Contents

Addressing Comments #189, #198, #95, #200, #201)

Comment #189 (Page 267, L10)

In figure 145A-2 few issues need to be addressed:
1) The device on the right in a circle is not sufficiently defined and by the implication of having a different shape is not just a resistance load.
2) There is no PI defined in this diagram.
3) To provide a diagram of a test network to be used as a load at the PSE PI and a table of values for the test sequence that needs to be stepped through to perform the test.

Suggested Remedy for comment #189

1. ***Update 145A3 as follows:***

145A.3 PSE resistance and current unbalance

End to end pair-to-pair ~~resistance/~~current unbalance refers to current differences in powered pairs of the same polarity caused by end to end pair-to-pair effective resistance unbalance. Current unbalance can occur in positive and negative powered pairs when a PSE uses all four pairs to deliver power to a PD.

Current unbalance requirements (R_{PSE_min}, R_{PSE_max} and $I_{Con\text{-}2P\text{-}unb}$) of a PSE is met with R_{load_max} and R_{load_min} as specified in Equation (145-16), Equation (145-17) and Table 145–17.

A compliant unbalanced load, R_{load_min} and R_{load_max}, consists of the channel (cables and connectors) and PD PI effective resistances (RPD_min and RPD_max), including the effects (or influence) of system end-to-end unbalance.

Equation (145–15) is described in 145.2.8.5.1, specified for the PSE, assures that end to end pair-to-pair resistance unbalance will be met in the presence of all compliant unbalanced loads (R_{load_min} and R_{load_max}) attached to the PSE PI.

Figure 145–22 illustrates the relationship between effective resistances at the PSE PI as specified by Equation (145–15) and R_{load_min} and R_{load_max} as specified in Table 145–17.

There are two alternate verification methods for R_{PSE_max} and R_{PSE_min} and determining conformance to Equation (145–15) and to $I_{Con\text{-}2P\text{-}unb}$.

Measurement methods to determine R_{PSE_max} and R_{PSE_min} and $I_{Con\text{-}2P\text{-}unb}$ are defined in 145A.3.1 and 145A.3.2.

145A.3.1 Direct R_{PSE} measurement

If there is access to internal circuits, effective resistance may be determined by sourcing current in each path corresponding to maximum Class operation measured at the PD PI with the PSE compliant unbalanced load elements shown in Figure 145A-2, and measuring the voltage across all components that contribute to the effective resistance, including circuit board traces and all components passing current to the PSE PI output connection. The effective resistance Rpse_min or RPSE_maxis the measured voltage Veff, divided by the current through the path e.g. the effective value of R_{PSE_min} for i1 is $R_{PSE\_min}=V_{eff1} / i1$ as shown in Figure 145A–2. R_{PSE_min} and R_{PSE_max} values respectively may be different than $R_{pair\_PSE\_min}$ and $R_{pair\_PSE\_max}$ values.
R_{PSE_min} and R_{PSE_max} of the positive pairs may have different values of R_{PSE_min} and R_{PSE_max} of the negative pairs.

The effective resistance verification procedure is described below:

1) With the PSE powered on and connected to a constant power sink in the PD section through the elements shown in Figure 145A-2, which is set to PClass_PD measured at the PD PI, measure the currents i1, i2, i3 and i4 and the voltages Veff1, Veff2, Veff3 and Veff4.
2) Calculate the RPSE_min and RPSE_max values of each pair of the same polarity by calculating the following:
   For the positive pairs:
      R1=RPSE_min=Veff1/i1
      R2=RPSE_max=Veff2/i2
   For the negative pairs:
      R3=RPSE_min=Veff3/i3
      R4=RPSE_max=Veff4/i4
3) Verify that on each pair of the same polarity, RPSE_min and RPSE_max meets Equation 145-15.
4) Repeat steps 1 to 3 with the RCh_unb_min, RPD_min swapped location with RCh_unb_max, RPD_max.

2. *Replace Figure 145A-2 with the following:*

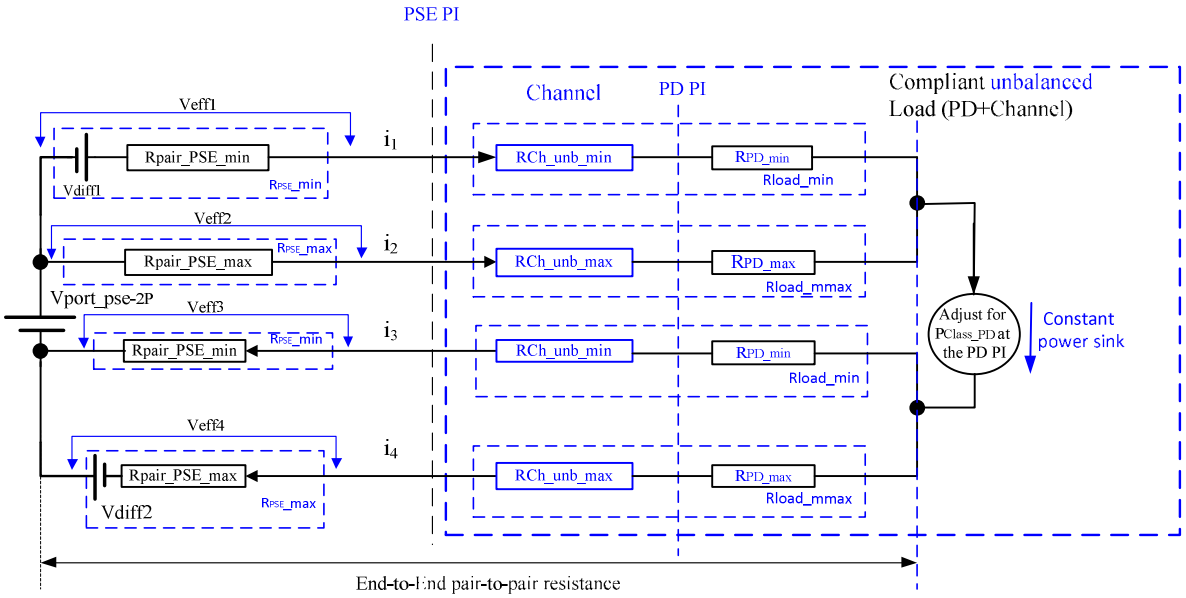


Figure 145A–2—Direct measurements of effective R_{pse_max} and R_{pse_min}

Comment (#198 and #95 page 163, L46,)

Comment 198:

Current text in P802.3bt/D2.4: ICon-2P-unb and Equation (145–15) are specified for **total channel common mode pair resistance** RChan-2P from 0.2 Ω to 12.5 Ω and worst case unbalance contribution by a PD.
Q1: I don't understand what “total channel common mode pair resistance” is in this context.
Q2: What are the measurement end points for this “total channel” and what is the relevance to the specification at hand? We have no control of “total channel common mode pair resistance” other than by the independent specification of each of the 3 elements, PSE, Link Section and PD.
Q3: Derivations of how we came to the values of each have no place in the specifications of each of the two separate devices.)
SuggestedRemedy: If we are to include these derivations they should be in an informative annex.

Yair response:

A1: We don’t need the word "total" in "total channel common mode pair resistance". The " channel common mode pair resistance" is defined in 145A.2 and other locations in the spec.
The reason that the above mentioned in this context is that Equation 145-15 and Icon-2P_unb were developed with a model of channel resistance range from 0.2 ohm to 12.5 ohm and not from 0 ohm to 12.5 ohm. The concept here is when the user want to design for lower than channel resistance of 0.2 ohm, he needs to use other values for Rload_min and Rload max.
A2: The measurements end points are the PSE PI and the PD PI.
A3: The intent is not to show derivation of anything. The intent was to show what to do when shorter cabling than the one corresponding to 0.2 ohm is used.
As a result, we need this text in the normative section.
Anyhow, the text clarity can be improved as the per the following proposal.

Comment 95:

This paragraph (starting with "ICon-2P-unb and Equation (145–15) are specified for…") needs some help. It is not very clear and is grammatically flawed.

The following changes are proposed to page 163 lines 45-53. (See clean version at the proposed remedy).

The values for ICon-2P-unb and the relationship between RPSE_max and RPSE_min (Equation (145–15)) are valid~~specified for total channel common mode pair resistance~~given that RChan-2P (see 145.1.3) ranges from 0.2 Ω to 12.5 Ω and that the PD ~~worst case unbalance contribution by a PD~~ meets 145.3.8.10. In cases where ~~PSEs that support~~ RChan-2P ~~channel common mode resistance~~ is less than 0.2 Ω, or ~~if~~ RChan is less than 0.1 Ω, ~~the~~ PSE compliance with ~~should meet~~ ICon-2P-unb can be evaluated using ~~requirements when connected to (~~Rload_min ~~= 0.5 × RChan-2P)~~ and ~~(~~Rload_max both reduced by ~~=~~0.5 × RChan-2P~~)~~. This compliance will require a reduction in the ratio of ~~can be achieved by using a lower~~ RPSE_max to ~~or higher~~ RPSE_min presented ~~than required~~ by Equation (145–15). ~~Lower RPSE_max values may be obtained by using smaller constant α or higher RPSE_min in Equation (145–15) in the form of RPSE_max = α × RPSE_min + β.~~

Proposed Remedy for comment #198 and #95

Replace the text in Page 163 lines 45-53 with:

The values for ICon-2P-unb and the relationship between RPSE_max and RPSE_min (Equation (145–15)) are valid given that RChan-2P (see 145.1.3) ranges from 0.2 Ω to 12.5 Ω and that the PD meets 145.3.8.10. In cases where RChan-2P is less than 0.2 Ω, or RChan is less than 0.1 Ω, PSE compliance with ICon-2P-unb can be evaluated using Rload_min and Rload_max both reduced by 0.5 × RChan-2P. This compliance will require a reduction in the ratio of RPSE_max to RPSE_min presented by Equation (145–15).

Comment (#200, #201)

Comment #200 page 164, L10:

Current text in P802.3bt/D2.4: The box on the far right in the figure is undefined. Is it a PD? Is it a PD minus some of its resistance? Is it a PD minus all its resistance? Is it something else? A test device perhaps. Where is it defined?

Yair response:

1) The box on the far right in the figure is undefined is a constant power sink which is part of the PD including the Rpd_min and Rpd_max.
2) All the components in Figure 145-22 are defined in the text in 145.2.8.1 excluding constant power sink which is part of the PD. See proposed update to Figure 145-22.

Comment #201 page 164, L17:

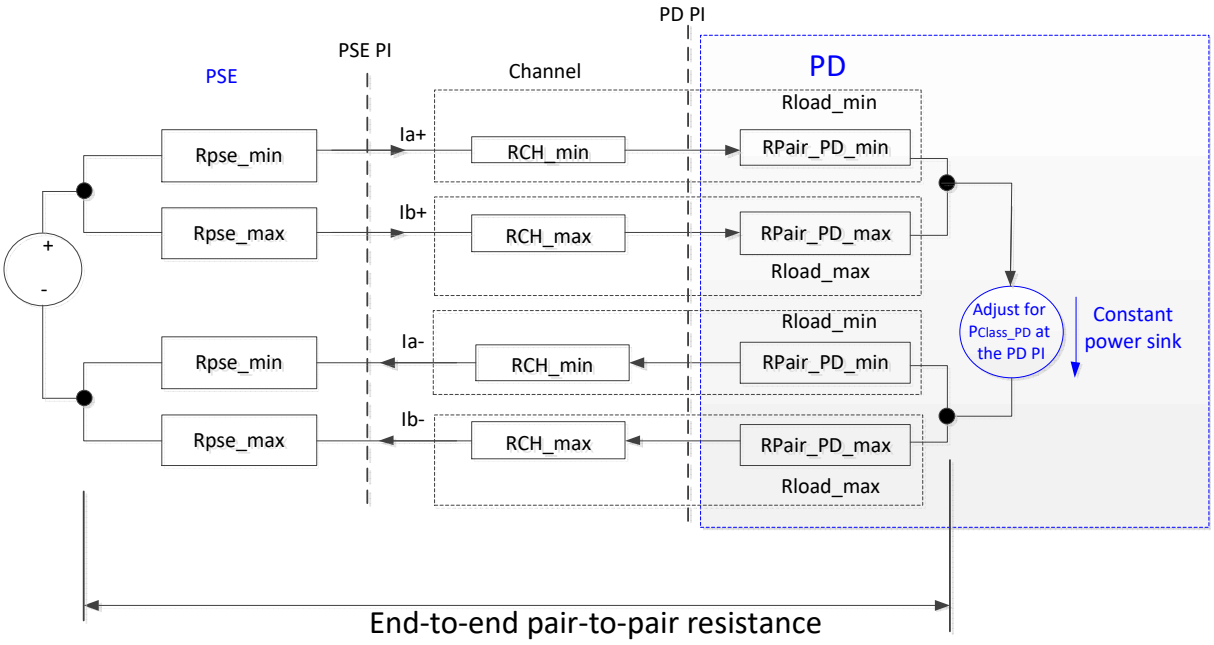
Current text in P802.3bt/D2.4: “End-to-end pair-to-pair resistance” The “ends” as used in this evaluation is not defined, not defined as being accessible and under normal circumstances don't even come from the same vendor. Therefore, I don't have a clue how to do this “evaluation”

Yair response:

The end to end pair to pair resistance unbalance is a system parameter that is defined from PSE internal PI circuits up to the PD PI internal circuit. Since PSE PI and PD PI are internal circuits, we are not specifying direct requirement to the end to end pair-to-pair resistance unbalance. We did huge mathematical work to break the parameter to its components i.e. PSE PI, Channel and PD PI. In order to complete the understanding of the reader what is this term, it is describes in Figure 145-22 and we need to add text to explain from which ends it is defined.

Suggested Remedy for comments #200 and #201:

1. ***Update Figure 145-22 as follows:***



2. ***Add the following notes below Figure 145-22.***

Notes:

1. The PD in Figure 145-22 include constant power sink that obeys to Equation 145-2.
2. The end to end pair-to pair resistance unbalance is evaluated from the PSE or PD at the point when the total current over two pairs of the same polarity (Icon) is split to its two components per Equation 145-8.

3. ***Modify the text in page 164 Lines 24-31 as follows:***

The evaluation method is as follows:

a) Use Rload_min and Rload_max components from Table 145–17 for low channel resistance conditions.
b) With the PSE powered on, adjust the constant power sink load to PClass_PD.
c) Measure Ia+, Ib+, Ia-, and Ib-.
d) Exchange Rload_max and Rload_min. Repeat steps b) and c).
e) Verify that the current in any pair does not exceed ICon-2P-unb, as defined in Table 145–16.
f) Repeat steps b) through e) for Rload_min and Rload_max components from Table 145–17 for high channel resistance conditions.