Extended Power

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System Level Power Allocations

Single-signature PD Rules

$$P_{Class} = \left\{ V_{PSE} \times \left(\frac{V_{PSE} - \sqrt{V_{PSE}^2 - 4 \times R_{Chan} \times P_{Class\_PD}}}{2 \times R_{Chan}} \right) \right\}_W \quad (145\text{–}2)$$

where

V_{PSE}	is the voltage at the PSE PI as defined in 145.1.3.
R_{Chan}	is the channel DC loop resistance
P_{Class_PD}	is the maximum power at the PD PI per the PDs assigned Class, as defined in Table 145–24)

PSE

Measured output power is P_{Con}

Guaranteed minimum output power is P_{Class}

Cable IR Drop

PD

Maximum input power is P_{Class_PD}

Dual-signature PD Rules

The minimum output power a PSE supports on a pairset for PSEs connected to a dual-signature PD is defined by Equation (145–3). PSE implementations may use $V_{PSE} = V_{Port\_PSE\text{-}2P}$ min and $R_{Chan} = R_{Ch}$ to arrive at over-margined values as shown in Table 145–11. $P_{Class\text{-}2P}$ may subsequently be adjusted using Data Link Layer classification.

$$P_{Class\text{-}2P} = \left\{ V_{PSE} \times \left(\frac{V_{PSE} - \sqrt{V_{PSE}^2 - 4 \times R_{Chan} \times P_{Class\_PD\text{-}2P}}}{2 \times R_{Chan}} \right) \right\}_W \quad (145\text{–}3)$$

where

V_{PSE}	is the voltage at the PSE PI as defined in 145.1.3.
R_{Chan}	is the channel DC loop resistance
$P_{Class\_PD\text{-}2P}$	is the maximum power at the PD PI for a pairset per the PDs assigned Class, as defined in Table 145–25

PD Extended Power

- PSE have always allowed to recover R_{Chan}
- Class 6 and Class 8 SS PDs are *now* allowed to recover R_{Chan}
- Class 5 DS PDs are *now* allowed to recover R_{Chan}

145.3.8.2.1 Input average power exceptions

For Class 6 and Class 8 single-signature PDs, when additional information is available to the PD regarding actual channel DC resistance between the PSE PI and the PD PI, the PD may consume greater than P_{Class_PD} but shall not consume greater than P_{Class} at the PSE PI and shall not draw a total 4-pair current in excess of $2 \times I_{Cable}$ as defined in Table 145–1.

For Class 5 dual-signature PDs, when additional information is available to the PD regarding actual channel DC resistance between the PSE PI and the PD PI, the PD may consume greater than $P_{Class\_PD\text{-}2P}$ but shall not consume greater than $P_{Class\text{-}2P}$ at the PSE PI and shall not draw current in excess of I_{Cable} as defined in Table 145–1.

PD P_{Class_PD}

- PD P_{Class_PD} is assigned
  - Initially by MEPLC
  - Later can be modified by LLDP
- It is not calculated, it is a scalar

Table 145–24—Physical Layer Classifications and Multiple Event Responses for single-signature PDs

PD Type	Requested Class	class_sig_A class signature	class_sig_B class signature	P_{Class_PD} (W)
3	1	1	1	3.84
	2	2	2	6.49
	3	3	3	13
	4	4	4	25.5
	5	4	0	40
	6	4	1	51
4	7	4	2	62
	8	4	3	71.3

NOTE—See Table 145–23 for definition of class signatures 0 to 4.
NOTE—PDs may be assigned to a lower Class than their requested Class, which results in a lower value of P_{Class_PD}.

Table 145–25—Physical Layer Classifications and Multiple Event Responses for dual-signature PDs

PD Type	Requested Class per pairset	class_sig_A class signature	class_sig_B class signature	$P_{Class\_PD\text{-}2P}$ (W)
3	1	1	0	3.84
	2	2	0	6.49
	3	3	0	13
	4	4	0	25.5
4	5	4	3	35.6

NOTE—See Table 145–23 for definition of class signatures 0 to 4.
NOTE—PDs may be assigned to a lower Class than their requested Class, which results in a lower value of P_{Class_PD}.

PSE P_{Class}

- The table appears to assign PSE P_{Class}
- Note refers to correct equation as shown in first slide
- PSE P_{Class} is dictated by equation as a function of:
  - P_{Class_PD}
  - R_{Chan}
  - V_{PSE}

$$P_{Class} = \left\{ V_{PSE} \times \left(\frac{V_{PSE} - \sqrt{V_{PSE}^2 - 4 \times R_{Chan} \times P_{Class\_PD}}}{2 \times R_{Chan}} \right) \right\}_W \quad (145\text{–}2)$$

where

V_{PSE} is the voltage at the PSE PI as defined in 145.1.3.

R_{Chan} is the channel DC loop resistance

P_{Class_PD} is the maximum power at the PD PI per the PDs assigned Class, as defined in Table 145–24)

Table 145–11—Physical Layer power classifications

PD Requested Class	Number of PSE class events	Assigned Class	P_{Class}	$P_{Class\text{-}2P}$
PSEs connected to a single-signature PD				
1	1	1	4 W	—
2	1	2	7 W	—
0, 3 to 8	1	3	15.4 W	—
4 to 8	2 or 3	4	30 W	—
5	4	5	45 W	—
6 to 8	4	6	60 W	—
7	5	7	75 W	—
8	5	8	90 W	—
PSEs connected to a dual-signature PD (classification per pairset)				
1	1, 2, or 3	1	—	4 W
2	1, 2, or 3	2	—	7 W
3	1, 2, or 3	3	—	15.4 W
4 or 5	1	3	—	15.4 W
4 or 5	2 or 3	4	—	30 W
5	4	5	—	45 W

NOTE 1—P_{Class} is the minimum required power at the PSE PI calculated using minimum $V_{Port\ PSE\text{-}2P}$ and maximum R_{Chan}. Use Equation (145–2) for other values of $V_{Port\ PSE\text{-}2P}$ and R_{Chan}. For maximum power available to PDs, see Table 145–24.

NOTE 2—$P_{Class\text{-}2P}$ is the minimum required power for a pairset calculated using minimum $V_{Port\ PSE\text{-}2P}$ and maximum $R_{Chan\text{-}2P}$. Use Equation (145–3) for other values of $V_{Port\ PSE\text{-}2P}$ and $R_{Chan\text{-}2P}$. For maximum power available to PDs, see Table 145–25.

NOTE 3—The number of PSE class events refers to the number of class events since the most recent PD reset.

Change 1: Reinvoke P_{Con} And Create P_{Con-2P}

Table 33–17—PSE output PI electrical requirements for all PD Classes, unless otherwise specified *(continued)*

13	Continuous output power capability in POWER_ON state	P_{Con}	W	P_{Class}		All	See 33.2.8.10, Table 33–12.

Table 33–17—PSE output PI electrical requirements for all PD Classes, unless otherwise specified *(continued)*

13	Continuous output power capability in POWER_ON state per pairset	P_{Con-2P}	W	$P_{Class-2P}$		All	See 33.2.8.10, Table 33–12.

Change 1: Recreate Associated Text for P_{Con} and P_{Con-2P}

145.2.8.11 Continuous output power in POWER_ON state

P_{Class} is the class power defined in 145.2.7 and Equation (145–2), or PSE allocated power (as defined in 79.3.2.6) added to the channel power loss for both pairsets combined.

$P_{Class-2P}$ is the class power defined in 145.2.7 and Equation (145–3), or PSE allocated power (as defined in 79.3.2.6) added to the channel power loss for a pairset. This parameter only applies to PSEs operating both pairsets and connected to a dual-signature PD that advertised a different class signature on each pairset.

P_{Class}, $P_{Class-2P}$, P_{Con} and P_{Con-2P} are valid over the range of V_{Port_PSE-2P} defined in Table 145–16. Measurements should be averaged using any sliding window with a width of 1 s.

Change 2: Hook Extended Power to PCon

- P_{Class} <-> P_{Class_PD} is a system-level contract and should be inviolate
- P_{Con} is the real-time output power of the PSE
- Additional power at the PSE output less the IR drop can be made available at the PD
- Mechanisms for communicating and negotiating are out-of-scope

145.3.8.2.1 Input average power exceptions

For Class 6 and Class 8 single-signature PDs, when additional information is available to the PD regarding actual channel DC resistance between the PSE PI and the PD PI, the PD may consume greater than P_{Class_PD} but shall not consume greater than ~~P_{Class}~~ at the PSE PI and shall not draw a total 4-pair current in excess of $2 \times I_{Cable}$ as defined in Table 145–1. P_{Con}

For Class 5 dual-signature PDs, when additional information is available to the PD regarding actual channel DC resistance between the PSE PI and the PD PI, the PD may consume greater than $P_{Class\_PD\text{-}2P}$ but shall not consume greater than ~~$P_{Class\text{-}2P}$~~ at the PSE PI and shall not draw current in excess of I_{Cable} as defined in Table 145–1.

$P_{Con\text{-}2P}$ on the corresponding pairset