IEEE Std 802.3™-2008/Cor 1-2009
(Corrigendum to
IEEE Std 802.3-2008)

IEEE Standard for 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

Corrigendum 1: Timing Considerations for PAUSE Operation

LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 9 December 2009
IEEE-SA Standards Board

Abstract: The correction to the PAUSE reaction timing delay for the 10GBASE-T port type is addressed in this corrigendum to IEEE Std 802.3-2008.

Keywords: 802.3, 802.3bb, 802.3-2008/Cor-1, PAUSE

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Introduction

This introduction is not part of IEEE Std 802.3-2008/Cor 1-2009, IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements, Part 3: CSMA/CD Access Method and Physical Layer Specifications, Corrigendum 1: Timing Considerations for PAUSE Operation.

IEEE Std 802.3™ was first published in 1985. Since the initial publication, many projects have added functionality or provided maintenance updates to the specifications and text included in the standard. Each IEEE 802.3 project/amendment is identified with a suffix (e.g., IEEE Std 802.3av™-2009).

The Media Access Control (MAC) protocol specified in IEEE Std 802.3 is Carrier Sense Multiple Access with Collision Detection (CSMA/CD). This MAC protocol was included in the experimental Ethernet developed at Xerox Palo Alto Research Center. While the experimental Ethernet had a 2.94 Mb/s data rate, IEEE Std 802.3-1985 specified operation at 10 Mb/s. Since 1985 new media options, new speeds of operation, and new capabilities have been added to IEEE Std 802.3.

Some of the major additions to IEEE Std 802.3 are identified in the marketplace with their project number. This is most common for projects adding higher speeds of operation or new protocols. For example, IEEE Std 802.3u™ added 100 Mb/s operation (also called Fast Ethernet), IEEE Std 802.3x™ specified full duplex operation and a flow control protocol, IEEE Std 802.3z™ added 1000 Mb/s operation (also called Gigabit Ethernet), IEEE Std 802.3ae™ added 10 Gb/s operation (also called 10 Gigabit Ethernet) and IEEE Std 802.3ah™ specified access network Ethernet (also called Ethernet in the First Mile). These major additions are all now included in, and are superseded by, IEEE Std 802.3-2008 and are not maintained as separate documents.

At the date of IEEE Std 802.3-2008/Cor 1-2009 publication, IEEE Std 802.3 comprises the following documents:

IEEE Std 802.3-2008

Section One—Includes Clause 1 through Clause 20 and Annex A through Annex H and Annex 4A. Section One includes the specifications for 10 Mb/s operation and the MAC, frame formats and service interfaces used for all speeds of operation.

Section Two—Includes Clause 21 through Clause 33 and Annex 22A through Annex 33E. Section Two includes management attributes for multiple protocols and speed of operation as well as specifications for providing power over twisted pair cabling for multiple operational speeds. It also includes general information on 100 Mb/s operation as well as most of the 100 Mb/s Physical Layer specifications.

Section Three—Includes Clause 34 through Clause 43 and Annex 36A through Annex 43C. Section Three includes general information on 1000 Mb/s operation as well as most of the 1000 Mb/s Physical Layer specifications.

Section Four—Includes Clause 44 through Clause 55 and Annex 44A through Annex 55B. Section Four includes general information on 10 Gb/s operation as well as most of the 10 Gb/s Physical Layer specifications.

Section Five—Includes Clause 56 through Clause 74 and Annex 57A through Annex 74A. Clause 56 through Clause 67 and associated annexes specify subscriber access and other Physical Layers and sublayers for operation from 512 kb/s to 1000 Mb/s, and defines services and protocol elements that enable the exchange of IEEE Std 802.3 format frames between stations in a subscriber access network. Clause 68 specifies a 10 Gb/s Physical Layer specification. Clause 69 through Clause 74 and

associated annexes specify Ethernet operation over electrical backplanes at speeds of 1000 Mb/s and 10 Gb/s.

IEEE Std 802.3av-2009

This amendment includes changes to IEEE Std 802.3-2008 and adds Clause 75 through Clause 77 and Annex 75A through Annex 76A. This amendment adds new Physical Layers for 10 Gb/s operation on point-to-multipoint passive optical networks.

IEEE Std 802.3bc™-2009

This amendment includes changes to IEEE Std 802.3-2008 and adds Clause 79. This amendment moves the Ethernet Organizationally Specific Type, Length, Value (TLV) information elements that were specified in IEEE Std 802.1AB to IEEE Std 802.3.

IEEE Std 802.3at™-2009

This amendment includes changes to IEEE Std 802.3-2008. This amendment augments the capabilities of IEEE Std 802.3-2008 with higher power levels and improved power management information.

IEEE Std 802.3-2008/Cor 1–2009

This corrigendum corrects the PAUSE reaction timing delay value for the 10GBASE-T PHY type.

IEEE Std 802.3 will continue to evolve. New Ethernet capabilities are anticipated to be added within the next few years as amendments to this standard.

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Annex 31B

31B.3.7 Timing considerations for PAUSE operation

Change subclause 31B.3.7 as follows:

In a full duplex mode DTE, it is possible to receive PAUSE frames asynchronously with respect to the transmission of MAC frames. For effective flow control, it is necessary to place an upper bound on the length of time that a DTE can transmit data frames after receiving a valid PAUSE frame with a non-zero pause_time request_operand.

Reception of a PAUSE frame shall not affect the transmission of a MAC frame that has been submitted by the MAC Control sublayer to the underlying MAC (i.e., the MAC:MA_DATA.request service primitive is synchronous, and is never interrupted).

At operating speeds of 100 Mb/s or less, a station that implements an exposed MII, shall not begin to transmit a (new) frame (assertion of TX_EN at the MII, see 22.2.2.3) more than pause_quantum bit times after the reception of a valid PAUSE frame (de-assertion of RX_DV at the MII, see 22.2.2.6) that contains a non-zero value of pause_time. Stations that do not implement an exposed MII, shall measure this time at the MDI, with the timing specification increased to (pause_quantum + 64) bit times.

At an operating speed of 1000 Mb/s, a station shall not begin to transmit a (new) frame more than two pause_quantum bit times after the reception of a valid PAUSE frame that contains a non-zero value of pause_time, as measured at the MDI.

~~At operating speeds of 10 Gb/s and above, a station shall not begin to transmit a (new) frame more than sixty pause_quantum bit times after the reception of a valid PAUSE frame that contains a non-zero value of pause_time, as measured at the MDI.~~

At operating speeds of 10 Gb/s, a station with a 10GBASE-T PHY shall not begin to transmit a (new) frame more than 74 pause_quantum bit times after the reception of a valid PAUSE frame that contains a non-zero value of pause_time, as measured at the MDI. A station using any other 10 Gb/s PHY shall not begin to transmit a (new) frame more than 60 pause_quantum bit times after the reception of a valid PAUSE frame that contains a non-zero value of pause_time, as measured at the MDI.

In addition to DTE and MAC Control delays, system designers should take into account the delay of the link segment when designing devices that implement the PAUSE operation.

31B.4.6 PAUSE command MAC timing considerations

Change Table in 31B.4.6 as follows:

Item	Feature	Subclause	Value/Comment	Status	Support
TIM1	Effect of PAUSE frame on a frame already submitted to underlying MAC	31B.3.7	Has no effect	M	Yes [ ]
	Delay from receiving valid PAUSE command, with non-zero value for pause_time, to cessation of transmission	31B.3.7	Measured as described		
TIM2	Measurement point for station with MII		Delay at MII ≤ pause_quantum bits	MIIa: M	N/A [ ] M: Yes [ ]
TIM3	Measurement point for station without MII at 100 Mb/s or less		Delay at MDI ≤ (pause_quantum + 64) bits	MIIb: M	N/A [ ] M: Yes [ ]
TIM4	Measurement point for station at 1000 Mb/s		Delay at MDI ≤ (2 × pause_quantum) bits	MIIc: M	N/A [ ] M: Yes [ ]
TIM5	Measurement point for station at 10 Gb/s ~~or greater~~ with PHY types other than 10GBASE-T		Delay at MDI ≤ (60 × pause_quantum) bits	MIId: M	N/A [ ] M: Yes [ ]
TIM6	Measurement point for station at 10 Gb/s with PHY types of 10GBASE-T		Delay at MDI ≤ (74 × pause_quantum) bits	MIIe: M	N/A [ ] M: Yes [ ]