

---

---

**Information technology —  
Telecommunications and information  
exchange between systems — Local  
and metropolitan area networks —  
Specific requirements —**

**Part 3:  
Standard for Ethernet**

**(standards.iteh.ai)**

**AMENDMENT 4: Physical layer  
specifications and management**

**parameters for 1 Gb/s operation over a  
single twisted-pair copper cable**

ISO/IEC/IEEE 8802-3:2017/Amd 4:2017  
<https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-bcfd-aacd4f50a891/iso-iec-8802-3-2017-amd-4-2017>

*Technologies de l'information — Télécommunications et échange  
d'information entre systèmes — Réseaux locaux et métropolitains —  
Prescriptions spécifiques —*

*Partie 3: Norme pour Ethernet*

*AMENDEMENT 4: Spécifications des couches physiques et paramètres  
de gestion pour l'exploitation des interfaces à 1 Go/s sur un seul câble  
de cuivre à paires torsadées*



## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/IEC/IEEE 8802-3:2017/Amd 4:2017](https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017)  
<https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017>



### **COPYRIGHT PROTECTED DOCUMENT**

© IEEE 2016

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO or IEEE at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

Institute of Electrical and Electronics Engineers, Inc  
3 Park Avenue, New York  
NY 10016-5997, USA

stds.ipr@ieee.org  
www.ieee.org

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

The main task of ISO/IEC JTC 1 is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is called to the possibility that implementation of this standard may require the use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. ISO/IEEE is not responsible for identifying essential patents or patent claims for which a license may be required, for conducting inquiries into the legal validity or scope of patents or patent claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance or a Patent Statement and Licensing Declaration Form, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from ISO or the IEEE Standards Association.

ISO/IEC/IEEE 8802-3:2017/Amd.4 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE STD 802.3bp-2016). It was adopted by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*, in parallel with its approval by the ISO/IEC national bodies, under the “fast-track procedure” defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE. IEEE is responsible for the maintenance of this document with participation and input from ISO/IEC national bodies.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO/IEC/IEEE 8802-3:2017/Amd 4:2017](https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017)

<https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017>

**IEEE Std 802.3bp™-2016**

(Amendment to  
IEEE Std 802.3™-2015  
as amended by  
IEEE Std 802.3bw™-2015,  
IEEE Std 802.3by™-2016, and  
IEEE Std 802.3bq™-2016)

# IEEE Standard for Ethernet

## Amendment 4: Physical Layer Specifications and Management Parameters for 1 Gb/s Operation over a Single Twisted-Pair Copper Cable

Sponsor

LAN/MAN Standards Committee  
of the  
IEEE Computer Society

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO/IEC/IEEE 8802-3:2017/Amd 4:2017](https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017)

<https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017>

Approved 30 June 2016

IEEE-SA Standards Board

**Abstract:** This amendment to IEEE Std 802.3-2015 adds point-to-point 1 Gb/s Physical Layer (PHY) specifications and management parameters for operation on a single twisted-pair copper cable in an automotive application.

**Keywords:** 1000BASE-T1, Ethernet, IEEE 802<sup>®</sup>, IEEE 802.3<sup>™</sup>, IEEE 802.3bp<sup>™</sup>

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/IEC/IEEE 8802-3:2017/Amd 4:2017](https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017)

<https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017>

---

The Institute of Electrical and Electronics Engineers, Inc.  
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2016 by The Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved. Published 9 September 2016. Printed in the United States of America.

IEEE and 802 are registered trademarks in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

Print: ISBN 978-1-5044-2288-8     STD21091  
PDF:    ISBN 978-1-5044-2289-5     STDPD21091

*IEEE prohibits discrimination, harassment, and bullying.*

*For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.*

*No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.*

## Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notice” or “Important Notices and Disclaimers Concerning IEEE Standards Documents.”

## Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

## Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

## Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

## Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board  
445 Hoes Lane  
Piscataway, NJ 08854 USA

## Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

## Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.



## Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

## Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE-SA Website at <http://ieeexplore.ieee.org/Xplore/home.jsp> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

ISO/IEC/IEEE 8802-3:2017/Amd.4:2017

<https://standards.ieeh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017>

## Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

## Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at <http://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

## Participants

The following individuals were officers and members of the IEEE 802.3 Working Group at the beginning of the IEEE P802.3bp Working Group ballot. Individuals may have not voted, voted for approval, disapproval, or abstained on this standard.

**David J. Law**, *IEEE 802.3 Working Group Chair*  
**Adam Healey**, *IEEE 802.3 Working Group Vice-Chair*  
**Peter Anslow**, *IEEE 802.3 Working Group Secretary*  
**Steven B. Carlson**, *IEEE 802.3 Working Group Executive Secretary*  
**Valerie Maguire**, *IEEE 802.3 Working Group Treasurer*

**Steven B. Carlson**, *IEEE P802.3bp 1000BASE-T1 Task Force Chair*  
**Marek Hajduczenia**, *IEEE P802.3bp 1000BASE-T1 Task Force Editor-in-Chief*  
**Curtis Donahue**, *IEEE P802.3bp 1000BASE-T1 Task Force PICS Editor*

John Abbott	Christopher R. Cole	Thomas Hogenmueller
David Abramson	Keith Conroy	Brian Holden
Shadi Abughazaleh	Eugene Dai	Rita Horner
Faisal Ahmad	Shaoan Dai	Bernd Hormmeyer
Dale Amason	John D'Ambrosia	Victor Hou
J. Michael Andrewartha	Mike Darling	Liang-wei Huang
Oleksandr Babenko	Yair Darshan	Yasuhiro Hyakutake
Kwang-Hyun Baek	Piers Dawe	Scott Irwin
Amrik Bains	Fred Dawson	Kazuhiko Ishibe
Koussalya Balasubramanian	Ian Dedic	Hideki Isono
Thananya Baldwin	Chris Diminico	Tom Issenhuth
Denis Beaudoin	Thuyen Dinh	Kenneth Jackson
Christian Beia	Dan Dove	Andrew Jimenez
Yakov Belopolsky	Mike Dudek	Chad Jones
Michael Bennett	Nick Duer	Peter Jones
Vipul Bhatt	David Dwelley	Antony Joseph
William Bliss	Frank Effenberger	Manabu Kagami
Brad Booth	Hesham Elbakoury	Upen Kareti
Martin Bouda	David Estes	Keisuke Kawahara
David Brandt	John Ewen	Yasuaki Kawatsu
Ralf-Peter Braun	Josef Faller	Michael Kelsen
Theodore Brillhart	Shahar Feldman	Yongbum Kim
Paul Brooks	German Feyh	Jonathan King
David Brown	Alan Flatman	Scott Kipp
Matthew Brown	Howard Frazier	Michael Klempa
Thomas Brown	Richard Frosch	Curtis Knittle
Phillip Brownlee	Andrew Gardner	Shigeru Kobayashi
Juan-Carlos Calderon	Mike Gardner	Keisuke Kojima
J. Martin Carroll	Ali Ghiasi	Paul Kolesar
Clark Carty	Joel Goergen	Tom Kolze
Mandeep Chadha	Zhigang Gong	Glen Kramer
David Chalupsky	Steven Gorshe	Hans Lackner
Jacky Chang	James Graba	Brett Lane
Xin Chang	Robert Grow	Jeff Lapak
David Chen	Mark Gustlin	Efstathios Larios
Wheling Cheng	Bernie Hammond	Mark Laubach
Ahmad Chini	Takehiro Hayashi	Greg Le Cheminant
Golam Choudhury	David Hess	Arthur Lee
Keng Hua Chuang	Yasuo Hidaka	David Lewis
Peter Cibula	Riu Hirai	Jon Lewis

Lei Li	John Petrilla	Kiyoto Takahata
Mike Peng Li	Rick Pimpinella	Alexander Tan
Shaohua Li	Neven Pischl	Toshiki Tanaka
Thomas Lichtenegger	Rainer Poehmerer	Mehmet Tazebay
Ru Jian Lin	William Powell	Brian Teipen
Robert Lingle	Richard Prodan	Geoffrey Thompson
James Liu	Rick Rabinovich	Alan Tipper
Zhenyu Liu	Saifur Rahman	Pirooz Tooyserkani
William Lo	Adee Ran	Nathan Tracy
Miklos Lukacs	Ram Rao	David Tremblay
Kent Lusted	Alon Regev	Albert Tretter
Jeffery Maki	Duane Remein	Stephen Trowbridge
James Malkemus	Victor Renteria	Wen-Cheng Tseng
Yonatan Malkiman	Michael Ressler	Yoshihiro Tsukamoto
Edwin Mallette	Poldi (Pavlick) Rimboim	Mike Tu
Arthur Marris	Martin Rossbach	Alan Ugolini
Chris Mash	Christopher Roth	Ed Ulrichs
Kirsten Matheus	Salvatore Rotolo	Sterling A. Vaden
Erdem Matoglu	Hisaya Sakamoto	Stefano Valle
Laurence Matola	Vineet Salunke	Paul Vanderlaan
Brett McClellan	Sam Sambasivan	Robert Wagner
Thomas Mcdermott	Yasuo Sasaki	Robert Wang
John McDonough	Fred Schindler	Roy Wang
Richard Mei	Stefan Schneele	Tongtong Wang
Richard Mellitz	Peter Scruton	Xiaofeng Wang
Bryan Moffitt	Alexander Seiger	Xinyuan Wang
Leo Montreuil	Naoshi Serizawa	Zhong Feng Wang
Paul Mooney	Megha Shanbhag	Markus Weber
Andy Moorwood	Masood Shariff	Brian Welch
Thomas Mueller	Stephen Shellhammer	Yang Wen
Ron Muir	Bazhong Shen	Matthias Wendt
Dale Murray	Mizuki Shirao	Oded Wertheim
Henry Muyschondt	Kapil Shrikhande	Martin White
Edward Nakamoto	Jeff Slavick	Natalie Wienckowski
Gary Nicholl	Scott Sommers	Ludwig Winkel
Paul Nikolich	Yoshiaki Sone	Peter Wu
Kevin Noll	Xiaolu Song	Yu Xu
Ronald Nordin	Tom Souvignier	Lennart Yseboodt
Mark Nowell	Bryan Sparrowhawk	Ting-Fa Yu
David Ofelt	Edward Sprague	Liquan Yuan
Ichiro Ogura	Peter Stassar	Hayato Yuki
Tom Palkert	Leonard Stencil	Garold Yurko
Hui Pan	Robert Stone	Andrew Zambell
Sujan Pandey	Steve Swanson	Jin Zhang
Sesha Panguluri	Andre Szczepanek	Yan Zhuang
Carlos Pardo	William Szeto	George Zimmerman
Moon Park	Bharat Tailor	Helge Zinner
Petar Pepeljugin	Akio Tajima	Pavel Zivny
Gerald Pepper	Takayuki Tajima	Gaoling Zou
Ruben Perez De Aranda Alonso	Tomoo Takahara	
Michael Peters	Satoshi Takahashi	

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Shadi Abughazaleh	Adam Healey	Arumugam Paventhan
Thomas Alexander	Marco Hernandez	Ruben Perez De Aranda Alonso
Richard Alfvin	David Hess	Michael Peters
Dale Amason	Guido Hiertz	Adee Ran
Peter Anslow	Werner Hoelzl	Alon Regev
Butch Anton	Rita Horner	Duane Remein
Stefan Aust	Tetsushi Ikegami	Maximilian Riegel
Saman Behtash	Noriyuki Ikeuchi	Robert Robinson
Jacob Ben Ary	Sergiu Iordanescu	Benjamin Rolfe
Michael Bennett	Atsushi Ito	Nicola Scantamburlo
Gennaro Boggia	Michael Johas Teener	Frank Schewe
Christian Boiger	Vincent Jones	Dieter Schicketanz
Ralf-Peter Braun	Adri Jovin	Stefan Schneele
Nancy Bravin	Shinkyoo Kaku	Shusaku Shimada
Theodore Brillhart	Piotr Karocki	Kapil Shrikhande
William Bush	John Kay	Ju-Hyung Son
Jairo Bustos Heredia	Stuart Kerry	Thomas Starai
William Byrd	Yongbum Kim	Peter Stassar
Steven B. Carlson	Scott Kipp	Eugene Stoudenmire
Juan Carreon	Bruce Kraemer	Walter Struppler
Mandeep Chadha	Mark Laubach	Mitsutoshi Sugawara
Minho Cheong	David J. Law	Patricia Thaler
Ahmad Chini	David Lewis	David Thompson
Keng Hua Chuang	Jon Lewis	Geoffrey Thompson
Peter Cibula	Arthur H. Light	Michael Thompson
Charles Cook	William Lo	Sterling A. Vaden
Rodney Cummings	Michael Lynch	Dmitri Varsanofiev
Shaoan Dai	Elvis Maculuba	Prabodh Varshney
John D'Ambrosia	Valerie Maguire	George Vlantis
Christopher Diminico	Jeffery Maki	Stephen Webb
Daniel Dove	Arthur Marris	Hung-Yu Wei
Sourav Dutta	Michael Maytum	Natalie Wienckowski
Liu Fangfang	Brett McClellan	Andreas Wolf
German Feyh	Richard Mellitz	Peter Wu
Matthias Fritsche	Bryan Moffitt	Oren Yuen
Yukihiro Fujimoto	Charles Moorwood	Andrew Zambell
James Graba	Henry Muyschondt	Zhen Zhou
Randall Groves	Michael Newman	George Zimmerman
Robert Grow	Nick S. A. Nikjoo	
Marek Hajduczenia	Satoshi Obara	

When the IEEE-SA Standards Board approved this standard on 30 June 2016, it had the following membership:

**Jean-Philippe Faure**, *Chair*  
**Ted Burse**, *Vice Chair*  
**John D. Kulick**, *Past Chair*  
**Konstantinos Karachalios**, *Secretary*

Chuck Adams  
Masayuki Ariyoshi  
Stephen Dukes  
Jianbin Fan  
Ronald W. Hotchkiss  
J. Travis Griffith

Gary Hoffman  
Michael Janezic  
Joseph L. Koepfinger\*  
Hung Ling  
Kevin Lu  
Gary Robinson  
Annette D. Reilly

Mehmet Ulema  
Yingli Wen  
Howard Wolfman  
Don Wright  
Yu Yuan  
Daidi Zhong

\*Member Emeritus

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/IEC/IEEE 8802-3:2017/Amd 4:2017](https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017)  
<https://standards.iteh.ai/catalog/standards/sist/b4fc9bc3-959e-4154-befd-aacd4f50a895/iso-iec-ieee-8802-3-2017-amd-4-2017>

## Introduction

This introduction is not part of IEEE Std 802.3bp™-2016, IEEE Standard for Ethernet—Amendment 4: Physical Layer Specifications and Management Parameters for 1 Gb/s Operation over a Single Twisted-Pair Copper Cable.

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 802.3ba™-2010).

The half-duplex Media Access Control (MAC) protocol specified in IEEE Std 802.3-1985 is Carrier Sense Multiple Access with Collision Detection (CSMA/CD). This MAC protocol was key to the experimental Ethernet developed at Xerox Palo Alto Research Center, which had a 2.94 Mb/s data rate. Ethernet at 10 Mb/s was jointly released as a public specification by Digital Equipment Corporation (DEC), Intel, and Xerox in 1980. Ethernet at 10 Mb/s was approved as an IEEE standard by the IEEE Standards Board in 1983 and subsequently published in 1985 as IEEE Std 802.3-1985. Since 1985, new media options, new speeds of operation, and new capabilities have been added to IEEE Std 802.3. A full duplex MAC protocol was added in 1997.

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 802.3z™ added 1000 Mb/s operation (also called Gigabit Ethernet), IEEE Std 802.3ae™ added 10 Gb/s operation (also called 10 Gigabit Ethernet), IEEE Std 802.3ah™ specified access network Ethernet (also called Ethernet in the First Mile), and IEEE Std 802.3ba added 40 Gb/s operation (also called 40 Gigabit Ethernet) and 100 Gb/s operation (also called 100 Gigabit Ethernet). These major additions are all now included in and are superseded by IEEE Std 802.3-2015 and are not maintained as separate documents.

At the date of IEEE Std 802.3bp-2016 publication, IEEE Std 802.3 is composed of the following documents:

### IEEE Std 802.3-2015

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 77 and Annex 57A through Annex 76A. Clause 56 through Clause 67 and Clause 75 through Clause 77, as well as associated annexes, specify subscriber access and other Physical Layers and sublayers for operation from 512 kb/s to 10 Gb/s, and defines services and protocol elements that enable the exchange of IEEE 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.

Section Six—Includes Clause 78 through Clause 95 and Annex 83A through Annex 93C. Clause 78 specifies Energy-Efficient Ethernet. Clause 79 specifies IEEE 802.3 Organizationally Specific Link Layer Discovery Protocol (LLDP) type, length, and value (TLV) information elements. Clause 80 through Clause 95 and associated annexes include general information on 40 Gb/s and 100 Gb/s operation as well the 40 Gb/s and 100 Gb/s Physical Layer specifications. Clause 90 specifies Ethernet support for time synchronization protocols.

#### IEEE Std 802.3bw-2015

Amendment 1—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 96. This amendment adds 100 Mb/s Physical Layer (PHY) specifications and management parameters for operation on a single balanced twisted-pair copper cable.

#### IEEE Std 802.3by-2016

Amendment 2—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 105 through Clause 112, Annex 109A, Annex 109B, Annex 109C, Annex 110A, Annex 110B, and Annex 110C. This amendment adds MAC parameters, Physical Layers, and management parameters for the transfer of IEEE 802.3 format frames at 25 Gb/s.

#### IEEE Std 802.3bq-2016

Amendment 3—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 113 and Annex 113A. This amendment adds new Physical Layers for 25 Gb/s and 40 Gb/s operation over balanced twisted-pair structured cabling systems.

#### IEEE Std 802.3bp-2016

Amendment 4—This amendment includes changes to IEEE Std 802.3-2015 and adds Clause 97 and Clause 98. This amendment adds point-to-point 1 Gb/s Physical Layer (PHY) specifications and management parameters for operation on a single balanced twisted-pair copper cable in automotive and other applications not utilizing the structured wiring plant.

A companion document IEEE Std 802.3.1 describes Ethernet management information base (MIB) modules for use with the Simple Network Management Protocol (SNMP). IEEE Std 802.3.1 is updated to add management capability for enhancements to IEEE Std 802.3 after approval of the enhancements.

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.