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AMENDMENT 12
2022-10

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

Part 3:
Standard for Ethernet

AMENDMENT 12: Maintenance #15: Power over Ethernet

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

Partie 3: Norme pour Ethernet

AMENDEMENT 12: Maintenance #15: Alimentation électrique par câble Ethernet

Reference number
ISO/IEC/IEEE 8802-3:2021/Amd.12:2022(E)

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ISO/IEC/IEEE 8802-3:2021/Amd.12 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE 802.3cv-2021) and drafted in accordance with its editorial rules. It was adopted, under the “fast-track procedure” defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

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IEEE Std 802.3cv™-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,
IEEE Std 802.3ca™-2020,
IEEE Std 802.3cr™-2021,
and IEEE Std 802.3cu™-2021)

IEEE Standard for Ethernet

Amendment 12: Maintenance #15: Power over Ethernet

Developed by the

LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 9 May 2021

IEEE SA Standards Board

Abstract: This amendment implements editorial and technical corrections, refinements, and clarifications to Clause 145, Power over Ethernet, and related portions of the standard. No new features are added by this amendment.

Keywords: amendment, DTE power via MDI, Ethernet, IEEE 802.3™, IEEE 802.3bt™, PoE, Power over Ethernet

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Introduction

This introduction is not part of IEEE Std 802.3cv-2021, IEEE Standard for Ethernet—Amendment 12: Maintenance #15: Power over Ethernet.

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 802.3cv-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 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.

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.

IEEE Std 802.3cu™-2021

Amendment 11—This amendment includes changes to IEEE Std 802.3-2018 and adds Clause 151. This amendment adds Physical Layer (PHY) specifications and management parameters for 100 Gb/s and 400 Gb/s operation over single-mode fiber, based on 100 Gb/s per wavelength optical signaling.

IEEE Std 802.3cv™-2021

Amendment 12—This amendment includes editorial and technical corrections, refinements, and clarifications to Clause 145, Power over Ethernet, and related portions of the standard.

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.

Contents

IEEE Standard for Ethernet

Amendment 12: Maintenance #15: Power over Ethernet

(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, IEEE Std 802.3ca™-2020, IEEE Std 802.3cr™-2021, and IEEE Std 802.3cu™-2021.)

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]

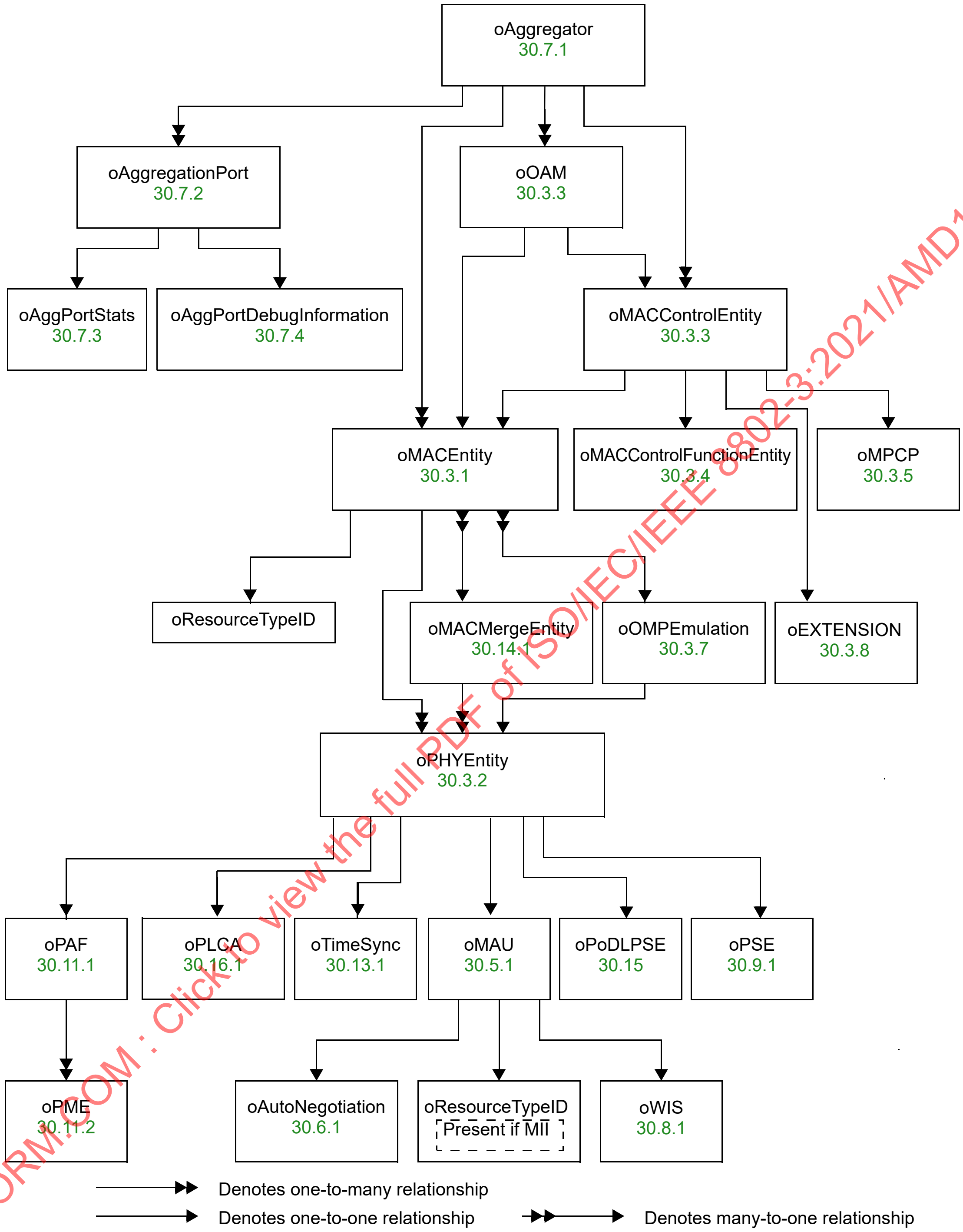
[1] Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

30. Management

30.2 Managed objects

30.2.3 Containment

Replace Figure 30–3 as modified by IEEE Std 802.3cg-2019 to remove oPD as shown on the following page.



NOTE—The objects oAggregator, oAggregationPort, oAggPortStats, and oAggPortDebugInformation are deprecated by IEEE Std 802.1AX™-2008.

Figure 30–3—DTE System entity relationship diagram

30.12 Layer Management for Link Layer Discovery Protocol (LLDP)

30.12.3 LLDP Remote System Group managed object class

30.12.3.1 LLDP Remote System Group attributes

Change 30.12.3.1.18f and 30.12.3.1.18g (as inserted by IEEE Std 802.3bt-2018) as follows:

30.12.3.1.18f aLldpXdot3RemPowerClassExtA

ATTRIBUTE

APPROPRIATE SYNTAX:

An ENUMERATED VALUE that has one of the following entries:

singlesig	Single-signature PD or 2-pair only PSE
class1	Class 1
class2	Class 2
class3	Class 3
class4	Class 4
class5	Class 5

BEHAVIOUR DEFINED AS:

For a dual-signature PD, a read-only value that indicates the currently assigned Class for Mode A by the remote 4-pair PSE. For a single-signature PD or a dual-signature PD connected to a 2-pair only PSE, a read-only value set to 'singlesig' by the remote PSE. For a PSE connected to a dual-signature PD, a read-only value that indicates the requested Class for Mode A during Physical Layer classification (see 145.2.8) by the remote PD. For a PSE connected to a single-signature PD, a read-only value set to 'singlesig' by the remote PD.;

30.12.3.1.18g aLldpXdot3RemPowerClassExtB

ATTRIBUTE

APPROPRIATE SYNTAX:

An ENUMERATED VALUE that has one of the following entries:

singlesig	Single-signature PD or 2-pair only PSE
class1	Class 1
class2	Class 2
class3	Class 3
class4	Class 4
class5	Class 5

BEHAVIOUR DEFINED AS:

For a dual-signature PD, a read-only value that indicates the currently assigned Class for Mode B by the remote 4-pair PSE. For a single-signature PD or a dual-signature PD connected to a 2-pair only PSE, a read-only value set to 'singlesig' by the remote PSE. For a PSE connected to a dual-signature PD, a read-only value that indicates the requested Class for Mode B during Physical Layer classification (see 145.2.8) by the remote PD. For a PSE connected to a single-signature PD, a read-only value set to 'singlesig' by the remote PD.;

33. Power over Ethernet over 2 Pairs

33.6 Data Link Layer classification

33.6.3 Power control state diagrams

33.6.3.3 Variables

Change the following definitions in 33.6.3.3, some of which were changed by IEEE Std 802.3bt-2018 (unchanged definitions not shown):

…

MirroredPDRequestedPowerValue

The copy of PDRequestedPowerValue that the PSE receives from the remote system. This variable is mapped from the aLldpXdot3RemPDRequestedPowerValue attribute (30.12.3.1.17). ~~Actual power numbers are represented using an integer value that is encoded according to Equation (79–1), where *X* is the decimal value of MirroredPDRequestedPowerValue.~~ Power numbers are represented using an integer value in units of 0.1 W.

Values: 1 through 255

…

MirroredPSEAllocatedPowerValue

The copy of PSEAllocatedPowerValue that the PD receives from the remote system. This variable is mapped from the aLldpXdot3RemPSEAllocatedPowerValue attribute (30.12.3.1.18). ~~Actual power numbers are represented using an integer value that is encoded according to Equation (79–2), where *X* is the decimal value of MirroredPSEAllocatedPowerValue.~~ Power numbers are represented using an integer value in units of 0.1 W.

Values: 1 through 255

…

PDMaxPowerValue

Integer that indicates the actual PD power value of the local system. The actual PD power value for a PD is the maximum input average power (see 33.3.7.2) the PD ever draws under the current power allocation. ~~Actual power numbers are represented using an integer value that is encoded according to Equation (79–1), where *X* is the decimal value of PDMaxPowerValue.~~ Power numbers are represented using an integer value in units of 0.1 W.

PDRequestedPowerValue

Integer that indicates the PD requested power value in the PD. The value is the maximum input average power (see 33.3.7.2) the PD requests. ~~This power value is encoded according to Equation (79–1), where *X* is the decimal value of PDRequestedPowerValue.~~ Power numbers are represented using an integer value in units of 0.1 W. This variable is mapped from the aLldpXdot3LocPDRequestedPowerValue attribute (30.12.2.1.17).

Values: 1 through PD_DLLMAX_VALUE

PSEAllocatedPowerValue

Integer that indicates the PSE allocated power value in the PSE. ~~The value is the maximum input average power (see 33.3.7.2) the PD ever draws. The power value for a PSE is the maximum input average power the PD may ever draw. This power value is encoded according to Equation (79–2), where *X* is the decimal value of PSEAllocatedPowerValue.~~ Power numbers are represented using an integer value in units of 0.1 W. This variable is mapped from the aLldpXdot3LocPSEAllocatedPowerValue attribute (30.12.2.1.18).

Values: 1 through 255

…

TempVar

~~A temporary variable used to store Power Value. Actual power numbers are represented using an integer value that is encoded according to Equation (79–1) or Equation (79–2), where *X* is the~~

~~decimal value of TempVar.~~ A temporary variable used to store Power Value, represented by an integer value in units of 0.1 W.

33.6.3.4 Functions

Change 33.6.3.4 as follows:

pse_power_review

This function evaluates the power allocation or budget of the PSE based on local system changes. The function returns the following variables:

PSE_NEW_VALUE:

The new maximum power value that the PSE expects the PD to draw. ~~Actual power numbers are represented using an integer value that is encoded according to Equation (79–2), where *X* is the decimal value of PSE_NEW_VALUE.~~

Power numbers are represented using an integer value in units of 0.1 W.

pd_power_review

This function evaluates the power requirements of the PD based on local system changes and/or changes in the PSE allocated power value. The function returns the following variables:

PD_NEW_VALUE:

The new maximum power value that the PD wants to draw. ~~Actual power numbers are represented using an integer value that is encoded according to Equation (79–1), where *X* is the decimal value of PD_NEW_VALUE.~~

Power numbers are represented using an integer value in units of 0.1 W.

79. IEEE 802.3 Organizationally Specific Link Layer Discovery Protocol (LLDP) type, length, and value (TLV) information elements

79.3.2 Power Via MDI TLV

Delete the last paragraph of 79.3.2 beginning "If a Type 1 or Type 2 power entity …", as inserted by IEEE Std 802.3bt-2018.

Insert the following text and Table 79–2a at the end of 79.3.2 as follows:

Power entities that implement Data Link Layer classification shall support the Power via MDI TLV DLL classification extension fields shown in Figure 79–3 after the PI has been powered. Type 3 or Type 4 power entities that implement Data Link Layer classification and are connected to another Type 3 or Type 4 power entity shall support the Type 3 and Type 4 extension fields shown in Figure 79–3 after the PI has been powered. Such entities, when connected to a Type 1 or Type 2 power entity, may support the Type 3 and Type 4 extension fields shown in Figure 79–3 after the PI has been powered. Type 1 and Type 2 devices shall not include the Type 3 and Type 4 extension fields in the transmitted Power via MDI TLV.

NOTE—Some implementations of the Power via MDI TLV in Type 1 and Type 2 power entities ignore TLVs that are longer than 12 octets. In order to be interoperable with these implementations, Type 3 and Type 4 power entities are permitted to transmit 12-octet TLVs (without the Type 3 and Type 4 extension) after first transmitting at least one valid 29-octet TLV (including the Type 3 and Type 4 extension). Table 79–2a lists the recommended Power via MDI TLV formats for each combination of power entity Types.

Table 79–2a—Recommended TLV format

Power entity A	Power entity B	Power entity A sends	Power entity B sends	Recommended TLV format
Type 1, Type 2	Type 1, Type 2	12-octet TLV	12-octet TLV	12-octet TLV
Type 3, Type 4	Type 1, Type 2	29-octet TLV	12-octet TLV	12-octet TLV
Type 1, Type 2	Type 3, Type 4	12-octet TLV	29-octet TLV	12-octet TLV
Type 3, Type 4	Type 3, Type 4	29-octet TLV	29-octet TLV	29-octet TLV

Type 3 and Type 4 PD power entities can determine the PSE Type based on the duration of the first classification event (see 145.3.7) or based on the length of a received Power via MDI TLV (see Figure 79–3). Type 3 and Type 4 PSEs can determine the PD Type based on the PDs Physical Layer requested Class (see 145.2.8 and 145.3.6.1) or based on the length of a received Power via MDI TLV (see Figure 79–3).

79.3.8 Power via MDI Measurements TLV

79.3.8.1 Measurements

Change footnote a to Table 79–8a (as inserted by IEEE Std 802.3bt-2018) as follows:

[a] The valid range of this field extends beyond the allowed operating range of V_{Port_PD} or V_{Port_PD-2P}; see ~~33.3.8.1~~ 33.3.7.1 and 145.3.8.1.

Clause 145 was added by IEEE Std 802.3bt-2018

145. Power over Ethernet

145.2 Power sourcing equipment (PSE)

145.2.5 PSE state diagrams

145.2.5.1 State diagram overview and timing

Change the third paragraph of 145.2.5.1 as follows:

A PSE performing detection using only Alternative B may fail to detect a valid PD detection signature. ~~When this occurs, the PSE shall back off for at least T_{dbo} as defined in Table 145–16 before attempting another detection, except in the case of an open circuit as defined in 145.2.6.5. During this backoff, the PSE shall not apply a voltage greater than V_{Off} to the PI.~~ When this occurs, the PSE shall not apply a voltage greater than V_{Off} to the PI until after at least T_{dbo}, as defined in Table 145–16, has passed before attempting another detection, except in the case of an open circuit as defined in 145.2.6.5. See 145.2.6.5 for more information on Alternative B detection backoff requirements.

Change the fifth paragraph of 145.2.5.1 as follows:

Connection ~~C~~check timing requirements are specified in Table 145–10. Detection and power turn-on timing requirements are specified in Table 145–16. Classification timing requirements are specified in Table 145–14. Autoclass timing requirements are specified in Table 145–15.

145.2.5.2 Conventions

Insert new subclause 145.2.5.2.1 at the end of 145.2.5.2 as follows:

145.2.5.2.1 Alternative designation

Alternative information is obtained by replacing the X in the desired variable or function with the letter of the Alternative of interest. The Alternative is referred to in general as follows:

X

Generic Alternative designator. When X is used in a state diagram, its value is local to that state diagram and not global to the set of state diagrams.
Values:
A: Alternative A
B: Alternative B

NOTE—The variables alt_pri and alt_sec map Alternatives to Primary and Secondary.

145.2.5.3 Constants

Change the definition for value 0 of CC_DET_SEQ as follows:

0: Connection ~~C~~check is followed by staggered detection for a single-signature PD and parallel or staggered detection for a dual-signature PD.

145.2.5.4 Variables

Insert new variable ac_measurement_completed at the beginning of 145.2.5.4:

ac_measurement_completed
A variable that indicates that an Autoclass measurement has been completed. This variable is set by the state diagram.
Values:
FALSE: The Autoclass measurement has not completed.
TRUE: An Autoclass measurement has been completed.

Change the variable definition for MirroredPDAutoclassRequest in 145.2.5.4 as follows:

MirroredPDAutoclassRequest
~~A variable output by the PSE power control state diagram that indicates whether the PSE has received an Autoclass measurement request from the PD via the Data Link Layer. See 145.5. This variable is assigned through Table 145–38.~~
The copy of the 'PD Autoclass request' field in the Power via MDI TLV that the PSE receives from the remote system. This variable is mapped from aLldpXdot3RemAutoclassRequest (30.12.3.1.18o) and assigned through Table 145–38.

Insert new variable option_MEC_after_probe after variable option_detect_ted_sec in 145.2.5.4:

option_MEC_after_probe
This variable indicates if Multiple-Event classification is allowed after a class probe in the dual-signature state diagrams.
Values:
FALSE: Only allow Single-Event classification after class probe.
TRUE: Allow Multiple-Event classification after class probe.

Insert new variable pd_autoclass_cancelled after variable pd_4pair_cand in 145.2.5.4:

pd_autoclass_cancelled
A variable that indicates whether the PD cancelled Autoclass by drawing less than Class 1 power during the Autoclass measurement period.
Values:
FALSE: The PD did not cancel Autoclass or did not request Autoclass.
TRUE: The PD requested Physical Layer Autoclass and cancelled.

Insert two new variables pse_ready_pri and pse_ready_sec after variable pse_ready in 145.2.5.4:

pse_ready_pri
Variable that is asserted in an implementation-dependent manner to probe the Primary Alternative. This variable may be set by the PSE at any time.
Values:
FALSE: PSE is not ready to probe the primary link segment.
TRUE: PSE is ready to probe the primary link segment.

pse_ready_sec
Variable that is asserted in an implementation-dependent manner to probe the Secondary Alternative. This variable may be set by the PSE at any time.
Values:
FALSE: PSE is not ready to probe the secondary link segment.
TRUE: PSE is ready to probe the secondary link segment.

145.2.5.6 Functions

Change the definition of do_autoclass_measure in 145.2.5.6 as follows:

do_autoclass_measure

This function measures $P_{Autoclass}$ as defined in 145.2.8.2. This function returns the following variable:

$P_{Autoclass}$: The power measured by the PSE during Physical Layer classification as defined in 145.2.8.2.

Change the first sentence of the definition of do_cxn_chk in 145.2.5.6 as follows:

do_cxn_chk

This function initiates the Cconnection Ccheck as defined in 145.2.7.

Change the definition of do_initialize in 145.2.5.6 as follows:

do_initialize

This function returns the following variables (see 145.2.5.4):

alt_pri
autoclass_enable
class_4PID_mult_events_pri
class_4PID_mult_events_sec
option_2ev
option_class_probe
option_class_probe_pri
option_class_probe_sec
option_detect_ted
option_detect_ted_pri
option_detect_ted_sec
option_MEC_after_probe
option_probe_alt_sec
pse_alternative
pse_avail_pwr
pse_avail_pwr_pri
pse_avail_pwr_sec
pse_dll_capable
semi_pwr_en

Change the definition of do_update_pse_allocated_pwr_pri in 145.2.5.6 as follows:

do_update_pse_allocated_pwr_pri

A function that updates the pse_allocated_pwr_pri value based on the value of PSEAllocatedPowerValue_alt(X) as defined in Table 145–12. This function returns the following variable:

pse_allocated_pwr_pri: See do_classification_pri function pse_allocated_pwr_pri in 145.2.5.4.

Change the definition of do_update_pse_allocated_pwr_sec in 145.2.5.6 as follows:

do_update_pse_allocated_pwr_sec
A function that updates the pse_allocated_pwr_sec value based on the value of PSEAllocatedPowerValue_alt(X) as defined in Table 145–12. This function returns the following variable:

pse_allocated_pwr_sec: See pse_allocated_pwr_sec in ~~145.2.5.4~~145.2.5.6.

145.2.5.7 State diagrams

Replace part 3 of Figure 145–13, (with changed content in state CLASS_EV1_LCE) as shown on the following page.

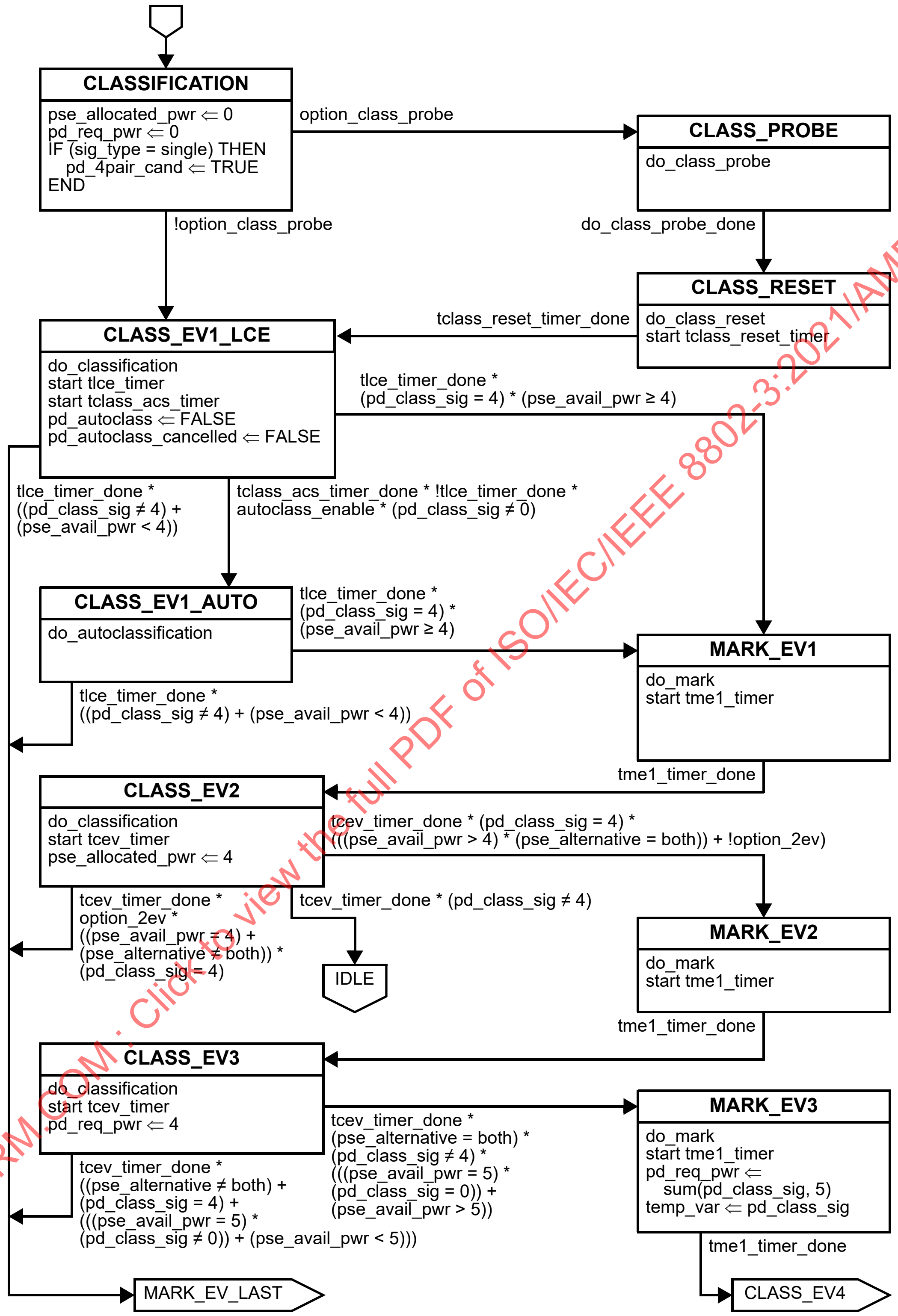


Figure 145–13—Top level PSE state diagram *(continued)*

Replace Figure 145–14 with the following figure:

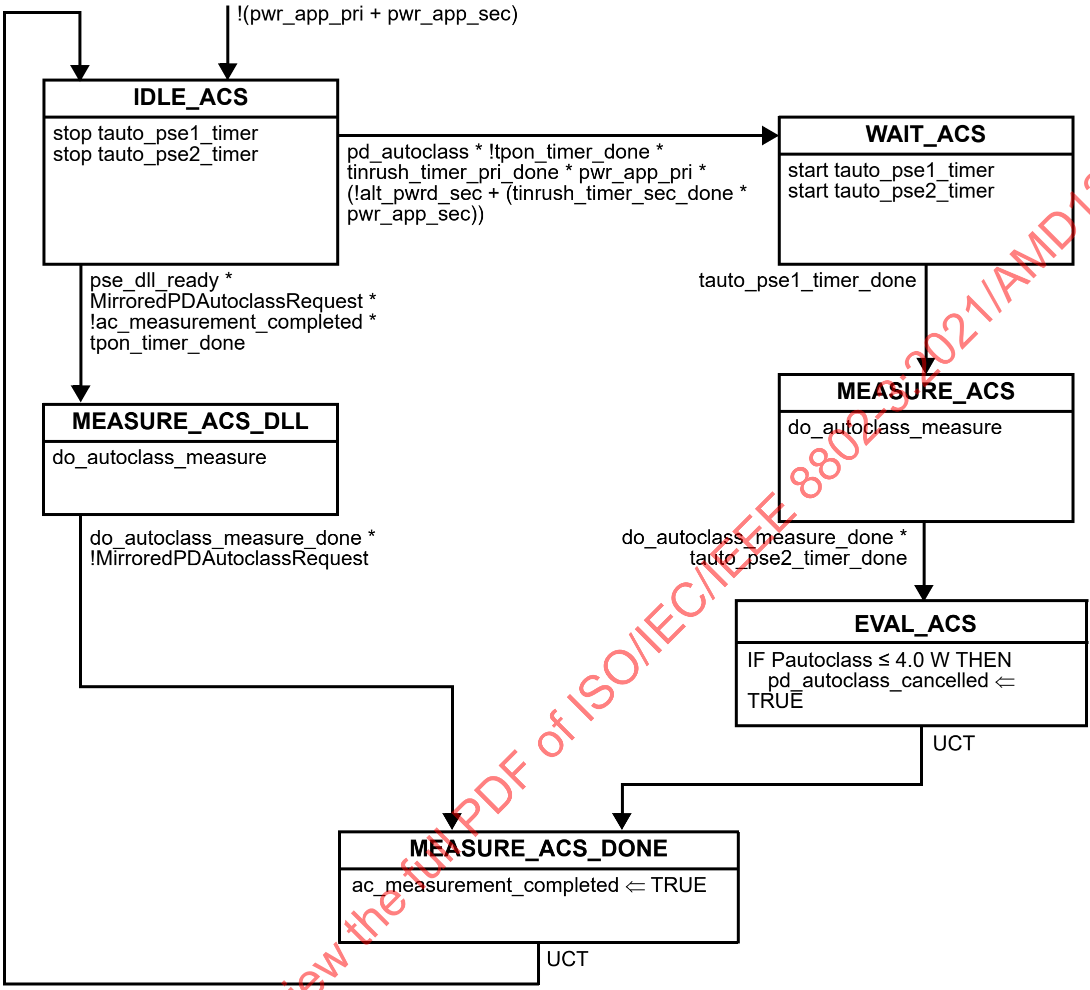


Figure 145–14—PSE Autoclass state diagram

Replace part 1 of Figure 145–15 with the following figure (with changed exit condition from IDLE_PRI to START_DETECT_PRI):

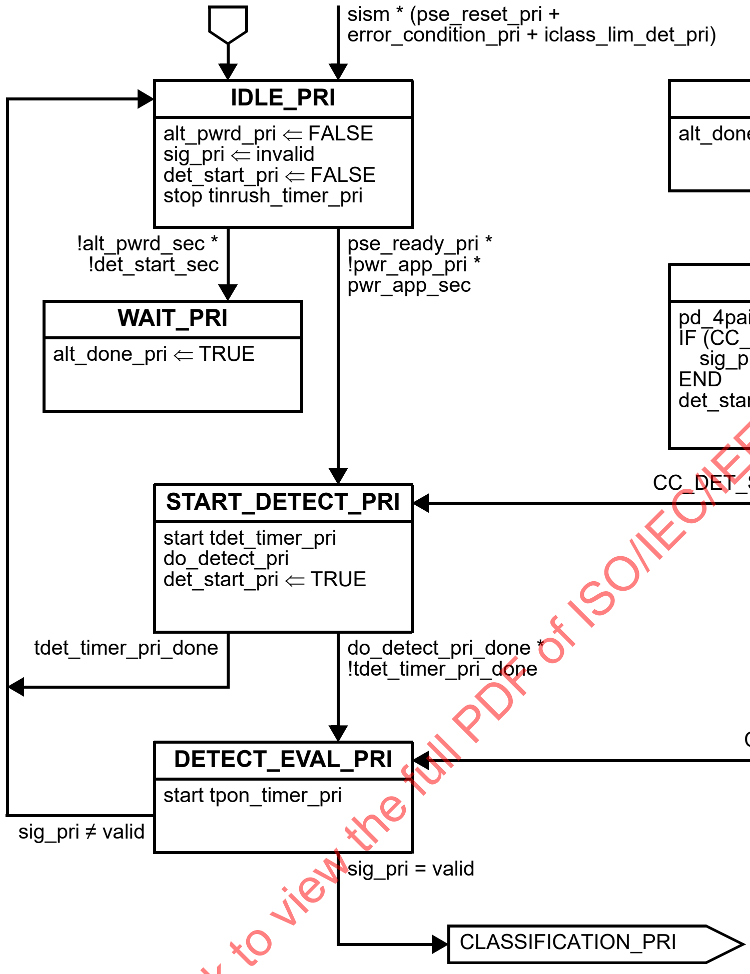


Figure 145–15—Primary Alternative dual-signature semi-independent PSE state diagram

Replace part 2 of Figure 145–15 (with changed exit conditions from CLASS_PROBE_PRI) as shown on the following page.

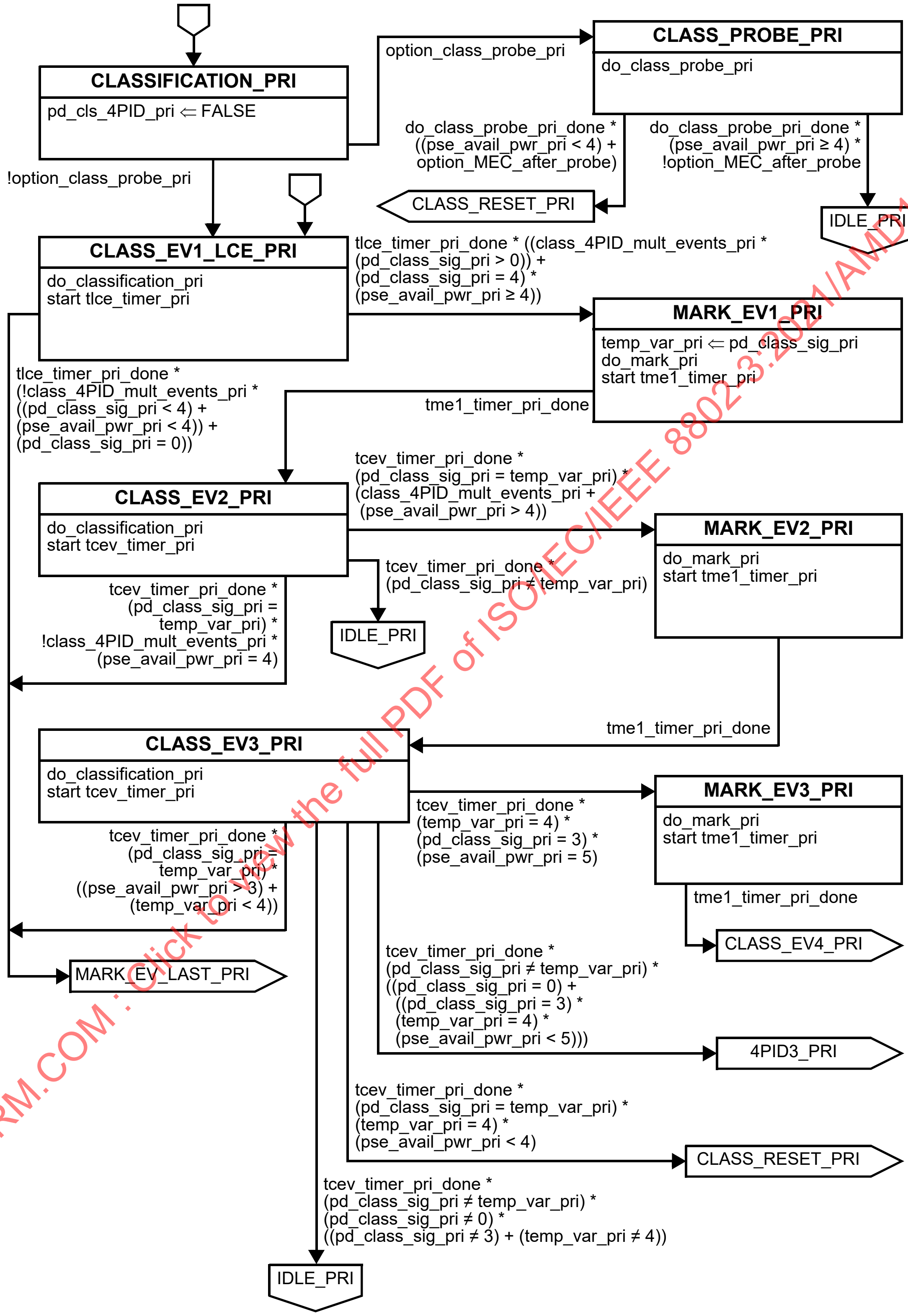


Figure 145–15—Primary Alternative dual-signature semi-independent PSE state diagram *(continued)*

Replace part 3 of Figure 145–15 with the following figure (with changed exit conditions from CLASS_RESET_PRI):

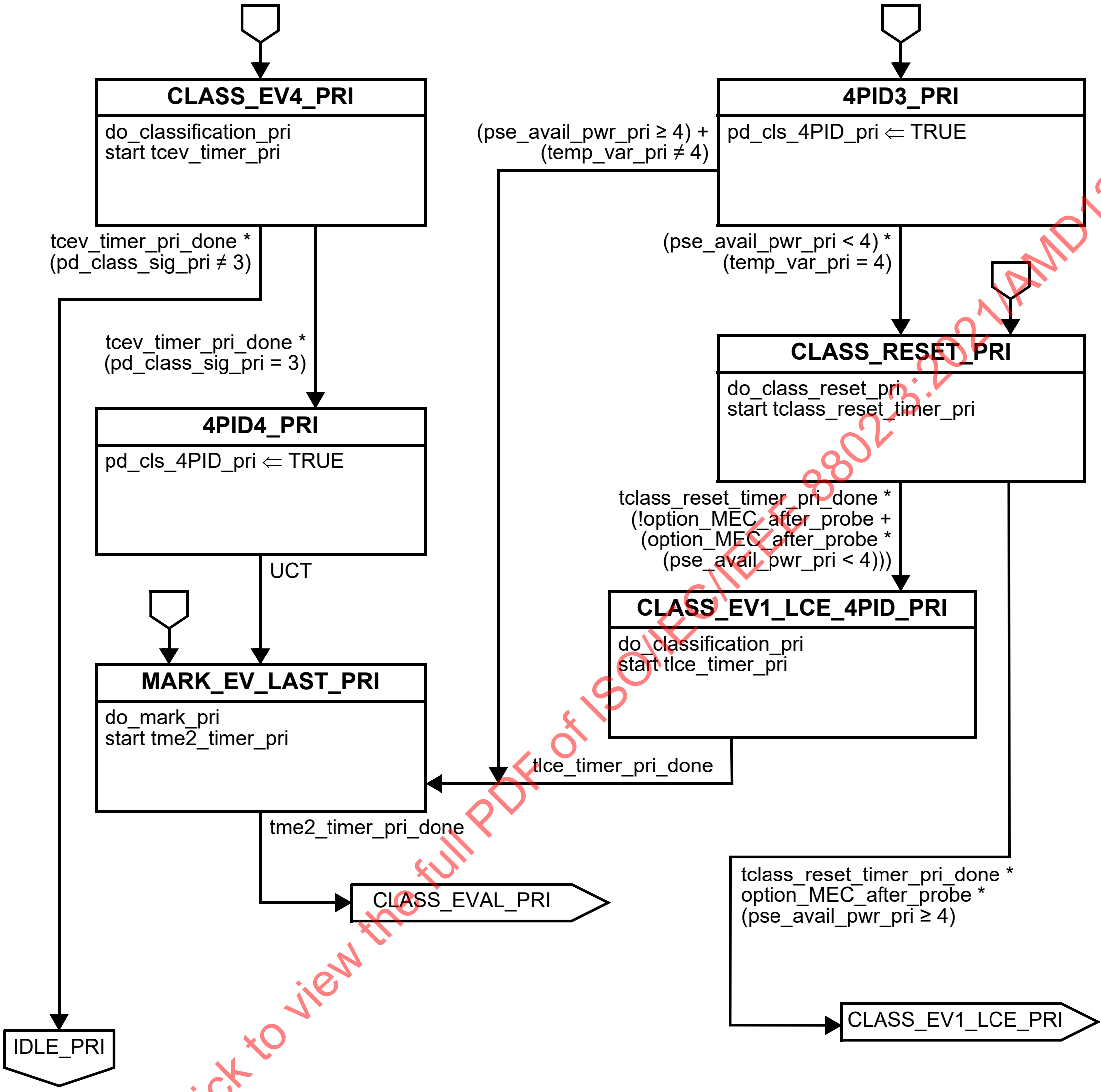


Figure 145–15—Primary Alternative dual-signature semi-independent PSE state diagram *(continued)*

Replace part 2 of Figure 145–16 with the following figure (with changed exit conditions from CLASS_PROBE_SEC):

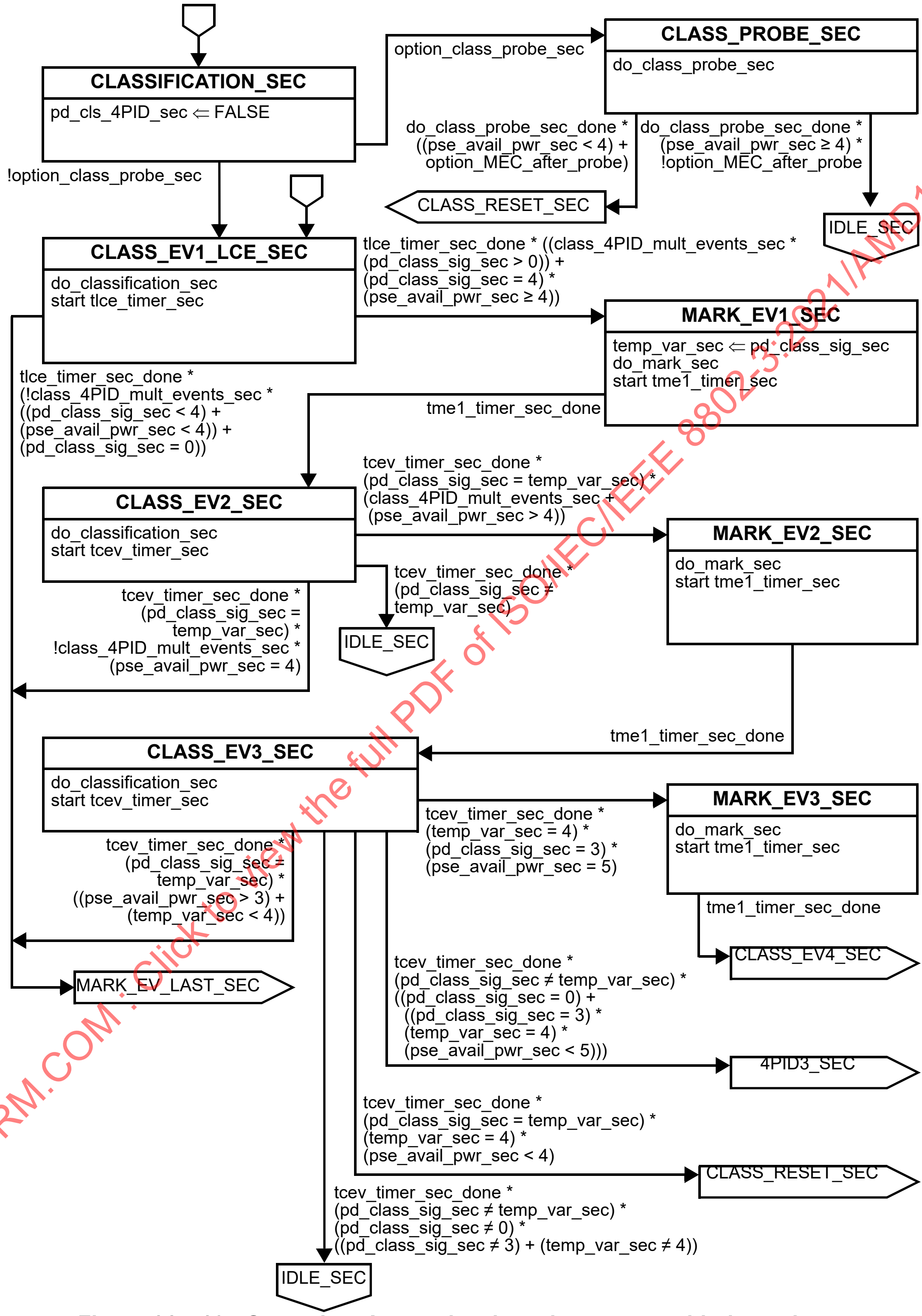


Figure 145–16—Secondary Alternative dual-signature semi-independent PSE state diagram *(continued)*

Replace part 3 of Figure 145–16 with the following figure (with changed exit conditions from CLASS_RESET_SEC):

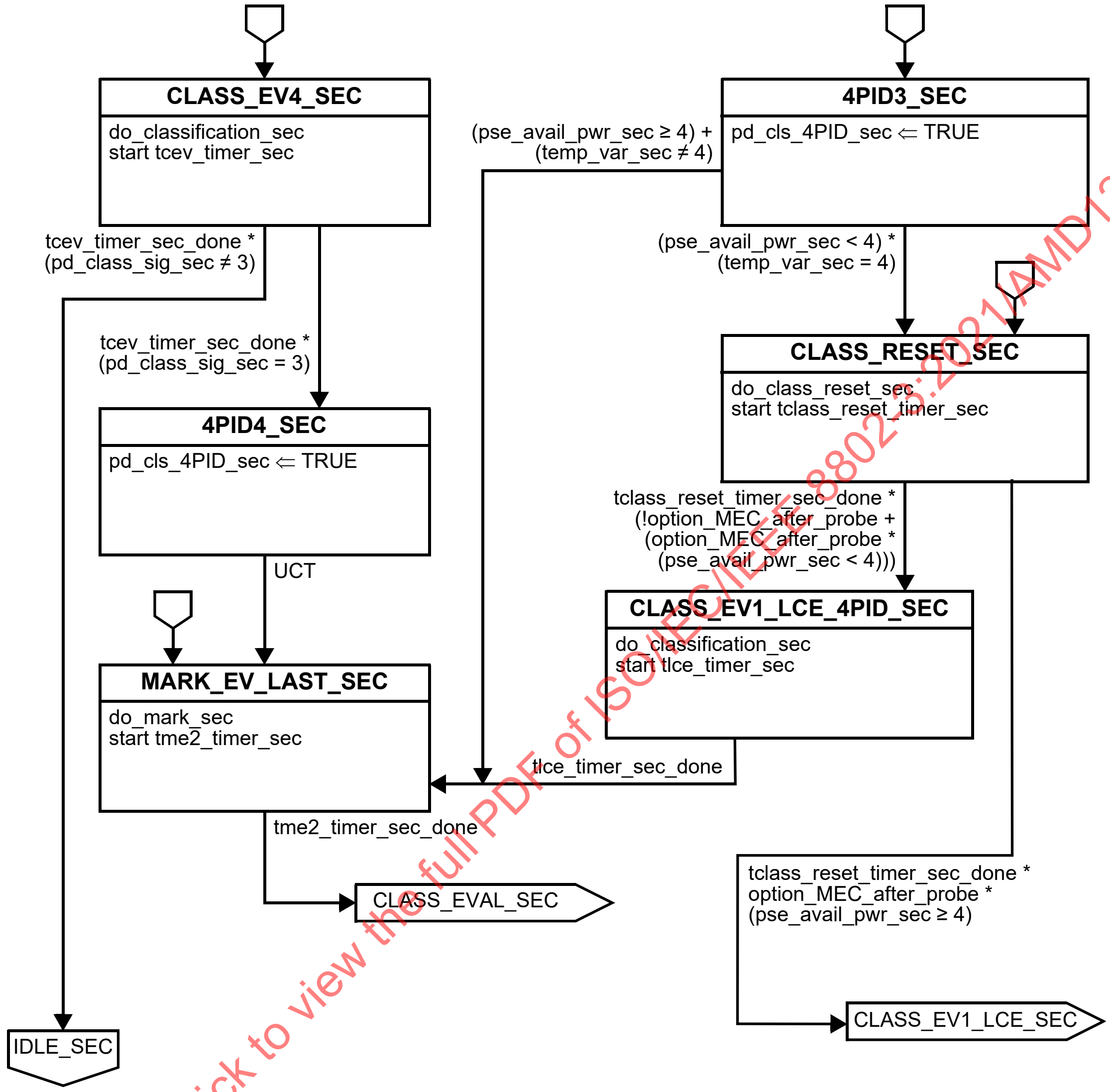


Figure 145–16—Secondary Alternative dual-signature semi-independent PSE state diagram *(continued)*

145.2.8 PSE classification of PDs and mutual identification

Change the tenth paragraph of 145.2.8 as follows:

If the PD connected to the PSE performs Autoclass (see 145.2.8.2 and 145.3.6.2), the PSE may set the minimum supported output power based on $P_{Autoclass}$, the power drawn during the Autoclass measurement window. $P_{Autoclass}$ shall be increased by at least P_{ac_margin}, as defined in Table 145–15, in order to account for potential increase in link section resistance due to temperature increase, up to the value defined in Table 145–11 of the Class assigned to the PD~~, and with a minimum power allocation of Class 1~~. If $P_{Autoclass}$ is less than or equal to 4 W then the minimum supported output power shall be P_{Class} per the assigned Class.

Replace Equation (145–4) with the following equation:

$$P_{ac\_extra} = \left\{\left(\frac{P_{Autoclass}}{V_{Port\_PSE\text{-}2P}\min}\right)^2 \times \frac{R_{Ch}}{2}\right\}_{W} \qquad (145\text{–}4)$$

145.2.8.1 PSE Multiple-Event Physical Layer classification

Change the third paragraph from the end of 145.2.8.1 as follows:

If any measured I_{Class} is equal to or greater than I_{Class_LIM} min, a PSE ~~shall~~ returns to IDLE, IDLE_PRI, or IDLE_SEC as appropriate. The PSE shall limit class event currents to I_{Class_LIM} and shall limit mark event currents to I_{Mark_LIM}.

Change the second paragraph from the end of 145.2.8.1 as follows:

All class event voltages and mark event voltages shall have the same polarity as defined for $V_{Port\_PSE\text{-}2P}$ in 145.2.4. PSEs may issue class events on one or both pairsets, when connected to a single-signature PD and operating over 4 pairs. The PSE shall complete Multiple-Event Physical Layer classification and transition to POWER_ON, POWER_ON_PRI, or POWER_ON_SEC without allowing the voltage at the PI or pairset to go below V_{Mark} min, unless in CLASS_RESET, CLASS_RESET_PRI, or CLASS_RESET_SEC. If the PSE returns to IDLE, it shall maintain the PI voltage in the range of V_{Reset} for a period of at least T_{Reset} min before starting a new detection cycle. If the PSE returns to IDLE_PRI or IDLE_SEC, it shall maintain the PI voltage on the corresponding pairset in the range of V_{Reset} for a period of at least T_{Reset} min before starting a new detection cycle. If the PSE is in any of the CLASS_RESET states it shall maintain the PI or pairset voltage in the range of V_{Reset} for a period of at least T_{Reset} min.

145.3 Powered devices (PDs)

145.3.3 PD state diagrams

145.3.3.3 Single-signature PD state diagrams

145.3.3.3.2 Variables

Insert new variable pd_acs_cancel after variable nopower as follows:

pd_acs_cancel
This variable indicates that the PD is aborting the Autoclass procedure. See 145.3.6.2.
Values:
FALSE: The PD does not abort the Physical Layer Autoclass procedure.
TRUE: The PD aborts the Physical Layer Autoclass procedure.

145.3.3.3.5 State diagrams

Replace part 1 of Figure 145–25 with the following (with changed content in DO_CLASS_EVENT_AUTO):

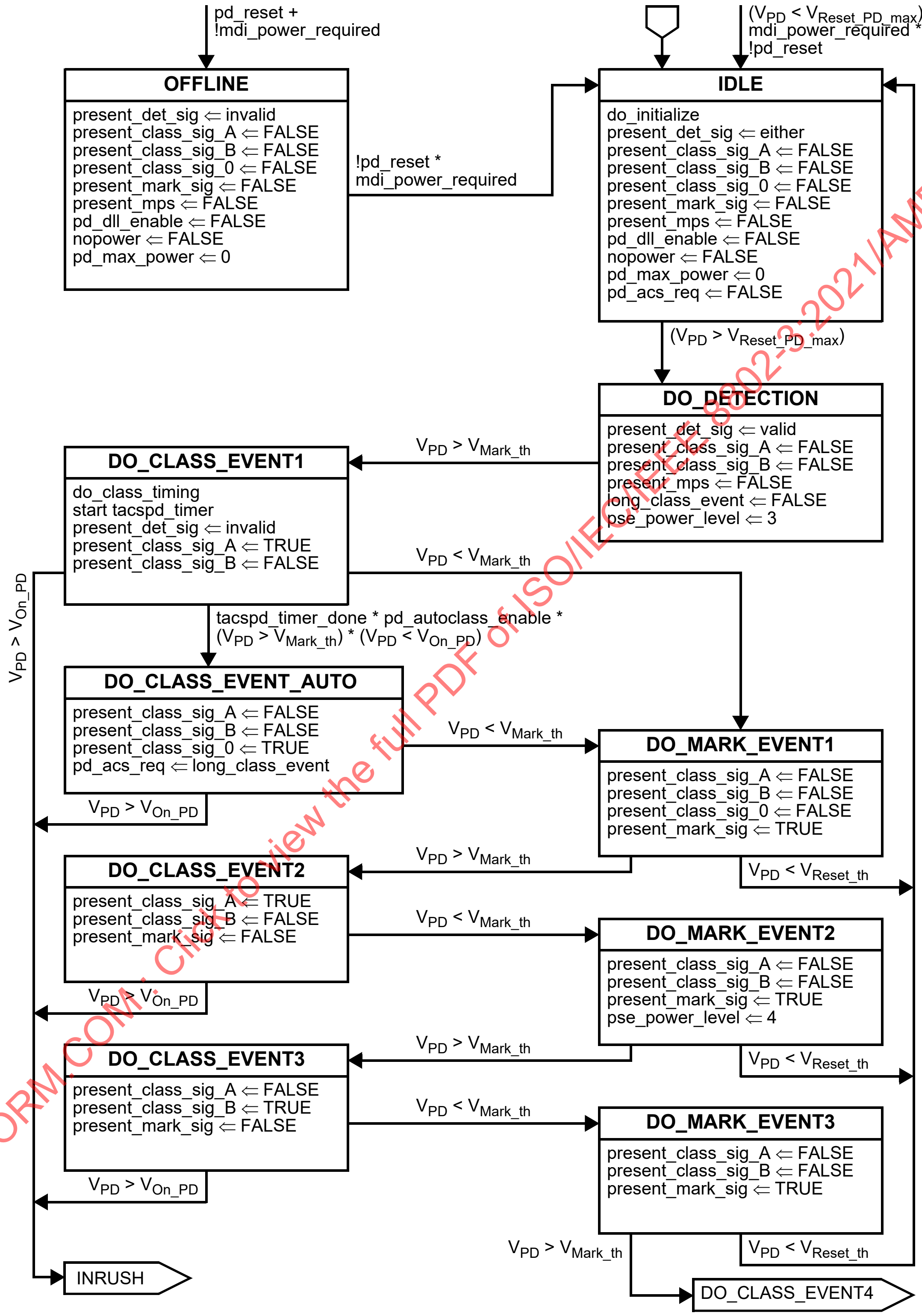


Figure 145–25—Single-signature PD state diagram

Replace Figure 145–26 with the following:

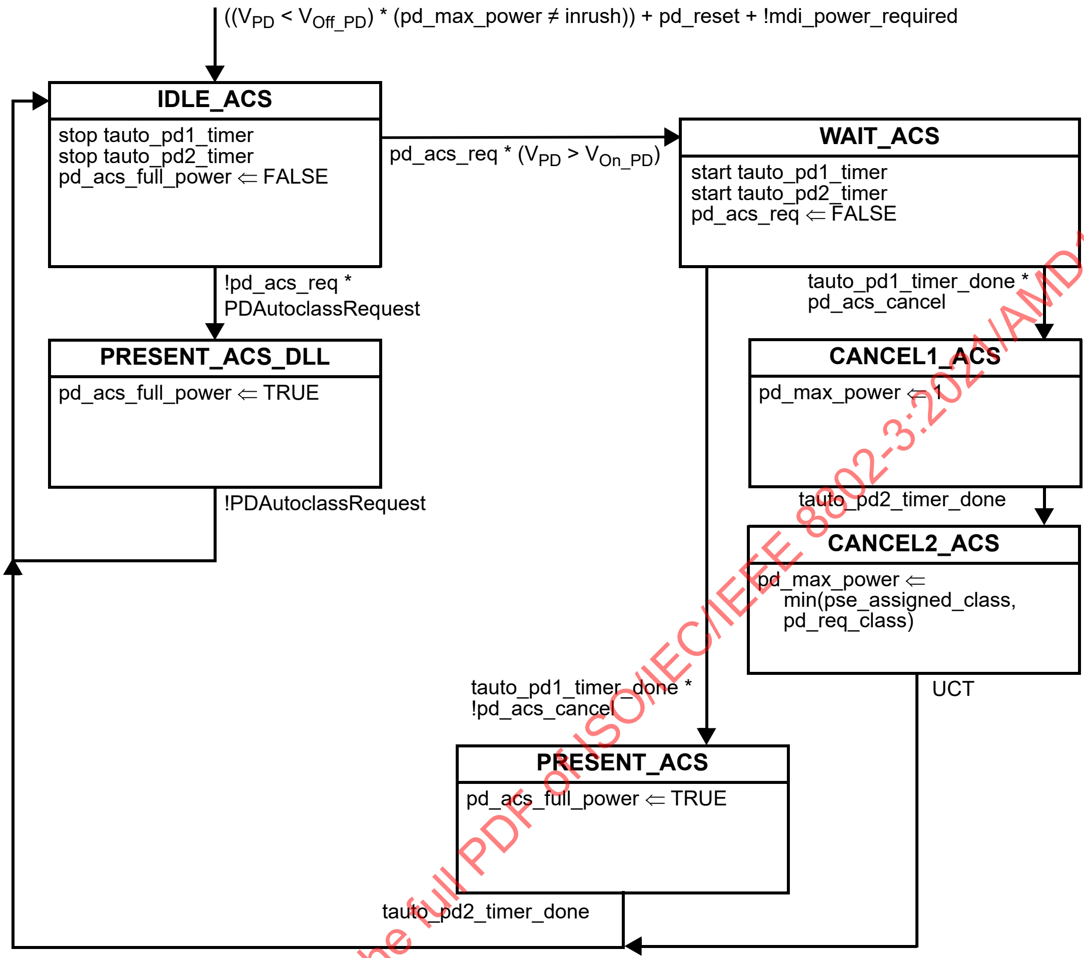


Figure 145–26—Single-signature PD Autoclass state diagram

145.3.3.4 Dual-signature PD state diagram

145.3.3.4.5 State diagram

Replace part 2 of Figure 145–27 with the following (with changed content in state POWERED):

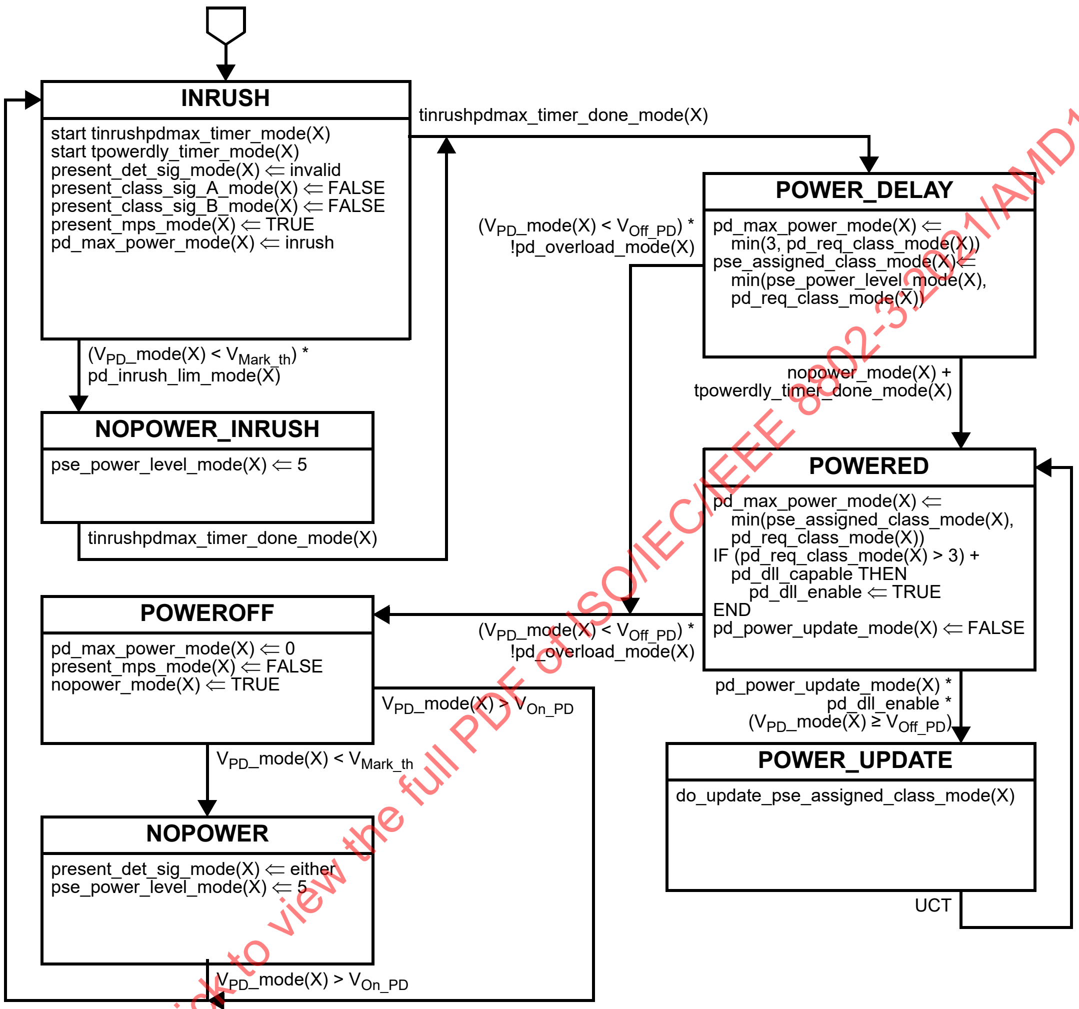


Figure 145–27—Dual-signature PD state diagram *(continued)*

145.3.6 PD classification

145.3.6.2 Autoclass (optional)

Change the third paragraph of 145.3.6.2 as follows:

After power up, a PD that implements Autoclass shall draw its highest required power, $P_{Autoclass\_PD}$, subject to the requirements on P_{Class_PD} in 145.3.8.4, throughout the period bounded by T_{AUTO_PD1} and T_{AUTO_PD2}, measured from when V_{PD} rises above V_{On_PD}. The PD is restricted to a maximum power draw of $P_{Autoclass\_PD}$ until the PD successfully negotiates a higher power level through Data Link Layer classification as defined in 145.5. A PD that draws less than P_{Class_PD} max for Class 1 during the period