System Unbalance Examples

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Issue

- System Unbalance calculated using the values and methods from Draft 2.1 is not in conformance with Icon-2p-unb from Table 33-19
- This presentation simply shows that the system is inoperable as defined
- The group needs to reach consensus on the path forward

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Class 5 Low Channel Resistance Example

Let:
Rpse_min = 0.1Ω
Vsupply = 50.12V

Rpse_max = 2.200 * 0.1 – 0.04 = 0.18Ω
Ra = Rpse_min + Rload_min = 0.823Ω
Rb = Rpse_max + Rload_max = 1.808Ω
Re2e = Ra || Rb = 0.565Ω
Icon = 813mA
Ia / Ib = Rb / Ra = 2.197
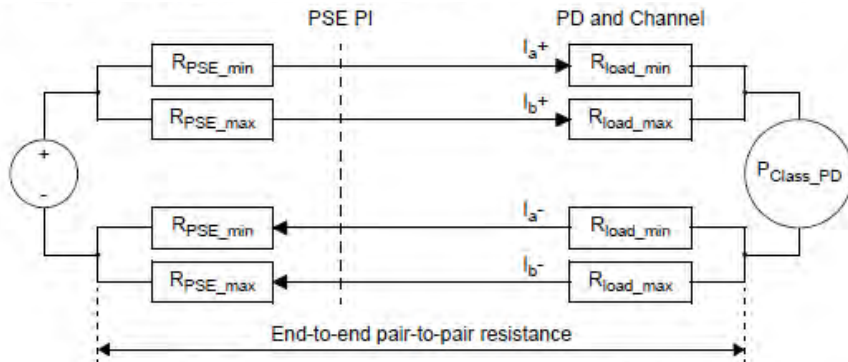**Ia = 558.6m <- Violates Icon-2p-unb**
Ib = 254.3m

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

$$R_{PSE\_max} = \begin{cases} 2.200 \times R_{PSE\_min} - 0.040 & \text{for Class 5} \\ 2.010 \times R_{PSE\_min} - 0.040 & \text{for Class 6} \\ 1.800 \times R_{PSE\_min} - 0.030 & \text{for Class 7} \\ 1.750 \times R_{PSE\_min} - 0.030 & \text{for Class 8} \end{cases} \Omega$$

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

PSE Class	R_{load_min} (Ω)	R_{load_max} (Ω)	Additional information
5	0.723	1.628	R_{load} is at low channel resistance conditions
6	0.623	1.289	
7	0.590	1.090	
8	0.544	0.975	
5	5.920	7.190	R_{load} is at high channel resistance conditions
6	5.780	7.000	
7	5.710	6.870	
8	5.650	6.790	

Measurement methods to determine R_{PSE_max} and R_{PSE_min} and $I_{Con-2P-unb}$ are defined in 33B.2, 33B.3, and 33B.4.

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Class 5 Low Channel Resistance Icon Calculation

```
Let:
Re2e = 0.565Ω
Vsupply = 50.12V
Rthev = 2 * Re2e (factor of 2 for source and return paths)
Ppd  = 40W
Vpd  = [Vsupply - sqrt(Vpse^2 - 4 * Ppd * Rthev)] / 2
Vpd  = 49.2V
Icon = (Vsupply - Vpd) / Rthev = 813mA
```

Class 6 Low Channel Resistance Example

Let:
Rpse_min = 0.1Ω
Vsupply = 50.14V

Rpse_max = 2.010 * 0.1 – 0.04 = 0.161Ω
Ra = Rpse_min + Rload_min = 0.723Ω
Rb = Rpse_max + Rload_max = 1.450Ω
Re2e = Ra || Rb = 0.482Ω
Icon = 1038mA
Ia / Ib = Rb / Ra = 2.005
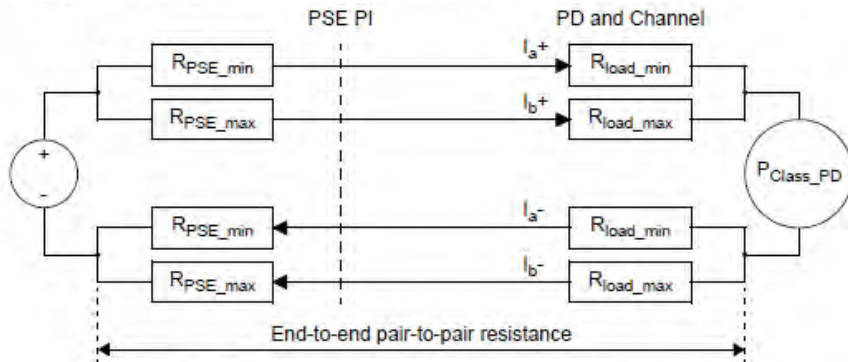**Ia = 692.5m <- Violates Icon-2p-unb**
Ib = 345.3m

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

$$R_{PSE\_max} = \begin{cases} 2.200 \times R_{PSE\_min} - 0.040 & \text{for Class 5} \\ 2.010 \times R_{PSE\_min} - 0.040 & \text{for Class 6} \\ 1.800 \times R_{PSE\_min} - 0.030 & \text{for Class 7} \\ 1.750 \times R_{PSE\_min} - 0.030 & \text{for Class 8} \end{cases} \Omega$$

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

PSE Class	R_{load_min} (Ω)	R_{load_max} (Ω)	Additional information
5	0.723	1.628	R_{load} is at low channel resistance conditions
6	0.623	1.289	
7	0.590	1.090	
8	0.544	0.975	
5	5.920	7.190	R_{load} is at high channel resistance conditions
6	5.780	7.000	
7	5.710	6.870	
8	5.650	6.790	

Measurement methods to determine R_{PSE_max} and R_{PSE_min} and $I_{Con-2P-unb}$ are defined in 33B.2, 33B.3, and 33B.4.

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Class 6 Low Channel Resistance Icon Calculation

```
Let:
Re2e = 0.482Ω
Vsupply = 50.14V
Rthev = 2 * Re2e (factor of 2 for source and return paths)
Ppd  = 51W
Vpd  = [Vsupply – sqrt(Vpse^2 – 4 * Ppd * Rthev)] / 2
Vpd  = 49.13V
Icon = (Vsupply – Vpd) / Rthev = 1038mA
```

Conclusion

- System Unbalance calculated using the values and methods from Draft 2.1 is not in conformance with Icon-2p-unb from Table 33-19
- Possible Fixes
    - Reduce PDs unbalance allocation
    - Increase system unbalance allocation
    - Reduce Pclass_PD (~1W)
    - Raise Vpse