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

ASHRAE ADDENDA

BACnet®

A Data Communication Protocol for Building Automation and Control Networks

Approved by the ASHRAE Standards Committee on June 25, 2011; by the ASHRAE Board of Directors on June 29, 2011; and by the American National Standards Institute on June 30, 2011.

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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 135*ad* 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 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. Only this new and deleted text is open to comment as this time. All other material in this addendum is provided for context only and is not open for public review comment except as it relates to the proposed changes.

135-2010ad-1 This section has been removed

135-2010ad-2 Provide Examples of Encoding Tag Numbers Greater than 14

Rationale

Recent additions to the standard have resulted in ASN.1 tag values greater than 14, which require an extra octet in the encoding, however, no examples of this were given.

[Change **Clause 20.2.15**, p. 557]

…

The context tag numbers shown in the following examples are for illustrative purposes only.

Example: Context-tagged null value

ASN.1 =	[3] NULL
Context Tag =	3
Encoded Tag =	X'38'

Example: Context-tagged Boolean value

ASN.1 =	[6] BOOLEAN
Value =	FALSE
Context Tag =	6
Encoded Tag =	X'69'
Encoded Data =	X'00'

Example: Context-tagged Boolean value with context tag number greater than 14

ASN.1 =	*[27] BOOLEAN*
Value =	*FALSE*
Context Tag =	*27*
Encoded Tag =	*X'F9'*
Tag Number Extension =	*X'1B'*
Encoded Data =	*X'00'*

Example: Context-tagged unsigned integer

ASN.1 =	[0] Unsigned
Value =	256
Context Tag =	0
Encoded Tag =	X'0A'
Encoded Data =	X'0100'

Example: Context-tagged signed integer

ASN.1 =	[5] INTEGER
Value =	-72
Context Tag =	5
Encoded Tag =	X'59'
Encoded Data =	X'B8'

Example: Context-tagged signed integer with context tag number greater than 14

ASN.1 =	*[33] INTEGER*
Value =	*-72*
Context Tag =	*33*
Encoded Tag =	*X'F9'*
Tag Number Extension =	*X'21'*
Encoded Data =	*X'B8'*

Example: Context-tagged single precision real

ASN.1 =	[0] REAL
Value =	-33.3
Context Tag =	0

Encoded Tag = X'0C'
Encoded Data = X'C2053333'

Example: Context-tagged double precision real
ASN.1 = [1] Double
Value = -33.3
Context Tag = 1
Encoded Tag = X'1D'
~~Extended Length = X'08'~~
Length Extension = X'08'
Encoded Data = X'C040A66666666666'

Example: Context-tagged double precision real with context tag number greater than 14
ASN.1 = [85] Double
Value = -33.3
Context Tag = 85
Encoded Tag = X'FD'
Tag Number Extension = X'55'
Length Extension = X'08'
Encoded Data = X'C040A66666666666'

Example: Context-tagged octet string
ASN.1 = [1] OctetString
Value = X'4321'
Context Tag = 1
Encoded Tag = X'1A'
Encoded Data = X'4321'

Example: Context-tagged character string
ASN.1 = [5] CharacterString
Value = "This is a BACnet string!" (ANSI X3.4)
Context Tag = 5
Encoded Tag = X'5D'
Length Extension = X'19'
Character Set = X'00' (ANSI X3.4)
Encoded Data = X'546869732069732061204241436E657420737472696E6721'

Example: Context-tagged character string with context tag number greater than 14
ASN.1 = [127] CharacterString
Value = "This is a BACnet string!" (ANSI X3.4)
Context Tag = 127
Encoded Tag = X'FD'
Tag Number Extension = X'7F'
Length Extension = X'19'
Character Set = X'00' (ANSI X3.4)
Encoded Data = X'546869732069732061204241436E657420737472696E6721'

Example: Context-tagged bit string
ASN.1 = [0] BIT STRING
Value = B'10101'
Context Tag = 0
Encoded Tag = X'0A'
Unused Bits in Last Octet = X'03'
Encoded Data = X'A8'

…

[Change **Clause 20.2.16 Encoding of a Sequence Value**, p. 559]

…

Example: Context-tagged SEQUENCE value
ASN.1 = [0] BACnetDateTime
Value = January 24, 1991, 5:35:45.17 P.M.
Context Tag = 0
Encoded Tag = X'0E' (opening tag)
Application Tag =Date (Tag Number = 10)
Encoded Tag = X'A4'
Encoded Data = X'5B011805'
Application Tag = Time (Tag Number = 11)
Encoded Tag = X'B4'
Encoded Data = X'11232D11'
Encoded Tag = X'0F' (closing tag)

Example: Context-tagged SEQUENCE value with context tag number greater than 14
ASN.1 = [47] BACnetDateTime
Value = January 24, 1991, 5:35:45.17 P.M.
Context Tag = 47
Encoded Tag = X'FE' (opening tag)
Tag Number Extension = X'2F'
Application Tag = Date (Tag Number = 10)
Encoded Tag = X'A4'
Encoded Data = X'5B011805'
Application Tag = Time (Tag Number = 11)
Encoded Tag = X'B4'
Encoded Data = X'11232D11'
Encoded Tag = X'FF' (closing tag)
Tag Number Extension = X'2F'

All ASN.1 productions of sequences that contain structured elements shall have distinct tags as necessary to permit unambiguous encoding and decoding of values. The follow example illustrates this requirement.

...

135-2010ad-3 Allow Feedback_Value to be used to calculate Elapsed_Active_Time

Rationale

Mechanical systems controlled by a Binary Output object often provide additional external means to control the running state of the system, such as mechanical service-switches, security means to switch overheated motors, electrical fuses, etc. The actual active time of the mechanical system may therefore differ from the value calculated from the Present_Value. A more appropriate basis to calculate the active time may be the Feedback_Value, which indicates the effective status of the controlled mechanical system.

[Change **Clause 12.7.17,** p. 182]

12.7.17 Elapsed_Active_Time

This property, of type Unsigned32, represents the accumulated number of seconds that the Present_Value property *or the Feedback_Value property* has had the value ACTIVE since this property was most recently set to a zero value. If one of the optional properties Elapsed_Active_Time or Time_Of_Active_Time_Reset is present, then both of these properties shall be present. *Whether Present_Value or Feedback_Value is used as the indicator for the calculation of the Elapsed_Active_Time is a local matter.*

135-2010ad-4 Add READ_ACCESS_DENIED condition to ReadProperty and ReadPropertyMultiple

Rationale

The error code READ_ACCESS_DENIED is not included in the Error Type description clauses for the ReadPropertyMultiple and ReadProperty services. With this addition, some text from the definition of the Log_Buffer property which was incorrectly handling the ReadPropertyMultiple case is being removed.

[Change **Clause 15.5.1.3.1, Error Type**, p. 476]

15.5.1.3.1 Error Type

This parameter consists of two component parameters: (1) an 'Error Class' and (2) an 'Error Code'. See Clause 18. The 'Error Class' and 'Error Code' to be returned for specific situations are as follows:

Situation	Error Class	Error Code
Specified object does not exist.	OBJECT	UNKNOWN_OBJECT
Specified property does not exist.	PROPERTY	UNKNOWN_PROPERTY
An array index is provided but the property is not an array.	PROPERTY	PROPERTY_IS_NOT_AN_ARRAY
An array index is provided that is outside the range existing in the property.	PROPERTY	INVALID_ARRAY_INDEX
The property is not accessible using this service.	*PROPERTY*	*READ_ACCESS_DENIED*

[Change **Clause 15.7.1.3.1**, **Error Type**, p. 478]

15.7.1.3.1 Error Type

This parameter consists of two component parameters: (1) an 'Error Class' and (2) an 'Error Code'. See Clause 18. The 'Error Class' and 'Error Code' to be returned for specific situations are as follows:

Situation	Error Class	Error Code
Specified object does not exist.	OBJECT	UNKNOWN_OBJECT
Specified property does not exist.	PROPERTY	UNKNOWN_PROPERTY
An array index is provided but the property is not an array.	PROPERTY	PROPERTY_IS_NOT_AN_ARRAY
An array index is provided that is outside the range existing in the property.	PROPERTY	INVALID_ARRAY_INDEX
The property is not accessible using this service.	*PROPERTY*	*READ_ACCESS_DENIED*

[Change **Clause 12.25.14**, Trend Log object 'Log_Buffer', p.275]
[Change **Clause 12.27.13**, Event Log object 'Log_Buffer', p.290]
[Change **Clause 12.30.19**, Trend Log Multiple object 'Log_Buffer', p.310]

…

The buffer is not network accessible except through the use of the ReadRange service, in order to avoid problems with record sequencing when segmentation is required. ~~Attempts to read this property with the ReadProperty-Request or ReadPropertyMultiple-Request shall cause a Result( ) response to be issued, specifying an 'Error Class' of PROPERTY and an 'Error Code' of READ_ACCESS_DENIED.~~

135-2010ad-5 Remove Unqualified Frame Reference in USE_TOKEN

Rationale

In the SendAndWait transition of the USE_TOKEN state, a reference to frame type BACnet Data Expecting Reply appears twice. The first, unqualified, reference is an error.

[Change **Clause 9.5.6.3**, p. 105]

9.5.6.3 USE_TOKEN

...

SendAndWait

If the next frame awaiting transmission is of type Test_Request, ~~BACnet Data Expecting Reply,~~ a proprietary type that expects a reply, or a frame of type BACnet Data Expecting Reply with a DestinationAddress that is not equal to 255 (broadcast),

then call SendFrame to transmit the data frame; increment FrameCount; and enter the WAIT_FOR_REPLY state.

135-2010ad-6 Align the Loop Object's Out_Of_Service Behavior with Other Objects

Rationale

In the Loop Object, it is not currently clear whether the property referenced by Manipulated_Variable_Reference is still written with the value in the Loop object's Present_Value property when Out_Of_Service is TRUE. To align the behavior of the Loop object with other objects, it is proposed that when Out_Of_Service is TRUE in the Loop object, the behavior should facilitate testing, over and above simply stopping the PID algorithm.

The following behaviors are specified for the times when Out_Of_Service is TRUE:
- the algorithm is out of service
- Present_Value is writable
- Reliability is "changeable" by unspecified means (as it is in other objects)
- changes to Present_Value are written to the property referenced by Manipulated_Variable_Reference

[Change **Table 12-20**, p. 230]

Table 12-20. Properties of the Loop Object Type

Property Identifier	Property Datatype	Conformance Code
...	...	...
Present_Value	REAL	~~R~~ *R*[7]
...	...	...
Reliability	BACnetReliability	~~O~~ *O*[7]
...	...	...

...

[6] This property, if present, is required to be read only
[7] *These properties are required to be writable when Out_Of_Service is TRUE.*

[Change **Clause 12.17.4**, p. 231]

12.17.4 Present_Value

This property indicates the current output value of the loop algorithm in units of the Output_Units property. *The Present_Value property shall be writable when Out_Of_Service is TRUE.*

[Change **Clause 12.17.9**, p.233]

12.17.9 Out_Of_Service

The Out_Of_Service property, of type BOOLEAN, is an indication whether (TRUE) or not (FALSE) the algorithm this object represents is or is not in service. *The Present_Value property shall be decoupled from the algorithm when the value of Out_Of_Service is TRUE. In addition, the Reliability property and the corresponding state of the FAULT flag of the Status_Flags property shall be decoupled from the algorithm when Out_Of_Service is TRUE. While the Out_Of_Service property is TRUE, the Present_Value and Reliability properties may be changed to any value as a means of simulating specific fixed conditions or for testing purposes. The property referenced by Manipulated_Variable_Reference and other functions that depend on the state of the Present_Value or Reliability properties shall respond to changes made to these properties while Out_Of_Service is TRUE, as if those changes had been made by the algorithm.*

135-2010ad-7 Add DM-DDB-A to the Device Profile B-AAC

Rationale

The standard does not include requirements to support DM-DDB-A in the device-profile B-AAC. A device claiming conformance to B-AAC is required to support AE-N-I-B. Due to the possible presence of Device Identifiers in a recipient list, the device requires support for DM-DDB-A (Who-Is initiation) to determine the physical address of the device in the recipient list.

[Change **Clause L.7**, p. 881]

L.7 Profiles of the Standard BACnet Devices

…

Device & Network Management

...	**B-AAC**	**...**
...	~~DM-DDB-B~~ *DM-DDB-A,B*	...
...		...
...		...
...	DM-DOB-B	...
...	DM-DCC-B	...
...	DM-TS-B or DM-UTC-B	...
...		...
...		...
...	DM-RD-B	...
...		...

135-2010ad-8 This section was removed after the first public review.

135-2010ad-9 Clarify Requirements for BBMDs

Rationale

The standard does not clearly specify which services defined in ANNEX J are required to be supported by a BBMD.

[Change **Clause J.4.3**, p. 837]

J.4.3 BBMD Concept

Each IP subnet that is part of a B/IP network comprised of two or more subnets shall have at least one BBMD. Each BBMD shall possess a table called a Broadcast Distribution Table (BDT). If there are two or more BBMDs on a single subnet, their BDTs shall not contain any common entries in order to avoid a broadcast forwarding loop. The BDT determines which remote IP subnets receive forwarded BACnet broadcasts. To reduce BACnet broadcast traffic, it is possible to configure the BDT to forward broadcasts only to IP subnets where they are required. ~~If the BBMD has also been designated to register foreign devices as described below, it shall also possess a Foreign Device Table (FDT).~~ *A BBMD shall be able to be configured to accept Foreign Device registrations, shall support the two-hop broadcast distribution method, and shall support the execution of all BDT and FDT read and write messages defined in Clause J.2. Support for the one-hop broadcast distribution method is optional.*

135-2010ad-10 Restrict BBMD Foreign Device Forwarding

Rationale

A BBMD should only distribute messages from foreign devices which are registered.

[Change **Clause J.4.5**, p. 838]

J.4.5 BBMD Operation - Broadcast Distribution

...

Upon receipt of a BVLL Distribute-Broadcast-To-Network message from a *registered* foreign device, the receiving BBMD shall transmit a BVLL Forwarded-NPDU message on its local IP subnet using the local B/IP broadcast address as the destination address. In addition, a Forwarded-NPDU message shall be sent to each entry in its BDT as described above in the case of the receipt of a BVLL Original-Broadcast-NPDU as well as directly to each foreign device currently in the BBMD's FDT except the originating node. If the BBMD is unable to perform the forwarding function, *or the message was not received from a registered foreign device*, *then* it shall return a BVLC-Result message to the foreign device with a result code of X'0060' indicating that the forwarding attempt was unsuccessful.

[Change **Clause J.8.3**, p. 847]

J.8.3 B/IP-M BBMD Operation

...

Upon receipt of a BVLL Distribute-Broadcast-To-Network message from a *registered* foreign device, the receiving BBMD shall transmit a BVLL Forwarded-NPDU message using the B/IP-M group address as the destination address. In addition, a Forwarded-NPDU message shall be sent to each entry in its BDT as described in *Clause* J.4.5 as well as directly to each foreign device currently in the BBMD's FDT except the originating node. Error processing is as described in *Clause* J.4.5,

135-2010ad-11 Restrict ReadRange 'Count' to INTEGER16

Rationale

For interoperability, the 'Count' parameter should not be unrestricted in size.

[Change **Clause 15.8.1.1.4,** p. 481]

15.8.1.1.4 Range

This optional parameter shall convey criteria for the consecutive range items within the referenced property that are to be returned, as described in *Clause* 15.8.2. The 'Range' parameter is shown in Table 15-14. The terminology and symbology used in this table are explained in *Clause* 5.6.

Table 15-14. Structure of the 'Range' Parameter

Parameter Name	Req	Ind	Datatype
By Position	S	S(=)	
Reference Index	M	M(=)	Unsigned
Count	M	M(=)	~~INTEGER~~ *INTEGER16*
By Sequence Number	S	S(=)	
Reference Sequence Number	M	M(=)	Unsigned32
Count	M	M(=)	~~INTEGER~~ *INTEGER16*
By Time	S	S(=)	
Reference Time	M	M(=)	BACnetDateTime
Count	M	M(=)	~~INTEGER~~ *INTEGER16*

[Change **Clause 21,** ReadRange-Request production, p. 570]

```
ReadRange-Request ::= SEQUENCE {
        objectIdentifier        [0]  BACnetObjectIdentifier,
        propertyIdentifier      [1]  BACnetPropertyIdentifier,
        propertyArrayIndex      [2]  Unsigned OPTIONAL,          -- used only with array datatype
        range                    CHOICE {
                                        byPosition              [3]  SEQUENCE {
                                                referenceIndex  Unsigned,
                                                count           ~~INTEGER~~INTEGER16
                                                },
                                        -- context tag 4 is deprecated
                                        -- context tag 5 is deprecated
                                        bySequenceNumber        [6]  SEQUENCE {
                                                referenceIndex  Unsigned,
                                                count           ~~INTEGER~~INTEGER16
                                                },
                                        byTime                  [7]  SEQUENCE {
                                                referenceTime   BACnetDateTime,
                                                count           ~~INTEGER~~INTEGER16
                                                }
                                        } OPTIONAL
        }
```

[Change **Clause 21**, p. 582]

...

-- INTEGER [APPLICATION 3], equivalent to [UNIVERSAL 2]

INTEGER16 ::= *INTEGER (-32768..32767)*

...

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.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive technical committee structure, continue to generate up-to-date standards and guidelines where appropriate and adopt, recommend, and promote those new and revised standards developed by other responsible organizations.

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

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating standards and guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

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.