
**Building automation and control
systems —**

**Part 5:
Data communication protocol**

Systèmes d'automatisation et de gestion technique du bâtiment —

Partie 5: Protocole de communication de données

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16484-5 was prepared by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) (as ANSI/ASHRAE 135-2010) and was adopted without modifications by Technical Committee ISO/TC 205, *Building environment design*.

This fourth edition cancels and replaces the third edition (ISO 16484-5:2010), which has been technically revised, as detailed in the enclosed ANSI/ASHRAE publication, pages 993 to 1002.

ISO 16484 consists of the following parts, under the general title *Building automation and control systems (BACS)*:

- *Part 1: Project specification and implementation*
- *Part 2: Hardware*
- *Part 3: Functions*
- *Part 5: Data communication protocol*
- *Part 6: Data communication conformance testing*

Applications and project implementation are to form the subjects of future Parts 4 and 7.

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Building automation and control systems —

Part 5: Data communication protocol

1 Scope

This part of ISO 16484 defines data communication services and protocols for computer equipment used for monitoring and control of heating, ventilation, air-conditioning and refrigeration (HVAC&R) and other building systems. It defines, in addition, an abstract, object-oriented representation of information communicated between such equipment, thereby facilitating the application and use of digital control technology in buildings. The scope and field of application are furthermore detailed in Clause 2 of the enclosed ANSI/ASHRAE publication.

2 Requirements iTeh STANDARD PREVIEW

Requirements are the technical recommendations made in the following publication (reproduced on the following pages), which is adopted as an International Standard:

ANSI/ASHRAE 135-2010, *A Data Communication Protocol for Building Automation and Control Networks*
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The text on the back of the title page of the ANSI/ASHRAE standard and the policy statement on the last page are not relevant for the purposes of international standardization.

The following International Standards are cited in the text:

ISO/IEC 7498 (all parts), *Information technology — Open Systems Interconnection — Basic Reference Model*

ISO/TR 8509, *Information processing systems — Open Systems Interconnection — Service conventions*

ISO/IEC 8649, *Information technology — Open Systems Interconnection — Service definition for the Association Control Service Element*

ISO/IEC 8802-2, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 2: Logical link control*

ISO/IEC 8802-3, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 8822, *Information technology — Open Systems Interconnection — Presentation service definition*

ISO/IEC 8824 (all parts), *Information technology — Abstract Syntax Notation One (ASN.1)*

ISO/IEC 8825 (all parts), *Information technology — ASN.1 encoding rules*

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ISO/IEC 8859-1, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*

ISO/IEC 9545, *Information technology — Open Systems Interconnection — Application Layer structure*

ISO/IEC 10646, *Information technology — Universal Coded Character Set (UCS)*

3 Revision of ANSI/ASHRAE 135

It has been agreed with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) that Technical Committee ISO/TC 205 will be consulted in the event of any revision or amendment of ANSI/ASHRAE 135. To this end, ANSI will act as a liaison body between ASHRAE and ISO.

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ANSI/ASHRAE Standard 135-2010
 (Supersedes ANSI/ASHRAE Standard 135-2008)

Includes ANSI/ASHRAE addenda listed in the History of Revisions



ASHRAE STANDARD



A Data Communication Protocol for Building Automation and Control Networks

See the History of Revisions at the end of this standard for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, and the American National Standards Institute.

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 (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 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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FOREWORD

BACnet, the ASHRAE building automation and control networking protocol, has been designed specifically to meet the communication needs of building automation and control systems for applications such as heating, ventilating, and air-conditioning control, lighting control, access control, and fire detection systems. The BACnet protocol provides mechanisms by which computerized equipment of arbitrary function may exchange information, regardless of the particular building service it performs. As a result, the BACnet protocol may be used by head-end computers, general-purpose direct digital controllers, and application specific or unitary controllers with equal effect.

The motivation for this Standard was the widespread desire of building owners and operators for "interoperability," the ability to integrate equipment from different vendors into a coherent automation and control system - and to do so competitively. To accomplish this, the Standard Project Committee (SPC) solicited and received input from dozens of interested firms and individuals; reviewed all relevant national and international data communications standards, whether de facto or the result of committee activity; and spent countless hours in debate and discussion of the pros and cons of each element of the protocol.

What has emerged from the committee deliberations is a network protocol model with these principal characteristics:

(a) All network devices (except MS/TP slaves) are peers, but certain peers may have greater privileges and responsibilities than others.

(b) Each network device is modeled as a collection of network-accessible, named entities called "objects." Each object is characterized by a set of attributes or "properties." While this Standard prescribes the most widely applicable object types and their properties, implementors are free to create additional object types if desired. Because the object model can be easily extended, it provides a way for BACnet to evolve in a backward compatible manner as the technology and building needs change.

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(c) Communication is accomplished by reading and writing the properties of particular objects and by the mutually acceptable execution of other protocol "services." While this Standard prescribes a comprehensive set of services, mechanisms are also provided for implementors to create additional services if desired.

(d) Because of this Standard's adherence to the ISO concept of a "layered" communication architecture, the same messages may be exchanged using various network access methods and physical media. This means that BACnet networks may be configured to meet a range of speed and throughput requirements with commensurately varying cost. Multiple BACnet networks can be interconnected within the same system forming an internetwork of arbitrarily large size. This flexibility also provides a way for BACnet to embrace new networking technologies as they are developed.

BACnet was designed to gracefully improve and evolve as both computer technology and demands of building automation systems change. Upon its original publication in 1995, a Standing Standards Project Committee was formed to deliberate enhancements to the protocol under ASHRAE rules for "continuous maintenance." Much has happened since the BACnet standard was first promulgated. BACnet has been translated into Chinese, Japanese, and Korean, and embraced across the globe. BACnet devices have been designed, built and deployed on all seven continents. Suggestions for enhancements and improvements have been continually received, deliberated, and, ultimately, subjected to the same consensus process that produced the original standard. This publication is the result of those deliberations and brings together all of the corrections, refinements, and improvements that have been adopted.

Among the features that have been added to BACnet are: increased capabilities to interconnect systems across wide area networks using internet protocols, new objects and services to support fire detection and other life safety applications, capabilities to backup and restore devices, standard ways to collect trend data, new tools to make specifying BACnet systems easier, a mechanism for making interoperable extensions to the standard visible, and many others. The successful addition of these features demonstrates that the concept of a protocol deliberately crafted to permit extension of its capabilities over time as technology and needs change is viable and sound.

All communication protocols are, in the end, a collection of arbitrary solutions to the problems of information exchange and all are subject to change as time and technology advance. BACnet is no exception. Still, it is the hope of those who have contributed their time, energies, and talents to this work that BACnet will help to fulfill, in the area of building automation and control, the promise of the information age for the public good!