Second Generation IEEE 802.3at

PSE Multi-Port Test Suite for the PowerSync® Analyzer & Programmable Load

Product Overview

Key Features

- In-Depth System Testing of IEEE 802.3at PSE’s
- Concurrently Analyze Up To 192 PSE Ports
- Fully Automated Testing and Reporting
- Assess PSE Power Administration Decisions
- Assess PSE Power Management Behaviors
- Robust Emulation of Type-1 and/or Type-2 PD’s
- PoE LLDP Emulation of Type-1 and/or Type-2 PD’s
- Easily Configured, Single Sequence Testing of All PSE’s
- Static and Transient Reserve Capacity Analysis
- Formulate PD Powering Uncertainty Metrics
- Formulate PSE Port Uniformity Metrics
- Assess PSE Power Reliability Over Time

Verification, Simplified.
Overview

The PSE Multi-Port Test Suite is a component of the PSE Multi-Port Suite for PowerSync® Analyzers and Programmable Loads. This fully automated group of tests and reporting takes the PowerSync Analyzer (PSA) and its proven PSE Conformance Testing capabilities into the realm of fully automated PSE System Power Management and Multi-Port Behavior testing.

Whereas PSE Conformance Testing assesses compliance of each stand-alone PSE port to 802.3at specifications, Multi-Port Testing assesses system-wide behaviors only observable when many PD’s are powered by a PSE. The PSE Multi-Port Test Suite will acquire and distill information regarding key behaviors of a PSE including class-based power administration, multi-port LLDP granting, power-up and LLDP grant timing, static power capacity, transient reserve capacity, power down timing, power-per-port uniformity and uncertainty, and power stress test analyses.

The Multi-Port Test Suite is easily configured to cover all required PD emulations such that system testing of Type-2 and Type-1 PSE’s is performed in a just a single sequence, with up to 38 limit-checked parameters produced on a single, graphic-rich Microsoft Excel report.

The standard report generated by the Multi-Port Test Suite organizes all parameters by Multi-Port Test and by PD emulation (e.g. Class 4, Type-1, etc.) with colorful annotations for parameters that represent non-ideal or design-constrained behaviors and, for certain parameters, IEEE 802.3at specification violations.

The PSE Multi-Port Suite is available as a feature option to all Sifos PSA-3000 and PSL-3000 chassis-based platforms. The Multi-Port Suite also includes Live PD Emulation for use with interactive testing of PSE administrative and power management behaviors. Live PD Emulation is described separately in Sifos datasheet Multi-Port Live PD Emulation Overview.

PSE Multi-Port Tests
- Class-Based Powering & Granting
- Multi-Port Power-Up & LLDP Timing
- Multi-Port Disconnect Timing
- Static Power Capacity Analysis
- Transient Reserve Capacity Analysis
- Port Capacity Uniformity & Uncertainty
- Multi-Port Overload Response Timing
- Port & Class Subset Administration
- Power Stress Testing

Multi-Port System Test Automation
- Automated Analysis and Reporting up to 192 PSE Ports at a Time
- Run Individual Tests from PSA
- Interactive or PowerShell PSA
- Sequence Selected Tests from PSA
- Interactive or PowerShell PSA
- Automated Microsoft Excel® Report Generation with Colorful Graphics and Test-Specific Help Information

PSE Multi-Port Test Suite Features
- Up to 38 Limit-Checked PSE System Parameters from 9 Automated Tests
- Up to 10 802.3at PSE Conformance Parameters Produced from Multi-Port Test Cases
- Simple User Configuration – Just Specify PD Emulation (Type 1, 2, or both 1 & 2) and PSE Power Granting Mode (PHY or LLDP)
- Comprehensive Diagnostic Logging from Every Test Provides Insight to System Anomalies
- Most (8 of 9) Tests Run with Low Cost PSL-3000 Programmable Load Platform
- Increased Parameter Coverage and Granularity Available from PSA-3000 PowerSync Analyzer Platform

* The standard report requires Microsoft Office 2007 or newer
### Multi-Port Tests and Parameters

The following tables introduce each Multi-Port test, describing the basic purpose of each test and the parameters that are measured by each test. Parameters that are accompanied by **Class N** are collected and reported per PD Class, that is, Class 0 – Class 4. Parameters that are accompanied by **Type X** are collected and reported per PD Type, that is, Type-1 and/or Type-2.

Any limitations imposed on each test by the PSL-3000 Programmable Load are also described.

#### Multi-Port Administrative Decisions and Timing Analysis

<table>
<thead>
<tr>
<th><strong>Test Objective</strong></th>
<th><strong>Sequence Objective</strong></th>
<th><strong>Test Parameters (Retained)</strong></th>
<th><strong>Test Parameters (Local)</strong></th>
<th><strong>PSL-3000 Limitations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>mp_class_admit</td>
<td></td>
<td><strong>Power Administration by PD Class and/or LLDP Request</strong></td>
<td></td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Test Objective</strong></td>
<td><strong>Sequence Objective</strong></td>
<td><strong>Test Parameters (Retained)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>mp_class_admit</td>
<td>mp_pwrup_time</td>
<td>Fast Power-Up,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Slow Power-Up,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Average Power-Up</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>First Port Powered</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Final Port Powered</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

**Power Administration by PD Class and/or LLDP Request**

Evaluates PSE powering and power granting strategy as it relates to each PD classification and to (maximum) LLDP-based power requests. Look for instability and inconsistencies accompanying multi-port power-ups, and where applicable, multi-port LLDP negotiations.

**Test Objective**

Gain insight into the efficiency of PSE power management when processing multiple demands for power and LLDP power allocations. Expose scenarios where PD’s may be unacceptably delayed in receiving power and/or LLDP allocations. Assess any vulnerability in per-port PoE service to PD group-connect events.

**Sequence Objective**

This test is not prerequisite to other Multi-Port tests.

**Test Parameters (Local)**

- **Power Administration by PD Class and/or LLDP Request**
  - **Test Objective**
    - **Sequence Objective**
    - **Test Parameters (Retained)**
    - **Test Parameters (Local)**
    - **PSL-3000 Limitations**

**PSL-3000 Limitations**

- **NONE**

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**Multi-Port Power-Up and LLDP Grant Timing**

- **Test Objective**
  - **Sequence Objective**
    - **Test Parameters (Local)**
    - **PSL-3000 Limitations**

**PSL-3000 Limitations**

- **NONE**

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### PSE Multi-Port 2nd Generation Test Suite for the
PowerSync® Analyzer & Programmable Load

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## Multi-Port Disconnect Shutdown Timing

### Test Objective
Determine that PSE ports are uniformly responding to valid PD disconnect signatures and then autonomously (independently) managing disconnect shutdown timing. Separately, determine if a group-disconnect shutdown event is in any way detrimental to subsequent per-port PoE service under control of PSE power management.

### Sequence Objective
This test is not prerequisite to other Multi-Port tests.

### Test Parameters (Local)

| Minimum, Maximum, Average Shutdown Times | Time in milliseconds between emulated PD disconnect and power removal by PSE port. Reported as minimum time, maximum time, and average time across all ports. |
| First Port Down | Chassis address and test port that first removed power. (PSA-3000 only) |
| Last Port Down | Chassis address and test port that was the last to remove power. (PSA-3000 only) |
| Minimum, Maximum, Average Power | Time in seconds between emulated PD disconnect followed by a shutdown and immediate PD re-connect until power is restored by the PSE port. |
| Re-Cycle Time | |
| Stuck On Ports | Ports that fail to remove power given PD disconnects. |
| Out-of-Service Ports | Ports that initially powered for the disconnect shutdown timing measurements but then fail to recycle power. |

### PSL-3000 Limitations
Because the PSL-3000 (Programmable Load) does not support programmable load transients, time interval measurements, and cross-chassis triggering, shutdown and power recycle timing is assessed with low resolution ranges. Shutdown states are sampled after 500msec following all port disconnects and then again after 3 seconds. If any ports have removed power at 500msec, then Minimum Range is ‘500msec’. If all ports remove power at 500msec or at 3 seconds, than that range is reported as the Maximum Range. Recycle power states are assessed at 15 seconds, 35 seconds, then again at 75 seconds following the group disconnect shutdown.

## Power Administration by PSE Port Subsets

### Test Objective
Ultimately, the purpose of this test is to determine if PSE power management treats all PSE ports, regardless of location, equally and independently when making (class based) power-up decisions and LLDP power grants. Ideally, all ports should be treated independently regardless of physical location on the PSE.

### Sequence Objective
This test is not prerequisite to other Multi-Port tests.

### Test Parameters (Local)

| Expected Ports | Case M Count of ports that are expected to power up (and, if applicable, provide LLDP grant) given the class-specific power-up (and, if applicable, LLDP grant) counts. |
| Actual Ports Powered | Case M Count of ports that actually powered up (and, if applicable, provided LLDP grant). |

### PSL-3000 Limitations
NONE

## Multi-Port Power Capacity Analysis

### mp_static_cap

### Test Objective
Measure static (or steady-state) total power available and determine if PSE is correctly and efficiently allocating all available steady-state power to powered PSE ports.

### Sequence Objective
Provide other Multi-Port tests with values for maximum steady state power available to Type-1 and/or Type-2 PD’s along with Pclass, the minimum steady

### Test Parameters (Retained)

| Static_Capacity | Type-X Peak total steady state output power measured given Type-X (1 or 2) PD emulation measured across all test ports. Peak power point may appear prior to or after one or more individual PSE ports start to overload and are shut down. Retained values: st_static_cap(X) |
| Pclass_PSE | Class N Given the PSE port voltage at full PSE power capacity, this is the individual steady-state power capacity required on each port in order to meet IEEE 802.3at steady-state power capacity requirements. Retained values: st_pclass(N) |
**Multi-Power Transient Reserve Power**

**Test Objective**
Determine if PSE is keeping power in reserve to meet IEEE 802.3at allowed PD transient loads (e.g. \(I_{\text{peak}}\)). If PSE allocates all available power to static (steady state) loads, there is the risk that one or more allowable PD load transients will cause one or more PSE ports to remove power, including ports that do not experience the load transient.

**Sequence Objective**
This test is not prerequisite to other Multi-Power tests.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Alloc_Power/ PD</th>
<th>Class N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Given the number of powered ports, this is essentially the total static power capacity spread to each of those ports. In the case of LLDP, this figure is the total static power available to just those ports that were granted their requested power level (e.g. 25.5 watts). Retained values: (st_{\text{alloc}}_{\text{port}}(\text{power}(N))).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Min_PD’s</th>
<th>Type-X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This is the number of PD’s that could receive maximum allowed power given PD classification, PSE static power capacity, and PSE port voltage. For Class 0, that port would be 13 watts at the PD interface, or Pclass(0) at the PSE interface, and for Class 4, that power is 25.5W at the PD interface, or Pclass(4) at the PSE interface.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Static_Cap_Port_Count</th>
<th>Type-X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This is the count of powered ports when the peak static power capacity, (\text{Static Capacity}_{(\text{Type}-X)}), is measured. This may be the same or less than the number of ports originally powered with Type-X emulation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Under_Alloc_Pwr_1</th>
<th>Excess power available for powering additional Type-1 PD’s based on PSE capacity, Pclass (Type-1), and also considering any differences in capacity between Type-2 powering and Type-1 powering.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters</td>
<td>Under_Alloc_Pwr_2</td>
<td>Excess power available for powering additional Type-2 PD’s based on PSE capacity, Pclass(Type-2), and also considering any differences in capacity between Type-1 powering and Type-2 powering.</td>
</tr>
</tbody>
</table>

| Parameters                 | Out-of-Service Ports     | This is a list of chassis addresses and test ports that refuse to power up to PD Class 1 emulation following completion of the static power capacity measurements. |

**PSL-3000 Limitations**
NONE

Because this test requires programmable Load Transients, it is only available to PSA-3000 test ports and is not available to PSL-3000s.
# PSE Port Power Uncertainty and Variations by PD Class

## Test Objective
From a PD’s perspective, total power uncertainty is the range of possible power levels available to any PD powering at a particular classification. It is dependent on PSE power allocation to other PD’s and on individual overload tolerance variation by PSE port. This test produces figures for total power uncertainty by PD class and PSE port variation in that figure.

## Sequence Objective
Provide other Multi-Port Tests with maximum per-port static power capacity as a function of PD Class.

## Test Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max_Pwr/port</strong></td>
<td>N</td>
<td>The maximum static power tolerated before port shutdown on all sampled ports at each PD class. st_admit.<strong>(N)</strong> ports are initially powered to low power and overload thresholds are scanned just one port at a time. Retained value: st_max_port_power(N)</td>
</tr>
<tr>
<td><strong>Min_Pwr/port</strong></td>
<td>N</td>
<td>The minimum static power tolerated before port shutdown on all sampled ports at each PD class. st_admit.<strong>(N)</strong> ports are initially powered to low power and overload thresholds are scanned just one port at a time.</td>
</tr>
<tr>
<td><strong>Average_Pwr/port</strong></td>
<td>N</td>
<td>The average power tolerated before port shutdown across all sampled ports at each PD class.</td>
</tr>
<tr>
<td><strong>Uncertainty/port</strong></td>
<td>N</td>
<td>The total uncertainty range of power available to any Class N PD connecting to any port of the PSE. This is a function of power management power allocation decisions and a function of I_var overload threshold variation.</td>
</tr>
<tr>
<td><strong>Variation</strong></td>
<td>N</td>
<td>The percentage variation in power available to any Class N PD. This variation is purely a function of I_var overload threshold variation across PSE ports.</td>
</tr>
<tr>
<td><strong>Premature Dropped Ports</strong></td>
<td>N</td>
<td>List of chassis addresses and test ports where individual port power capacity was heavily affected by the presence of other ports operating at minimum static power levels.</td>
</tr>
</tbody>
</table>

## PSL-3000 Limitations
NONE

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# Multi-Port Load and Overload Stressing

## mp_overld_time

### Test Objective
Determine that PSE ports are uniformly responding to overload conditions and then autonomously (or independently) managing overload shutdown timing. Separately, determine if a group-overload event is in any way detrimental to subsequent per-port PoE service under control of PSE power management.

### Sequence Objective
This test is not prerequisite to other Multi-Port tests.

### Test Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min., Maximum, and Average Shutdown Time</th>
<th>First Port Down</th>
<th>Last Port Down</th>
<th>Minimum, Maximum, and Average Power Re-Cycle Time</th>
<th>Stuck On Ports</th>
<th>Out-of-Service Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in milliseconds between emulated PD overload and power removal by PSE port.</td>
<td>Reported as minimum time, maximum time, and average time across all ports. PD overload applied is calculated using maximum observed individual port overload, st_max_port_power(N), in mp_port_caps. PD Class emulation is one of Class 0, Class 1, Class 2, or Class 3 selected to maximize both the overload level and the initially powered port count.</td>
<td>Chassis address and test port that first removed power. (PSA-3000 only)</td>
<td>Chassis address and test port that was the last to remove power. (PSA-3000 only)</td>
<td>Time in seconds between emulated PD group overload shutdown event until power is restored by the PSE port. Overload magnitude and duration are determined from initial overload shutdown timing measurements.</td>
<td>List of chassis addresses and test ports that fail to remove power given PD overloads.</td>
<td>List of chassis addresses and test ports that initially powered for the disconnect shutdown timing measurements but then fail to recycle power.</td>
</tr>
</tbody>
</table>

### PSL-3000 Limitations
Because the PSL-3000 (Programmable Load) does not support programmable load transients, time interval measurements, and cross-chassis triggering, shutdown and power recycle timing is assessed with low resolution ranges. Shutdown states are sampled after 500msec following all port disconnects and then again after 3 seconds. If any ports have removed power at 500msec, then Minimum Range is ‘500msec’. If all ports remove power at 500msec or at 3 seconds, than that range is reported as the Maximum Range. Recycle power states are assessed at 15 seconds, 35 seconds, then again at 75 seconds following the group disconnect shutdown.
Multi-Port Full Power Stress Test

**Test Objective**
Demonstrate that the PSE withstands a high static power load over a long duration of time without causing ports to drop power either temporarily or permanently.

**Sequence Objective**
This test is not prerequisite to other Multi-Port tests.

**Test Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Load Power</td>
<td>This is the actual total PSE power established while trying to attain 95% of previously measured static power capacity. The test automatically selects PD Class that enables powering to 95% of ( st_{\text{static_cap}}(N) ), the maximum steady state load capacity, with as many PSE ports as possible.</td>
</tr>
<tr>
<td>Dropped Power Count</td>
<td>The count of events where a port removed power over the course of testing. Each shutdown on each port is deemed a power removal event.</td>
</tr>
<tr>
<td>Power Drop Ports</td>
<td>The list of ports that experienced one or more power drops during the course of testing. Use the log file to get further details concerning how many times each port dropped power and when those drop-outs occurred.</td>
</tr>
<tr>
<td>Out-of-Service Ports</td>
<td>Since the test is only powering the number of ports expected to power based on ( st_{\text{admit_**(N)}} ), this is a list of ports that were expected to power up initially, but failed to power or provide expected LLDP power grant.</td>
</tr>
</tbody>
</table>

**PSL-3000 Limitations**
NONE

### Configuring and Running the Multi-Port Test Suite

The PSE Multi-Port Suite can be accessed from either PSA Interactive Software (GUI) or PowerShell PSA, an extended Tcl/Tk command line shell.

**PSA Interactive** provides three top level menus: Multi-Port Live PD Emulation*, Multi-Port PSE Tests, and Multi-Port Sequencer. Each top level menu then provides access to the Multi-Port Resource Configuration menu (see Figure 1). Resource Configuration is used to define the field of instruments and test ports to be used in Multi-Port Testing. Resource Configuration automatically determines if the instrument type is a PSA-3000 PowerSync Analyzer or a PSL-3000 Programmable Load. Any mixture of PSA-3000 and PSL-3000 instruments will be treated as a PSL-3000 Programmable Load with corresponding test limitations.

Resource Configuration also determines if LLDP is available to all instrument(s) in the Resource Configuration. If every instrument supports the LLDP emulation feature, then the test menus will enable use of Power Management modes LLDP2 and LLDP.

Once the Multi-Port Resource Configuration is defined and validated by PSA Interactive, users can run individual Multi-Port tests from the PSE Multi-Port-2 Tests menu (see Figure 2). This menu displays the Multi-Port Resource Configuration and provides several configuration options for running Multi-Port tests. These options exist within two categories:

- **PD Emulation**
- **Power Management**

PD Emulation is specified as **Type-1**, **Type-2**, or **Type-1 & 2**. **Type-1** means testing will run with PD Classes 0-3 emulated. This is the appropriate setting for Type-1 (15.4 Watt) PSE’s. **Type-2** results in only PD Class 4 emulations. **Type-1 & 2** deploys PD Class 0-4.

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* Live PD Emulation is described further in Sifos datasheet Multi-Port Live PD Emulation Overview
emulations and is the *recommended configuration* for Type-2 (30 Watt) PSE’s.

The test suite has been designed to work with Type-1 PSE’s that may only be enabled for PD Class 1 and/or PD Class 2 support. Given a Type-1 PD Emulation mode, users may select the maximum allowable PD Class as **Class 0/3**, **Class 2**, or **Class 1**. **Class 0/3** would be the *typical selection* for most Type-1 PSE’s.

Power Management is specified as *PHY, LLDP (Type-2), or LLDP (All PD’s)*. Generally, this setting pertains to the method used by a PSE to allow Type-2 power levels, that is, above 13 watts, to Type-2 PD’s. A Type-2 PSE that utilizes 2-Event classification would require the *PHY* selection. A Type-2 PSE that uses PoE LLDP to grant full power to Type-2 PD’s would generally be tested with the *LLDP (Type-2)* setting. LLDP capable PSE’s can also be tested using LLDP power negotiation at all PD Class levels (0-4) by selecting the *LLDP (All PD’s)* setting.

Users should also declare whether the PSE uses the **DC MPS** method or the less common **AC MPS** method for processing PD disconnect shutdowns.

The Multi-Port Test Suite can be automatically sequenced to a standard spreadsheet report using the **Multi-Port-2 Sequencer** menu (see Figure 3). Like the Multi-Port-2 Tests menu, this menu displays the Multi-Port Resource Configuration and provides setting selections for **PD Emulation** and **Power Management** characteristics of the PSE. These settings are retained between the two test menus. From the sequencer menu, users select the tests to sequence and then initiate the sequence. Upon completion, the standard report automatically appears. Both menus allow the optional selection of a **Logging Mode** where many details of each Multi-Port test are recorded to log files named for those specific tests. These files are very useful for troubleshooting system anomalies that may appear in the final test results. One portion of a Multi-Port Test log file is shown in Figure 4 below.

```
mp_trans_cap TEST LOG Recorded August 12, 2014 1:19:23 AM

mp_trans_cap: st_admit_pcl(0)= 15 st_static_cap(1)= 172.6, st_alloc_port_power(0)= 11.5 st_pclass(0)= 14.4 53.2
mp_trans_cap: st_admit_1lldp(4)= 15 st_stat_cap(4)= 171.6, st_alloc_port_power(4)= 11.4 st_pclass(4)= 29.3 53.1
mp_trans_cap: Assuring availability of all PSE ports and removing power...

mp_trans_cap: PD CLASS 0 TESTING at Full CAPACITY...
mp_trans_cap: Powering PSE to 90% of 172.6 W = 155.3 W total power...
mp_trans_cap: PSE powered 15 of 15 ports to measured power 158.6 W for transient reserve at Full power.
mp_trans_cap: At Full power, Multi-Port power-up measured typical Vports= 53.2 V, Iports= 198.7 mA.
mp_trans_cap: 802.3at ipeak for class 0 computes to 305.8 mA for this PSE.
mp_trans_cap: 45msec, 305.8 mA Load Transients will be applied to PSE ports. This is the IEEE 802.3at 'Ipeak' value.

. . . . .
```

Figure 4: Diagnostic Log Excerpt (from `mp_trans_cap`)

The Multi-Port Test Suite can also be configured and executed from **PowerShell PSA** using simple yet flexible commands (see Figure 5). All features of the test suite described above are available using PowerShell PSA commands. In addition, added flexibility in the form of scripts to *sequence Multi-Port sequences* allows engineers and technicians to easily capture and analyze PSE system behaviors that may be erratic or unstable across multiple cycles of the Multi-Port Test Suite.
Standard Multi-Port System Test Report

The PSE Multi-Port Test Suite provides a standard Microsoft Excel spreadsheet report* that is automatically produced upon the completion of any sequence of Multi-Port tests. The report offers both tabular and graphical presentations of many key parameters with extensive "behind the scenes" limit checking logic to draw attention to any potential problem areas. A sample report is shown in Figure 6.

The report includes header information describing the test configuration including Multi-Port Test Resources (chassis addresses and utilized test ports), chassis type (PSA vs PSL), PD Emulation (Type 1, 2, or 1+2), and Power Management Mode (PHY, LLDP, or LLDP2). Also included is time-date information and PSE-under-test description including the number of PSE ports tested.

Test data is organized by Multi-Port test following the ordinary sequence of testing. Many tabular parameters are evaluated against low and/or high test limits and if a value falls outside those limits, the parameter field is colored to

* The standard spreadsheet report requires Microsoft Office 2007 or later with macro processing enabled.
reflect the category of limit exception. Two categories are provided as shown in Figure 6. The first category is a Non-Ideal Feature / Design Limitation. Parameters highlighted with this color indicate a less-than ideal PSE behavior that may or may not affect end user experiences with the PSE. A very simple example of this would be inability to offer full Type-1 or Type-2 power demands on every PSE port. A second example would be over-allocation of power to PD’s where the power allocated may be more than the power available. These behaviors should not be interpreted as failures to some particular standard. The IEEE 802.3 clause 33 standard governing PSE’s does not address behaviors of PSE’s beyond just a single port.

There are also a number of parameters across several Multi-Port tests that have direct connections to single-port PSE behavior as described by IEEE 802.3 clause 33. One example would be the Maximum, Minimum, and Average Shutdown Times measured in mp_discx_time. These times are specified such that disconnect shutdowns, regardless of how many are performed simultaneously, should occur between 300msec and 400msec after virtual PD disconnect. A Minimum Shutdown time less than 300 msec or a Maximum Shutdown time greater than 400 msec will be highlighted in this color to reflect an 802.3at Specification Violation.

The standard spreadsheet test report includes several graphs that visually depict various tabular parameters. One series of graphs renders various Power Metrics including static and transient load capacity, static capacity versus required static capacity, and power uncertainty encountered by various classes of PD’s. A second series of graphs displays Timing Metrics related to initial and recycle power-ups, disconnect shutdowns, and overload shutdowns. The graphs provide a convenient means to rapidly spot problems and to compare results between test cycles.

The standard report also includes a page that details all of the test limits and their origins. Users are free to manipulate or refine those limits to fit their goals. Additionally, there is a page with detailed explanations of all test parameters and associated test limit strategies. A Test Info button on the test results page accompanies each test and when pressed, acts like a hotlink to the corresponding test information.

**Multi-Port Test Configuration (48 Port Example)**

Learn more about the Multi-Port 2 Test Suite. See the Multi-Port 2 Test Suite Overview video presentation at www.sifos.com.

**Ordering Information**

**PSA-MPT** PSE Multi-Port Suite including Multi-Port Live PD Emulation and the Multi-Port Test Suite, for one **PSA-3000** Controller* (up to 24 test ports)

**PSL-MPT** PSE Multi-Port Suite including Multi-Port Live PD Emulation and the Multi-Port Test Suite, for one **PSL-3000** Controller* (up to 24 test ports)

**PSA-QTD** PowerSync Analyzer Test Suite RackPack (e.g. PSA-3248) Discount

* The Multi-Port Suite requires a PSA-3000 or PSL-3000 with one or more PSx-3x02 test blades, PSA-3x48, or PSL-3x24. It may be added to previously installed PSA-3xxx and PSL-3xxx systems using a license key purchased from Sifos Technologies.

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