

BACnet Protocol Implementation Conformance Statement

Date: August 4, 2010
Vendor Name: Carel SpA
Product Name: BACnet pCOWeb/pCOnet
Product Model Number: pCOWeb@/pCOnet@
Application Software Version: 2.11
Firmware Revision: A???-B???
BACnet Protocol Revision: 4 (ANSI/ASHRAE 135-2004)
Product Description: Provides BACnet 8802.3 Ethernet, BACnet/IP (pCOWeb) and MS/TP (pCOnet) connectivity for Carel pCO² and SuperNode series controllers

BACnet Standardized Device Profile (Annex L):
BACnet Application Specific Controller (B-AAC)

List all BACnet Interoperability Building Blocks Supported (Annex K):

DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DS-COV-B, DS-COVP-B, DM-DDB-A, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B, DM-TS-B, DM-UTC-B, AE-N-I-B, AE-ACK-B, AE-INFO-B, SCHED-I-B

Segmentation Capability:
Segmentation not supported

Standard Object Types Supported:
No dynamic Creation or Deletion supported
No proprietary object types supported

Device Object:

Optional Properties Supported:

Active_COV_Subscriptions
Daylight_Savings_Time
Description
Location
Local_Date
Local_Time
Max_Info_Frames (MS/TP only)
Max_Master (MS/TP only)
Profile_Name
UTC_Offset

Proprietary Properties Supported:

Proprietary Property 1000 (Enable_Alarming BOOLEAN DataType)
Proprietary Property 1001 (MSTP_TS Unsigned DataType, pCOnet only)
Proprietary Property 1002 (MSTP_BAUD Unsigned DataType, pCOnet only)
Proprietary Property 1003 (LAN Type Unsigned DataType, 0=8802-3 Ethernet, 1=BACnet/IP, pCOWeb only)

Proprietary Property 1004 (BACnet/IP UDP Unsigned DataType, pCOWeb only)

Proprietary Property 1005 (Password Character String DataType, for ReinitializeDevice and Device Communication Control)

Proprietary Property 1006 (WhoslamInterval Unsigned DataType, in minutes for sending periodic lam and Whols request)

Proprietary Property 1007 (PCO_BAUD Unsigned DataType, the Baud Rate for the pCO network)

Proprietary Property 1009 (MAPPEDA Unsigned DataType, the actual number of Carel/MODBUS Analog points mapped)

Proprietary Property 1010 (MAPPEDI Unsigned DataType, the actual number of Carel/MODBUS Integer points mapped)

Proprietary Property 1011 (MAPPEDD Unsigned DataType, the actual number of Carel/MODBUS Digital points mapped)

Proprietary Property 1012 (BBMD_Address Unsigned DataType, the IP address of the BBMD to which a Foreign Device registration is made, pCOWeb only)

Proprietary Property 1013 (BBMD_TimeToLive Unsigned DataType, the TimeToLive value when a Foreign Device registration is made, pCOWeb only)

Proprietary Property 1015 (Controller Protocol Unsigned DataType, the type of protocol used between the pCOnet/PCOWeb and the Carel controller where 1=Carel and 30=MODBUS Extended)

Proprietary Property 1016 (pCOProtocolName CharacterString DataType, the type of protocol used between the pCOnet/PCOWeb and the Carel controller. The value is either Carel or MODBUS Extended)

Proprietary Property 1017 (maxAIDvars Unsigned DataType, the maximum total Analog, Integer and Digital controller points available for mapping where Carel=621 and MODBUS=6144)

Writable Properties:

APDU_Timeout

Daylight_Savings_Time

Description

Location

Max_Info_Frames (pCOnet only)

Max_Master (pCOnet only)

Number_Of_APDU_Retries

Object_Identifier

UTC_Offset

Proprietary Property 1000

Proprietary Property 1001

Proprietary Property 1002

Proprietary Property 1003

Proprietary Property 1004

Proprietary Property 1005

Proprietary Property 1006

Proprietary Property 1007

Proprietary Property 1009

Proprietary Property 1010

Proprietary Property 1011

Proprietary Property 1012

Proprietary Property 1013

Restrictions:

Description, Location (limited to 64 characters), Proprietary Properties
1009, 1010 and 1011 (limited to 0-207)

Analog Value Objects:

Optional Properties Supported:

Acked_Transitions
COV_Increment
Deadband
Description
Event_Enable
Event_Time_Stamps
High_Limit
Limit_Enable
Low_Limit
Notify_Type
Priority_Array ¹
Reliability
Relinquish_Default ¹
Time_Delay

Proprietary Properties Supported:

Proprietary Property 1014 (Object_RWC Unsigned DataType, where
0=Present_Value is read-only, 1=Present_Value is writable but not
commandable, 2= Present_Value is writable and commandable)

Writable Properties:

Object_Identifier ³
Deadband
Description
Event_Enable
High_Limit
Limit_Enable
Low_Limit
Notification_Class
Object_Name
Present_Value ²
Units
Proprietary Property 1014

Notes:

1. The Priority_Array and Relinquish_Default properties are present only if the Proprietary Property 1014=2
2. The Present_Value property is writable if the Proprietary Property 1014=1 or 2
3. The Analog Values 1001 through 1207 may be programmed as either Analog Value or Multi-State Value types by writing to the Object_Identifier property

Property Range Restrictions:

Description (limited to 64 characters)
Object_Name (limited to 32 characters)

Binary Value Objects:

Optional Properties Supported:

Acked_Transitions
Active_Text
Alarm_Value

Description
Event_Enable
Event_Time_Stamps
Inactive_Text
Notify_Type
Priority_Array ¹
Reliability
Relinquish_Default ¹
Time_Delay

Writable Properties:

Active_Text
Alarm_Value
Description
Event_Enable
Inactive_Text
Notification_Class
Object_Name
Present_Value ²
Proprietary Property 1014

Notes:

1. The Priority_Array and Relinquish_Default properties are present only if the Proprietary Property 1014=2
2. The Present_Value property is writable if the Proprietary Property 1014=1 or 2

Property Range Restrictions:

Description (limited to 64 characters)
Object_Name, Active_Text, Inactive_Text (limited to 32 characters)

Multi-state Value Objects:

Optional Properties Supported:

Acked_Transitions
Alarm_Values
Description
Event_Enable
Event_Time_Stamps
Fault_Values
Notify_Type
Priority_Array ¹
Reliability
Relinquish_Default ¹
State_Text
Time_Delay

Writable Properties:

Object_Identifier ³
Alarm_Values
Description
Event_Enable
Fault_Values
Notification_Class
Number_of_States
Object_Name
Present_Value ²
State_Text

Proprietary Property 1014

Notes:

1. The Priority_Array and Relinquish_Default properties are present only if the Proprietary Property 1014=2
2. The Present_Value property is writable if the Proprietary Property 1014=1 or 2
3. The Analog Values 1001 through 1207 may be programmed as either Analog Value or Multi-State Value types by writing to the Object_Identifier property

Property Range Restrictions:

Description (limited to 64 characters)
Object_Name, State_Text (limited to 32 characters)
Number_of_States (limited to 32)

Notification Class Objects:

Optional Properties Supported:

Description

Writable Properties:

Ack_Required
Priority
Recipient_List

Property Range Restrictions:

Object Instance (1-16, i.e. there are always sixteen (16) Notification Class Objects)
Description (limited to 64 characters)
Recipient_List (limited to 4)

Calendar Objects:

Optional Properties Supported:

Description

Writable Properties:

Object_Name
Description
Date_List

Property Range Restrictions:

Object Instance (1-16, i.e. there are always sixteen (16) Calendar Objects)
Object_Name (limited to 32 characters)
Description (limited to 64 characters)
Date_List (limited to 16)

Schedule Objects:

Optional Properties Supported:

Description
Exception_Schedule
Weekly_Schedule

Writable Properties:

Object_Name
Description
Effective_Period

Exception_Schedule
 List_Of_Object_Property_References
 Priority_For_Writing
 Schedule_Default
 Weekly_Schedule

Property Range Restrictions:

Object Instance (1-16, i.e. there are always sixteen (16) Schedule Objects)
 Object_Name (limited to 32 characters)
 Description (limited to 64 characters)
 Exception_Schedule (limited to 4)
 List_Of_Object_Property_References (limited to 64)
 Time_Values (6 per Weekly_Schedule and 6 per Exception_Schedule)

Data Link Layer Options:

8802.3 Ethernet (clause 7), BACnet/IP (Annex J), MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 78600

Device Address Binding:

Static device binding is not supported. (No client functionality is included).

Networking Options:

When configured for BACnet/IP as the Data Link, a pCOWeb allows registration as a Foreign Device to a single specified BACnet BBMD. The Time-to-Live is programmable.

Character Sets Supported:

ANSI X3.4

BACnet/Carel Mapping

For each pCOWeb/pCOnet that interfaces to a Carel controller using a standard Carel pCO connection there can be a maximum of 670 BACnet objects, which includes the Device Object. Of the 670 objects, there are always 16 Notification Class objects, 16 Calendar objects, 16 Schedule objects and there can be up to 207 Analog Values, 207 Analog Values or Multi-state Values and 207 Binary Values. The number of each type can be configured prior to use. From the factory all 621 Analog Value and Binary Value objects are mapped. Object_Identifier are assigned according to the following table:

Object Type	Instance Range	pCO Mapping
Analog Value	1-207	A001-A207
Analog Value or Multi-state Value	1001-1207	I001-I207
Binary Value	1-207	D001-D207

From the factory, I001-I2007 are mapped as Analog Value 1001-Analog Value 1207. Each of these may be reprogrammed as Multi-state Values on an individual basis, by writing to the Object_Identifier property. BACnet objects which are mapped but for which there are no corresponding physical pCO points return an *unreliable-other (7)* value for the Reliability property of the corresponding object and an undetermined value for the Present_Value property (usually=0 or 0.0).

The Object_Name properties for all the objects, except the Notification Class objects are writable and can be up to 32 characters in length. By default the Analog Value/Multi-state Value and

Binary Value objects are named **A001-A207**, **I001-I207** and **D001-D207** corresponding to their pCO mapping.

BACnet/MODBUS Mapping

For each pCOWeb/pCOnet that interfaces to a Carel controller using a Carel MODBUS Extended connection there can be a maximum of 6193 BACnet objects, which includes the Device Object. Of the 6193 objects, there are always 16 Notification Class objects, 16 Calendar objects, 16 Schedule objects and there can be up to 2048 Analog Values, 2048 Analog Values or Multi-state Values and 2048 Binary Values. The number of each type can be configured prior to use. Object_Identifier are assigned according to the following table:

Object Type	Instance Range	MODBUS Mapping
Analog Value	100001-102048	A0001-A2048
Analog Value or Multi-state Value	200001-202048	I0001-I2048
Binary Value	100001-102048	D0001-D2048

By default I0001-I2048 are mapped as Analog Value 100001-Analog Value 102048. Each of these may be reprogrammed as Multi-state Values on an individual basis, by writing to the Object_Identifier property. BACnet objects which are mapped but for which there are no corresponding physical MODBUS points return an *unreliable-other* (7) value for the Reliability property of the corresponding object and an undetermined value for the Present_Value property (usually=0 or 0.0).

The Object_Name properties for all the objects, except the Notification Class objects are writable and can be up to 32 characters in length. By default the Analog Value/Multi-state Value and Binary Value objects are named **A0001-A2048**, **I0001-I2048** and **D0001-D2048** corresponding to their MODBUS mapping.

Alarming

BACnet Intrinsic Alarming is supported for the Analog Values (Out_of_Range event types), Binary Values (Change_of_State event types) and Multi-state Values (Change_of_State event types). All optional properties related to Intrinsic Alarming are included and writable where appropriate. Use of Notification Class Objects may be optionally bypassed. In this scheme, if an object's Notification_Class property is set to 0, three standard BACnet properties that are normally included in Notification Class objects, specifically Ack_Required, Issue_Confirmed_Notifications and Priority, are included for each Analog Value, Binary Value and Multi-state Value object and take the place of the Notification Class. Although these properties are not standard or optional for Analog Value, Binary Value and Multi-state Value objects, they are treated in a standard BACnet way. Also in this scheme, two properties, Process_Identifier and Recipient, are included for the Device Object and take the place of the Notification Class Object. Although these properties are not standard or optional for Device objects, they are treated in a standard BACnet way. The Recipient property is limited to the Object_Identifier of a Device object. If the Notification_Class for an object is 0, it will be reported as 1 in alarm events.

For all alarms, the default Message Text that is always included by default is of the form:

"nnnnnn (Binary Value xxx) ChangeOfState v"

"nnnnnn (Analog Value xxx) OutOfRange v"

where:

nnnnn is the Object_Name

xxx is the object instance

ChangeOfState or OutOfRange is the Event_Type

v is the to-state (i.e. Normal, Offnormal, Fault, High Limit or Low Limit)

The Message Text can be customized by replacing any of the Event_Type text and/or to-state text with customized text up to 32 characters long each. In addition, the Object_Name property can be replaced with the Description property. Alarm Message Text can be customized on an object by object basis by writing to the following proprietary properties for the object:

Property name	Enumerated Property value	Datatype	Value
PROP_ALARMCUSTOM	3000	Boolean	True=Alarms are customized for this object False=Use the default Message Text format
PROP_ALARMPROPERTY	3001	Character string	Object_Name or Description
PROP_ALARMCOS	3002	Character string	String (up to 32 characters) to replace Event_Type ChangeofState text
PROP_ALARMLOOR	3003	Character string	String (up to 32 characters) to replace Event_Type OutofRange text
PROP_ALARMNORMAL	3004	Character string	String (up to 32 characters) to replace to-state Normal text
PROP_ALARMFAULT	3005	Character string	String (up to 32 characters) to replace to-state Fault text
PROP_ALARMOFFNORMAL	3006	Character string	String (up to 32 characters) to replace to-state Offnormal text
PROP_ALARMHILIM	3007	Character string	String (up to 32 characters) to replace to-state High Limit text
PROP_ALARMLOWLIM	3008	Character string	String (up to 32 characters) to replace to-state Low Limit text

COV Subscriptions

The DS-COV-B and/or DS-COVP-B BIBB support a maximum 250 simultaneous subscriptions. The following properties are eligible for COV reporting using the SubscribeCOVProperty Service:

- Present_Value
- Status_Flags
- Reliability
- Event_State
- Out_of_Service

Commandability

BACnet commandability is supported for the Analog Values, Binary Values and Multi-state Values on an individual object basis. In addition to being optionally selected as commandable, each of these individual objects may be programmed as read-only or writable but not commandable. This condition is controlled by writing to the proprietary property 1014 for the appropriate object. For the proprietary property 1014, a value of 0 indicates read-only, 1 indicates writable but not commandable and 2 indicates commandable. The Priority_Array and Relinquish_Default properties are present only if the proprietary property 1014 is 2 for an individual object. By default, the proprietary property 1014 has a value of 1 (writable but not commandable) for backward compatibility with older versions of the pCOWeb/pCOnet when delivered from the factory.

Schedules

BACnet schedules are supported and made visible through the 16 Schedule and 16 Calendar objects. For each Calendar object, there can be from 0 to 16 dates in the Date_List. For each Schedule, both the Weekly_Schedule and Exception_Schedule properties are supported. Each object's Exception_Schedule list can have from 0 to 4 entries. Each Weekly_Schedule and each Exception_Schedule can have from 0 to 6 Time_Values. Each object's List_Of_Object_Property_References property can have from 0 to 64 entries. External objects are not supported. Following a restart, schedules are not executed until the pCOWeb/pCOnet clock has been set using a TimeSynchronization or UTCTimeSynchronization. Schedules are checked approximately every 10 seconds for a minute rollover, so scheduled values may not change until 10 to 15 seconds after the minute turns over.

Default Factory Settings

Default values for the pCOWeb/pCOnet are as follows:

pCOWeb	pCOnet	Property	Default Value
Yes	Yes	Device Instance	77000
Yes	No	LAN type	1=BACnet/IP
Yes	No	BACnet/IP UDP	BAC0 (hexadecimal) or 47808 (decimal)
No	Yes	MS/TP Station Address	0
No	Yes	Max_Master	127
No	Yes	Max_Info_Frames	20
No	Yes	MS/TP Baud rate	38400
Yes	Yes	Alarming Enabled	False
Yes	Yes	Number of Analog Variables Mapped	207
Yes	Yes	Number of Integers Variables Mapped	207
Yes	Yes	Number of Digitals Variables Mapped	207
Yes	No	IP Address for BBMD	None
Yes	No	Foreign Device Time-To-Live	0 (seconds)