



ASHRAE STANDARD

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

Approved by the ASHRAE Standards Committee on January 23, 2010; by the ASHRAE Board of Directors on January 27, 2010; and by the American National Standards Institute on January 28, 2010.

This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site, <http://www.ashrae.org>, or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 404-321-5478. Telephone: 404-636-8400 (world-wide), or toll free 1-800-527-4723 (for orders in US and Canada).

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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 135k to ANSI/ASHRAE Standard 135-2008 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.

135-2008k-1. Add support for UTF-8, p. 2.

135-2008k-2. Change JIS Reference, p. 7.

In the following document, language added to existing clauses of ANSI/ASHRAE 135-2008 and addenda is indicated through the use of *italics*, while deletions are indicated by ~~strike through~~. Where entirely new subclauses are added, plain type is used throughout.

135-2008k-1. Add support for UTF-8.

Rationale

Due to the historic use of ANSI X3.4 in many controllers, there is an expectation that for many years to come BACnet installations will have to be able to deal with multiple character sets (ANSI X3.4 and UTF-8). This change is intended to extend character set 0 to include all UTF-8 characters.

It is expected to be fully backward compatible with devices that use character set 0 within the ANSI X3.4 subset of UTF-8. It is also expected that most devices that do not display characters will be compatible over the full range of UTF-8, thus enabling the use of internationalized strings in the extensive base of currently installed products.

This change does not address the issue surrounding display devices that are not capable of rendering the complete set of UTF-8 glyphs, as is already the case with devices that support the DBCS, UCS-2, and UCS-4 character sets.

Addendum 135-2008k-1

[Change Clause 3.2.42, p. 4]

3.2.42 printable character: a character that represents a printable symbol as opposed to a device control character. Printable characters These include, but are not limited to, upper- and lowercase letters, punctuation marks, and mathematical symbols. The exact set depends upon the character set being used. ~~In ANSI X3.4 the printable characters are represented by single octets in the range X'20'–X'7E'.~~

[Change Clause 20.2.9, p. 420]

20.2.9 Encoding of a Character String Value

The encoding of a character string value shall be primitive.

The encoding shall contain an initial contents octet, and zero, one, or more additional contents octets equal in value to the octets in the data value, in the order in which they appear in the data value, i.e., most significant octet first, and with the most significant bit of an octet of the data value aligned with the most significant bit of an octet of the contents octets.

The initial octet shall specify the character set with the following encoding:

X'00'	ANSI X3.4 ISO 10646 (UTF-8)
X'01'	IBM™/Microsoft™ DBCS
X'02'	JIS C 6226
X'03'	ISO 10646 (UCS-4)
X'04'	ISO 10646 (UCS-2)
X'05'	ISO 8859-1

Other values of the initial octet are reserved by ASHRAE.

Example: Application-tagged character string

ASN.1 =	CharacterString
Value =	"This is a BACnet string!" (ANSI X3.4 ISO 10646 UTF-8)
Application Tag =	Character String (Tag Number = 7)
Encoded Tag =	X'75'
Length Extension =	X'19'
Character Set =	X'00' (ANSI X3.4 ISO 10646: UTF-8)
Encoded Data =	X'546869732069732061204241 436E657420737472696E6721'

[Change clause **20.2.15** p. 423]

Example: Context-tagged character string

ASN.1 =	[5] CharacterString
Value =	"This is a BACnet string!" (ANSI X3.4 ISO 10646 UTF-8)
Context Tag =	5
Encoded Tag =	X'5D'
Length Extension =	X'19'
Character Set =	X'00' (ANSI X3.4 ISO 10646: UTF-8)
Encoded Data =	X'546869732069732061204241 436E657420737472696E6721'

Example: Application-tagged character string with non-ANSI character

ASN.1 =	CharacterString
Value =	"Français" (ISO 10646 UTF-8)
Application Tag =	Character String (Tag Number = 7)
Encoded Tag =	X'75'
Length Extension =	X'0A'
Character Set =	X'00' (ISO 10646: UTF-8)
Encoded Data =	X'4672616E6347616973'

[Change Clause **Annex A** p. 494]

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

☐ ANSI X3.4 ISO 10646 (UTF-8)	☐ IBM™/Microsoft™ DBCS	☐ ISO 8859-1
☐ ISO 10646 (UCS-2)	☐ ISO 10646 (UCS-4)	☐ JIS C 6226

[Change Clause F.1.4 p. 556]

X'4C'	SD Context Tag 4 (Acknowledgment Source, L=4)
X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
X'4D444C'	"MDL"

[Change Clause F.1.5 p. 556]

X'4C'	SD Context Tag 4 (Acknowledgment Source, L=4)
X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
X'4D444C'	"MDL"

[Change Clause F.1.9 p. 562]

X'1C'	SD Context Tag 1 (Requesting Source, L=4)
X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
X'4D444C'	"MDL"

[Change Clause F.3.3 p. 567]

X'75'	Application Tag 7 (Character String, L>4)
X'08'	Extended Length=8
X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
X'5472656E642031'	"Trend 1"

[Change Clause F.3.6, p. 573]

	X'75'	Application Tag 7 (Character String, L>4)
	X'0C'	Extended Length=12
	X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
	X'432A205072657373757265'	"C* Pressure"
	X'3F'	PD Closing Tag 3 (Comparison Value)
	X'09'	SD Context Tag 0 (Property Identifier, L=1)
	X'4D'	77 (OBJECT_NAME)
	X'29'	SD Context Tag 2 (Relation Specifier)
	X'00'	0 (EQUAL)
	X'3E'	PD Opening Tag 3 (Comparison Value)
	X'75'	Application Tag 7 (Character String, L>4)
	X'10'	Extended Length=16
	X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
	X'41433F20537570706C792054656D70'	"AC? Supply Temp"
	X'3F'	PD Closing Tag 3 (Comparison Value)
	X'1F'	PD Closing Tag 1 (List Of Selection Criteria)
X'0F'		PD Closing Tag 0 (Object Selection Criteria)
X'1E'		PD Opening Tag 1 (List Of Property References)
	X'09'	SD Context Tag 0 (Property Identifier, L=1)
	X'4D'	77 (OBJECT_NAME)
X'1F'		PD Closing Tag 1 (List Of Property References)

Assuming this service procedure executes correctly, a complex acknowledgment is returned:

X'30'	PDU Type=3 (BACnet-ComplexACK-PDU, SEG=0, MOR=0)	
X'54'	Invoke ID=84	
X'0D'	Service Ack Choice=13 (ReadPropertyConditional-ACK)	
X'0C'	SD Context Tag 0 (Object Identifier, L=4)	
X'00000004'	Analog Input, Instance Number=4	
X'1E'	PD Opening Tag 1 (List Of Results)	
	X'29'	SD Context Tag 2 (Property Identifier, L=1)
	X'4D'	77 (OBJECT_NAME)
	X'4E'	PD Opening Tag 4 (Property Value)
	X'75'	Application Tag 7 (Character String, L>4)
	X'10'	Extended Length=16
	X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
	X'41433120537570706C792054656D70'	"AC1 Supply Temp"
	X'4F'	PD Closing Tag 4 (Property Value)
X'1F'		PD Closing Tag 1 (List Of Results)
X'0C'	SD Context Tag 0 (Object Identifier, L=4)	
X'00000007'	Analog Input, Instance Number=7	
X'1E'	PD Opening Tag 1 (List Of Results)	
	X'29'	SD Context Tag 2 (Property Identifier, L=1)
	X'4D'	77 (OBJECT_NAME)
	X'4E'	PD Opening Tag 4 (Property Value)
	X'75'	Application Tag 7 (Character String, L>4)
	X'0E'	Extended Length=14
	X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
	X'43575031205072657373757265'	"CWP1 Pressure"

	X'4F'	PD Closing Tag 4 (Property Value)
X'1F'		PD Closing Tag 1 (List Of Results)
X'0C'		SD Context Tag 0 (Object Identifier, L=4)
X'00000008'		Analog Input, Instance Number=8
X'1E'		PD Opening Tag 1 (List Of Results)
	X'29'	SD Context Tag 2 (Property Identifier, L=1)
	X'4D'	77 (OBJECT_NAME)
	X'4E'	PD Opening Tag 4 (Property Value)
	X'75'	Application Tag 7 (Character String, L>4)
	X'19'	Extended Length=25
	X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
		X'4368696C6C657220312046726566E205072657373757265' "Chiller 1 Freon Pressure"
	X'4F'	PD Closing Tag 4 (Property Value)
X'1F'		PD Closing Tag 1 (List Of Results)
X'0C'		SD Context Tag 0 (Object Identifier, L=4)
X'0000000A'		Analog Input, Instance Number=10
X'1E'		PD Opening Tag 1 (List Of Results)
	X'29'	SD Context Tag 2 (Property Identifier, L=1)
	X'4D'	77 (OBJECT_NAME)
	X'4E'	PD Opening Tag 4 (Property Value)
	X'75'	Application Tag 7 (Character String, L>4)
	X'10'	Extended Length=16
	X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
		X'41433220537570706C792054656D70' "AC2 Supply Temp"
	X'4F'	PD Closing Tag 4 (Property Value)
X'1F'		PD Closing Tag 1 (List Of Results)
X'0C'		SD Context Tag 0 (Object Identifier, L=4)
X'0000000C'		Analog Input, Instance Number=12
X'1E'		PD Opening Tag 1 (List Of Results)
	X'29'	SD Context Tag 2 (Property Identifier, L=1)
	X'4D'	77 (OBJECT_NAME)
	X'4E'	PD Opening Tag 4 (Property Value)
	X'75'	Application Tag 7 (Character String, L>4)
	X'10'	Extended Length=16
	X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
		X'41433320537570706C792054656D70' "AC3 Supply Temp"
	X'4F'	PD Closing Tag 4 (Property Value)
X'1F'		PD Closing Tag 1 (List Of Results)

[Change Clause F.4.1 p. 579]

X'08'	Extended Length=8
X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
X'23656762646621'	"#egbdf!"

[Change Clause F.4.4 p. 581]

X'09'	Extended Length=9
X'00'	ANSI X3.4 ISO 10646 (UTF-8) Encoding
X'4162436445664768'	"AbCdEfGh"

[Change Clause F.4.5 p. 581]

X'18' Extended Length=24
X'00' ~~ANSI X3.4~~ISO 10646 (UTF-8) Encoding
X'504D20726571756972656420666F722050554D50333437' "PM required for PUMP347"

[Change Clause F.4.6 p. 581]

X'18' Extended Length=24
X'00' ~~ANSI X3.4~~ISO 10646 (UTF-8) Encoding
X'504D20726571756972656420666F722050554D50333437' "PM required for PUMP347"

[Change Clause F.4.8 p. 582]

X'07' Extended Length=7
X'00' ~~ANSI X3.4~~ISO 10646 (UTF-8) Encoding
X'4F4154656D70' "OATemp"

[Change Clause F.4.8 p. 582 (second occurrence)]

X'07' Extended Length=7
X'00' ~~ANSI X3.4~~ISO 10646 (UTF-8) Encoding
X'4F4154656D70' "OATemp"

[Change Clause F.4.8 p. 582 (third occurrence)]

X'07' Extended Length=7
X'00' ~~ANSI X3.4~~ISO 10646 (UTF-8) Encoding
X'4F4154656D70' "OATemp"

[Add the following new reference in Clause 25, p. 491]
[Note: the lines shown here are to be added with italics as shown.]

25 REFERENCES

...
UNICODE Technical Report# 17-5: *Character Encoding Model*. The Unicode Consortium.
...

Sources for Reference Material

...
The Unicode Consortium. P.O. Box 391476, Mountain View, CA 94039-1476, USA.

135-2008k-2. Update the JIS Reference.

Rationale

The standard is updated to reflect the fact that the Japanese Industrial Standards Committee has changed the name of "JIS C 6226" to "JIS X 0208".

Addendum 135-2008k-2

[Change Clause 20.2.9, p. 381.]

20.2.9 Encoding of a Character String Value

The encoding of a character string value shall be primitive.

The encoding shall contain an initial contents octet, and zero, one, or more additional contents octets equal in value to the octets in the data value, in the order in which they appear in the data value, i.e., most significant octet first, and with the most significant bit of an octet of the data value aligned with the most significant bit of an octet of the contents octets.

The initial octet shall specify the character set with the following encoding:

X'00'	ANSI X3.4
X'01'	IBM™/Microsoft™ DBCS
X'02'	JIS C 6226 X 0208
X'03'	ISO 10646 (UCS-4)
X'04'	ISO 10646 (UCS-2)
X'05'	ISO 8859-1

Other values of the initial octet are reserved by ASHRAE.

...

[Change clause Annex A p 471]

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

- | | | |
|--|---|---|
| ☐ ANSI X3.4 | ☐ IBM™/Microsoft™ DBCS | ☐ ISO 8859-1 |
| ☐ ISO 10646 (UCS-2) | ☐ ISO 10646 (UCS-4) | ☐ JIS C 6226 X 0208 |

[Add a new entry to **History of Revisions**, p. 688]

(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

<i>Protocol</i>		<i>Summary of Changes to the Standard</i>
<i>Version</i>	<i>Revision</i>	
...	...	...
1	10	Addendum k to ANSI/ASHRAE 135-2008 Approved by the ASHRAE Standards Committee January 23, 2010; by the ASHRAE Board of Directors January 27, 2010; and by the American National Standards Institute January 28, 2010. 1. Add support for UTF-8. 2. Change JIS Reference.

**POLICY STATEMENT DEFINING ASHRAE'S CONCERN
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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.