Product Implementation Conformance Statement bCX1-CR

Date: April, 2008
Vendor Name: Schneider Electric
Product Name: bCX1
Product Model Number: bCX1-CR
Applications Software Version: <u>4.5</u>   **Firmware Revision: <u>4.5</u>**
BACnet Protocol Version: 1   **BACnet Protocol Revision: 4**

Product Description

The bCX1-CR 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 used to communicate with MS/TP controller devices.

The bCX1-CR 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)
	BACnet Advanced Application Controller (B-AAC)
	BACnet Application Specific Controller (B-ASC)
	BACnet Smart Actuator (B-SA)
	BACnet Smart Sensor (B-SS)

BACnet Interoperability Building Blocks (BIBBs) Supported

BIBB	Name	BACnet Service	Support	Init	Exec
DS-RP-A	Data Sharing - ReadProperty-A	ReadProperty	X	X	
DS-RP-B	Data Sharing - ReadProperty-B	ReadProperty	X		X
DS-RPM-A[1]	Data Sharing - ReadPropertyMultiple-A	ReadPropertyMultiple	X	X	
DS-RPM-B	Data Sharing - ReadPropertyMultiple-B	ReadPropertyMultiple	X		X
DS-RPC-B	Data Sharing - ReadPropertyConditional-B	ReadPropertyConditional	X		X
DS-WP-A	Data Sharing - WriteProperty-A	WriteProperty	X	X	
DS-WP-B	Data Sharing - WriteProperty-B	WriteProperty	X		X
DS-WPM-B	Data Sharing - WritePropertyMultiple-B	WritePropertyMultiple	X		X
DS-COV-A	Data Sharing - COV-A	SubscribeCOV	X	X	
		ConfirmedCOVNotification	X		X
		UnconfirmedCOVNotification	X		X
DS-COV-B	Data Sharing - COV-B	SubscribeCOV	X		X
		ConfirmedCOVNotification	X	X	
		UnconfirmedCOVNotification	X	X	
AE-N-A[2]	Alarm and Event-Notification-A	ConfirmedEventNotification	X		X
		UnconfirmedEventNotification	X		X
AE-N-I-B	Alarm and Event-Notification-B	ConfirmedEventNotification	X	X	
		UnconfirmedEventNotification	X	X	
AE-ACK-B	Alarm and Event-ACK-B	AcknowledgeAlarm	X		X
AE-ESUM-B	Alarm and Event-Enrollment Summary-B	GetEnrollmentSummary	X		X
AE-INFO-B	Alarm and Event-Information-B	GetEventInformation	X		X
SCHED-I-B	Scheduling-Internal-B		X		
SCHED-E-B	Scheduling-External-B		X		
T-VMT-I-B	Trending - Viewing and Modifying Trends Internal-B	ReadRange	X		X
T-VMT-E-B	Trending - Viewing and Modifying Trends External-B		X		
T-ATR-B	Trending – Automated Trend Retrieval-B	ConfirmedEventNotification	X	X	
		ReadRange	X		X
DM-DDB-A	Device Management-Dynamic Device Binding-A	Who-Is	X	X	
		I-Am	X		X
DM-DDB-B	Device Management-Dynamic Device Binding-B	Who-Is	X		X
		I-Am	X	X	
DM-DOB-A	Device Management-Dynamic Object Binding-A	Who-Has	X	X	
		I-Have	X		X
DM-DOB-B	Device Management-Dynamic Object Binding-B	Who-Has	X		X
		I-Have	X	X	
DM-DCC-B	Device Management-DeviceCommunicationControl-B	DeviceCommunicationControl	X		X
DM-TS-A	Device Management-TimeSynchronization-A	TimeSynchronization	X		
DM-TS-B	Device Management-TimeSynchronization-B	TimeSynchronization	X	X	
DM-UTC-B	Device Management-UTCTimeSynchronization-B	UTCTimeSynchronization	X	X	
DM-RD-B	Device Management-ReinitializeDevice-B	ReinitializeDevice	X	X	
DM-BR-B[3]	Device Management-Backup and Restore-B	AtomicReadFile	X		X
		AtomicWriteFile	X		X
		ReinitializeDevice	X		X
DM-OCD-B	Device Management-Object Creation and Deletion-B	CreateObject	X		X
		DeleteObject	X		X
NM-CE-A	Network Management – Connection Establishment-A	Establish-Connection-To-Network	X	X	
		Disconnect-Connection-To-Network	X	X	
NM-RC-B	Network Management-Router Configuration-B	Who-Is-Router-To-Network	X	X	X
		I-Am-Router-To-Network	X	X	X
		Initialize-Routing-Table	X		X
		Initialize-Routing-Table-Ack	X	X	

[1] Used to support External Trend Logging and SNMP alarms.
[2] Used to support SNMP alarms.
[3] 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

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[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 Supported (S), Writable (W) and Optional (O) 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	**S**	**W**	**O**
COV_Increment	X	X	
Description	X	X	X
Event_State	X		
Object_Identifier	X		
Object_Name	X		
Object_Type	X		
Out_Of_Service	X	X	
Present_Value	X	X	
Status_Flags	X		
Units	X	X	

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

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

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

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

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

Calendar			
Property	S	W	O
Active_Text	X	X	
Description	X	X	X
Event_State	X		
Inactive_Text	X	X	
Object_Identifier	X		
Object_Name	X		

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

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

Action_Text is limited to 32 characters.

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

Infinity_Path is a proprietary property. See "Infinity Path Property" below.

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 Property" below.

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

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

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

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

Present_Value is writable only when Out_Of_Service is true.

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

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

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

Cyberstation can configure the State_Text.

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

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

Read_Property of Program_Change always return Ready.

Schedule			
Property	**S**	**W**	**O**
Description	X	X	X
Effective_Period	X	X	
Exception_Schedule	X	X	X
Following_Transition_Time	X		
List_Of_Obj_Property_References	X	X	
Next_Transition_Time	X		
Object_Identifier	X		
Object_Name	X	X	
Object_Type	X		
Out_Of_Service	X	X	
Present_Value	X	X	
Previous_Transition_Time	X		
Priority_For_Writing	X	X	
Reliability	X		
Schedule_Default	X	X	
Status_Flags	X		
Weekly_Schedule	X	X	

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

Present_Value is writable only when Out_Of_Service is true.

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

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

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.

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	☐	YES	■	NO

Networking Options

■ Router   List all routing configurations __BACnet IP, MS/TP, Ethernet___

☐ Annex H, BACnet Tunneling Router over IP

■ BACnet/IP Broadcast Management Device (BBMD)

       ■ Support registrations by foreign devices

Character Sets Supported

■ ANSI X3.4		■ ISO 8859-1
☐ ISO 10646 (UCS-2)		☐ ISO 10646 (UCS-4)
☐ IBM /Microsoft DBCS		☐ JIS C 6626

Serial Number Property

Every bCX1 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.

Infinity Path Property

bCX1 devices can also be accessed via the proprietary Infinity protocol, which requires specific path information to access each device. Accordingly, the Infinity_Path property (identifier 517) of the Device object provides an unsigned integer value composed as follows:

Byte Position	bCX1 controllers	b3xxx controllers
Lowest	ACC Net ID of the device	ACC Net ID of the parent bCX1 device [bCX1 or other BACnet router]
Second	0	Commport Id [in the parent bCX1] of the MSTP network
Third	0	MSTP Mac address of the controller

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 do not change the value are not considered transitions.

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	4194302
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 '.'.

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).

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