Comment
[33.2.7.4.1 Page 108, Lines 37-38 in D1.5
Annex B: Page 201 - 204 in D1.5

Background

This comment tries to resolve comment #144 from D1.4.

Summary of comment and remedy of 144 from D1.4:

a) When reading 33.2.7.4.1 (PSE P2PRunb) there is a link to Annex B which is normative and contains shalls and readers may miss to read these shalls.

b) Annex 33B contains: 2 shalls, 2 musts. Do we need a normative annex for 2 shalls?

c) Also, the shalls are very similar to each other.

The remedy for comment 144 from D1.4:

Proposed remedy: TF to discuss the 'musts' and either reword or turn into 'shalls'.

The final remedy: To consider moving the requirement into the appropriate section , 33.2.7.4.1 seems like a good candidate.

Add "Editor's Note (TBRBD2.0): Yair working to move the shalls to clause 33. Readers are encouraged to work with him."

Response to the comments above:

a) 33.2.7.4.1 was modified by adding shall to meet Annex B requirements so annex B will not be overlooked for its shalls.
b) Yes, we need the normative Annex due to the fact that we need to use the test circuit and procedure as proposed. In addition, the “shalls” there were clarified, some of the “must” converted to shall and some deleted by editorial changes. So far Annex B is the simplest way to achieve annex B objectives without complicating the standard body.
c) The shalls are not exactly similar to each other, they are referring to different alternative tests and for each test different parameters are tested. Some editorial changes were made to clarify it.
d) It was hard to move all the shalls to 33.2.7.4.1 as proposed, instead, 33.2.7.4.1 was modified to include shall for the test methods in Annex 33B without changing most of the shalls in Annex 33B.
e) Some editorial changes made due to typos and other errors

Proposed Remedy

33.2.7.4.1 PSE PI pair-to-pair resistance and current unbalance

[Page 108, Lines 7-35: No changes]

[Page 108, Change Lines 37-38 as follows:]

The following changes in page 108, lines 37-38 are meant to:
a) Prevent the case that the reader will miss the normative Annex B.
b) Move the shall's to 33.2.7.4.1

The values of RPSE_max and RPSE_min are implementation specific and need to satisfy Equation (33–4f). RPSE_max, RPSE_min and Icon-2P_unb ~~See Annex 33B~~ shall be measured ~~for the~~ according to the test setup and test conditions shown in the normative Annex 33 B.~~for RPSE_max and RPSE_min.~~

1. Remove editor note in page 201 line 8
2. Update Annex B as follows.

Annex 33B

(normative)

PSE PI pair-to-pair resistance/current unbalance

Editor's Note (remove prior to D2.0): Yair working to move the shalls to Clause 33. Readers are encouraged to participate.

Few editorial changes to match the text to the title regarding:
a) Resistance/current unbalance
b) Acronym for End to end pair-to-pair resistance unbalance to explain what will be used later.
c) Current unbalance is a group of few requirements such Rpse_min/max, Icon-2P_unb so Current unbalance is not sufficient to describe what PSE shall be met.

End to end ~~Pair~~pair-to-pair resistance/current unbalance (E2EP2PRunb) refers to current differences in powered pairs of the same polarity. 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 (Rpse_min, RPSE_max and Icon-2P_unb) of a PSE shall be met with Rload_max and Rload_min as specified by Table ~~1~~33B-1. The details for derivation of Rload_max and Rload_min can be found in Annex 33E.

A compliant unbalanced load, Rload consists of the channel (cables and connectors) and the PD effective resistances.

Equation (33–4f) is described in 33.2.7.4.1, specified for the PSE, assures that E2EP2PRunb will be met in a compliant 4-pair powered system. Figure ~~1~~33B-1 illustrates the relationship between PSE PI Equation (33–4f) and Rload_min and Rload_max as specified in Table 1.

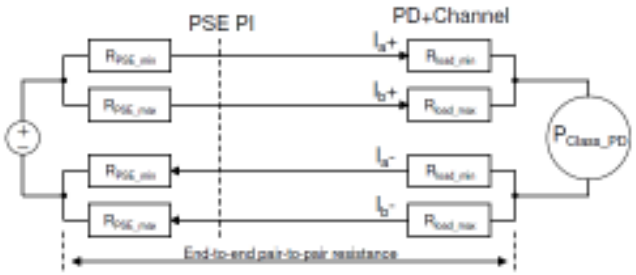

Figure 33B–1—PSE PI unbalance specification and E2EP2PRunb

Table 33B–1—R_{load_max} and R_{load_min} requirements

PSE Class	R_{load_min} (Ω)	R_{load_max} (Ω)
5	0.723	1.628
6	0.623	1.289
7	0.590	1.090
8	0.544	0.975

Equation (33–4f) specifies the PSE effective resistances required to meet E2EP2PRunb in the presence of all compliant, unbalanced loads attached to the PSE PI. There are three alternate test methods for RPSE_max and RPSE_min and determining conformance to Equation (33–4f) and to Icon-2P_unb.

Measurement methods to determine RPSE_max and RPSE_min are defined in 33B.1, 33B.2, and 33B.3.

33B.1 Direct RPSE measurement

If there is access to internal circuits, effective resistance may be determined by sourcing current in each path corresponding to maximum PClass operation, 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 is the measured voltage Veff, divided by the current through the path e.g. the effective value of RPSE_min for i1 is RPSE_min =Veff1/i1 as shown in Figure ~~2~~33B-2.

The two sections that follow, 33B.2 and 33B.3 illustrate two other possible measurements of PSE effective resistances for Rpse_max and Rpse_min Equation (33–4f) verification, if the internal circuits are not accessible.

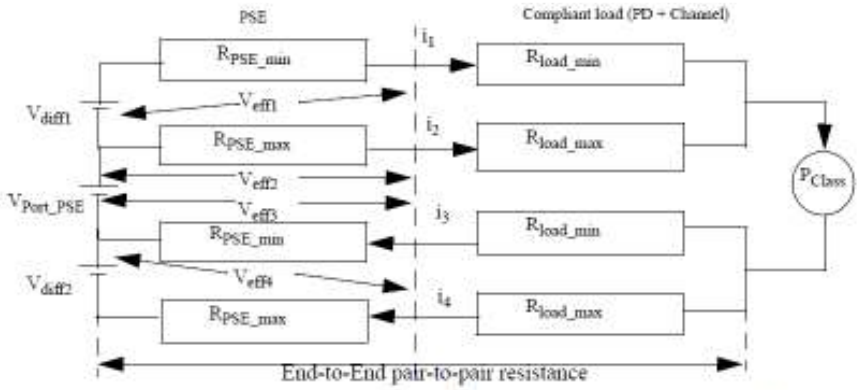

Figure 33B–2—Direct measurements of effective R_{pse_max} and R_{pse_min}

33B.2 Effective resistance Rpse measurement

Figure ~~3~~33B-3 shows a possible test circuit for effective resistance measurements on a PSE port for evaluating conformance to Equation (33–4f).

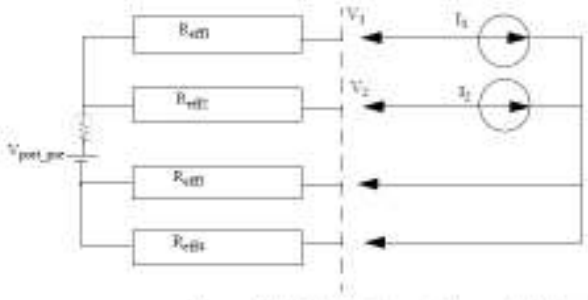

Figure 33B–3—Effective resistance test circuit

The Effective Resistance Test Procedure is described below:

1) With the PSE powered on, set the following current values
   a. 10 mA < I_2 < 50 mA
   b. $I_1 = 0.5 \times (P_{max}/V_{port}) - I_2$
2) Measure voltage difference V_{diff} across V_1, V_2 ($V_{diff}=V_1-V_2$).
3) Reduce I_1 by 20% (=I_1'). Ensure I_2 remains unchanged.
4) Measure V_{diff}' across V_1, V_2.
5) Calculate R_{eff1}:
   $R_{eff1} = [(V_{diff}) - (V_{diff}')] / (I_1 - I_1')$
7) Repeat procedure for R_{eff2}, with I_1, I_2 values swapped.
8) Repeat procedure for R_{eff3}, R_{eff4}.
9) Evaluate compliance of R_{eff1}, R_{eff2}, R_{eff3} and R_{eff4} with Equation (33–4f).

The effective resistance test method applies to the general case. If pair-to-pair balance is actively controlled in a manner that changes effective resistance to achieve balance, then the current unbalance measurement method described in 33B.3 ~~should~~ shall be used.

33B.3 Current unbalance RPSE measurement

~~Unbalanced load resistances must be selected per Table 1.~~ Current unbalance ~~must~~ shall be met for any pair-to-pair resistances (RPair_max and RPair_min) meeting ~~the e~~Equation 33-4f and with the load resistances per Table 33B-1. Selected resistance values for RPair_max and RPair_min which provide adequate verification are dependent upon PSE circuit implementation and as such are left to the designer. Figure ~~4~~33B-4 shows a test circuit for the current unbalance requirements measurement.

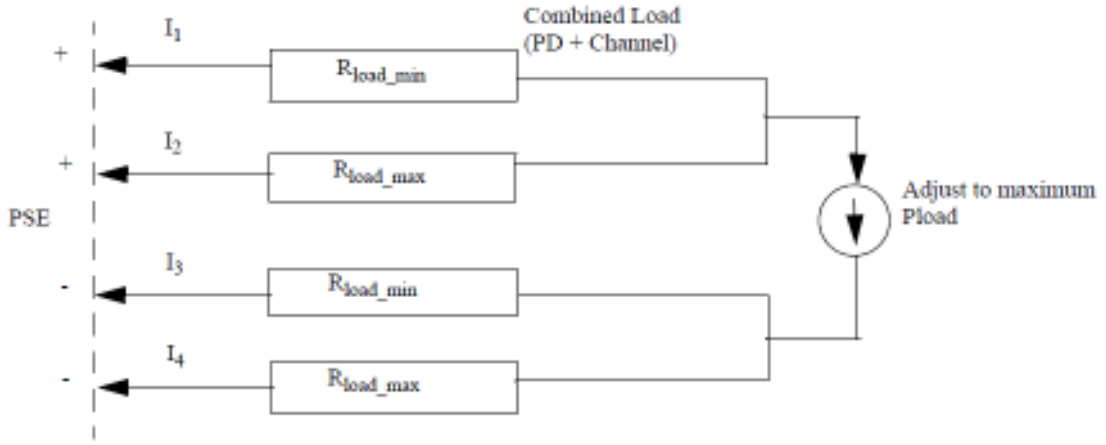

Figure 33B–4—Current unbalance test circuit

The current unbalance test method is described below:

1) Use Rload_min and Rload_max from Table 1.
2) With the PSE powered on, adjust the load for maximum power at the PSE.
3) Measure I1, I2.
4) Swap Rload_max, Rload_min, repeat steps 1 and 2.
5) Repeat for I3, I4.
6) Verify that the current ~~unbalance~~ in each case does not exceed Icon-2P_unb minimum in Table 33–11 item 4a.

Verification of Icon-2P_unb in step 6 confirms PSE Rpse_max ~~RPair_max~~ and Rpse_min~~RPair_min~~ are in conformance to Equation (33–4f).

33B.4 Channel resistance with less than 0.1Ω

Icon_2P_unb max and Equation 33-4f ~~is~~are specified for total channel common mode pair resistance from 0.1Ω to 12.5Ω and worst case unbalance contribution by a PD. When the PSE is tested for channel common mode resistance less than 0.1 Ω, i.e. 0 Ω < Rch_x < 0.1 Ω, the PSE shall be tested with (Rload_min - Rch_x) and (Rload_max - Rch_x) to meet Icon_2P_unb requirements and Rpse_min and Rpse_max conformance to Equation (33–4f).

Editor's Note: To consider the value of adding informative section to present Rload_max and Rload_min equation derivation and values.