

Assessing Connection Check Outcome

Background Review

❑ Connection Check

- Feature of Type-3 & Type-4 PSE's
- Resolve Single (or shared) versus Dual (or independent) Signature PD
- Applies to PD Classes 0-8
- Applies to PD Types 1-4
- Outcomes: Single Signature, Dual Signature, Invalid (or Unknown) Signature

❑ 4-Pair ID

- Feature of Type-3 and Type-4 PSE's
- Resolve 4-Pair Powering of Class 0-4 PD's that are either Type-1, Type-2, or Type-3
- (Simplified) Requirement for 4-Pair Powering:
 - (Connection Check = Single OR Dual) AND both pair sets measure valid ~25KW signatures
 - Some PSE's will not power Dual Signature PD's
- Outcomes: 4-Pair Powering OK or 4-Pair Powering Not OK

❑ Affected PSE Behaviors

- 4-Pair Powering
- 2-Pair Powering
- DC MPS
- 2-Pair and 4-Pair Overload Responses

Questions:

How do we determine that a PSE has properly evaluated a Single Signature PD?

How do we determine that a PSE has properly evaluated a Dual Signature PD?

Is there a predictable and observable PSE behavior that provides this information?

PSE Powering Behaviors

❑ 4-Pair Powering

- Single Signature with valid 4-Pair ID: PSE should provide 4-Pair Power
- Dual Signature with valid 4-Pair ID: PSE may provide 4-Pair Power
 - PSE's must monitor per-pair set load in order to power Dual Signature PD's
- Failed Power-Up Could Indicate:
 - Valid Dual Signature Rejection
 - Faulty Connection Check (misread Valid CC as Invalid CC, misread Single as Dual)
 - Faulty Detection Measurement(s) (misread Valid as Invalid)
- Successful Power-Up Could Indicate:
 - Valid 4-Pair ID
 - Faulty Connection Check (misread Dual as Single, misread Invalid CC as Valid CC)
 - Faulty Detection Measurement(s) (misread Invalid as Valid)
- Spontaneous 4-Pair Power Removal Could Indicate:
 - Mysterious PSE decision about PD given either Single or Dual Signature CC
- Spontaneous 2-Pair Power Removal Could Indicate:
 - Mysterious PSE decision about PD given Dual Signature CC

❑ 2-Pair Powering

- 4-Pair ID Invalid but detection/classification on 2-Pair is okay
- Faulty Detection measurement with Valid Signature on one pair set
- Classification discrepancy between pair sets (TBD) ???

SUMMARY: Nothing decisive about connection check can be resolved from PSE powering behavior

PSE Overload Evaluation and Response

- ❑ PSE removes 4-Pair power with $>I_{cut_2p}$ applied to each pair set simultaneously
 - Single versus Dual Signature **indeterminate** (no information)
- ❑ PSE removes 4-Pair power with $>I_{cut_2p}$ applied to one pair set
 - PSE correctly or incorrectly resolved Single Signature and removed 4-Pair power
 - PSE correctly or incorrectly resolved Dual Signature and, at PSE's discretion, removed 4-Pair power rather than 2-Pair power.
 - This case also **indeterminate**
- ❑ PSE removes 2-Pair power with $>I_{cut_2p}$ applied to one pair set
 - PSE correctly or incorrectly resolved Dual Signature and, at PSE's discretion, removed 2-Pair power to that pair set.
 - There is **no guarantee** a PSE will ever do this

SUMMARY: Nothing decisive about connection check can be resolved from PSE overload responses

PSE DC MPS Evaluation and Response

- ❑ PSE removes 4-Pair power with 0mA combined
 - Single versus Dual Signature **indeterminate** (no information)
- ❑ PSE maintains 4-Pair power with 20 mA on each pair set
 - Single versus Dual Signature **indeterminate**
- ❑ PSE removes power with 0mA on one pair set, 20mA on the other pair set
 - PSE correctly or incorrectly determined Dual Signature and at its discretion, removed either 4-Pair power or 2-Pair power on 0mA pair set
 - PSE correctly determined Single Signature but is measuring just one pair set (non-compliant)
 - PSE correctly determined Single Signature but has faulty I_{hold} monitor on pair set with 20mA
- ❑ PSE maintains 4-Pair power with 0 mA on one pair set, 20mA on the other pair set
 - PSE correctly or incorrectly determined Single Signature and has 20mA on at least one pair set
 - PSE correctly determined Dual Signature but is only measuring one pair set (non-compliant)
 - PSE correctly determined Dual Signature and faulty I_{hold} monitor on one pair set
- ❑ PSE removes 4-Pair (or 2-Pair) power with 20 mA on each pair set
 - PSE correctly or incorrectly determined Dual Signature and faulty I_{hold} monitor on one pair set
 - PSE correctly or incorrectly determined Single Signature and faulty I_{hold} monitor on both pair sets

SUMMARY: DC MPS responses CAN indicate connection check outcome!

Connection Check Assessment Method:

1. Apply (valid) Single Signature

- No power: Signature misread
- Assess response to 0mA pair set A, 20mA pair set B
- Assess response to 0mA pair set B, 20mA pair set A
- No power removal in either case?
 - PSE properly discerned Single Signature
- Power removed with BOTH cases?
 - Single Signature was misread as Dual Signature
- Power removed with just ONE case?
 - Signature was likely read as Single and there is faulty MPS behavior on one pair set

2. Apply (valid) Dual Signature

- No power: Signature misread OR PSE won't power Dual Signature
 - If PSE did power Single Signature, it is probably denying the Dual Signature
- Assess response to 0mA pair set A, 20mA pair set B
- Assess response to 0mA pair set B, 20mA pair set A
- Power removed in both cases?
 - PSE properly discerned Dual Signature
- Power maintained with BOTH cases?
 - Dual Signature was misread as Single Signature
- Power maintained with just ONE case?
 - Signature was likely read as Dual and there is faulty MPS behavior on one pair set

Alternatives for PSE Connection Check Assessment

1. DC MPS Method

- ❑ Requires Type-3 and Type-4 PSE's to use DC MPS

2. Other “Signaling” Alternatives

- ❑ Class Event 2 Pulse Width ?
 - 6-30 msec if CC= Single Signature
 - 35-65 msec if CC= Dual Signature
 - Works with all 4-Pair PSE's
- ❑ Pair Set Power-Up Rules
 - Single Signature: Power-Ups Staggered by 0 to 100 msec
 - Dual Signature: Power-Ups Staggered by > 100 msec
 - May not work with all 4-Pair PSE's