EXCEPTION_SCHEDULE_DESCRIPTION cannot be accessed.

By default, the Device Object proprietary property ALLOW_LOCAL_SCHEDULE_EDIT is set to FALSE.

ALLOW_LOCAL_SCHEDULE_EDIT	EXCEPTION_SCHEDULE_DESCRIPTION FROM WebCtrl
False	Accessible
True	Access denied

Up to 16 descriptions can be saved, but up to 20 exception schedules can be entered.
The last 4 ones have no exception description saved.

It works like a FIFO: Last ExceptSched description entered is at position 01.
Descriptions are saved.

4.10 Calendar object

The Calendar object type defines a standardized object used to describe a list of calendar dates, which might be thought of as "holidays", "special events", or simply as a list of dates.

For chiller application, there is only one calendar object. The object instance is 1.

> **ℹ** **See BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

There are 3 Member Types for calendar periods:
- Date
- Date Range
- BACnetWeekNday also named WildCard

How to enable calendar

To be effective, the "BACnet Manage Occupancy" parameter available in BACnet Parameters menu (BACNET) has to be set to "YES".

The Present value indicates the current value of the calendar: TRUE if the current date is in the Date_List and FALSE if it is not.

When calendar present value is true, then today is a holiday because it matches one of the dates in the calendar object. CHIL_OCC is set to UNOCCUPIED.

When false, the calendar object does not contain today's date. CHIL_OCC is set by the schedule object or by a BMS regarding BACnet_BMS_OCC value.

Up to 10 entries of the Calendar object can be saved.

4.11 File object

The File object type defines a standardized object that is used to describe properties of data files that may be accessed using File Services (atomic read and atomic write file).

File objects are mainly used for I-Vu, WebCtrl compatibility.

> **ℹ** **See BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

4.12 Program object

The Program object type defines a standardized object whose properties represent the externally visible characteristics of an application program. The 'program_location' property is where i-Vu or WebCTRL store the 'display-name' of the equipment. This property is shown in iVu/WebCTRL on the tree as the name of the equipment when we upload the device.

The user is allowed to change this value. WebCTRL will write the change to the device.

The 'program_location' property is writable and non-volatile.

> **ℹ** **See BACnet PICS (section 7) and refer to BACnet ASHRAE specification for properties description.**

4.13 Change Of value (COV)

Change of Value is an event that occurs when a measured or calculated analogue value changes by a predefined amount.

Change of value (COV) reporting allows a COV-client to subscribe to a COV-server, on a permanent or temporary basis, to receive reports of some changes of value of some referenced property based on fixed criteria.

The COV option is set at BACnet stack construction. It cannot be added on field.

For object supporting COV, the COV increment property is required and added to the object.

COV Increment specifies the increment to be used in determining that a change of value has occurred.

Important

- If the variation of the Present Value exceeds (positive or negative) this increment, then a notification is sent to the subscriber.
- The COV increment is configurable through BACnet.
- The COV subscription can be set for a time duration (lifetime parameter > 0) or for an infinite duration.
- The PIC software will reject COV subscription service when Lifetime parameter is equal to zero with the error "Value out of Range".
- The list of the subscription can be found in the device object property "active_cov_subscription".
- The device will allow up to 6 COV subscribers for a given object. Additional subscriptions will be rejected with the "no-space-to-add-list-element" error.
- The entire list of active-COV-subscriptions can be retrieved by using the ReadRange service, 10 max at a time.

i **The device shall allow up to 6 COV subscribers for a given object. Additional subscriptions shall be rejected with the "no-space-to-add-list-element" error.**

4.14 Intrinsic reporting

Intrinsic reporting is the detection and reporting of an alarm or event, based on algorithm defined as part of the object type specification.

For the INTRINSIC REPORTING option (IR) the alarm configuration and the configuration of the equipment to be notified are required. Otherwise, the option will not be active.

Intrinsic reporting allows a BACnet device to provide one or more event sources, intrinsic to the device, that generate event notifications that may be directed to one or more destinations.

The Notification Class object is used to specify the handling and routing of events to one or more destinations.

For objects supporting IR, the following required properties are added to the object.

• Time_Delay	0 (default) – Read only
• Notification_Class	1 (default) – Read only
• Alarm_Value	0 default – Read only
• Event_Enable BACnet	{101} default – Read Write
• Acked_Transitions	{111} default – Read only
• Notify_Type	1 (default) – Read only
• Event_Time_Stamps	Read only

These properties are configurable through BACnet.

The IR option is set at BACnet stack construction. It cannot be added on field. The alarm configuration (see Event Enable Reporting parameter) and the configuration of the Notification Class object properties must be set properly.

Regarding Chiller application only BV object named ALM*** support Intrinsic reporting.

The equipment shall set the BV object present value and "in alarm" status flag according to its internal item value, as follows:

- item value = 0 : BV object present value = 0 "in alarm" = False
- item value = 1 : BV object present value = 1 "in alarm" = True

The equipment will resend *alarm notification* if *acknowledgement frame type* is not received for *Confirmed Event Notification* on or before the expiry of six seconds after *alarm notification.*

It will resend *alarm notification* three times.

4.15 Commandable

AV, BV, MV objects can support the commandable option. The **Commandable** option reflects the state of the output.

For those objects, the following required properties must be added:

- Priority_Array
- Relinquish_Default

The CMD option is set at BACnet stack construction. It cannot be added on field.

Objects with Commandable option are usually named with the "_wr" suffix.

If the Local Operating Type is set to "Network", then it is possible to control the Unit from BACnet by writing these objects. The highest priority value of the commandable object will be copied to the present value of the object using the same name with the "_rd" suffix.

Example:
CTRL_POINT_wr highest priority value copied to CTRL_POINT_rd present value

If the Local Operating Type is set to Local or Remote, then the Priority value won't be applied and the value determined by the controller will be used:

- The present value of the object name with the "_rd" suffix (example: CTRL_POINT_rd) will still reflect the current software value.

- The BACnet priority level corresponds to the CCN override level (1:1). If this BACnet priority level is removed, the priority level that is immediately below will be applied to the corresponding CCN point (CCN "Auto" command will be applied first).

- When a CCN override level is applied from CCN, the CCN override level will be the BACnet priority level.

4.16 LOCK

The equipment supports a "LOCK" proprietary concept for "locked" and "locked values" on a point. This is a concept used to temporarily bypass a non-working sensor or to test logic behaviour under certain conditions. These two proprietary properties are supported by AV, BV and MV objects.

LOCK	3804	The LOCK property is an indication of whether (TRUE) or not (FALSE) the PRESENT_VALUE is overridden by the LOCKED_VALUE property. This property is writable.
LOCKED_VALUE	3805	This property has the same data type as the PRESENT_VALUE in this object. This value can be NULL. This property is writable.

When locking is enabled (LOCK = TRUE), the object present value will be updated with the LOCKED_VALUE property.

When locking is disabled (LOCK = FALSE) for commandable objects, the object present value is restored and ALC_LOCKED_VALUE is no more used.

4.17 Read Write Access to Chiller

Writing AV, BV, MV "Present Value" is authorized by the BACnet protocol for all objects.

However, the Chiller application will authorize or won't authorize the "Present value" to be written in Chiller database regarding the "access" object parameter (Read Only (RO) or Read/Write (RW)).

"Access" parameter is not a BACnet property. This is a local and internal parameter used at BACnet stack construction.

If a "present value" property with an access parameter equal to Read only (RO) is written, then the present value will be overwritten by the chiller application with the previous value.

Objects with "present value" in Read Only access are all objects used for Chiller configuration and status.

Objects with "present value" in Read/Write access are objects used for setpoint configuration (named with a SETPOINT_ prefix) and Commandable objects with a _wr suffix.

5 I-VU, WEBCTRL COMPATIBILITY

5.1 General overview

i-Vu/WebCtrl is designed to be a plug and play system. This means that once controllers have basic individual configuration completed, the i-Vu/WebCtrl server can scan and build up a system with minimal user effort.

Files necessary to build the system are automatically uploaded from the controller or retrieved from application library file(s).

To accomplish the plug and play goal, controllers shall have their equipment, graphics, and driver files defined and downloaded at factory level (they will be ready for discovery prior to iVu/WebCtrl being used).

5.2 Colour chart

The following colours are used for thermographic floor plans by WebCtrl/i-Vu. Colours represent the current state of the equipment's operation.

Colour Chart supported:

Colour	Status Code	Condition Indicated	Comment
Red	9	**Cooling Alarm**	Cooling Mode Chiller status is Tripout
Orange	8	**Maximum cooling**	Cooling Mode When GENUNIT_CAP_T = 100%
Yellow	7	**Moderate cooling**	Cooling Mode When GENUNIT_CAP_T > 0%
Light Blue	4	**Moderate heating**	Heating Mode When GENUNIT_CAP_T > 0%
Dark Blue	3	**Maximum heating**	Heating Mode When GENUNIT_CAP_T = 100%
Red	2	**Heating alarm**	Heating Mode Chiller status is Tripout

Prime value: Prime' represents the primary function of equipment the PIC is controlling.
"Prime" is one single most important value (number) for a controller.

For the equipment, the Prime value is the present value of the CAPACTRL_ctrl_wt object.

5.3 Backup & Restore Config file

The device will allow a user at i-Vu/WebCtrl user interface or 3rd party BMS to backup or restore all its operating configuration parameters.

The files to be backed-up and restored shall be listed in a file (BACNET_BACKUP.TXT) that must be present on the PIC file system.

The Backup procedure consists of the following steps:

1. The device receives a Reinitialize-Device Start-Backup command.
2. It reads and follows instructions listed in BACNET_BACKUP.TXT file.
3. It fails the backup procedure if something is wrong (i.e. Required file missing).
4. It zips all copied files into BACNET_BACKUP.ZIP
5. Indicates that the Backup procedure succeeded in the device object.
6. The BMS reads the backup and restores state property.
7. If it was successfully completed, then the BMS reads the FILE object instance 2 to upload BACNET_BACKUP.ZIP via Atomic Read file.

The Restore procedure consists of the following steps:

1. The device receives a Reinitialize-Device Start-Restore command.
2. It sets the device object's Backup & Restore state property to "preparing for backup".
3. It sets the device object's System Status property to "backup in progress".
4. The device does nothing else. The BACnet client is supposed to write the configuration to be restored via Atomic Write file commands to the configuration file object, then it sends a Reinitialize-Device End-Restore command.
5. The device receives a Reinitialize-Device End-Restore command.
6. It reads and follows instructions listed in BACNET_BACKUP.TXT
7. It fails the restore procedure if something is wrong (i.e. Required file missing).
8. Set the indicators to show that the Restore procedure has succeeded.
9. Send a "Reboot" command to the main device software module.
10. Wait for the reboot to occur.

6 IP ADDRESS SETTINGS

6.1 IP address controller

The IP address information can be accessed via the System menu available on the controller user interface.

To go to IP address settings

1. Go to the home screen on the controller user interface.

2. Press the **System** menu button 🌐 in the upper-right corner of the screen.

3. Select the *Network* menu (NETWORK)*.*
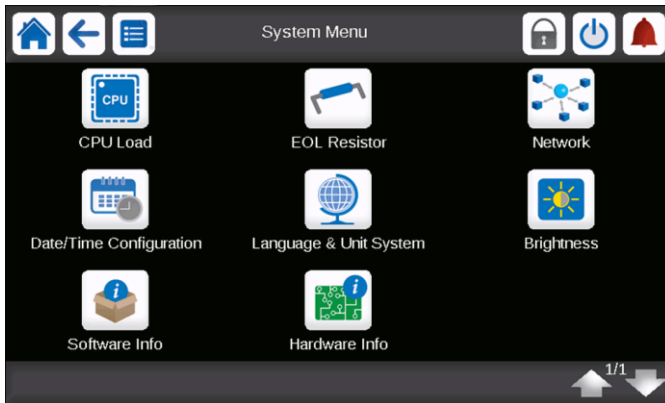
6.2 IP address modification

If necessary, you may change unit IP address on the controller user interface or via the web browser (the web browser interface looks similar to the touch screen).

To modify unit IP address

1. Go to the *Network* menu (NETWORK).
   - The first page displays eth0 (J15) settings.
   - The second page displays eth1 (J16) settings.

2. Change IP address and mask as necessary.

3. Press the Save button to confirm or the Cancel button to cancel changes.
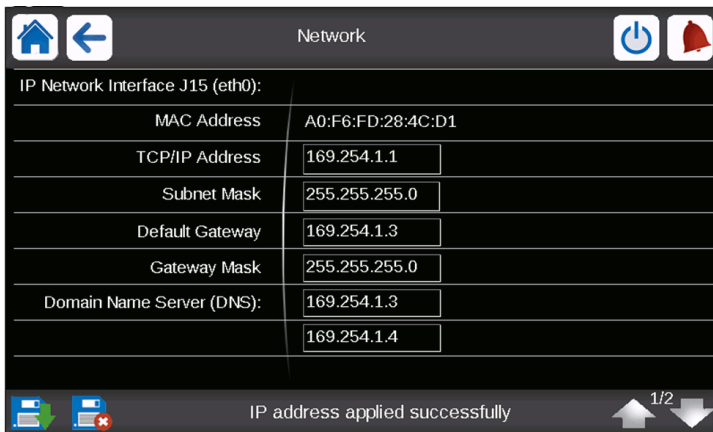
7 BACNET PICS

This section contains the Protocol Implementation Conformance Statement (PICS) and BACnet® Interoperability Building Blocks (BIBBs) for the BACnet stack as required by the American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 135-2010, BACnet protocol.

BACnet interoperability building blocks are collections of one or more BACnet services. This document includes a listing of the BIBBs currently supported by the device and BACnet stack.

The BACnet stack shall be native BACnet Advanced Application Controller (B-AAC).

Date:
Vendor Name: Carrier
Product Name: PIC6 - Chiller Series
Product Model Number :   PIC6
Application Software Version:
Firmware Revision:
BACnet Protocol Revision: Version 1, Revision 12

7.1 Product Description

The chiller user-interface is a controller designed for UTC HVAC chillers. It communicates over BACnet/IP network.

7.2 BACnet Requirements BACnet Standardized Device Profile (Annex L)

- ☐ 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)

7.3 BACnet Interoperability Building Blocks (BIBBs)(Annex K)

Table below lists all the BIBBs that are required for the BACnet Advanced Application Controller (B-AAC) profile for the BACnet stack. The BIBBS that are not required for B-AAC Profile but supported in the BACnet stack are also listed.

Application Services (B-AAC)	Designation
Required for B-AAC Profile	
Data Sharing - Read Property – B	DS-RP-B
Data Sharing - Read Property Multiple – B	DS-RPM-B
Data Sharing - Write Property – B	DS-WP-B
Data Sharing - Write Property Multiple – B	DS-WPM-B
Alarm and Event-Notification Internal-B	AE-N-I-B
Alarm and Event-ACK-B	AE-ACK-B
Alarm and Event-Information-B	AE-INFO-B
Scheduling-Internal-B	SCHED-I-B
Device Management - Dynamic Device Binding – B	DM-DDB-B
Device Management- Dynamic Device Binding – A	DM-DDB-A
Device Management - Dynamic Object Binding – B	DM-DOB-B
Device Management - Device Communication Control – B	DM-DCC-B
Device Management - Time Synchronization – B	DM-TS-B
Device Management – UTC Time Synchronization – B	DB-UTC-B
Device Management - Reinitialize Device – B	DM-RD-B
Not Required for B-AAC Profile but supported in the BACnet stack	
Device Management - Dynamic Object Binding – A	DM-DOB-A
Data Sharing - Read Property – A	DS-RP-A
Device Management – Backup and Restore – B	DM-BR-B
Device Management – Private Transfer - B	DM-PT-B
Device Management – Private Transfer - A	DM-PT-A
Trending-Automated Trend Retrieval-B	T-ATR-B
Trending-Viewing and Modifying Trends Internal-B	T-VMT-I-B
Data Sharing-COV-A	DS-COV-A
Data Sharing-COV-B	DS-COV-B
Alarm and Event Management- Event Log – Internal - B	AE-EL-I-B

7.4 Standard Object Types Supported

The following is a list of the standard object types as define by the standard. The objects checked are currently supported by this product. See the section in this document for the supported object type for details.

- ☐ Accumulator
- ☐ Analog Input
- ☐ Analog Output
- ☐ Analog Value
- ☐ Averaging
- ☐ Binary Input
- ☐ Binary Output
- ☐ Binary Value
- ☐ Calendar
- ☐ Command
- ☐ Device
- ☐ Event Log
- ☐ File
- ☐ Group
- ☐ Life Safety Point
- ☐ Life Safety Zone
- ☐ Loop
- ☐ Multistate Input
- ☐ Multistate Output
- ☐ Multistate Value
- ☐ Notification Class
- ☐ Program
- ☐ Pulse Converter
- ☐ Schedule
- ☐ Trend Log

⚠ **Dynamic Object creation and deletion are not supported.**

7.5 Device Object type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			RW	75	
Object_Name	☐			RW	77	
Object_Type	☐			R	79	
System_Status	☐			R	112	
Vendor_Name	☐			R	121	
Vendor_Identifier	☐			R	120	
Model_Name	☐			R	70	
Firmware_Revision	☐			R	44	
Application_Software_Version	☐			R	12	
Location		☐		RW	58	
Protocol_Version	☐			R	98	
Protocol_Revision	☐			R	139	
Protocol_Services_Supported	☐			R	97	
Protocol_Object_Types_Supported	☐			R	96	
Object_List	☐			R	76	
Max_APDU_Length_Accepted	☐			R	62	
Segmentation_Supported	☐			R	107	
Local_Date		☐		R	56	
Local_Time		☐		R	57	
UTC_Offset		☐		RW	119	
Daylight_Savings_Status		☐		R	24	
APDU_Timeout	☐			RW	10	
Number_Of_APDU_Retries	☐			RW	73	
Device_Address_Binding	☐			R	30	
Database_Revision	☐			R	155	
Description		☐		R	28	
Configuration Files		☐		R	154	
Last Restore Time		☐		R	157	
Backup Failure timeout		☐		RW	153	
Backup and Restore State		☐		R	338	
Backup preparation time		☐		R	339	
Restore completion time		☐		R	45	
Active_COV_Subscriptions		☐		R	152	
DST_OFFSET			☐	RW	3801	
ALLOW_LOCAL_SCHEDULE_EDIT			☐	RW	3803	
EQUIPMENT_SERIAL_NUMBER			☐	R	3820	
RNET_ENABLE			☐	RW	3821	
AUTO_IDENTITY_SCHEME			☐	RW	4149	
AUTO_IDENTITY_BASE			☐	RW	4150	
CONTROLLER_SERIAL_NUMBER			☐	R	4153	

7.6 Analog value (AV) Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Object_Identifier	☐			R	75	☐	☐	☐	☐	☐	☐
Object_Name	☐			R	77	☐	☐	☐	☐	☐	☐
Object_Type	☐			R	79	☐	☐	☐	☐	☐	☐
Present_Value	☐			RW	85	☐	☐	☐	☐	☐	☐
Status_Flags	☐			R	111	☐	☐	☐	☐	☐	☐
Event_State	☐			R	36	☐	☐	☐	☐	☐	☐
Out_Of_Service	☐			R	81	☐	☐	☐	☐	☐	☐
Units	☐			R	117	☐	☐	☐	☐	☐	☐
Description		☐		R	28	☐	☐	☐	☐	☐	☐
Priority_Array		☐		R	87	☐	☐				
Relinquish_Default		☐		RW	104	☐	☐				
COV_Increment		☐		RW	22	☐		☐		☐	
LOCK			☐	RW	3804	☐	☐	☐	☐		
LOCKED_VALUE			☐	RW	3805	☐	☐	☐	☐		

For each Analog Value object in the list, type 1 to type 6 to define the presence of optional and proprietary properties.

7.7 Binary Value (BV) Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Type 1	Type 2		Type 4	Type 5	
Object_Identifier	☐			R	75	☐	☐		☐	☐	
Object_Name	☐			R	77	☐	☐		☐	☐	
Object_Type	☐			R	79	☐	☐		☐	☐	
Present_Value	☐			RW	85	☐	☐		☐	☐	
Status_Flags	☐			R	111	☐	☐		☐	☐	
Event_State	☐			R	36	☐	☐		☐	☐	
Out_Of_Service	☐			R	81	☐	☐		☐	☐	
Description		☐		R	28	☐	☐		☐	☐	
Inactive_Text		☐			46	☐	☐		☐	☐	
Active_Text		☐			4	☐	☐		☐	☐	
Priority_Array		☐		R	87	☐					
Relinquish_Default		☐		RW	104	☐					
Time_Delay		☐		R	113					☐	
Notification_Class		☐		R	17					☐	
Alarm_Value		☐		R	6					☐	
Event_Enable BACnet		☐		RW	35					☐	
Acked_Transitions		☐		RW	0					☐	
Notify_Type		☐		R	72					☐	
Event_Time_Stamps		☐		R	130					☐	
ALC_LOCK			☐	RW	3804	☐	☐				
ALC_LOCKED_VALUE			☐	RW	3805	☐	☐				

For each Binary Value object in the list, type 1 to type 6 define the presence of optional and proprietary properties.

7.8 Multi-state Value (MSV) Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID		Type 2		Type 4	Type 5	
Object_Identifier	☐			R	75		☐		☐	☐	
Object_Name	☐			R	77		☐		☐	☐	
Object_Type	☐			R	79		☐		☐	☐	
Present_Value	☐			RW	85		☐		☐	☐	
Status_Flags	☐			R	111		☐		☐	☐	
Event_State	☐			R	36		☐		☐	☐	
Out_Of_Service	☐			R	81		☐		☐	☐	
Number_of_States	☐			R	74		☐		☐	☐	
Description		☐		R	28		☐		☐	☐	
State_Text		☐		R	110		☐		☐	☐	
Priority_Array		☐		R	87		☐				
Relinquish_Default		☐		RW	104		☐				
ALC_LOCK			☐	RW	3804		☐		☐		
ALC_LOCKED_VALUE			☐	RW	3805		☐		☐		

For each Multi State Value object in the list, type 1 to type 6 define the presence of optional and proprietary properties.

7.9 Program Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			R	75	
Object_Name	☐			R	77	
Object_Type	☐			R	79	
Program_State	☐			R	92	
Program_Change	☐			RW	90	
Status_Flags	☐			R	111	
Out_Of_Service	☐			R	81	
Program Location		☐		RW	91	

7.10 Calendar Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			R	75	
Object_Name	☐			R	77	
Object_Type	☐			R	79	
Present_Value	☐			R	85	
Date_List	☐			RW	23	
Description		☐		R	28	

7.11 File Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			R	75	
Object_Name	☐			RW	77	
Object_Type	☐			R	79	
File_Type	☐			R	43	
File_Size	☐			RW	42	
Modification_Date	☐			RW	71	
Archive	☐			RW	13	
Read_Only	☐			R	99	
File_Access_Method	☐			R	41	
Description		☐		R	28	

7.12 Schedule Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			R	75	
Object_Name	☐			R	77	
Object_Type	☐			R	79	
Present_Value	☐			R	92	
Effective_Period	☐			R	32	
Weekly_Schedule		☐		RW	123	
Exception_Schedule		☐		RW	38	
Schedule_Default	☐			R	174	
List_Of_Object_Property_References	☐			R	54	
Priority_For_Writing	☐			R	88	
Status_Flags	☐			R	111	
Reliability	☐			R	103	
Out_Of_Service	☐			R	81	
Exception-schedule-description			☐	RW	557	
Next-transition-time			☐	R	3813	
Minutes-remaining			☐	R	3814	

7.13 Trend Log (TL) Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			R	75	
Object_Name	☐			R	77	
Object_Type	☐			R	79	
Status_Flags	☐			R	111	
Event_State	☐			R	36	
Enable	☐			RW	133	
Start-time		☐		RW	142	
Stop-time		☐		RW	143	
Stop-when-full	☐			RW	144	
Log_device_object_property	☐			R	132	
Log interval	☐			RW	134	
Client COV Increment		☐		RW	127	
Buffer-size	☐			R	126	
Log-Buffer	☐			R	131	
Record Count	☐			RW	141	
Total record count	☐			R	145	
Notification class		☐		RW	17	
Records since-notification		☐		R	140	
Last-notify-record		☐		R	173	
Notification-threshold		☐		RW	137	
Event-enable		☐		RW	35	
Acked-transitions		☐		RW	0	
Notify-type		☐		R	72	
Event-time-stamps		☐		R	130	
Logging Type	☐			R	197	
Description		☐		R	28	

7.14 Notification Class (NC) Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			R	75	
Object_Name	☐			R	77	
Object_Type	☐			R	79	
Notification class	☐			R	17	
Priority	☐			RW	86	
Ack Required	☐			RW	1	
Recipient List	☐			RW	102	
Description		☐		R	28	

7.15 Event Log (EL) Object Type

☐ Dynamically Creatable

☐ Dynamically Deletable

Property Name	Mandatory	Optional	Proprietary	RW	ID	Range
Object_Identifier	☐			R	75	
Object_Name	☐			R	77	
Object_Type	☐			R	79	
Status_Flags	☐			R	111	
Event_State	☐			R	36	
Enable	☐			RW	133	
Start-time		☐		RW	142	
Stop-time		☐		RW	143	
Stop-when-full	☐			RW	144	
Buffer-size	☐			R	126	
Log-Buffer	☐			R	131	
Record Count	☐			RW	141	
Total record count	☐			R	145	
Notification class		☐		RW	17	
Records since-notification		☐		R	140	
Last-notify-record		☐		R	173	
Notification-threshold		☐		RW	137	
Event-enable		☐		RW	35	
Acked-transitions		☐		RW	0	
Notify-type		☐		R	72	
Event-time-stamps		☐		R	130	
Event-message-texts		☐		R	351	
Description		☐		R	28	

7.16 Data Link Layer Option

- ☐ **BACnet IP (Annex J)**
- ☐ BACnet IP (Annex J), Foreign Device
- ☐ ISO 8802-3, Ethernet (Clause 7)
- ☐ ANSI/ATA 878.1, 2.5 MB ARCNET (Clause 8)
- ☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rates:
- ☐ Master-Slave/Token-Passing (MS/TP) master (Clause 9), baud rates: 9600, 19200, 38400, 57600, 76800,115200
- ☐ MS/TP slave (Clause 9), baud rates: 9600, 19200, 38400, 76800
- ☐ Point-To-Point, EIA 232 (Clause 10), baud rates:
- ☐ Point-To-Point, modem (Clause 10), baud rates:
- ☐ LonTalk, (Clause 11), medium:
- ☐ BACnet/ZigBee (ANNEX O)
- ☐ Other:

7.17 Segmentation Capability

- ☐ Segmented requests supported
- ☐ Segmented responses supported

7.18 Device Address Binding

Is static device binding supported? (Required for two-way communication between MS/TP slaves and other devices)

☐ YES   ☐ **NO**

7.19 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   ☐ NO

Does the BBMD support network address translation?   ☐ YES   ☐ NO

7.20 Network Security Options

- **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)

7.21 Character Sets Supported

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

- IBM®/Microsoft® Double-Byte Character Set (DBCS)
- ISO 8859-1
- ISO 10646 Universal Character Set-2 (UCS-2)
- **ISO 10646 UCS Transformation Format (UTF-8)**
- ISO 10646 (UCS-4)
- Japanese Industrial Standard (JIS) X 0208

7.22 SystemVu Supported Services

Table below lists all the BACnet standard application services.

The checked services are supported by the SystemVu.

Application Service	Initiates Requests	Executes Requests
ConfirmedEventNotification Service	☐	
UnconfirmedEventNotification Service	☐	
GetEventInformation Service		☐
ReadProperty Service		☐
ReadPropertyMultiple Service		☐
WriteProperty Service		☐
WritePropertyMultiple Service		☐
DeviceCommunicationControl Service		☐
ReinitializeDevice Service		☐
Timesynchronization Service		☐
UTCTimesynchronization Service		☐
Who-Is		☐
Who-Has		☐
I-Am		☐
I-Have		☐
SubscribeCOV		☐
ConfirmedCOVNotification		
UnConfirmedCOVNotification		
AcknowledgeAlarm		☐
ReadRange		☐
AtomicReadFile		☐
AtomicWritefile		☐
ConfirmedPrivateTransfer		☐
UnconfirmedPrivateTransfer		☐

8 BACNET IP COMMUNICATION TROUBLESHOOTING

8.1 Communication troubleshooting

In the case of BACnet IP communication problem, i.e. the unit is not responding to the *Building Manager System*, please read the following to learn more about possible causes.

	Possible cause	Solution
1.	The BACnet activation is not detected by the chiller application	• In the Configuration menu, go to Network menu and open "BACnet Parameters" menu and check that "BACnet Enable" parameter is set to "enable". • In the Main menu, open "Software Options" table, "OPT149: BACnet" parameter must be set to "YES".
2.	The Ethernet cable is not correctly connected	• On the Ethernet connector, verify that the green LED is ON and the orange LED is blinking (see also IOM Control). • In Configuration menu, go to Network menu and open "BACnet Parameters" menu and check if the "BACnet network IF name" parameter matches Ethernet cable connection.
3.	Network parameters are invalid	• Go to the System menu on the user interface and verify all network parameters (see also section 6). • Open a command prompt under Windows (Start > Run > type "cmd" > OK). Type the command "ping" followed by the IP address of the device Ethernet port, (e.g. for eth0 by default **ping 169.254.1.1**). The equipment must respond.
4.	There is an IP router between the equipment and the BMS	• To verify the connection, you need to have any BDT software (BACnet Discovery Tool) installed. This software will allow you to display the list of devices connected to the BACnet network, including the physical names and instance numbers. To discover devices connected to the BACnet network: 1. Run the BDT software and execute the "Who Is" command. 2. A list of devices connected to the BACnet network will be displayed. 3. Find the required device according to the BACnet device instance configured, i.e. 1600001. Free download is available at: www.ccontrols.com/sd/bdt.htm

8.2 BACnet tool incompatibilities

CAUSE:

- If more than one BACnet client has to be installed on the same PC, an error message may be raised at BACnet tool start-up.

SOLUTION:

- In the configuration panel, set the windows service called "BACstack protocol" to "manual" start-up type and start/stop it as necessary.

8.3 BDT cannot discover BACnet device(s)

CAUSE:

- Incorrect parameters configuration.
- IP router separates Chiller BACnet/IP network and PC BACnet/IP network.

SOLUTION:

- Make sure network prefix and subnet number parameters are the same between the chiller controller (user interface) and the PC. Is Gateway IP address correct ?
- Install BBMD (BACnet Broadcast Management Device) devices on each BACnet/IP network.

9 BACNET OBJECT LIST

9.1 Object name/instance

Objects name are built from CCN table name and CCN point name put together. Object descriptions are in English (the same as the ones in CCN tables).

Depending on chillers, the object instance can follow this logic:

Instances	Values	Comment
Pre-defined	1 to 899	AV, BV, MV mixed unique instance pre-defined
	900 to 959	Setpoints
	960 to 979	AV Starts, Hour
	980 to 999	Chiller Alarm 1…5
	1000 to 1899	AV, BV, MV Circuit A
	1960 to 1979	AV Starts, Hour Circuit A
	2000 to 2899	AV, BV Circuit B
	2960 to 2979	AV Starts, hour Circuit B
	3000 to 3899	AV, BV Circuit C
	3960 to 3979	AV Starts, hour Circuit C
Free	5000 to 9999	AV, BV, MV mixed without pre-defined instance
Built	10000 to 19999	CMD object named "_wr" Inst. = 10000 + Object Inst "_rd"
Built	1 to 9999	Trend Log, Inst. = Obj Ref inst.
Built	100000 to 999999	BV + Intrinsic Reporting option (Alarm) Inst = 100 000 + Alarm code
• Instance from 1 to 4999 will be pre-defined and common to all chillers (highlighted in blue in the table given above).		
• Instance from 5000 to 9999 will be free for all chillers (highlighted in green in the table given above).		

9.2 BACnet object list description

The object list description is available on demand in an EDE format type.
EDE file are xml file readable with Microsoft Excel and compatible with standard BACnet tools as BMS.

- BACnet objects are in Read Only access by default.
- BACnet objects starting with "SETPOINT_" and "BACnet_BMS_OCC" object are in read/write access.
- BACnet objects ending with "_wr" are commandable objects. Note that the chiller must be in "Network" mode to activate the linked chiller functionnalities.
- "xxxx_EMSTOP_wr" is the chiller "Emergency Stop". "xxxx" represents the table name. This functionality is always activated.