IEEE P1904.2™/D0.0
Draft Standard for Management Channel for Customer-Premises Equipment Connected to Ethernet-based Subscriber Access Networks

Sponsor

**Standards Development Board**of the **IEEE Communications Society**

Approved <XX MONTH 20XX>

**IEEE-SA Standards Board**

Copyright © 2014 by the Institute of Electrical and Electronics Engineers, Inc.

Three Park Avenue

New York, New York 10016-5997, USA

All rights reserved.

This document is an unapproved draft of a proposed IEEE Standard. As such, this document is subject to change. USE AT YOUR OWN RISK! Because this is an unapproved draft, this document must not be utilized for any conformance/compliance purposes. Permission is hereby granted for IEEE Standards Committee participants to reproduce this document for purposes of international standardization consideration. Prior to adoption of this document, in whole or in part, by another standards development organization, permission must first be obtained from the IEEE Standards Activities Department (stds.ipr@ieee.org). Other entities seeking permission to reproduce this document, in whole or in part, must also obtain permission from the IEEE Standards Activities Department.

IEEE Standards Activities Department

445 Hoes Lane

Piscataway, NJ 08854, USA

Abstract: This standard TBD

Keywords: TBD[[1]](#footnote-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 or the soundness of any judgments contained in its standards.

Use of an IEEE Standard is wholly voluntary. The IEEE disclaims liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this, or any other IEEE Standard document.

The IEEE does not warrant or represent the accuracy or content of the material contained herein, and expressly disclaims any express or implied warranty, including any implied warranty of merchantability or fitness for a specific purpose, or that the use of the material contained herein is free from patent infringement. IEEE Standards documents are supplied “**AS IS**.”

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. Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation, or every ten years for stabilization. When a document is more than five years old and has not been reaffirmed, or more than ten years old and has not been stabilized, 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 publishing and making this document available, the IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Nor is the IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other IEEE Standards document, should rely upon his or her 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.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received 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 interpretation requests except in those cases where the matter has previously received formal consideration. A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal interpretation of the 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, explanation, or interpretation of the IEEE.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Recommendations to change the status of a stabilized standard should include a rationale as to why a revision or withdrawal is required. Comments and recommendations on standards, and requests for interpretations should be addressed to:

Secretary, IEEE-SA Standards Board

445 Hoes Lane

Piscataway, NJ 08854

USA

Authorization to photocopy portions of any individual standard for internal or personal use is granted by The Institute of Electrical and Electronics Engineers, Inc., provided that the appropriate fee is paid to Copyright Clearance Center. To arrange for payment of licensing fee, 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.

Introduction

This introduction is not part of IEEE P1904.2/D0.0

This standard TBD …

Notice to users

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

This document is copyrighted by the IEEE. It is made available 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 this document available for use and adoption by public authorities and private users, the IEEE does not waive any rights in copyright to this document.

Updating of IEEE 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. 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://standards.ieee.org/index.html> or contact the IEEE at the address listed previously. For more information about the IEEE Standards Association or the IEEE standards development process, visit the IEEE-SA Website at <http://standards.ieee.org/index.html>.

Errata

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

Interpretations

Current interpretations can be accessed at the following URL: <http://standards.ieee.org/findstds/interps/index.html>.

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 <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 nondiscriminatory. 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

At the time this draft standard was submitted to the IEEE-SA Standards Board for approval, the SIEPON Working Group had the following membership:

**Glen Kramer**, *Working Group Chair*

**Ken-Ichi Suzuki**, *Working Group* *Vice Chair*

**Zhou Zhen***, Executive Secretary*

**Marek Hajduczenia***,* *Chief Editor*

**Lior Khermosh**, *Service Configuration and Provisioning* *Task Force Chair*

**Alan M. Brown**, *Service Configuration and Provisioning* *Task Force Editor*

**Curtis Knittle**, *Performance Requirements and Service Quality* *Task Force Chair*

**Jeff Stribling**, *Performance Requirements and Service Quality* *Task Force Editor*

**Seiji Kozaki**, *Service Survivability* *Task Force Chair*

**Jeff Stribling**, *Service Survivability* *Task Force Editor*

**James Chen**, *System/Device Management* *Task Force Chair*

**Fumio Daido**, *System/Device Management* *Task Force Editor*

**Toshihiko Kusano**, *Conformance Test Procedures* *Task Force Chair*

**Marek Hajduczenia**, *Conformance Test Procedures* *Task Force Editor for Package A*

**Motoyuki Takizawa,** *Conformance Test Procedures* *Task Force Editor for Package B*

**Liu Qian**, *Conformance Test Procedures* *Task Force Editor for Package C*

The following individuals submitted technical contributions or commented on the draft standard at various stages of the project development.

Name

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

***(to be supplied by IEEE)***

Balloter1

Balloter2

Balloter3

Balloter4

Balloter5

Balloter6

Balloter7

Balloter8

Balloter9

When the IEEE-SA Standards Board approved this standard on <XX MONTH 20XX>, it had the following membership:

***(to be supplied by IEEE)***

**<Name>,** *Chair*

**<Name>,** *Vice Chair*

**<Name>,** *Past President*

**<Name>,** *Secretary*

SBMember1

SBMember2

SBMember3

SBMember4

SBMember5

SBMember6

SBMember7

SBMember8

SBMember9

\*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

<Name>, *NRC Representative*

<Name>, *DOE Representative*

<Name>, *NIST Representative*

<Name>

*IEEE Standards Program Manager, Document Development*

<Name>

*IEEE Standards Program Manager, Technical Program Development*

**Contents**

[1 Overview 11](#_Toc391467477)

[1.1 Scope 11](#_Toc391467478)

[1.2 Purpose 11](#_Toc391467479)

[1.3 Coverage 11](#_Toc391467480)

[1.4 Overview of clauses 11](#_Toc391467481)

[2 Normative references 12](#_Toc391467482)

[3 Definitions, acronyms, and abbreviations 13](#_Toc391467483)

[3.1 Definitions 13](#_Toc391467484)

[3.2 Acronyms and abbreviations 13](#_Toc391467485)

[3.3 Special Terms 13](#_Toc391467486)

[3.4 Notation for state diagrams 13](#_Toc391467487)

[3.4.1 General conventions 13](#_Toc391467488)

[3.4.1.1 Representation of states 14](#_Toc391467489)

[3.4.1.2 Transitions 14](#_Toc391467490)

[3.4.2 State diagrams and accompanying text 15](#_Toc391467491)

[3.4.3 Actions inside state blocks 15](#_Toc391467492)

[3.4.4 State diagram variables 15](#_Toc391467493)

[3.4.5 Operators 15](#_Toc391467494)

[3.4.6 Timers 16](#_Toc391467495)

[3.4.7 Hexadecimal notation 16](#_Toc391467496)

[3.4.8 Binary notation 16](#_Toc391467497)

[3.5 Notation for PICS 16](#_Toc391467498)

[3.5.1 Abbreviations and special symbols 17](#_Toc391467499)

[3.5.2 Instructions for completing the PICS proforma 17](#_Toc391467500)

[3.5.3 Additional information 18](#_Toc391467501)

[3.5.4 Exception information 18](#_Toc391467502)

[3.5.5 Conditional items 18](#_Toc391467503)

[4 Universal Management Tunnel (UMT) Architecture 20](#_Toc391467504)

[4.1 UMT Architecture 20](#_Toc391467505)

[4.2 UMT Interfaces 20](#_Toc391467506)

[4.3 UMT Device Functions 20](#_Toc391467507)

[5 UMT Discovery Protocol (UMDP) 21](#_Toc391467508)

[5.1 Definition of UMDP Data Unit 21](#_Toc391467509)

[5.2 UMDP Operation 21](#_Toc391467510)

[5.3 21](#_Toc391467511)

[6 Examples: Header 1 23](#_Toc391467512)

[6.1 Examples: Header 2 23](#_Toc391467513)

[6.1.1 Examples: Header 3 23](#_Toc391467514)

[6.1.1.1 Examples: Header 4 23](#_Toc391467515)

[6.1.1.1.1 Examples: Header 5 23](#_Toc391467516)

# Overview

## Scope

1. This standard TBD ...

## Purpose

1. The purpose of this standard is to TBD …

## Coverage

1. This specification provides TBD ...

## Overview of clauses

This subclause provides an overview of the scope of individual clauses included in this specification, namely:

* + - TBD ...

# Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

# Definitions, acronyms, and abbreviations

## Definitions

For the purposes of this document, the following terms and definitions apply. The IEEE Standards Dictionary Online should be consulted for terms not defined in this clause.[[2]](#footnote-2)

TBD

## Acronyms and abbreviations

TBD

## Special Terms

**Term**: Definition

## Notation for state diagrams

All the state diagrams used in this standard meet the set of requirements included in the following subclauses.

### General conventions

The operation of any protocol defined in this standard can be described by subdividing the protocol into a number of interrelated functions. The operation of the functions can be described by state diagrams. Each diagram represents the domain of a function and consists of a group of connected, mutually exclusive states. Only one state of a function is active at any given time (see Figure 3‑1).



Figure 3‑1—State diagram notation example

#### Representation of states

Each state that the function can assume is represented by a rectangle. These are divided into two parts by a horizontal line. In the upper part the state is identified by a name in capital letters. The lower part contains the body of the given state, containing description of the actions taken in this state, as defined in 3.4.3.

#### Transitions

All permissible transitions between the states of a function are represented graphically by arrows between them. A transition that is global in nature (for example, an exit condition from all states to the IDLE or RESET state) is indicated by an open arrow (an arrow with no source block). Global transitions are evaluated continuously whenever any state is evaluating its exit conditions. When the condition for a global transition becomes true, it supersedes all other transitions, including Unconditional Transition (UCT), returning control to the block pointed to by the open arrow.

Labels on transitions are qualifiers that are required to be fulfilled before the transition is taken. The label UCT designates an unconditional transition. Qualifiers described by short phrases are enclosed in parentheses.

The following terms are valid transition qualifiers:

* + - Boolean expressions
		- An event such as the expiration of a timer: timer\_done
		- An event such as the reception of a message: MAC\_DATA.indication
		- An unconditional transition: UCT
		- A branch taken when other exit conditions are not satisfied: ELSE

State transitions occur instantaneously. No transition in the state diagram can cross another transition. When possible, any two transitions with different logical conditions are not joined together into a single transition line.

### State diagrams and accompanying text

State diagrams take precedence over text.

### Actions inside state blocks

The actions inside a state block execute instantaneously. Actions inside state blocks are atomic (i.e., uninterruptible).

After performing all the actions listed in a state block one time, the state diagram then continuously evaluates exit conditions for the given state block until one is satisfied, at which point control passes through a transition arrow to the next block. While the state awaits fulfillment of one of its exit conditions, the actions inside do not implicitly repeat.

Valid state actions may include generation of *indication* and *request* primitives.

No actions are taken outside of any blocks of the state diagram.

### State diagram variables

Once set, variables retain their values as long as succeeding blocks contain no references to them.

Setting the parameter of a formal interface message assures that, on the next transmission of that message, the last parameter value set is transmitted.

Testing the parameter of a formal interface message tests the value of that message parameter that was received on the last transmission of said message. Message parameters may be assigned default values that persist until the first reception of the relevant message.

### Operators

The state diagram operators are shown in Table 3‑1.

Table 3‑1—State diagram operators

| **Character** | **Meaning** |
| --- | --- |
| AND | Boolean AND |
| OR | Boolean OR |
| XOR | Boolean XOR |
| ! | Boolean NOT |
| < | Less than |
| > | More than |
| ≤ | Less than or equal to |
| ≥ | More than or equal to |
| == | Equals (a test of equality) |
| != | Not equals |
| () | Indicates precedence |
| = | Assignment operator |
| | | Concatenation operation that combines several sub-fields or parameters into a single aggregated field or parameter |
| else | No other state condition is satisfied |
| true | Designation of a Boolean value of TRUE |
| false | Designation of a Boolean value of FALSE |

### Timers

Some of the state diagrams use timers for various purposes, e.g., measurement of time, and confirmation of activity. All timers operate in the same fashion.

A timer is reset and starts counting upon entering a state where [start x\_timer, x\_timer\_value] is asserted. Time “x” after the timer has been started, “x\_timer\_done” is asserted and remains asserted until the timer is reset. At all other times, “x\_timer\_not\_done” is asserted.

When entering a state where [start x\_timer, x\_timer\_value] is asserted, the timer is reset and restarted even if the entered state is the same as the exited state.

Any timer can be stopped at any time upon entering a state where [stop x\_timer] is asserted, which aborts the operation of the “x\_timer” asserting “x\_timer\_not\_done” indication until the timer is restarted again.

### Hexadecimal notation

Numerical values designated by the 0x prefix indicate a hexadecimal notation of the corresponding number, with the least significant bit shown on the right. For example: 0x0F represents an 8-bit hexadecimal value of the decimal number 15; 0x00-00-00-00 represents a 32-bit hexadecimal value of the decimal number 0; 0x11-AB-11-AB represents a 32-bit hexadecimal value of the decimal number 296423851.

### Binary notation

Numerical values designated by the 0b prefix indicate a binary notation of the corresponding number, with the least significant bit shown on the right. For example: 0b0001000 represents an 8-bit binary value of the decimal number 8.

## Notation for PICS

The supplier of a device implementation that is claimed to conform to this standard is required to complete a protocol implementation conformance statement (PICS) proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of this standard have been implemented. The PICS can be used for a variety of purposes by various parties, including the following:

* 1. As a checklist by the protocol implementer, to reduce the risk of failure to conform to the standard through oversight;
	2. As a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard PICS proforma, by the supplier and acquirer, or potential acquirer, of the implementation;
	3. As a basis for initially checking the possibility of interworking with another implementation by the user, or potential user, of the implementation (note that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICS);
	4. As the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation, by a protocol tester.

Each PICS entry is uniquely identified by an item number, with the following form: [Package][Device]-[Feature][Number], where:

* + - [Package] is the designation of the given Package,
		- [Device] identifies whether the given PICS item describes the ONU (U) or OLT (T) requirements,
		- [Feature] is the identification of individual features, and finally,
		- [Number] is a number allocated to each subsequent PICS entry. This item may have one of two possible formats: a decimal number or a decimal number followed by a lower-case letter. The first format is used to designate PICS with functionally distinct requirements. The latter format is used to designate PICS with functionally similar requirements.

For example, CU-LPTK3a represents a PICS entry for an ONU compliant with Package C for the “optical link protection, trunk type” feature, item 3, subitem a.

### Abbreviations and special symbols

The following symbols are used in the PICS proforma:

|  |  |
| --- | --- |
| M | mandatory field/function |
| ! | negation |
| O | optional field/function |
| O.<n> | optional field/function, but at least one of the group of options labeled by the same numeral <n> is required |
| O/<n> | optional field/function, but one and only one of the group of options labeled by the same numeral <n> is required |
| X | prohibited field/function |
| <item>: | simple-predicate condition, dependent on the support marked for <item> |
| <item1>\*<item2>: | AND-predicate condition, the requirement needs to be met if both optional items are implemented |

### Instructions for completing the PICS proforma

The first part of the PICS proforma, Implementation Identification and Protocol Summary, is to be completed as indicated with the information necessary to identify fully both the supplier and the implementation.

The main part of the PICS proforma is a fixed-format questionnaire divided into subclauses, each containing a group of items. Answers to the questionnaire items are to be provided in the right-most column, either by simply marking an answer to indicate a restricted choice (usually Yes, No, or Not Applicable), or by entering a value or a set or range of values. (Note that there are some items where two or more choices from a set of possible answers can apply; all relevant choices are to be marked.)

Each item is identified by an item reference in the first column; the second column contains the question to be answered; the third column contains the reference or references to the material that specifies the item in the main body of the standard; the fourth column contains values and/or comments pertaining to the question to be answered. The remaining columns record the status of the items—whether the support is mandatory, optional or conditional—and provide the space for the answers.

The supplier may also provide, or be required to provide, further information, categorized as either Additional Information or Exception Information. When present, each kind of further information is to be provided in a further subclause of items labeled A<i> or X<i>, respectively, for cross-referencing purposes, where <i> is any unambiguous identification for the item (e.g., simply a numeral); there are no other restrictions on its format or presentation.

A completed PICS proforma, including any Additional Information and Exception Information, is the protocol implementation conformance statement for the implementation in question.

Note that where an implementation is capable of being configured in more than one way, according to the items listed under Major Capabilities/Options, single PICS may be able to describe all such configurations. However, the supplier has the choice of providing more than one PICS, each covering some subset of the implementation’s configuration capabilities, if that would make presentation of the information easier and clearer.

### Additional information

Items of Additional Information allow a supplier to provide further information intended to assist the interpretation of the PICS. It is not intended or expected that a large quantity be supplied, and the PICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations; or a brief rationale, based perhaps upon specific application needs, for the exclusion of features that, although optional, are nonetheless commonly present in implementations.

References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception Information.

### Exception information

It may occasionally happen that a supplier wishes to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer is found in the Support column for this; instead, the supplier is required to write into the Support column an X<i> reference to an item of Exception Information, and to provide the appropriate rationale in the Exception item itself.

An implementation for which an Exception item is required in this way does not conform to this standard. Note that a possible reason for the situation described above is that a defect in the standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

### Conditional items

The PICS proforma may contain conditional items. These are items for which both the applicability of the item itself, and its status if it does apply—mandatory, optional, or prohibited—are dependent upon whether or not certain other items are supported.

Individual conditional items are indicated by a conditional symbol of the form “<item>:<s>” in the Status column, where “<item>” is an item reference that appears in the first column of the table for some other item, and “<s>” is a status symbol, M (Mandatory), O (Optional), or X (Not Applicable).

If the item referred to by the conditional symbol is marked as supported, then:

* 1. the conditional item is applicable,
	2. its status is given by “<s>”, and
	3. the support column is to be completed in the usual way.

Each item whose reference is used in a conditional symbol is indicated by an asterisk in the Item column.

# Universal Management Tunnel (UMT) Architecture

Editorial Note: this Clause will describe te UMT architecture, showing a single UMT domain interconnecting multiple L2 domains with UMT switches, and showing UMT instance between two UMT end-points. Description of the individual device functions follows (tentative names are used)

## UMT Architecture

## UMT Interfaces

## UMT Device Functions

## Examples of UMT Use Cases

# UMT Discovery Protocol (UMTDP)

## Definition of UMTDP Data Unit

## UMTDP Operation

## State diagrams and variable definitions

### Variables

### Times

### Functions

### Primitives

### State diagrams

# PICS

# Examples: Header 1

## Examples: Header 2

Example of a paragraph of text.

Example of a table is shown below.

Table 7‑1—Table Template

|  |  |  |
| --- | --- | --- |
| **Column1** | **Column2** | **Column3** |
| Value1 | Value2 | Value3 |
| Value1 | Value2 | Value3 |
| Value1 | Value2 | Value3 |



Figure 7‑1—Example of a figure

Example of a bulleted list:

* + - Line 1; and
		- Line 2.

### Examples: Header 3

#### Examples: Header 4

##### Examples: Header 5

1. The Institute of Electrical and Electronics Engineers, Inc.

3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 20XX by the Institute of Electrical and Electronics Engineers, Inc.

All rights reserved. Published <XX MONTH 20XX>. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by the Institute of Electrical and Electronics
Engineers, Incorporated.

**PDF: ISBN 978-0-XXXX-XXXX-X STDXXXXX**

**Print: ISBN 978-0-XXXX-XXXX-X STDPDXXXXX**

*IEEE prohibits discrimination, harassment and bullying. For more information, visit* [*http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html*](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.*  [↑](#footnote-ref-1)
2. IEEE Standards Dictionary Online subscription is available at <http://www.ieee.org/portal/innovate/products/standard/standards_dictionary.html>. [↑](#footnote-ref-2)