



Product Implementation Conformance Statement bCX-4040

Date: December 6, 2004

Vendor Name: Andover Controls Corporation

Product Name: Continuum

Product Model Number: bCX-4040

Applications Software Version: 4.3 **Firmware Revision:** 4.3

BACnet Protocol Version: 1 **BACnet Protocol Revision:** 3

Product Description

The bCX-4040 is a native BACnet/IP protocol controller with a built-in web server to serve up custom web pages and expandable Input/Output through the use of expansion modules. It has 2 serial ports, one of which may be used to communicate with MS/TP controller devices.

The bCX-4040 also serves as a BACnet protocol router and BACnet/IP Broadcast Management Device (BBMD). It performs BACnet routing functions among attached UDP/IP, Ethernet (ISO 8802-3) and MS/TP networks. It optionally serves as a gateway, converting BACnet Alarms to SNMP Alarms.

BACnet Standardized Device Profile (Annex L)

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

BACnet Interoperability Building Blocks (BIBBs) Supported

BIBB	Name	BACnet Service	Init	Exec
DS-RP-A	Data Sharing - ReadProperty-A	ReadProperty	X	
DS-RP-B	Data Sharing - ReadProperty-B	ReadProperty		X
DS-RPM-A ¹	Data Sharing - ReadPropertyMultiple-A	ReadPropertyMultiple	x	
DS-RPM-B	Data Sharing - ReadPropertyMultiple-B	ReadPropertyMultiple		X
DS-RPC-B	Data Sharing - ReadPropertyConditional-B	ReadPropertyConditional		X
DS-WP-A	Data Sharing - WriteProperty-A	WriteProperty	X	
DS-WP-B	Data Sharing - WriteProperty-B	WriteProperty		X
DS-WPM-B	Data Sharing - WritePropertyMultiple-B	WritePropertyMultiple		X
DS-COV-A	Data Sharing - COV-A	SubscribeCOV	X	
		ConfirmedCOVNotification		X
		UnconfirmedCOVNotification		X
DS-COV-B	Data Sharing - COV-B	SubscribeCOV		X
		ConfirmedCOVNotification	X	
		UnconfirmedCOVNotification	X	
AE-N-A ²	Alarm and Event-Notification-A	ConfirmedEventNotification		X
		UnconfirmedEventNotification		X
AE-N-I-B	Alarm and Event-Notification-B	ConfirmedEventNotification	X	
		UnconfirmedEventNotification	X	
AE-ACK-B	Alarm and Event-ACK-B	AcknowledgeAlarm		X
AE-ESUM-B	Alarm and Event-Enrollment Summary-B	GetEnrollmentSummary		X
AE-INFO-B	Alarm and Event-Information-B	GetEventInformation		X
SCHED-I-B	Scheduling-Internal-B			
SCHED-E-B	Scheduling-External-B			
T-VMT-I-B	Trending - Viewing and Modifying Trends Internal-B	ReadRange		X
T-VMT-E-B	Trending - Viewing and Modifying Trends External-B			
T-ATR-B	Trending – Automated Trend Retrieval-B	ConfirmedEventNotification	X	
		ReadRange		X
DM-DDB-A	Device Management-Dynamic Device Binding-A	Who-Is	X	
		I-Am		X
DM-DDB-B	Device Management-Dynamic Device Binding-B	Who-Is		X
		I-Am	X	
DM-DOB-A	Device Management-Dynamic Object Binding-A	Who-Has	x	
		I-Have		X
DM-DOB-B	Device Management-Dynamic Object Binding-B	Who-Has		X
		I-Have	X	
DM-DCC-B	Device Management-DeviceCommunicationControl-B	DeviceCommunicationControl		X

¹ Used to support External Trend Logging and SNMP alarms.

² Used to support SNMP alarms.

BACnet Interoperability Building Blocks (BIBBs) Supported – Cont.

BIBB	Name	BACnet Service	Init	Exec
DM-TS-A	Device Management-TimeSynchronization-A	TimeSynchronization	X	
DM-TS-B	Device Management-TimeSynchronization-B	TimeSynchronization		X
DM-UTC-B	Device Management-UTCTimeSynchronization-B	UTCTimeSynchronization		X
DM-RD-B	Device Management-ReinitializeDevice-B	ReinitializeDevice		X
DM-BR-B ¹	Device Management-Backup and Restore-B	AtomicReadFile		X
		AtomicWriteFile		X
		ReinitializeDevice		X
DM-OCD-B	Device Management-Object Creation and Deletion-B	CreateObject		X
		DeleteObject		X
NM-CE-A	Network Management – Connection Establishment-A	Establish-Connection-To-Network	X	
		Disconnect-Connection-To-Network	X	
NM-RC-B	Network Management-Router Configuration-B	Who-Is-Router-To-Network	X	X
		I-Am-Router-To-Network	X	X
		Initialize-Routing-Table		X
		Initialize-Routing-Table-Ack	X	

¹ A single stream-based file object is provided, to support Backup and Restore. Record-based access is *not* supported. The file has a proprietary format, which is produced by the controller during a Backup operation. Any attempt to write the file using data not obtained by reading it, will result in an error.

Segmentation Capability

X	Able to transmit segmented messages	Window Size: 1
X	Able to receive segmented messages	Window Size: 1

Standard Object Types Supported

Object Type	Supported	Creatable ¹	Deletable ¹
Analog Input	X		
Analog Output	X		
Analog Value	X	X	X
Binary Input	X		
Binary Output	X		
Binary Value	X	X	X
Calendar	X	X	X
Command	X	X	X
Device	X		
Event Enrollment	X	X	X
File	X		
Loop	X	X	X
Multi-state Input	X		
Multi-state Output	X		
Multi-state Value	X	X	X
Notification Class	X	X	X
Program	X		
Schedule	X	X	X
Trend Log	X	X	X

¹ Except for Device and File, instances of all supported object types can be created, deleted and configured using CyberStation.

Object Types and Properties Supported

Properties that are Writable and Optional are indicated. See Restrictions on Object Identifiers and Names, below. Descriptions are limited to 32 characters. Except as otherwise specified, all other strings are restricted to 132 characters. Unsigned values are limited to 4 294 967 294.

All Input and Output objects restrict Out_Of_Service to **true** if Channel is not configured [requires expansion module.]

Analog Input		
Property	W	O
COV_Increment	X	
Description	X	X
Event_State		
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service	X	
Present_Value	X	
Status_Flags		
Units	X	

Binary Input		
Property	W	O
Active_Text	X	X
Description	X	X
Event_State		
Inactive_Text	X	X
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service ¹	X	
Polarity	X	
Present_Value	X	
Status_Flags		

Analog Output		
Property	W	O
COV_Increment	X	
Description	X	X
Event_State		
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service	X	
Present_Value	X	
Priority_Array		
Relinquish_Default	X	
Status_Flags		
Units	X	

Binary Output		
Property	W	O
Active_Text	X	X
Description	X	X
Event_State		
Inactive_Text	X	X
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service ¹	X	
Polarity	X	
Present_Value	X	
Priority_Array		
Relinquish_Default	X	
Status_Flags		

Analog Value		
Property	W	O
COV_Increment	X	
Description	X	X
Event_State		
Object_Identifier		
Object_Name	X	
Object_Type		
Out_Of_Service	X	
Present_Value	X	
Priority_Array		
Relinquish_Default	X	
Status_Flags		
Units	X	

Binary Value		
Property	W	O
Active_Text	X	X
Description	X	X
Event_State		
Inactive_Text	X	X
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service	X	
Present_Value	X	
Priority_Array		
Relinquish_Default	X	
Status_Flags		

Calendar		
Property	W	O
Date_List	X	
Description	X	X
Object_Identifier		
Object_Name	X	
Object_Type		
Present_Value		

Dates are restricted to years 1989-2105. See Interpretation of Wildcards in Dates, below.

Device		
Property	W	O
Active_COV_Subscriptions		
APDU_Segment_Timeout	X	
APDU_Timeout	X	
Application_Software_Version		
Backup_Failure_Timeout	X	
Configuration_Files		
Database_Revision		
Daylight_Savings_Status	X	
Description	X	X
Device_Address_Binding		
Firmware_Revision		
Last_Restore_Time		
Local_Date		
Local_Time		
Location	X	X
Max_APDU_Length_Accepted		
Max_Info_Frames	X	
Max_Master	X	
Max_Segments_Accepted		
Model_Name		
Number_Of_APDU_Retries	X	
Object_Identifier		
Object_List		
Object_Name	X	
Object_Type		
Protocol_Object_Types_Supported		
Protocol_Revision		
Protocol_Services_Supported		
Protocol_Version		
Segmentation_Supported		
Serial_Number		X
System_Status		
Time_Synchronization_Recipients	X	
UTC_Offset	X	
Vendor_Identifier		
Vendor_Name		

Max_Info_Frames is restricted to the range 1..127.

Number_Of_APDU_Retries is restricted to the range 0..255.

Serial_Number is a proprietary property – See “Serial Number” below.

Command		
Property	W	O
Action	X	
Action_Text	X	X
All_Writes_Successful		
Description	X	X
In_Process		
Object_Identifier		
Object_Name	X	
Object_Type		
Present_Value	X	

Action_Text is limited to 32 characters.

Event Enrollment		
Property	W	O
Acked_Transitions		
Description	X	X
Event_Enable	X	
Event_Parameters	X	
Event_State		
Event_Time_Stamps		
Event_Type	X	
Notification_Class	X	
Notify_Type	X	
Object_Identifier		
Object_Name	X	
Object_Property_Reference	X	
Object_Type		

Event_Type limited to Change_Of_State, Change_Of_Value, Floating_Limit, Out_Of_Range and Buffer_Ready.

Object_Property_Reference must reference Present_Value of point in same controller

File		
Property	W	O
Archive	X	
File_Access_Method		
File_Size	X	
File_Type		
Modification_Date		
Object_Identifier		
Object_Name		
Object_Type		
Read_Only		

File_Size is writable when in Restore mode.
Values limited to zero and current file size.

Multistate Input		
Property	W	O
Description	X	X
Event_State		
Number_Of_States		
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service	X	
Present_Value	X	
State_Text		X
Status_Flags		

Multistate Output		
Property	W	O
Description	X	X
Event_State		
Number_Of_States		
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service	X	
Present_Value	X	
Priority_Array		
Relinquish_Default	X	
State_Text		X
Status_Flags		

Multistate Value		
Property	W	O
Description	X	X
Event_State		
Number_Of_States		
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service	X	
Present_Value	X	
Priority_Array		
Relinquish_Default	X	
State_Text		X
Status_Flags		

Cyberstation can configure the State_Text.

Notification Class		
Property	W	O
Ack_Required	X	
Notification_Class		
Description	X	X
Object_Identifier		
Object_Name	X	
Object_Type		
Priority	X	
Recipient_List	X	

Program		
Property	W	O
Description	X	X
Object_Identifier		
Object_Name		
Object_Type		
Out_Of_Service	X	
Program_Change	X	
Program_State		
Status_Flags		

Read_Property of Program_Change always return Ready.

Schedule		
Property	W	O
Description	X	X
Effective_Period	X	
Exception_Schedule	X	X
Following_Transition_Time		
List_Of_Obj_Property_References	X	
Next_Transition_Time		
Object_Identifier		
Object_Name	X	
Object_Type		
Present_Value		
Previous_Transition_Time		
Priority_For_Writing	X	
Weekly_Schedule	X	

In Effective_Period and Exception_Schedule, dates are restricted to years 1989-2105. See Interpretation of Wildcards in Dates, below.

Previous_Transition_Time, Next_Transition_Time and Following_Transition_Time are proprietary properties – See “Support for Optimum Start-Stop” below.

Trend Log		
Property	W	O
Buffer_Size	X	
COV_Resubscription_Interval		X
Description	X	X
Event_State		
Log_Buffer		
Log_Device_Object_Property	X	
Log_Enable	X	
Log_Interval	X	
Object_Identifier		
Object_Name	X	
Object_Type		
Record_Count	X	
Start_Time	X	
Stop_Time	X	
Stop_When_Full	X	
Total_Record_Count		

In Start_Time and Stop_Time, dates are restricted to years 1989-2105. Buffer_Size is required to be at least 2 but is otherwise limited only by available memory.

Loop		
Property	W	O
Action	X	
Bias	X	X
Controlled_Variable_Reference	X	
Controlled_Variable_Units	X	
Controlled_Variable_Value		
Derivative_Constant	X	X
Derivative_Constant_Units	X	X
Description	X	X
Event_State		
Integral_Constant	X	X
Integral_Constant_Units	X	X
Manipulated_Variable_Reference	X	
Maximum_Output	X	X
Minimum_Output	X	X
Object_Identifier		
Object_Name	X	
Object_Type		
Out_Of_Service	X	
Output_Units	X	
Present_Value		
Priority_For_Writing	X	
Proportional_Constant	X	X
Proportional_Constant_Units	X	X
Reliability		X
Setpoint	X	
Setpoint_Reference	X	
Status_Flags		
Update_Interval	X	X

Present_Value is writable only when Out_Of_Service is true.

Data Link Layer Options

X	BACnet IP
X	BACnet IP, Foreign Device
X	ISO 8802_3, Ethernet
	ANSI/ATA 878.1, 2.5 MB ARCNET
	ANSI/ATA 878.1, RS_485, baud rate(s)_____
X	MS/TP master, baud rate(s)_____9600,19200,38400,76800_____
	MS/TP slave, baud rate(s)_____
	Point-To-Point, EIA 232, baud rate(s)_____
	Point-To-Point, modem, baud rate(s)_____
	LonTalk, medium: _____
	Other

Device Address Binding

Static Device Binding Supported	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No
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Networking Options

<input checked="" type="checkbox"/>	Router	List all routing configurations __BACnet IP, MS/TP, Ethernet__
<input type="checkbox"/>	Annex H, BACnet Tunneling Router over IP	
<input checked="" type="checkbox"/>	BACnet/IP Broadcast Management Device (BBMD)	
<input checked="" type="checkbox"/>	Support registrations by foreign devices	

Character Sets Supported

<input checked="" type="checkbox"/>	ANSI X3.4	<input checked="" type="checkbox"/>	ISO 8859-1
<input type="checkbox"/>	ISO 10646 (UCS-2)	<input type="checkbox"/>	ISO 10646 (UCS-4)
<input type="checkbox"/>	IBM /Microsoft DBCS	<input type="checkbox"/>	JIS C 6626

Serial Number Property

Every Andover Controls device has a unique serial number, assigned at the factory. The serial number is made available by the Serial_Number property of the Device object. The property identifier is 515, and the data type is Unsigned.

Support for Optimum Start-Stop

The controller includes a proprietary extension that can be used, together with Plain English programming, to optimize the start and stop times for heating and cooling systems based on scheduled occupancy times. The extension consists of three proprietary properties of the Schedule object type:

Name	Identifier	Meaning
Previous_Transition_Time	512	The time when the Schedule's Present_Value most recently changed value
Next_Transition_Time	513	The time when the Schedule's Present_Value is next scheduled to change value
Following_Transition_Time	514	The time when the Schedule's Present_Value is next scheduled to change value after the time indicated by Next_Transition

These properties are unsigned integer values, each giving a date and time expressed as the number of seconds after midnight, January 1, 1970. The Plain English language, which is used to specify the behavior of Program objects, includes the ability to compare these times with the present time, and to compute time intervals.

Each transition indicates a scheduled change in the value of the Schedule's Present_Value attribute. When determining a transition, time-value pairs that specify the same value as the Schedule's Present_Value (i.e. do not change the value) are not considered transitions. Similarly, if two or more time-value pairs have the same time, only the last pair with that time is used for determining a transition.

Restrictions on Object Identifiers and Names

The instance number portion of the Object_Identifier property has a restricted range, which depends to some extent on the object type. The following table gives the valid range of instance numbers:

Object Type	Minimum	Maximum
Device	1	4194303
File ¹	1	1
All others	7000	65535

For all object types, the Object_Name is limited to 16 characters. The first character must be alphabetic, and the remaining characters must be alphabetic, numeric, or one of '_' or '.'.

¹ Only one file object exists (for backup and restore) and users do not create objects of this type.

Interpretation of Wildcards in Dates

The BACnet specification [ANSI/ASHRAE Standard 135-2001] is open to multiple interpretations regarding the meaning of wildcards in dates, especially when used to specify date ranges. The following describes how the controllers, especially in the context of the Schedule properties Exception_Schedule and Effective_Period, and the Calendar property Date_List, interpret wildcards.

For purposes of comparing dates, the day-of-week fields are not used. That is, they are totally redundant. When comparing dates, a wildcard field is considered equal to the corresponding field in the date being compared. A date falls within the range if it is not before the StartDate and not after the EndDate.

Because the day-of-week field is redundant, its value must be either unspecified or consistent with the other fields. Because it can be consistent with those fields only if they are specified, the controllers allow the day-of-week to be specified only if the other three fields are specified as well.

Accordingly, the following conditions in a date range are treated as errors and will prevent a WriteProperty from completing:

1. A day-of-week is specified but two or fewer of the other fields in the Date are specified.
2. A day-of-week is specified, but is inconsistent with the Date specified by the other fields.
3. A year field is specified, which is outside the range limit of 1989 – 2105.
4. The endDate is earlier than the StartDate.
5. Any of the specified fields are out of range (e.g., 31st day of February).