



ADDENDA

**ANSI/ASHRAE Addendum ch to
ANSI/ASHRAE Standard 135-2020**



A Data Communication Protocol for Building Automation and Control Networks

Approved by the ASHRAE Standards Committee on June 28, 2024, and by the American National Standards Institute on June 28, 2024.

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[This foreword, the table of contents, the introduction, 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

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.

135-2020ch-1 Changes to Clause 5 to address segmentation errors, p. 3

In the following document, language to be added to existing clauses of ANSI/ASHRAE Standard 135-2020 is indicated through the use of *italics* and deletions are indicated by ~~strike through~~. Where entirely new subclauses are proposed to be added, plain type is used throughout. Only this new and deleted text is open to comment at this time. All other material in this document is provided for context only and is not open for public review comment except as it relates to the proposed changes.

The use of placeholders such as XX, YY, ZZ, X1, X2, NN, x, n, ? etc. should not be interpreted as literal values of the final published version. These placeholders will be assigned actual numbers/letters only after final publication approval of the addendum.

135-2020ch-1 Changes to Clause 5 to address segmentation errors

Rationale

Addendum 135-2012bh part 1 contained updates to handle two cases described in the rationale. Case 2 is valid for behavior in the IDLE state; however, Case 1 has two flaws and the state machine description itself contains flaws.

The first flaw of Case 1 is in the function DuplicateInWindow described in clause 5.4.2.2 regarding the local variable receivedCount. In the scenario described in Case 1, the value of receivedCount is not actually the number of received message segments in the current Window and will not be zero as required in step (4) that was added for the scenario.

The second flaw of Case 1 is more important. The scenario described in Case 1 is flawed, because there is no efficient way for a receiving device to determine if retransmitted message segments are being retransmitted because of delays in message transport or because the last BACnet-SegmentACK-PDU it sent was lost. If the last BACnet-SegmentACK-PDU was lost, then the receiving device is required to send another BACnet-SegmentACK-PDU to allow the message sender to continue with the remainder of the message.

In addition to these two flaws related to Case 1, there is a flaw in the calling parameters where the function DuplicateInWindow is called. The first parameter in each case specifies the BACnet-SegmentACK-PDU rather than the message that is currently being processed. As a result, the function cannot be checking the received message segment if used as written.

[Change Clause 5.4.2.2]

5.4.2.2 Function DuplicateInWindow

The function "DuplicateInWindow" determines whether a ~~value~~ *message segment sequence-number, seqA, is within the range firstSeqNumber through lastSequenceNumber modulo 256, of successfully received message segments in the current incomplete Window. or if called at the start of a new Window and no new message segments have been received yet, it determines if the value seqA is within the range of the previous Window. This case does not require a segment acknowledge, because the message segments in the Window have not all been successfully received yet. Only the last message segment of a Window requires a segment acknowledge before the message is complete. Parameter initialSequenceNumber is the last sequence number within the previously completed Window. Parameter lastSequenceNumber is the sequence number of the last segment successfully received in order. All computations and comparisons are modulo 256 operations on unsigned eight-bit quantities.*

function DuplicateInWindow(seqA, ~~firstSeqNumber~~ initialSequenceNumber, lastSequenceNumber)

- (1) Set local variable receivedCount to lastSequenceNumber minus ~~firstSeqNumber~~ initialSequenceNumber, modulo 256 *which is the number of successfully received message segments in the current Window.*
- (2) If receivedCount is ~~greater than ActualWindowSize~~ zero, then *the first received segment for the current Window is out of order and no segments of the current Window have been successfully received,* return FALSE.
- (3) If seqA minus ~~firstSeqNumber~~ initialSequenceNumber, modulo 256, is less than or equal to receivedCount, then *the message segment is a duplicate within the current incomplete Window, return TRUE so that the message segment is ignored. This segment is located in a previous part of the current Window.*
- ~~(4) If receivedCount is zero and firstSeqNumber minus seqA, modulo 256, is less than or equal to ActualWindowSize, then return TRUE.~~
- ~~(5)~~(4) Else *the message segment is an out of order segment in the current Window not yet successfully received,* return FALSE.

Example (not normative): if ActualWindowSize is equal to 4, then

DuplicateInWindow(0, 0, 1) returns TRUE
DuplicateInWindow(1, 0, 1) returns TRUE
DuplicateInWindow(2, 0, 1) returns FALSE
DuplicateInWindow(3, 0, 1) returns FALSE

[Change Clause 5.4.4.4]

5.4.4.4 SEGMENTED_CONF

[...]

DuplicateSegmentReceived

If a BACnet-ComplexACK-PDU is received from the network layer whose 'segmented-message' parameter is TRUE and whose 'sequence-number' parameter is not equal to LastSequenceNumber plus 1, modulo 256, and DuplicateInWindow('sequence-number' parameter of the BACnet-~~Segment~~ComplexACK-PDU, InitialSequenceNumber+1 modulo 256, LastSequenceNumber) returns a value of TRUE and DuplicateCount is less than Ndup,

then discard the BACnet-ComplexACK-PDU segment; restart SegmentTimer; increment DuplicateCount, and enter the SEGMENTED_CONF state to receive the remaining segments.

TooManyDuplicateSegmentsReceived

If a BACnet-ComplexACK-PDU is received from the network layer whose 'segmented-message' parameter is TRUE and whose 'sequence-number' parameter is not equal to LastSequenceNumber plus 1, modulo 256, and DuplicateInWindow('sequence-number' parameter of the BACnet-~~Segment~~ComplexACK-PDU, InitialSequenceNumber+1 modulo 256, LastSequenceNumber) returns a value of TRUE and DuplicateCount is equal to Ndup,

then discard the BACnet-ComplexACK-PDU segment; issue an N-UNITDATA.request with 'data_expecting_reply' = FALSE to transmit a BACnet-SegmentACK-PDU with 'negative-ack' = TRUE, 'server' = FALSE, 'sequence-number' = LastSequenceNumber, and 'actual-window-size' = ActualWindowSize; restart SegmentTimer; set DuplicateCount to zero; and enter the SEGMENTED_CONF state to receive the remaining segments.

SegmentReceivedOutOfOrder

If a BACnet-ComplexACK-PDU that has sufficient security parameters is received from the network layer whose 'segmented-message' parameter is TRUE and whose 'sequence-number' parameter is not equal to LastSequenceNumber plus 1, modulo 256, and DuplicateInWindow('sequence-number' parameter of the BACnet-~~Segment~~ComplexACK-PDU, InitialSequenceNumber+1 modulo 256, LastSequenceNumber) returns a value of FALSE,

then discard the BACnet-ComplexACK-PDU segment; issue an N-UNITDATA.request with 'data_expecting_reply' = FALSE to transmit a BACnet-SegmentACK-PDU with 'negative-ack' = TRUE, 'server' = FALSE, 'sequence-number' = LastSequenceNumber, and 'actual-window-size' = ActualWindowSize; restart SegmentTimer; set InitialSequenceNumber = LastSequenceNumber; set DuplicateCount to zero; and enter the SEGMENTED_CONF state to receive the remaining segments.

[Change Clause 5.4.5.2]

5.4.5.2 SEGMENTED_REQUEST

[...]

DuplicateSegmentReceived

If a BACnet-Confirmed-Request-PDU is received from the network layer whose 'segmented-message' parameter is TRUE and whose 'sequence-number' parameter is not equal to LastSequenceNumber plus 1, modulo 256, and DuplicateInWindow('sequence-number' parameter of the BACnet-~~SegmentACK~~Confirmed-Request-PDU, InitialSequenceNumber+1 modulo 256, LastSequenceNumber) returns a value of TRUE and DuplicateCount is less than Ndup,

then discard the BACnet-Confirmed-Request-PDU segment; restart SegmentTimer; increment DuplicateCount; and enter the SEGMENTED_REQUEST state to receive the remaining segments.

TooManyDuplicateSegmentsReceived

If a BACnet-Confirmed-Request-PDU is received from the network layer whose 'segmented-message' parameter is TRUE and whose 'sequence-number' parameter is not equal to LastSequenceNumber plus 1, modulo 256, and DuplicateInWindow('sequence-number' parameter of the BACnet-~~SegmentACK~~Confirmed-Request-PDU, InitialSequenceNumber+1 modulo 256, LastSequenceNumber) returns a value of TRUE and DuplicateCount is equal to Ndup,

then discard the BACnet-Confirmed-Request-PDU segment; issue an N-UNITDATA.request with 'data_expecting_reply' = FALSE to transmit a BACnet-SegmentACK-PDU with 'negative-ack' = TRUE, 'server' = TRUE, 'sequence-number' = LastSequenceNumber, and 'actual-window-size' = ActualWindowSize; restart SegmentTimer; set InitialSequenceNumber = LastSequenceNumber; set DuplicateCount to zero; and enter the SEGMENTED_REQUEST state to receive the remaining segments.

SegmentReceivedOutOfOrder

If a BACnet-Confirmed-Request-PDU that is secured with the same settings as the original PDU is received from the network layer whose 'segmented-message' parameter is TRUE and whose 'sequence-number' parameter is not equal to LastSequenceNumber plus 1, modulo 256, and DuplicateInWindow('sequence-number' parameter of the BACnet-SegmentACK-Confirmed-Request-PDU, InitialSequenceNumber+1 modulo 256, LastSequenceNumber) returns a value of FALSE,

then discard the BACnet-Confirmed-Request-PDU segment; issue an N-UNITDATA.request with 'data_expecting_reply' = FALSE to transmit a BACnet-SegmentACK-PDU with 'negative-ack' = TRUE, 'server' = TRUE, 'sequence-number' = LastSequenceNumber, and 'actual-window-size' = ActualWindowSize; restart SegmentTimer; set InitialSequenceNumber = LastSequenceNumber; set DuplicateCount to zero; and enter the SEGMENTED_REQUEST state to receive the remaining segments.

[Add a new entry to History of Revisions, p. 1364]

(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

...
1	26	Addendum <i>ch</i> to ANSI/ASHRAE Standard 135-2020 Approved by ASHRAE on June 28, 2024; and by the American National Standards Institute on June 28, 2024. 1. Changes to Clause 5 to correct segmentation errors.

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