ADDENDA

ANSI/ASHRAE Addendum ao to
ANSI/ASHRAE Standard 135-2010

BACnet®—A Data Communication Protocol for Building Automation and Control Networks

Approved by the ASHRAE Standards Committee on October 2, 2012; by the ASHRAE Board of Directors on October 26, 2012; and by the American National Standards Institute on October 27, 2012.

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[This foreword and the "rationales" on the following pages are not part of this standard. They are merely informative and do not contain requirements necessary for conformance to the standard.]

FOREWORD

Addendum *ao* to ANSI/ASHRAE Standard 135-2010 contains a number of changes to the current standard. These modifications are the result of change proposals made pursuant to the ASHRAE continuous maintenance procedures and of deliberations within Standing Standard Project Committee 135. The proposed changes are summarized below.

In the following document, language to be added to existing clauses of ANSI/ASHRAE 135-2010 and Addenda is indicated through the use of *italics*, while deletions are indicated by ~~strikethrough~~. Where entirely new subclauses are proposed to be added, plain type is used throughout.

135-2010*ao*-1 Update ReadRange Example

Rationale

The example for ReadRange was not updated to match changes in the service made by Addendum 2001b.

[Change **Clause E.3.8**, p. 768]

E.3.8 Example of the ReadRange Service

Assumed objects:	Object Identifier	Object Name	Object Type
	(Trend Log, Instance 1)	ROOM3TEMP	TREND_LOG

~~We wish to look at all the records for the last five minutes within a Trend Log's Log Buffer.~~
We wish to look at the next 4 records within a Trend Log's Log Buffer starting at 23-MAR-1998, 19:52:34.00.
The Trend Log's Log Buffer currently only holds 2 Entries which are newer than 23-MAR-1998, 19:52:34.00.

Service = ReadRange
'ObjectIdentifier' = (Trend Log, Instance 1)
'PropertyIdentifier' = Log_Buffer
'Range'
~~'Time Range'~~
~~'Beginning Time' = (23-MAR-1998, 19:52:34.0)~~
~~'Ending Time' = (23-MAR-1998, 19:57:34.0)~~
'By Time'
'Reference Time' = (23-MAR-1998, 19:52:34.00)
'Count' = 4

A typical result might be:

'Result Flags' = (TRUE, TRUE, FALSE)
'Item Count' = 2
'Item Data' = (((23-MAR-1998, 19:54:27.0), 18.0, (FALSE,FALSE,FALSE,FALSE)),
((23-MAR-1998, 19:56:27.0), 18.1, (FALSE,FALSE,FALSE,FALSE)))
'First Sequence Number' = 79201

[Change **Clause F.3.8**, p. 792]

F.3.8 Encoding for Example E.3.8 - ReadRange Service

Example 1: Reading records from a Trend Log object.

X'02' PDU Type = 0 (BACnet-Confirmed-Request-PDU, SEG=0, MOR=0, SA=1)
X'02' Maximum APDU Size Accepted = 206 octets
X'01' Invoke ID = 1
X'1A' Service Choice = (26), (ReadRange-Request)

X'0C' SD Context Tag 0 (Object Identifier, L=4)
X'05000001' Trend Log, Instance Number = 1
X'19' SD Context Tag 1 (Property Identifier, L=1)
X'83' 131 (LOG_BUFFER)
~~X'5E' PD Opening Tag 5 (Time Range)~~
~~X'A4' Application Tag 10 (Date, L=4)~~
~~X'620317FF' March 23, 1998 (Day Of Week Unspecified)~~
~~X'B4' Application Tag 11, (Time, L=4)~~
~~X'13342200' 19:52:34.0~~
~~X'A4' Application Tag 10 (Date, L=4)~~
~~X'620317FF' March 23, 1998 (Day Of Week Unspecified)~~
~~X'B4' Application Tag 11, (Time, L=4)~~
~~X'13392200' 19:57:34.0~~
~~X'5F' PD Closing Tag 5 (Time Range)~~

X'7E' *PD Opening Tag 7 (By Time)*
X'A4' *Application Tag 10 (Date, L=4)*
X'62031701' *March 23, 1998 (Day Of Week Monday)*
X'B4' *Application Tag 11, (Time, L=4)*
X'13342200' *19:52:34.0*
X'31' *Application Tag 1 (Signed Integer, L=1)*
X'04' *4 (Count)*
X'7F' *PD Closing Tag 7 (By Time)*

Assuming the service procedure executes correctly, a complex acknowledgment is returned containing the requested data:

X'30' PDU Type = 3 (BACnet-ComplexACK-PDU, SEG=0, MOR=0)
X'01' Invoke ID=1
X'1A' Service ACK Choice = (26), (ReadRange-ACK)

X'0C' SD Context Tag 0 (Object Identifier, L=4)
X'05000001' Trend Log, Instance Number = 1
X'19' SD Context Tag 1 (Property Identifier, L=1)
X'83' 131 (LOG_BUFFER)
X'3A' SD Context Tag 3 (Result Flags, L=2)
X'05C0' 1,1,0 (TRUE, TRUE, FALSE)
X'49' SD Context Tag 4 (Item Count, L=1)
X'02' 2
X'5E' PD Opening Tag 5 (Item Data)
X'0E' PD Opening Tag 0 (Timestamp)
X'A4' Application Tag 10 (Date, L=4)
X'62031701' Monday, March 23, 1998
X'B4' Application Tag 11, (Time, L=4)
X'13361B00' 19:54:27.0
X'0F' PD Closing Tag 0 (Timestamp)
X'1E' PD Opening Tag 1 (Log Datum)
X'2C' SD Context Tag 2 (REAL, L=4)
X'41900000' 18.0
X'1F' PD Closing Tag 1 (Log Datum)
X'2A' SD Context Tag 2 (Status Flags, L=2)
X'0400' 0,0,0,0 (FALSE, FALSE, FALSE, FALSE)
X'0E' PD Opening Tag 0 (Timestamp)
X'A4' Application Tag 10 (Date, L=4)
X'62031701' Monday, March 23, 1998
X'B4' Application Tag 11, (Time, L=4)
X'13381B00' 19:56:27.0
X'0F' PD Closing Tag 0 (Timestamp)
X'1E' PD Opening Tag 1 (Log Datum)
X'2C' SD Context Tag 2 (REAL, L=4)
X'4190CCCD' 18.1
X'1F' PD Closing Tag 1 (Log Datum)
X'2A' SD Context Tag 2 (Status Flags, L=2)
X'0400' 0,0,0,0 (FALSE, FALSE, FALSE, FALSE)
X'5F' PD Closing Tag 5 (Item Data)
X'6B' *SD Context Tag 6 (First Sequence Number, L=3)*
X'013561' *79201*

135-2010*ao*-2 Add Present_Value Range to Value Objects

Rationale

The standard does not define network accessible information about the usable range, or range that can be obtained and the resolution for the Present_Value of numeric value objects.

To make this information network visible, the properties Min_Pres_Value, Max_Pres_Value, and Resolution are added as optional properties to all numeric value objects.

[Change **Table 12-4**, Properties of the Analog Value Object Type, p. 166]

Property Identifier	Property Datatype	Conformance Code
…	…	…
Min_Pres_Value	*REAL*	*O*
Max_Pres_Value	*REAL*	*O*
Resolution	*REAL*	*O*
Profile_Name	CharacterString	O

[Insert new **Clauses 12.4.X1 - X3**, p. 170]

12.4.X1 Min_Pres_Value
This property, of type REAL, indicates the lowest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.4.X2 Max_Pres_Value
This property, of type REAL, indicates the highest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.4.X3 Resolution
This property, of type REAL, indicates the smallest recognizable change in Present_Value in engineering units (read-only).

[Change **Table 12-46** Properties of the Large Analog Value Object Type, p. 365]

Property Identifier	Property Datatype	Conformance Code
…	…	…
Min_Pres_Value	*Double*	*O*
Max_Pres_Value	*Double*	*O*
Resolution	*Double*	*O*
Profile_Name	CharacterString	O

[Insert new **Clauses 12.39.X1 - X3,** p. 369]

12.39.X1 Min_Pres_Value
This property, of type Double, indicates the lowest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.39.X2 Max_Pres_Value
This property, of type Double, indicates the highest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.39.X3 Resolution
This property, of type Double, indicates the smallest recognizable change in Present_Value in engineering units (read-only).

[Change **Table 12-50,** Properties of the Integer Value Object Type, p. 380]

Property Identifier	Property Datatype	Conformance Code
…	…	…
Min_Pres_Value	*INTEGER*	*O*
Max_Pres_Value	*INTEGER*	*O*
Resolution	*INTEGER*	*O*
Profile_Name	CharacterString	O

[Insert new **Clauses 12.43.X1 - X3,** p. 384]

12.43.X1 Min_Pres_Value
This property, of type INTEGER, indicates the lowest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.43.X2 Max_Pres_Value
This property, of type INTEGER, indicates the highest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.43.X3 Resolution
This property, of type Integer, indicates the smallest recognizable change in Present_Value in engineering units (read-only).

[Change **Table 12-51** Properties of the Positive Integer Value Object Type, p. 385]

Property Identifier	Property Datatype	Conformance Code
…	…	…
Min_Pres_Value	*Unsigned*	*O*
Max_Pres_Value	*Unsigned*	*O*
Resolution	*Unsigned*	*O*
Profile_Name	CharacterString	O

[Insert new **Clauses 12.44.X1 - X3,** p. 389]

12.44.X1 Min_Pres_Value
This property, of type Unsigned, indicates the lowest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.44.X2 Max_Pres_Value
This property, of type Unsigned, indicates the highest number in engineering units that can be reliably obtained or used for the Present_Value property of this object.

12.44.X3 Resolution
This property, of type Unsigned, indicates the smallest recognizable change in Present_Value in engineering units (read-only).

[Change **Clauses 12.3.12-13,** p. 163]

12.3.12 Min_Pres_Value
This property, of type REAL, indicates the lowest number *in engineering units* that can be reliably used for the Present_Value property of this object.

12.3.13 Max_Pres_Value
This property, of type REAL, indicates the highest number *in engineering units* that can be reliably used for the Present_Value property of this object.

135-2010*ao*-3 Clarify Reject-Message-To-Network reason #3 DNET

Rationale

The Reject-Message-To-Network network layer message defines a field for returning DNET (Figure 6-7, Clauses 6.4.4 and 6.6.3.5). However, for Reject-Message-To-Network reason #3, there is no value that is appropriate for this field.

[Change **Clause 6.4.4**, pp. 60]

6.4.4 Reject-Message-To-Network

This message is indicated by a Message Type of X'03' followed by an octet indicating the reason for the rejection and a 2- octet network number (see Figure 6-7). It is directed to the node that originated the message being rejected, as indicated by the source address information in that message. The rejection reason octet shall contain an unsigned integer with one of the following values:

0: Other error.

1: The router is not directly connected to DNET and cannot find a router to DNET on any directly connected network using Who-Is-Router-To-Network messages.

2: The router is busy and unable to accept messages for the specified DNET at the present time.

3: It is an unknown network layer message type. *The DNET returned in this case is a local matter.*

4: The message is too long to be routed to this DNET.

5. The source message was rejected due to a BACnet security error and that error cannot be forwarded to the source device. See Clause 24.12.1.1 for more details on the generation of Reject-Message-To-Network messages indicating this reason.

6. The source message was rejected due to errors in the addressing. The length of the DADR or SADR was determined to be invalid.

135-2010*ao*-4 Prevent Reliance on Static Router Bindings

Rationale

Manual configuration of router bindings is generally not in the best interest of maintaining proper communications in a potentially dynamic networking environment. Therefore, devices should not be allowed to rely solely on this method, and some form of dynamic determination of router address must be supported.

[Change **Clause 6.5.3**, pp. 64]

6.5.3 Network Layer Procedures for the Transmission of Remote Traffic

....

Note that five methods exist for establishing the address of a BACnet router for a particular DNET: 1) the address may be established manually at the time a device is configured, 2) the address may be learned by issuing a Who-Is request and noting the SA associated with the subsequent I-Am message (assuming the device specified in the Who-Is is located on a remote DNET and the I-Am message was handled by a router on the local network), 3) by using the network layer message Who-Is-Router-To-Network, 4) by using the local broadcast MAC address in the initial transmission to a device on a remote DNET and noting the SA associated with any subsequent responses from the remote device, and 5) by noting the SA associated with any requests received from the remote DNET. Which method is used shall be a local ~~matter.~~ *matter; however, devices shall not rely solely on method 1.*

...

135-2010*ao*-5 Add Property_List Property

Rationale

Determining the list of properties that an object supports can be difficult, especially if the device does not support ReadPropertyMultiple or has APDU size or segmentation limits that prevent discovery of all available properties. A simple list of property identifiers supported by the object shall be provided for this purpose. This property is an array so that very limited devices can still support reading the list one index at a time.

[Change all objects in Clauses **12.x** and **Table 12-x Properties Of ...**, including any Clauses 12.x added in addenda.]

12.x ... Object Type

The object and its properties are summarized in Table 12-... and described in detail in this subclause.

Table 12-x. Properties of the ... Object Type

Property Identifier	Property Datatype	Conformance Code
…	…	…
Object_Type	BACnetObjectType	R
Property_List	*BACnetARRAY[N]of BACnetPropertyIdentifier*	*R*
	...	...

[Add new **Clauses 12.x.X** to all Clauses 12.x]

12.x.X Property_List

This read only property is a BACnetARRAY of property identifiers, one property identifier for each property that exists within the object. The Object_Name, Object_Type, Object_Identifier, and Property_List properties are not included in the list.

[Change **Clause 15.7.3.1.2**, p. 479]

15.7.3.1.2 List of Property References

This parameter shall be a list of one or more BACnetPropertyReferences, each of which corresponds directly to a specific property of the object identified above. The property identifier ALL means that all defined properties of the object are to be accessed, including any proprietary properties.

The property identifier REQUIRED means that only those standard properties having a conformance code of "R" or "W" shall be returned. The property identifier OPTIONAL means that only those standard properties present in the object that have a conformance code "O" shall be returned. *The Property_List property shall not be returned when properties ALL or REQUIRED are requested.* See the specification for the particular object type in Clause 12. If the property identifier ALL, REQUIRED, or OPTIONAL is specified and any of the selected properties is not readable by this service, then a Property Access Error for that property shall be returned in the List of Read Access Results as specified by Clause 15.7.3.2.

[Change **Clause 21**, p. 613]

BACnetPropertyIdentifier ::= ENUMERATED { -- see below for numerical order

```
...
program-state                   (92),
property-list                   (371),
proportional-constant           (93),
...
-- see event-message-texts      (351),
-- see property-list            (371)
...
}
```

[Change **Clause 12 Preamble**, p. 144]

12 MODELING CONTROL DEVICES AS A COLLECTION OF OBJECTS

...

Nonstandard object types are required to support the following properties:

- Object_Identifier BACnetObjectIdentifier
- Object_Name CharacterString
- Object_Type BACnetObjectType
- *Property List* *BACnetARRAY of BACnetPropertyIdentifier*

...

[Change **Clause 23.4.3**, p. 637]

23.4.3 Required Properties in Proprietary Object Types

Non-standard object types shall support the following properties:

Object_Identifier
Object_Name
Object_Type
Property_List

These properties shall be implemented to behave as they would in standard BACnet objects. This means that the Object_Identifier and Object_Name properties shall be unique within the BACnet device that maintains them. The Object_Name string shall be at least one character in length and shall consist of only printable characters. *The Property_List property was added in Protocol Revision 14.*

[Add a new entry to **History of Revisions**, p. 1006]

(This History of Revisions is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard.)

HISTORY OF REVISIONS

Protocol		***Summary of Changes to the Standard***
Version	***Revision***	
…	…	**…**
1	14	**Addendum *ao* to ANSI/ASHRAE 135-2010** Approved by the ASHRAE Standards Committee Xxxx xx, 2012; by the ASHRAE Board of Directors Xxxx xx, 2012; and by the American National Standards Institute Xxxx xx, 2012. 1. Update ReadRange Example 2. Add Present_Value Range to Value Objects 3. Clarify Reject-Message-To-Network reason #3 DNET 4. Prevent Reliance on Static Router BindingsClarify when Priority_Array and Relinquish_Default are allowed to be Present 5. Add Property_List Property

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the standards and guidelines as established by itself and other responsible bodies.

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Through its *Handbook*, appropriate chapters will contain up-to-date standards and design considerations as the material is systematically revised.

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ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

ADDENDA

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