

ANSI/ASHRAE Addendum k  
to ANSI/ASHRAE Standard 135-2008



# ASHRAE STANDARD

## BACnet<sup>®</sup> — 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](mailto:orders@ashrae.org). Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada).

© Copyright 2010 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

ISSN 1041-2336



**American Society of Heating, Refrigerating  
and Air-Conditioning Engineers, Inc.**  
1791 Tullie Circle NE, Atlanta, GA 30329  
[www.ashrae.org](http://www.ashrae.org)

**ASHRAE Standing Standard Project Committee 135**  
**Cognizant TC: TC 1.4, Control Theory and Application**  
**SPLS Liaison: Douglas T. Reindl**

David Robin, <i>Chair*</i>	Coleman L. Brumley, Jr.*	John J. Lynch
Carl Neilson, <i>Vice-Chair</i>	Bernhard Isler*	Ted Sunderland
Sharon E. Dinges, <i>Secretary*</i>	Stephen Karg*	David B. Thompson*
Donald P. Alexander*	Simon Lemaire	Stephen J. Treado*
Barry B. Bridges*	J. Damian Ljungquist*	J. Michael Whitcomb*

*\*Denotes members of voting status when the document was approved for publication*

---

**ASHRAE STANDARDS COMMITTEE 2009–2010**

Steven T. Bushby, <i>Chair</i>	Merle F. McBride
H. Michael Newman, <i>Vice-Chair</i>	Frank Myers
Robert G. Baker	Janice C. Peterson
Michael F. Beda	Douglas T. Reindl
Hoy R. Bohanon, Jr.	Lawrence J. Schoen
Kenneth W. Cooper	Boggarm S. Setty
K. William Dean	Bodh R. Subherwal
Martin Dieryckx	James R. Tauby
Allan B. Fraser	James K. Vallort
Katherine G. Hammack	William F. Walter
Nadar R. Jayaraman	Michael W. Woodford
Byron W. Jones	Craig P. Wray
Jay A. Kohler	Wayne R. Reedy, <i>BOD ExO</i>
Carol E. Marriott	Thomas E. Watson, <i>CO</i>

Stephanie Reiniche, *Manager of Standards*

---

**SPECIAL NOTE**

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this standard as an ANS, as “substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution.” Compliance with this standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Manager of Standards of ASHRAE should be contacted for:

- a. interpretation of the contents of this Standard,
- b. participation in the next review of the Standard,
- c. offering constructive criticism for improving the Standard, or
- d. permission to reprint portions of the Standard.

**DISCLAIMER**

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE’s Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

**ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS**

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

**[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*k* 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.

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

**135-2008*k*-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'	<del>ANSI X3-4ISO 10646 (UTF-8) Encoding</del>
	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'	<del>ANSI X3-4ISO 10646 (UTF-8) Encoding</del>
	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'	<del>ANSI X3-4ISO 10646 (UTF-8) Encoding</del>
	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'	<del>ANSI X3-4ISO 10646 (UTF-8) Encoding</del>
X'23656762646621'	"#egbdf!"

[Change Clause F.4.4 p. 581 ]

X'09'	Extended Length=9
X'00'	<del>ANSI X3-4ISO 10646 (UTF-8) Encoding</del>
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



**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.