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Telecommunications and exchange between information technology systems — Requirements for local and metropolitan area networks —

Part 3: Standard for Ethernet

AMENDMENT 10: Maintenance #14: Isolation

Télécommunications et échange entre systèmes informatiques — Exigences pour les réseaux locaux et métropolitains —

Partie 3: Norme pour Ethernet

AMENDEMENT 10: Maintenance n° 14 : Isolation

Reference number
ISO/IEC/IEEE 8802-3:2021/Amd.10:2022(E)

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IEEE Std 802.3cr™-2021
(Amendment to IEEE Std 802.3™-2018
as amended by IEEE Std 802.3cb™-2018,
IEEE Std 802.3bt™-2018,
IEEE Std 802.3cd™-2018,
IEEE Std 802.3cn™-2019,
IEEE Std 802.3cg™-2019,
IEEE Std 802.3cq™-2020,
IEEE Std 802.3cm™-2020,
IEEE Std 802.3ch™-2020,
and IEEE Std 802.3ca™-2020)

IEEE Standard for Ethernet

Amendment 10: Maintenance #14: Isolation

Developed by the

LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 9 February 2021

IEEE SA Standards Board

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Abstract: This amendment to IEEE Std 802.3-2018 replaces references to the IEC 60950 series of standards with appropriate references to the IEC 62368 series and makes appropriate changes to the standard corresponding to the new references.

Keywords: Ethernet, IEC 60950, IEC 62368, IEEE 802.3™, IEEE 802.3cr™, isolation, safety

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Introduction

This introduction is not part of IEEE Std 802.3cr-2021, IEEE Standard for Ethernet. Amendment 10: Maintenance #14: Isolation.

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 802.3-2018 and are not maintained as separate documents.

At the date of IEEE Std 802.3cr-2021 publication, IEEE Std 802.3 was composed of the following documents:

IEEE Std 802.3-2018

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

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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.

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.

Section Seven—Includes Clause 96 through Clause 115 and Annex 97A through Annex 115A. Clause 96 through Clause 98, Clause 104, and associated annexes, specify Physical Layers and optional features for 100 Mb/s and 1000 Mb/s operation over a single twisted pair. Clause 100 through Clause 103, as well as associated annexes, specify Physical Layers for the operation of the EPON protocol over coaxial distribution networks. Clause 105 through Clause 114 and associated annexes include general information on 25 Gb/s operation as well as 25 Gb/s Physical Layer specifications. Clause 99 specifies a MAC merge sublayer for the interspersing of express traffic. Clause 115 and its associated annex specify a Physical Layer for 1000 Mb/s operation over plastic optical fiber.

Section Eight—Includes Clause 116 through Clause 126 and Annex 119A through Annex 120E. Clause 116 through Clause 124 and associated annexes include general information on 200 Gb/s and 400 Gb/s operation as well the 200 Gb/s and 400 Gb/s Physical Layer specifications. Clause 125 and Clause 126 include general information on 2.5 Gb/s and 5 Gb/s operation as well as 2.5 Gb/s and 5 Gb/s Physical Layer specifications.

IEEE Std 802.3cb™-2018

Amendment 1—This amendment includes changes to IEEE Std 802.3-2018 and its amendments, and adds Clause 127 through Clause 130, Annex 127A, Annex 128A, Annex 128B, and Annex 130A. This amendment adds new Physical Layers for operation at 2.5 Gb/s and 5 Gb/s over electrical backplanes.

IEEE Std 802.3bt™-2018

Amendment 2—This amendment includes changes to IEEE Std 802.3-2018 and adds Clause 145, Annex 145A, Annex 145B, and Annex 145C. This amendment adds power delivery using all four pairs in the structured wiring plant, resulting in greater power being available to end devices. This amendment also allows for lower standby power consumption in end devices and adds a mechanism to better manage the available power budget.

IEEE Std 802.3cd™-2018

Amendment 3—This amendment includes changes to IEEE Std 802.3-2018 and adds Clause 131 through Clause 140 and Annex 135A through Annex 136D. This amendment adds MAC parameters, Physical Layers, and management parameters for the transfer of IEEE 802.3 format frames at 50 Gb/s, 100 Gb/s, and 200 Gb/s.

IEEE Std 802.3cn™-2019

Amendment 4—This amendment includes changes to IEEE Std 802.3-2018 and adds 50 Gb/s, 200 Gb/s, and 400 Gb/s Physical Layer specifications and management parameters for operation over single-mode fiber with reaches of at least 40 km.

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IEEE Std 802.3cg™-2019

Amendment 5—This amendment includes changes to IEEE Std 802.3-2018 and its amendments and adds Clause 146 through Clause 148 and Annex 146A and Annex 146B. This amendment adds 10 Mb/s Physical Layer specifications and management parameters for operation on a single balanced pair of conductors.

IEEE Std 802.3cq™-2020

Amendment 6—This amendment includes editorial and technical corrections, refinements, and clarifications to Clause 33 and related portions of the standard.

IEEE Std 802.3cm™-2020

Amendment 7—This amendment includes changes to IEEE Std 802.3-2018 and adds Clause 150. This amendment adds Physical Layer (PHY) specifications and management parameters for 400 Gb/s operation on four pairs (400GBASE-SR4.2) and eight pairs (400GBASE-SR8) of multimode fiber, over reaches of at least 100 m.

IEEE Std 802.3ch™-2020

Amendment 8—This amendment includes changes to IEEE Std 802.3-2018 and adds Clause 149, Annex 149A, Annex 149B, and Annex 149C. This amendment adds physical layer specifications and management parameters for operation at 2.5 Gb/s, 5 Gb/s, and 10 Gb/s over a single balanced pair of conductors.

IEEE Std 802.3ca™-2020

Amendment 9—This amendment to IEEE Std 802.3-2018 extends the operation of Ethernet passive optical networks (EPONs) to multiple channels of 25 Gb/s providing both symmetric and asymmetric operation for the following data rates (downstream/upstream): 25/10 Gb/s, 25/25 Gb/s, 50/10 Gb/s, 50/25 Gb/s, and 50/50 Gb/s. This amendment specifies the 25 Gb/s EPON Multi-Channel Reconciliation Sublayer (MCRS), Nx25G-EPON Physical Coding Sublayers (PCSs), Physical Media Attachment (PMA) sublayers, and Physical Medium Dependent (PMD) sublayers that support both symmetric and asymmetric data rates while maintaining backward compatibility with already deployed 10 Gb/s EPON equipment. The EPON operation is defined for distances of at least 20 km, and for a split ratio of at least 1:32.

IEEE Std 802.3cr™-2021

Amendment 10—This amendment includes changes to IEEE Std 802.3-2018 and adds Annex J. This amendment replaces references to the IEC 60950 series of standards (including IEC 60950-1 "Information technology equipment—Safety—Part 1: General requirements") with appropriate references to the IEC 62368 "Audio/video, information and communication technology equipment" series and makes appropriate changes to the standard corresponding to the new references.

Two companion documents exist, IEEE Std 802.3.1 and IEEE Std 802.3.2. IEEE Std 802.3.1 describes Ethernet management information base (MIB) modules for use with the Simple Network Management Protocol (SNMP). IEEE Std 802.3.2 describes YANG data models for Ethernet. IEEE Std 802.3.1 and IEEE Std 802.3.2 are updated to add management capability for enhancements to IEEE Std 802.3 after approval of those 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.

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IEEE Standard for Ethernet

Amendment 10:
Maintenance #14: Isolation

(This amendment is based on IEEE Std 802.3™-2018 as amended by IEEE Std 802.3cb™-2018, IEEE Std 802.3bt™-2018, IEEE Std 802.3cd™-2018, IEEE Std 802.3cn™-2019, IEEE Std 802.3cg™-2019, IEEE Std 802.3cq™-2020, IEEE Std 802.3cm™-2020, IEEE Std 802.3ch™-2020, and IEEE Std 802.3ca™-2020.)

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and <u>underscore</u> (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.

Cross references that refer to clauses, tables, equations, or figures not covered by this amendment are highlighted in green.[1]

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[1] Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

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1. Introduction

1.3 Normative references

Change the reference for IEC 62368-1 (as inserted by IEEE Std 802.3cg-2019) as follows:

IEC 62368-1:2018~~4~~, Audio/video, information and communication technology equipment—Part 1: Safety requirements.[2]

Insert the following new reference in alphanumeric order:

ITU-T Recommendation K.44, 2019—Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents—Basic Recommendation.[3]

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[2]IEC publications are available from the International Electrotechnical Commission (https://www.iec.ch/) and the American National Standards Institute (https://www.ansi.org).

[3]ITU-T publications are available from the International Telecommunications Union (https://www.itu.int/).

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8. Medium Attachment Unit and baseband medium specifications, type 10BASE5

8.3 MAU–medium electrical characteristics

8.3.2 MAU electrical characteristics

8.3.2.1 Electrical isolation

Change 8.3.2.1 as follows:

The MAU provides isolation between the AUI cable and the coaxial trunk cable. This isolation shall meet the isolation requirements as specified in J.1.

~~The MAU must provide isolation between the AUI cable and the coaxial trunk cable. This isolation shall withstand at least one of the following electrical strength tests:~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in 5.3.2 of IEC 60950: 1991.~~
~~b) 2250 Vdc for 60 s, applied as specified in 5.3.2 of IEC 60950: 1991.~~
~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time of half value), as defined in IEC 60060.~~

~~There shall be no isolation breakdown, as defined in 5.3.2 of IEC 60950: 1991, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 Vdc. In addition, the isolation impedance between the DTE and the coaxial cable shield shall be less than 15 Ω between 3 MHz and 30 MHz.~~

CAUTION

The current electrical isolation requirement is a change that was incorporated into IEEE Std 802.3-1996. Older editions of IEEE Std 802.3 had a significantly lower isolation requirement.

8.7 Environmental specifications

8.7.1 General safety requirements

Change 8.7.1 as follows:

~~All stations~~All Physical Layer MDIs meeting this standard shall conform to ~~IEC 60950: 1991~~the general safety requirements as specified in J.2.

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8.8 Protocol implementation conformance statement (PICS) proforma for Clause 8, Medium Attachment Unit and baseband medium specifications, type 10BASE5[4]

8.8.6 PICS proforma tables for MAU

8.8.6.8 MAU electrical characteristics

Change the table in 8.8.6.8 as follows:

Item	Parameter	Reference	Status	Support	Value/Comment
1	Isolation ~~impedance~~ between MDI and AUI cable (each conductor, including shields)	8.3.2.1	M	Yes [ ] No [ ]	~~> 250 kΩ at 60 Hz, < 15 Ω for 3 MHz to 30 MHz~~ Conforms to J.1
~~2~~	~~Breakdown voltage~~	~~8.3.2.1~~	~~M~~	~~Yes [ ] No [ ]~~	~~≥ 1.5 kV ac, rms~~
~~3~~ 2	Current drawn from AUI sources	8.3.2.2	M	Yes [ ] No [ ]	≤ 0.5 A
~~4~~ 3	Operation over VP voltage range	8.3.2.2	M	Yes [ ] No [ ]	11.28–15.75 V, any permissible AUI cable
~~5~~ 4	Low VP circuit behavior	8.3.2.2	M	Yes [ ] No [ ]	No disruption of media
~~6~~ 5	MAU current labeling	8.3.2.2	M	Yes [ ] No [ ]	Current consumption shall be labeled externally
~~7~~ 6	Reliability	8.3.2.3	M	Yes [ ] No [ ]	MTBF ≥ 1 million hours of continuous operation

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8.8.6.11 Safety requirements

Change the row for item 2 in the table in 8.8.6.11 as follows (unchanged rows not shown):

Item	Parameter	Reference	Status	Support	Value/Comment
…					
2	General safety	8.7.1	M	Yes [ ] No [ ]	~~Conforms to IEC 60950: 1991~~ Conforms to J.2
…					

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9. Repeater unit for 10 Mb/s baseband networks

9.9 Medium attachment unit and baseband medium specification for a vendor-independent FOIRL

9.9.3 FOMAU electrical characteristics

9.9.3.1 Electrical isolation

Insert a new note at the beginning of 9.9.3.1 as follows:

NOTE—Since February 2021, electrical isolation requirements are in J.1.

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10. Medium attachment unit and baseband medium specifications, type 10BASE2

10.8 Environmental specifications

10.8.3 Regulatory requirements

Change 10.8.3 as follows:

NOTE—Since September 2011, maintenance changes are no longer being considered for this clause. Since February 2021, electrical isolation requirements are in J.1.

The MAU and medium should consider IEC 60950 in addition to local and national regulations. See IEC 60950 and MIL-C-17F-1983 [B51].

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12. Physical signaling, medium attachment, and baseband medium specifications, type 1BASE5

12.10 Safety

12.10.1 Isolation

Insert a new note at the beginning of 12.10.1 as follows:

NOTE—Since September 2003, maintenance changes are no longer being considered for this clause. Since February 2021, electrical isolation requirements are in J.1.

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14. Twisted-pair medium attachment unit (MAU) and baseband medium, type 10BASE-T including type 10BASE-Te

14.3 MAU electrical specifications

14.3.1 MAU-to-MDI interface characteristics

Change the title and text of 14.3.1.1 (as modified by IEEE Std 802.3bt-2018) as follows:

14.3.1.1 ~~Isolation requirement~~Electrical isolation

A MAU with a MDI that is a PI (see 33.1.3) shall meet the isolation requirements defined in 33.4.1 or 145.4.1.

A MAU with a MDI that is not a PI shall provide isolation between the DTE Physical Layer circuits including frame ground and all MDI leads including those not used by 10BASE-T.

This electrical isolation shall meet the isolation requirements as specified in J.1.~~withstand at least one of the following electrical strength tests.~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~
~~b) 2250 V dc for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~
~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time of half value), as defined in IEC 60950-1:2001 Annex N.~~

~~There shall be no insulation breakdown, as defined in subclause 5.2.2 of IEC 60950-1:2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 V dc.~~

14.7 Environmental specifications

14.7.1 General safety

Change 14.7.1 as follows:

An MAU meeting this standard shall conform to the general safety requirements as specified in J.2.~~All equipment meeting this standard shall conform to IEC 60950-1.~~

14.10 Protocol implementation conformance statement (PICS) proforma for Clause 14, Twisted-pair medium attachment unit (MAU) and baseband medium, type 10BASE-T and type 10BASE-Te[5]

14.10.4 PICS proforma for 10BASE-T

14.10.4.5 PICS proforma tables for MAU

Change the title of 14.10.4.5.11 as follows:

14.10.4.5.11 ~~Isolation requirements~~Electrical isolation

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Change the table in 14.10.4.5.11 as follows:

	Parameter	Subclause	Req	Imp	Value/Comment
IR1 ~~IR1a~~	~~Isolation, MDI leads to DTE Physical Layer circuits~~ Electrical isolation	14.3.1.1	C		~~Any one of three tests listed in 14.3.1.1 Function provided by MAUs that do not encompass the PI of a PD within their MDI.~~ Conforms to J.1
~~IR1b~~	~~Isolation, MDI leads to all external conductors~~	~~14.3.1.1~~	~~C~~		~~Any of the three tests listed in 14.3.1.1. Function provided by MAUs that encompass the PI of a PD within their MDI.~~
~~IR2~~	~~Resistance after breakdown test~~	~~14.3.1.1~~	~~M~~		~~≥ 2 MΩ at 500 Vdc~~

14.10.4.5.15 Safety requirements

Change item SR3 in the table in 14.10.4.5.15 as follows (unchanged rows not shown):

	Parameter	Subclause	Req	Imp	Value/Comment
…					
SR3	General safety	14.7.1	M		~~Conforms to IEC 60950:1991~~ Conforms to J.2
…					

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15. Fiber optic medium and common elements of medium attachment units and star, type 10BASE-F

15.3 Characteristics of the fiber optic medium

15.3.4 Electrical isolation

Change 15.3.4 as follows:

Electrical isolation shall be provided between MDIs attached to the fiber optic cable. There shall be no conducting path between the optical medium connector plug and any conducting element within the fiber optic cable. This isolation shall meet the isolation requirements as specified in J.1.~~withstand at least one of the following electrical strength tests:~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in 5.3.2 of IEC 60950:1991.~~
~~b) 2250 Vdc for 60 s, applied as specified in 5.3.2 of IEC 60950:1991.~~
~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time of half value) as defined in IEC 60060.~~

~~There shall be no isolation breakdown, as defined in 5.3.2 of IEC 60950:1991, during the test. The resistance after the test shall be at least 2 MΩ measured at 500 Vdc.~~

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15.8 Protocol implementation conformance statement (PICS) proforma for Clause 15, Fiber optic medium and common elements of medium attachment units and star, type 10BASE-F[6]

15.8.6 PICS Proforma for the fiber optic medium

15.8.6.4 Electrical isolation requirements

Change the table in 15.8.6.4 as follows:

Item	Feature	Subclause	Value/Comment	Status	Support
IR1	Electrical isolation, optical connector plug to any electrically conducting element in cable	15.3.4	~~Any one of three tests listed in 15.3.4~~ Conforms to J.1	M	Yes [ ]
~~IR2~~	~~Resistance after breakdown test~~	~~15.3.4~~	~~> 2 MΩ measured at 500 Vdc~~	~~M~~	~~Yes [ ]~~

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23. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 100BASE-T4

23.5 PMA electrical specifications

23.5.1 PMA-to-MDI interface characteristics

23.5.1.1 Isolation requirement

Insert a new note at the beginning of 23.5.1.1 as follows:

NOTE—Since September 2003, maintenance changes are no longer being considered for this clause. Since February 2021, electrical isolation requirements are in J.1.

23.9 Environmental specifications

23.9.1 General safety

Change 23.9.1 as follows:

NOTE—Since September 2003, maintenance changes are no longer being considered for this clause. Since February 2021, safety information is in J.2.

All equipment meeting this standard shall conform to IEC 60950: 1991.

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25. Physical Medium Dependent (PMD) sublayer and baseband medium, type 100BASE-TX

25.4 Specific requirements and exceptions

25.4.6 Replacement of 8.4.1, "UTP isolation requirements"

Change 25.4.6 (as modified by IEEE Std 802.3bt-2018) as follows:

A PMD with a MDI that is a PI (see 33.1.3 and 145.1.3) shall meet the isolation requirements defined in 33.4.1 and 145.4.1.

A PMD with a MDI that is not a PI shall provide isolation between frame ground and all MDI leads including those not used by the 100BASE-TX PMD.

This electrical isolation shall meet the isolation requirements as specified in J.1.~~withstand at least one of the following electrical strength tests.~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~
~~b) 2250 V dc for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~
~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time of half value), as defined in IEC 60950-1:2001 Annex N.~~

~~There shall be no insulation breakdown, as defined in subclause 5.2.2 of IEC 60950-1:2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 V dc.~~

NOTE—In the case of a PMD with a MDI that is not a PI, these requirements are equivalent to those found in TP-PMD.

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25.6 Protocol implementation conformance statement (PICS) proforma for Clause 25, Physical Medium Dependent (PMD) sublayer and baseband medium, type 100BASE-TX[7]

25.6.4 PICS proforma tables for the Physical Medium Dependent (PMD) sublayer and baseband medium, type 100BASE-TX

25.6.4.2 PMD compliance

Change item PD7 in the table in 25.6.4.2 as follows (unchanged rows not shown):

Item	Feature	Subclause	Status	Support	Value/Comment
…					
PD7	Isolation requirements	25.4.6	M		Conforms to J.1

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27. Repeater for 100 Mb/s baseband networks

27.5 Environmental specifications

27.5.1 General safety

Insert a new note at the beginning of 27.5.1 as follows:

NOTE—Since September 2011, maintenance changes are no longer being considered for this clause. Since February 2021, safety information is in J.2.

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32. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 100BASE-T2

32.6 PMA electrical specifications

32.6.1 PMA-to-MDI interface characteristics

32.6.1.1 Isolation requirement

Insert a new note at the beginning of 32.6.1.1 as follows:

NOTE—Since September 2003, maintenance changes are no longer being considered for this clause. Since February 2021, electrical isolation requirements are in J.1.

32.10 Environmental specifications

32.10.1 General safety

Change 32.10.1 as follows:

NOTE—Since September 2003, maintenance changes are no longer being considered for this clause. Since February 2021, safety information is in J.2.

All equipment meeting this standard shall conform to IEC 60950.

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33. Power over Ethernet over 2 Pairs

33.4 Additional electrical specifications

Change the title and text of 33.4.1 as follows:

33.4.1 Electrical i~~I~~solation

PDs and PSEs shall provide isolation between all accessible external conductors, including frame ground (if any), and all MDI leads including those not used by the PD or PSE. Any equipment that can be connected to a PSE or PD through a non-MDI connector that is not isolated from the MDI leads needs to provide isolation between all accessible external conductors, including frame ground (if any), and the non-MDI connector. ~~Accessible external conductors are specified in subclause 6.2.1 b) of IEC 60950-1:2001.~~

This electrical isolation shall meet the isolation requirements as specified in J.1 with electrical strength test c) details being replaced by: "An impulse test consisting of a 1500 V, 10/700 waveform, applied 10 times, with a 60 s interval between pulses. The shape of the impulses is 10/700 (10 µs virtual front time, 700 µs virtual time to half value), as defined in ITU-T Recommendation K.44."~~withstand at least one of the following electrical strength tests:~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~
~~b) 2250 V dc for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~
~~c) An impulse test consisting of a 1500 V, 10/700 µs waveform, applied 10 times, with a 60 s interval between pulses. The shape of the impulses shall be 10/700 µs (10 µs virtual front time, 700 µs virtual time of half value), as defined in IEC 60950-1:2001 Annex N.~~

~~There shall be no insulation breakdown, as defined in subclause 5.2.2 of IEC 60950-1:2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 V dc.~~

Conductive link segments that have differing isolation and grounding requirements shall have those requirements provided by the port-to-port isolation of network interface devices (NID).

33.7 Environmental

33.7.1 General safety

Change 33.7.1 as follows:

All equipment subject to this clause shall conform to ~~IEC 60950-1~~ the general safety requirements as specified in J.2. ~~In particular, t~~The PSE shall be classified as a Limited Power Source in accordance with ~~IEC 60950-1~~ Annex Q of IEC 62368-1:2018, as applicable.

Equipment shall comply with all applicable local and national codes related to safety.

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33.8 Protocol implementation conformance statement (PICS) proforma for Clause 33, Power over Ethernet over 2 Pairs[8]

33.8.3 PICS proforma tables for Power over Ethernet over 2 Pairs

33.8.3.4 Electrical specifications applicable to the PSE and PD

Change the rows for items EL1 through EL5 in the table in 33.8.3.4 (as modified by IEEE Std 802.3bt-2018) as follows (unchanged rows not shown) and renumber existing items EL6 and above accordingly:

Item	Feature	Subclause	Value/Comment	Status	Support
EL1	Conductor isolation	33.4.1	~~Provided between accessible external conductors including frame ground and all MDI leads~~ Conforms to J.1 with electrical strength test c) details as specified in 33.4.1	M	Yes [ ]
~~EL2~~	~~Strength tests for electrical isolation~~	~~33.4.1~~	~~Withstand at least one of the electrical strength tests specified in 33.4.1~~	~~M~~	~~Yes [ ]~~
~~EL3~~	~~Insulation breakdown~~	~~33.4.1~~	~~No breakdown of insulation during electrical isolation tests~~	~~M~~	~~Yes [ ]~~
~~EL4~~	~~Isolation resistance~~	~~33.4.1~~	~~At least 2 MΩ, measured at 500 Vdc after electrical isolation tests~~	~~M~~	~~Yes [ ]~~
~~EL5~~ EL2	Isolation and grounding requirements	33.4.1	Conductive link segments that have different requirements have those requirements provided by the port-to-port isolation of the NID	M	Yes [ ]
…					

33.8.3.9 Environmental specifications applicable to PSEs and PDs

Change the rows for items ES1 and ES2 in the table in 33.8.3.9 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	Safety	33.7.1	Conforms to J.2 ~~IEC 60950-1:2001~~	M	Yes [ ]
ES2	PSE classified as a limited power source	33.7.1	In accordance with ~~IEC 60950-1:2001~~ Annex Q of IEC 62368-1:2018, as applicable	M	Yes [ ]
…					

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33.8.3.10 Environmental specifications applicable to the PSE

Change the table in 33.8.3.10 as follows:

Item	Feature	Subclause	Value/Comment	Status	Support
PSEES1	Safety	33.7.1	Limited Power Source in accordance with ~~IEC 60950-1:2001~~Annex Q of IEC 62368-1:2018, as applicable	M	Yes [ ]

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38. Physical Medium Dependent (PMD) sublayer and baseband medium, type 1000BASE-LX (long wavelength laser) and 1000BASE-SX (short wave-length laser)

38.7 Environmental specifications

38.7.1 General safety

Change 38.7.1 as follows:

All equipment ~~meeting this standard~~ subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC-60950:1991.~~

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38.12 Protocol implementation conformance statement (PICS) proforma for Clause 38, Physical Medium Dependent (PMD) sublayer and baseband medium, type 1000BASE-LX (Long Wavelength Laser) and 1000BASE-SX (Short Wavelength Laser)[9]

38.12.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and baseband medium, type 1000BASE-LX (Long Wavelength Laser) and 1000BASE-SX (Short Wavelength Laser)

38.12.4.5 Optical measurement requirements

Change the row for item OR30 in the table in 38.12.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
…					
OR30	~~Compliance with IEC 60950-1991~~ General safety	38.7.1	Conforms to J.2	M	Yes [ ]
…					

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40. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 1000BASE-T

40.6 PMA electrical specifications

40.6.1 PMA-to-MDI interface tests

Change the title and text of 40.6.1.1 (as modified by IEEE Std 802.3bt-2018) as follows:

40.6.1.1 ~~Isolation requirement~~Electrical isolation

A PHY with a MDI that is a PI (see 33.1.3) shall meet the isolation requirements defined in 33.4.1 or 145.4.1.

A PHY with a MDI that is not a PI shall provide electrical isolation between the port device circuits, including frame ground (if any) and all MDI leads. This electrical isolation shall meet the isolation requirements as specified in J.1.~~withstand at least one of the following electrical strength tests:~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~

~~b) 2250 V dc for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~

~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time of half value), as defined in IEC 60950-1:2001 Annex N.~~

~~There shall be no insulation breakdown, as defined in subclause 5.2.2 of IEC 60950-1:2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 V dc.~~

40.9 Environmental specifications

40.9.1 General safety

Change 40.9.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2. ~~IEC 60950:1991.~~

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40.12 Protocol implementation conformance statement (PICS) proforma for Clause 40—Physical coding sublayer (PCS), physical medium attachment (PMA) sublayer and baseband medium, type 1000BASE-T[10]

40.12.7 PMA Electrical Specifications

Change the rows for items PME1 through PME5 in the table in 40.12.7 as follows (unchanged rows not shown) and renumber existing items PME6 and above accordingly:

Item	Feature	Subclause	Status	Support	Value/Comment
PME1	~~The PHY shall provide electrical isolation between~~ Electrical isolation	40.6.1.1	!PD:M	Yes [ ] N/A [ ]	~~The port device circuits including frame ground, and all MDI leads.~~ Conforms to J.1.
PME2	The PHY shall provide electrical isolation between	40.6.1.1	PD:M	Yes [ ] N/A [ ]	All external conductors, including frame ground, and all MDI leads.
~~PME3~~	~~PHY provided electrical isolation shall withstand at least one of three electrical strength tests~~	~~40.6.1.1~~	~~M~~	~~Yes [ ]~~	~~a) 1500 V rms at 50Hz to 60Hz for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~ ~~b) 2250 V dc for 60 s, applied as specified in subclause 5.2.2 of IEC 60950-1:2001.~~ ~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs. (1.2 µs virtual front time, 50 µs virtual time or half value), as defined in IEC IEC 60950-1:2001 Annex N.~~
~~PME4~~	~~There shall be no insulation breakdown as defined in Section 5.3.2 of IEC 60950, during the test.~~	~~40.6.1.1~~	~~M~~	~~Yes [ ]~~	
~~PME5~~	~~The resistance after the test shall be at least~~	~~40.6.1.1~~	~~M~~	~~Yes [ ]~~	~~2 MΩ, measured at 500 Vdc.~~
…					

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40.12.10 General safety and environmental requirements

Change the row for item ENV1 in the table in 40.12.10 as follows (unchanged rows not shown):

Item	Feature	Subclause	Status	Support	Value/Comment
ENV1	Conformance to safety specifications	40.9.1	M	Yes [ ]	~~IEC 60950.~~ Conforms to J.2.
…					

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41. Repeater for 1000 Mb/s baseband networks

41.4 Environmental specifications

41.4.1 General safety

Change 41.4.1 as follows:

NOTE—Since September 2011, maintenance changes are no longer being considered for this clause. Since February 2021, safety information is in J.2.

All equipment meeting this standard shall conform to IEC 60950: 1991.

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52. Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-S (short wavelength serial), 10GBASE-L (long wavelength serial), and 10GBASE-E (extra long wavelength serial)

52.10 Environmental specifications

52.10.1 General safety

Change 52.10.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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52.15 Protocol implementation conformance statement (PICS) proforma for Clause 52, Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-S (short wavelength serial), 10GBASE-L (long wavelength serial), and 10GBASE-E (extra long wavelength serial)[11]

52.15.3 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and baseband medium, types 10GBASE-R and 10GBASE-W

52.15.3.11 Environmental specifications

Change the row for item ES1 in the table in 52.15.3.11 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	52.10.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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53. Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-LX4

53.10 Environmental specifications

53.10.1 General safety

Change 53.10.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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53.15 Protocol implementation conformance statement (PICS) proforma for Clause 53, Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-LX4[12]

53.15.4 PICS proforma tables for 10GBASE-LX4 and baseband medium

53.15.4.5 Optical measurement requirements

Change the row for item OM43 in the table in 53.15.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
…					
OM43	General safety	53.10.1	~~Conform to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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55. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 10GBASE-T

55.5 PMA electrical specifications

Change the title and text of 55.5.1 (as modified by IEEE Std 802.3bt-2018) as follows:

55.5.1 ~~Isolation requirement~~Electrical isolation

~~A PHY with a MDI that is a PI (see 33.1.3) shall meet the isolation requirements defined in 33.4.1 or 145.4.1.~~

A PHY with a MDI that is not a PI shall provide electrical isolation between the port device circuits, including frame ground (if any) and all MDI leads. This electrical isolation shall meet the isolation requirements as specified in J.1.~~withstand at least one of the following electrical strength tests:~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.~~
~~b) 2250 V dc for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.~~
~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses is 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time or half value), as defined in Annex N of IEC 60950-1:2001.~~

~~There shall be no insulation breakdown, as defined in Section 5.2.2 of IEC 60950-1:2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 V dc.~~

55.9 Environmental specifications

55.9.1 General safety

Change 55.9.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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55.12 Protocol implementation conformance statement (PICS) proforma for Clause 55—Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 10GBASE-T[13]

55.12.6 PMA electrical specifications

Change the rows for items PME1 and PME2 in the table in 55.12.6 as follows (unchanged rows not shown) and renumber existing items PME3 and above accordingly:

Item	Feature	Subclause	Status	Support	Value/Comment
PME1	Electrical isolation	55.5.1	M	Yes [ ]	~~One of three electrical strength tests listed in 55.5.1~~ Conforms to J.1
~~PME2~~	~~Insulation breakdown after test~~	~~55.5.1~~	~~M~~	~~Yes [ ]~~	~~>2 MΩ, measured at 500 V dc~~
…					

55.12.9 General safety and environmental requirements

Change the row for item ENV1 in the table in 55.12.9 as follows (unchanged rows not shown):

Item	Feature	Subclause	Status	Support	Value/Comment
ENV1	Conformance to safety specifications	55.9.1	M	Yes [ ]	~~IEC 60950-1~~ Conforms to J.2
…					

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58. Physical Medium Dependent (PMD) sublayer and medium, type 100BASE-LX10 (Long Wavelength) and 100BASE-BX10 (Bi-Directional Long Wavelength)

58.8 Environmental, safety, and labeling

58.8.1 General safety

Change 58.8.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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58.10 Protocol implementation conformance statement (PICS) proforma for Clause 58, Physical Medium Dependent (PMD) sublayer and medium, type 100BASE-LX10 (Long Wavelength) and 100BASE-BX10 (Bi-Directional Long Wavelength)[14]

58.10.3 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, type 100BASE-LX10 and 100BASE-BX10

58.10.3.6 Environmental specifications

Change the row for item ES1 in the table in 58.10.3.6 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	58.8.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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59. Physical Medium Dependent (PMD) sublayer and medium, type 1000BASE-LX10 (Long Wavelength) and 1000BASE-BX10 (Bi-Directional Long Wavelength)

59.8 Environmental, safety, and labeling specifications

59.8.1 General safety

Change 59.8.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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59.10 Protocol implementation conformance statement (PICS) proforma for Clause 59, Physical Medium Dependent (PMD) sublayer and medium, type 1000BASE-LX10 (Long Wavelength) and 1000BASE-BX10 (Bi-Directional Long Wavelength)[15]

59.10.3 Major capabilities/options

59.10.3.6 Environmental, safety, and labeling specifications

Change the row for item ES1 in the table in 59.10.3.6 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	59.8.1	~~Conforms to IEC 60950-1.~~ Conforms to J.2.	M	Yes [ ]
…					

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60. Physical Medium Dependent (PMD) sublayer and medium, type 1000BASE-PX (long wavelength passive optical networks)

60.10 Environmental, safety, and labeling

60.10.1 General safety

Change 60.10.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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60.12 Protocol implementation conformance statement (PICS) proforma for Clause 60, Physical Medium Dependent (PMD) sublayer and medium, type 1000BASE-PX (long wavelength passive optical networks)[16]

60.12.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, type 1000BASE-PX (long wavelength passive optical networks)

60.12.4.12 Environmental specifications

Change the row for item ES1 in the table in 60.12.4.12 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	60.10.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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70. Physical Medium Dependent sublayer and baseband medium, type 1000BASE-KX

70.9 Environmental specifications

70.9.1 General safety

Change 70.9.1 as follows:

All equipment that meets the requirements of this standard shall conform to the applicable requirements of Annex J.~~sections (including isolation requirements) of IEC 60950-1.~~

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70.10 Protocol implementation conformance statement (PICS) proforma for Clause 70, Physical Medium Dependent (PMD) sublayer and baseband medium, type 1000BASE-KX[17]

70.10.4 PICS proforma tables for Clause 70, Physical Medium Dependent (PMD) sublayer and baseband medium, type 1000BASE-KX

70.10.4.5 Environmental and safety specifications

Change the row for item ES1 in the table in 70.10.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	70.9.1	~~Conforms to IEC 60950-1~~ Conforms to the applicable requirements of Annex J	M	Yes [ ]
…					

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71. Physical Medium Dependent sublayer and baseband medium, type 10GBASE-KX4

71.9 Environmental specifications

71.9.1 General safety

Change 71.9.1 as follows:

All equipment that meets the requirements of this standard shall conform to the applicable requirements of Annex J.~~sections (including isolation requirements) of IEC 60950-1.~~

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71.10 Protocol implementation conformance statement (PICS) proforma for Clause 71, Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-KX4[18]

71.10.4 PICS proforma tables for Clause 71, Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-KX4

71.10.4.6 Environmental and safety specifications

Change the row for item ES1 in the table in 71.10.4.6 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	71.9.1	~~Conforms to IEC 60950-1~~ Conforms to applicable requirements of Annex J	M	Yes [ ]
…					

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72. Physical Medium Dependent sublayer and baseband medium, type 10GBASE-KR

72.9 Environmental specifications

72.9.1 General safety

Change 72.9.1 as follows:

All equipment that meets the requirements of this standard shall conform to the applicable requirements of Annex J.~~sections (including isolation requirements) of IEC 60950-1.~~

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72.10 Protocol implementation conformance statement (PICS) proforma for Clause 72, Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-KR[19]

72.10.4 PICS proforma tables for Clause 72, Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-KR

72.10.4.7 Environmental specifications

Change the row for item ES1 in the table in 72.10.4.7 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	72.9.1	~~Complies with applicable section of IEC 60950-1~~ Conforms to applicable requirements of Annex J	M	Yes [ ]
…					

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75. Physical Medium Dependent (PMD) sublayer and medium for passive optical networks, type 10GBASE–PR and 10/1GBASE–PRX

75.8 Environmental, safety, and labeling

75.8.1 General safety

Change 75.8.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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75.10 Protocol implementation conformance statement (PICS) proforma for Clause 75, Physical Medium Dependent (PMD) sublayer and medium for passive optical networks, type 10GBASE–PR and 10/1GBASE–PRX[20]

75.10.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium for passive optical networks, type 10GBASE–PR and 10/1GBASE–PRX

75.10.4.19 Environmental specifications

Change the row for item ES1 in the table in 75.10.4.19 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	75.8.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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84. Physical Medium Dependent sublayer and baseband medium, type 40GBASE-KR4

84.10 Environmental specifications

84.10.1 General safety

Change 84.10.1 as follows:

All equipment subject to this clause shall conform to the applicable requirements of Annex J.~~sections (including isolation requirements) of IEC 60950-1.~~

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84.11 Protocol implementation conformance statement (PICS) proforma for Clause 84, Physical Medium Dependent sublayer and baseband medium, type 40GBASE-KR4[21]

84.11.4 PICS proforma tables for Clause 84, Physical Medium Dependent (PMD) sublayer and baseband medium, type 40GBASE-KR4

84.11.4.5 Environmental specifications

Change the row for item ES1 in the table in 84.11.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	84.10.1	~~Complies with applicable section of IEC 60950-1~~ Conforms to applicable requirements of Annex J	M	Yes [ ]
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86. Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-SR4 and 100GBASE-SR10

86.9 Safety, installation, environment, and labeling

86.9.1 General safety

Change 86.9.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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86.11 Protocol implementation conformance statement (PICS) proforma for Clause 86, Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-SR4 and 100GBASE-SR10[22]

86.11.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, types 40GBASE-SR4 and 100GBASE-SR10

86.11.4.5 Environmental and safety specifications

Change the row for item SES1 in the table in 86.11.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
SES1	General safety	86.9.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
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87. Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-LR4 and 40GBASE-ER4

87.9 Safety, installation, environment, and labeling

87.9.1 General safety

Change 87.9.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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87.13 Protocol implementation conformance statement (PICS) proforma for Clause 87, Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-LR4 and 40GBASE-ER4[23]

87.13.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-LR4 and 40GBASE-ER4

87.13.4.6 Environmental specifications

Change the row for item XLES1 in the table in 87.13.4.6 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
XLES1	General safety	87.9.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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88. Physical Medium Dependent (PMD) sublayer and medium, type 100GBASE-LR4 and 100GBASE-ER4

88.9 Safety, installation, environment, and labeling

88.9.1 General safety

Change 88.9.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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88.12 Protocol implementation conformance statement (PICS) proforma for Clause 88, Physical Medium Dependent (PMD) sublayer and medium, type 100GBASE-LR4 and 100GBASE-ER4[24]

88.12.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, types 100GBASE-LR4 and 100GBASE-ER4

88.12.4.6 Environmental specifications

Change the row for item CES1 in the table in 88.12.4.6 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
CES1	General safety	88.9.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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89. Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-FR

89.8 Safety, installation, environment, and labeling

89.8.1 General safety

Change 89.8.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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89.11 Protocol implementation conformance statement (PICS) proforma for Clause 89, Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-FR[25]

89.11.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-FR

89.11.4.5 Environmental specifications

Change the row for item XLES1 in the table in 89.11.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
XLES1	General safety	89.8.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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93. Physical Medium Dependent (PMD) sublayer and baseband medium, type 100GBASE-KR4

93.10 Environmental specifications

93.10.1 General safety

Change 93.10.1 as follows:

All equipment subject to this clause shall conform to the applicable requirements of Annex J.~~sections (including isolation requirements) of IEC 60950-1.~~

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93.11 Protocol implementation conformance statement (PICS) proforma for Clause 93, Physical Medium Dependent (PMD) sublayer and baseband medium, type 100GBASE-KR4[26]

93.11.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and baseband medium, type 100GBASE-KR4

93.11.4.5 Environmental specifications

Change the row for item ES1 in the table in 93.11.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	93.10.1	~~Conform to applicable sections of IEC 60950-1~~ Conforms to applicable requirements of Annex J	M	Yes [ ]
…					

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94. Physical Medium Attachment (PMA) sublayer, Physical Medium Dependent (PMD) sublayer, and baseband medium, type 100GBASE-KP4

94.5 Environmental specifications

94.5.1 General safety

Change 94.5.1 as follows:

All equipment subject to this clause shall conform to the applicable requirements of Annex J.~~sections (including isolation requirements) of IEC 60950-1.~~

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94.6 Protocol implementation conformance statement (PICS) proforma for Clause 94, Physical Medium Attachment (PMA) sublayer, Physical Medium Dependent (PMD) sublayer, and baseband medium, type 100GBASE-KP4[27]

94.6.4 PICS proforma tables for Physical Medium Attachment (PMA) sublayer, Physical Medium Dependent (PMD) sublayer, and baseband medium, type 100GBASE-KP4

94.6.4.6 Environment specifications

Change the row for item ES1 in the table in 94.6.4.6 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	94.5.1	~~Complies with application section of IEC 60950-1~~ Conforms to applicable requirements of Annex J	M	Yes [ ]
…					

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95. Physical Medium Dependent (PMD) sublayer and medium, type 100GBASE-SR4

95.9 Safety, installation, environment, and labeling

95.9.1 General safety

Change 95.9.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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95.12 Protocol implementation conformance statement (PICS) proforma for Clause 95, Physical Medium Dependent (PMD) sublayer and medium, type 100GBASE-SR4[28]

95.12.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, type 100GBASE-SR4

95.12.4.5 Environmental specifications

Change the row for item CES1 in the table in 95.12.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
CES1	General safety	95.9.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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96. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 100BASE-T1

96.9 Environmental specifications

96.9.1 General safety

Change 96.9.1 as follows:

All equipment subject to this clause is expected to conform to all applicable local, state, national and application-specific standards.

~~All equipment subject to this clause shall conform to IEC 60950-1 (for IT and motor vehicle applications) and to ISO 26262 (for motor vehicle applications only, if required by the given application). All equipment subject to this clause may be additionally required to conform to any applicable local, state, or national standards or as agreed to between the customer and supplier.~~

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96.11 Protocol implementation conformance statement (PICS) proforma for Clause 96, Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 100BASE-T1[29]

96.11.4 PICS proforma tables for Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 100BASE-T1

96.11.4.9 Environmental specifications

Delete the rows for items ES1 and ES2 in the table in 96.11.4.9 and renumber the remaining items accordingly.

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97. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer, and baseband medium, type 1000BASE-T1

97.9 Environmental specifications

97.9.1 General safety

Change 97.9.1 as follows:

All equipment subject to this clause is expected to conform to all applicable local, state, national and application-specific standards.

~~All equipment subject to this clause shall conform to IEC 60950-1 (for IT and motor vehicle applications) and to ISO 26262 (for motor vehicle applications only, if required by the given application). All equipment subject to this clause may be additionally required to conform to any applicable local, state, or national standards or as agreed to between the customer and supplier.~~

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97.11 Protocol implementation conformance statement (PICS) proforma for Clause 97, Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer, and baseband medium, type 1000BASE-T1[30]

97.11.13 Environmental specifications

Delete the rows for items ES1 and ES2 in the table in 97.11.13 and renumber the remaining items accordingly.

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100. Physical Medium Dependent (PMD) sublayer, and medium for coaxial distribution networks, type 10GPASS-XR

100.5 Environmental, safety, and labeling

100.5.1 General safety

Change 100.5.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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100.7 Protocol implementation conformance statement (PICS) proforma for Clause 100, Physical Medium Dependent (PMD) sublayer and medium for coaxial cable distribution networks, type 10GPASS-XR[31]

100.7.3 PICS proforma tables for Physical Medium Dependent (PMD) sublayer for coax cable distribution networks, type 10GPASS-XR

100.7.3.3 Environmental specifications

Change the row for item ES1 in the table in 100.7.3.3 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	100.5.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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104. Power over Data Lines (PoDL) of Single-Pair Ethernet

104.8 Environmental

104.8.1 General safety

Change the first paragraph of 104.8.1 as follows:

All equipment subject to this clause shall conform to J.2~~IEC 60950-1~~. In particular, the PSE shall be classified as a Limited Power Source in accordance with Annex Q of IEC 62368-1:2018~~IEC 60950-1~~. For automotive applications, systems described in this clause may be subject to additional requirements; refer to ISO 26262.

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104.9 Protocol implementation conformance statement (PICS) proforma for Clause 104, Power over Data Lines (PoDL) of Single-Pair Ethernet

104.9.4 PICS proforma tables for Clause 104, Power over Data Lines (PoDL) of Single-Pair Ethernet

104.9.4.8 Environmental

Change the rows for items ENV1 and ENV2 in the table in 104.9.4.8 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ENV1	General safety for PoDL equipment	104.8.1	To conform to J.2~~IEC 60950-1~~	M	Yes [ ]
ENV2	General safety for PoDL PSEs	104.8.1	To be classified as a Limited Power Source in accordance with ~~IEC 60950-1~~Annex Q of IEC 62368-1:2018	M	Yes [ ]
…					

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112. Physical Medium Dependent (PMD) sublayer and medium, type 25GBASE-SR

112.8 Safety, installation, environment, and labeling

112.8.1 General safety

Change 112.8.1 as follows:

All equipment subject to this clause shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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112.11 Protocol implementation conformance statement (PICS) proforma for Clause 112, Physical Medium Dependent (PMD) sublayer and medium, type 25GBASE-SR[32]

112.11.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, type 25GBASE-SR

112.11.4.5 Environmental specifications

Change the row for item CES1 in the table in 112.11.4.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
CES1	General safety	112.8.1	~~Conforms to IEC 60950-1~~ Conforms to J.2	M	Yes [ ]
…					

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113. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer, and baseband medium, types 25GBASE-T and 40GBASE-T

113.5 PMA electrical specifications

Change the title and text of 113.5.1 as follows:

113.5.1 ~~Isolation requirement~~Electrical isolation

The PHY shall provide electrical isolation between the port device circuits, including frame ground (if any) and all MDI leads. This electrical isolation shall meet the isolation requirements as specified in J.1.~~withstand at least one of the following electrical strength tests:~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in 5.2.2 of IEC 60950-1:2001.~~
~~b) 2250 V dc for 60 s, applied as specified in 5.2.2 of IEC 60950-1:2001.~~
~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses is 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time or half value), as defined in Annex N of IEC 60950-1:2001.~~

~~There shall be no insulation breakdown, as defined in 5.2.2 of IEC 60950-1:2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 V dc.~~

113.9 Environmental specifications

113.9.1 General safety

Change 113.9.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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113.12 Protocol implementation conformance statement (PICS) proforma for Clause 113, Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer, and baseband medium, types 25GBASE-T and 40GBASE-T[33]

113.12.6 PMA Electrical Specifications

Change the rows for items PME1 and PME2 in the table in 113.12.6 as follows (unchanged rows not shown):

Item	Feature	Subclause	Status	Support	Value/Comment
PME1	Electrical isolation	113.5.1	M	Yes [ ]	~~One of three electrical strength tests listed in 113.5.1~~Conforms to J.1
PME2	Insulation breakdown after test	113.5.1	M	Yes [ ]	~~>2 MΩ, measured at 500 V dc~~ Conforms to J.1
…					

113.12.10 General safety and environmental requirements

Change the row for item ENV1 in the table in 113.12.10 as follows (unchanged rows not shown):

Item	Feature	Subclause	Status	Support	Value/Comment
ENV1	Conformance to safety specifications	113.9.1	M	Yes [ ]	~~IEC 60950-1~~ Conforms to J.2
…					

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122. Physical Medium Dependent (PMD) sublayer and medium, type 200GBASE-FR4, 200GBASE-LR4, 200GBASE-ER4, 400GBASE-FR8, 400GBASE-LR8, and 400GBASE-ER8

122.9 Safety, installation, environment, and labeling

122.9.1 General safety

Change 122.9.1 as follows:

All equipment subject to this clause shall conform to J.2~~IEC 60950-1~~.

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122.12 Protocol implementation conformance statement (PICS) proforma for Clause 122, Physical Medium Dependent (PMD) sublayer and medium, type 200GBASE-FR4, 200GBASE-LR4, 200GBASE-ER4, 400GBASE-FR8, 400GBASE-LR8, and 400GBASE-ER8[34]

122.12.4 PICS proforma tables for Physical Medium Dependent (PMD) sublayer and medium, type 200GBASE-FR4, 200GBASE-LR4, 200GBASE-ER4, 400GBASE-FR8, 400GBASE-LR8, and 400GBASE-ER8

122.12.4.8 Environmental specifications

Change the row for item ES1 in the table in 122.12.4.8 as follows (unchanged rows not shown):

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	122.9.1	Conforms to J.2~~IEC 60950-1~~	M	Yes [ ]
…					

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126. Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer, and baseband medium, types 2.5GBASE-T and 5GBASE-T

126.5 PMA electrical specifications

Change the title and text of 126.5.1 (as modified by IEEE Std 802.3bt-2018) as follows:

126.5.1 ~~Isolation requirement~~Electrical isolation

A PHY with a MDI that is a PI (see 33.1.3) shall meet the isolation requirements defined in 33.4.1 or 145.4.1.

A PHY with a MDI that is not a PI shall provide electrical isolation between the port device circuits, including frame ground (if any) and all MDI leads. This electrical isolation shall meet the isolation requirements as specified in J.1.~~withstand at least one of the following electrical strength tests:~~

~~a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.~~
~~b) 2250 V dc for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.~~
~~c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses is 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time or half value), as defined in Annex N of IEC 60950-1:2001.~~

~~There shall be no insulation breakdown, as defined in Section 5.2.2 of IEC 60950-1:2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 V dc.~~

126.9 Environmental specifications

126.9.1 General safety

Change 126.9.1 as follows:

All equipment meeting this standard shall conform to the general safety requirements as specified in J.2.~~IEC 60950-1.~~

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126.12 Protocol implementation conformance statement (PICS) proforma for Clause 126—Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer, and baseband medium, types 2.5GBASE-T and 5GBASE-T[35]

126.12.5 PMA Electrical Specifications

Change the rows for items PME1 and PME2 in the table in 126.12.5 as follows (unchanged rows not shown):

Item	Feature	Subclause	Status	Support	Value/Comment
PME1	Electrical isolation	126.5.1	M	Yes [ ]	~~One of three electrical strength tests listed in 126.5.1~~ Conforms to J.1
PME2	Insulation breakdown after test	126.5.1	M	Yes [ ]	~~>2 MΩ, measured at 500 V dc~~ Conforms to J.1
…					

126.12.9 General safety and environmental requirements

Change the row for item ENV1 in the table in 126.12.9 as follows:

Item	Feature	Subclause	Status	Support	Value/Comment
ENV1	Conformance to safety specifications	126.9.1	M	Yes [ ]	~~IEC 60950-1~~ Conforms to J.2
…					

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128. Physical Medium Dependent sublayer and baseband medium, type 2.5GBASE-KX

128.9 Environmental specifications

128.9.1 General safety

Change 128.9.1 as follows:

All equipment that meets the requirements of this standard shall conform to the general safety requirements in J.2.~~applicable sections (including isolation requirements) of IEC 60950-1.~~

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128.10 Protocol implementation conformance statement (PICS) proforma for Clause 128, Physical Medium Dependent sublayer and baseband medium, type 2.5GBASE-KX[36]

128.10.4 PICS proforma tables for Clause 128, Physical Medium Dependent (PMD) sublayer and baseband medium, type 2.5GBASE-KX.

128.10.4.5 Environmental and safety specifications

Change the table in 128.10.4.5 as follows:

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	128.9.1	Conforms to J.2~~IEC 60950-1~~	M	Yes [ ]
ES2	Electromagnetic compatibility	128.9.4	Comply with applicable local and national codes	M	Yes [ ]

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Clause 130 was added by IEEE Std 802.3cb-2018

130. Physical Medium Dependent sublayer and baseband medium, type 5GBASE-KR

130.9 Environmental specifications

130.9.1 General safety

Change 130.9.1 as follows:

All equipment that meets the requirements of this standard shall conform to the applicable requirements of Annex J.~~sections (including isolation requirements) of IEC 60950-1.~~

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130.10 Protocol implementation conformance statement (PICS) proforma for Clause 130, Physical Medium Dependent (PMD) sublayer and baseband medium, type 5GBASE-KR[37]

130.10.4 PICS proforma tables for Clause 130, Physical Medium Dependent (PMD) sublayer and baseband medium, type 5GBASE-KR

130.10.4.6 Environmental specifications

Change the table in 130.10.4.6 as follows:

Item	Feature	Subclause	Value/Comment	Status	Support
ES1	General safety	130.9.1	Complies with applicable ~~section of IEC 60950-1~~ requirements of Annex J	M	Yes [ ]
ES2	Electromagnetic interference	130.9.4	Complies with applicable local and national codes	M	Yes [ ]

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