Sifos® Technologies

PSA-3000
PowerSync®Analyzer
IEEE 802.3at & bt Power over Ethernet

Product Overview

Key Features

- ❑ **Industry Leading** IEEE 802.3at PoE PSE Conformance Tests

- ❑ Unique, Fully Automated **Multi-Port PSE** System Analysis for 802.3at

- ❑ Continuous **2-Pair** PSE Loading **> 47 Watts** Per Port x 24 Ports

- ❑ Continuous **4-Pair** PSE Loading **> 99 Watts** Per Test Blade x 12 Ports

- ❑ Flexible 802.3at Powered Device **LLDP Emulation** and **LLDP Analysis**

- ❑ Hardware / Firmware Ready for **IEEE 802.3bt** PSE Testing*

- ❑ Replaces All General Purpose Test Equipment & Fixtures

- ❑ **One-Button** 2-Pair and 4-Pair PSE **Waveform Analysis**

- ❑ **Highly Scalable** and Upgradeable Test Ports and Features

- ❑ Flexible and **Accurate Measurements** of Voltage, Current, & Noise

- ❑ **Noise Immune** Triggering, Transients, & Time Interval Measurements

- ❑ Supports PSE Packet Transmission Testing with PoE Loads

- ❑ Smart Fan Control – **Runs Cool and Quiet**

- ❑ High Level Script Automation and Graphical User Interface

When equipped with PSA-3202 test blades.

Verification, Simplified.

IEEE 802.3at and 802.3bt PSE's

End-Spans

Mid-Spans

PoE Connectors

Injectors

Fully Automated 802.3at PSE Conformance Test

Comprehensive Hardware / Firmware DV Testing

Device Qualification

LLDP Protocol Analysis

Interoperability Analysis

Quality Assurance

Fully Automated PSE System Power Management Test

PSE System and Power Management Verification

System Stability Analysis including PoE LLDP

PSE Administrative Responses up to 192* 802.3at PD's or 96* 4-Pair PD's

High Throughput QA, Manufacturing

Multi-Port Automation

Ready-to-Use, High Throughput Test Scripts

High Defect Coverage

Overview

Power-over-Ethernet (PoE) challenges design and test engineers to evaluate multi-channel, "intelligent" DC power sources that are activated and deactivated through signaling protocols operating over several power delivery and polarity configurations. The application and management of DC power over multiple local area network connections must be completely transparent and non-disruptive to the traditional data transmission functions of those network connections.

One Box Solution

Sifos Technologies provides a **one-box solution** to facilitate complete testing and analysis of Power Sourcing Equipment (PSE) behaviors including overall compliance to the **IEEE 802.3at** and future **802.3bt** specifications. Each test port inside a PowerSync Analyzer is an autonomous and fully isolated instrument offering a rich set of stimulus and measurement resources for 2-Pair PSE testing. Each test port pair (*or test blade*) can configure as an autonomous and fully isolated instrument for testing both **pre-802.3bt** and future **802.3bt** 4-Pair PSE's.

Automated 802.3at PSE Conformance Testing

The PSA-3000 may be optioned via a license key to run the world's most advanced **PSE Conformance Test Suite**. This fully automated application applies the PowerSync Analyzer's diverse resources to assess over 70 IEEE 802.3at specification parameters per port, presented in easily readable spreadsheet reports with multi-port statistics and clearly notated pass/fail limit analysis.

Automated 802.3at PSE System Testing

PSA-3000's may also be optioned via a license key to run the one-of-a-kind **PSE Multi-Port Suite**. This software offers flexible, programmable, simultaneous **Live PD Emulation** of up to 192 independent Powered Devices including 802.3at Type-2, LLDP capable devices and also supports live emulation of up to 96 pre-802.3bt (or proprietary) 4-Pair PD's. A fully automated second generation **Multi-Port Test Suite for 802.3at** evaluates PSE power allocation decisions and power management behaviors in response to multi-port PD loads including Type-2 PD's that negotiate power using PoE LLDP. Results are presented in colorful graphical reports.

LLDP Emulation

The IEEE 802.3at specification describes a new generation of PSE's and Powered Devices (PD's) that communicate highly resolved power needs and power allocations using Ethernet layer 2 (LLDP) link protocols. The PSA-3000 may be optioned via a license key to flexibly emulate PD's and fully analyze the power negotiation protocols between PSE's and PD's.

### Getting Ready for 4-Pair PoE (802.3bt)

PSA-3000's equipped with **PSA-3202** test blades offer capability to fully emulate future 802.3bt compliant PD's. Under PowerShell Wish, users may configure and observe signaling during 802.3bt compliant 4-pair power-up sequences while connected to either test port. Emulations include single and dual signatures, multi-event classes, and flexible 4-pair loading to over 99 watts. A rich set of 4-pair load control and metering commands enable early generation 802.3bt PSE analysis today. The PSA-3000 also supports PD emulation and analysis of a variety of pre-standard 4-Pair PSE formats from PSA Interactive (GUI) and PowerShell PSA software environments.

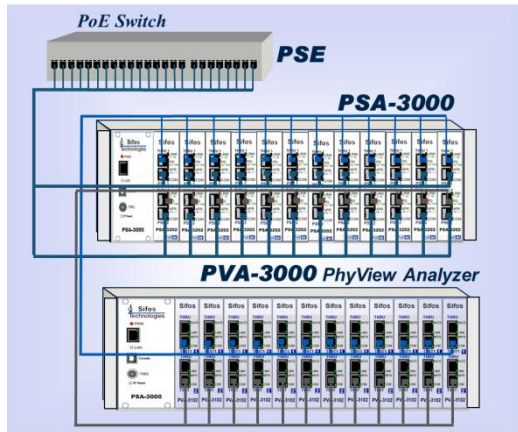**Assumes up to 8 PSA-3000's combined into a Multi-Port Resource Configuration.*

Verification, Simplified.

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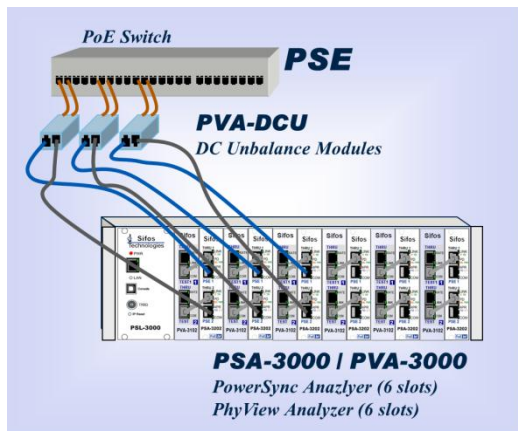
PowerSync Analyzer Test Equipment Setups

PSE DV, System, or Mfg. Test
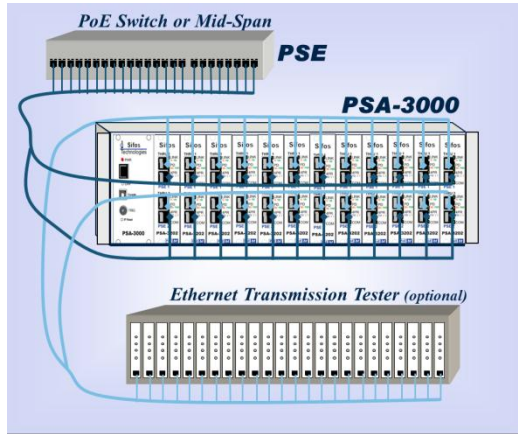
PSE PoE & 10/100/1000 Physical Layer Analysis

PSE DC Unbalance Tolerance

Per-Port PSE Test Resources

Flexible 2-Pair & 4-Pair PD Detection & Class Emulation

Flexible Loads and Load Transients

Event or Edge Triggering of Load Transients & Measurements

Average, Peak (Min/Max), and Trace Measurements of Port Voltage and Load Current with Flexible Sampling Apertures

Standard One-Button Waveform Library for Rapid PSE Analysis and Conformance Troubleshooting (*including 4-Pair PSE's*)

Flexibly Triggered, Noise-Immune Time Intervals / Slews

O-Scope Graphical Waveforms (*802.3at and 4-Pair PSE's*)

LAN Termination, LLDP Protocol Emulation and Tracing

Concurrent Packet Transmission and PoE Load Testing

External Trigger Input/Output

4-Pair PoE Loading and Analysis (*per Test Blade*)

PSE Conformance Suite for 802.3at*

High Coverage, Fully Automated IEEE 802.3at PSE Compliance Testing and Analysis (including LLDP)

23 PSE Tests Producing Over 70 802.3at Parameters / Port

Automated Test and Port Sequencing with Comprehensive, Colorful Spreadsheet Reporting

Automatically Adapts to PSE Device Technologies

> 95% 802.3at PSE PICS Coverage

Regularly Updated with Sifos Tracking Service Agreements

802.3at PSE System & Multi-Port Testing*

Fully Automated Multi-Port Test Suite for Type-1 and Type-2, including Type-2 LLDP PSE's up to 192 PSE Ports Covering:

  Power Administration by PD Class and Port Group Subsets

  Group Power-Up, Power Negotiation, and Disconnect Timing

  Static Power Capacity by PD Type

  Transient Reserve Capacity by PD Type

  PD Power Budget Uncertainty by PD Class

  Group Overload Response and Timing

  Power Stress Tolerance

Programmable Live PD Emulation Up to 192 Simultaneous 802.3at PD's (Type-1, Type-2, with or without LLDP) drawing up to 34 watts each

Programmable Live PD Emulation Up to 96 Simultaneous 4-Pair PD's (with or without UPoE LLDP) drawing up to 95 watts each

802.3at LLDP*, PHY, Packet Test Support

Flexible, Per-Port, Programmable PD LLDP Emulation for PoE with Payload, Timing, & Synchronization Control

Fully Automated LLDP Protocol Traces and Analysis

PSE Side LLDP Emulation and Protocol Traces

Cisco UPoE 4-Pair PD LLDP Support (*PD Emulation*)

Test Port "THRU" Channel for 10/100/1000 PHY Testing (*using the Sifos PVA-3000*) and Packet Transmission Testing

Negligible Thru-Channel Impairment (10/100/1000/2.5GBase-T)

Powerful Software

PSA Interactive Graphical User Interface

PowerShell PSA Script Automation

Sample High Throughput, Multi-Port PSE Test Script

***** *Available as an optional feature to the PSA-3000. See feature-specific data sheet.*

PSA Interactive Graphical User Interface

The Sifos **PSA Interactive** graphical user interface (GUI) is a flexible and powerful tool designed to allow user to quickly configure and perform both standard and user-defined measurements on IEEE 802.3 compliant power sourcing equipment (PSE). PSA Interactive provides an intuitive view of the full range of testing resources available within the PSA-3000 PowerSync Analyzer. Users can quickly harness the flexibility and power of these resources to perform design verification and diagnostic measurements or to prototype sequences that will eventually be automated in PowerShell PSA scripts.

PSA Interactive organizes PSA-3000 resources and testing features into a variety of distinct subsystems:

- Port Detection Configuration
- Trigger Configuration
- Load and Load Transient Configuration and Activation
- DC Meters (Average, Max Peak, Min Peak, and Trace Voltage and Current meters)
- AC Peak Voltage Meter
- Time Interval / Slew Rate Meter
- PSE Conformance Tests
- PSE Conformance Test Sequencer
- One-Button Standard Waveforms
- One-Button PD LLDP Emulation and Protocol Testing
- Multi-Port Live PD Emulation (*Using up to 8 PSA*'s)
- PSE Multi-Port Tests (*Using up to 8 PSA*'s)
- PSE Multi-Port Test Sequencer (*Using up to 8 PSA*'s)
- Pre-802.3bt 4-Pair PSE Signature / Load Configurations and Metering (including Standard Waveforms)
- PSE LLDP Emulation / PD LLDP Testing
- Quick-Test PSE Fast Multi-Port PSE Verification
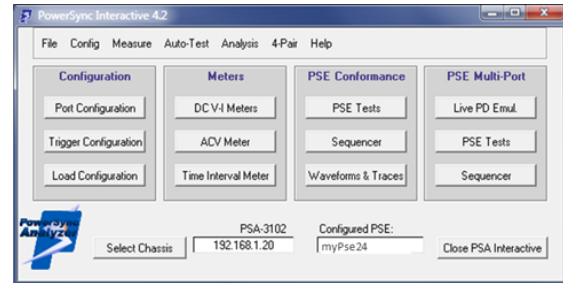
PSA Interactive Main Menu
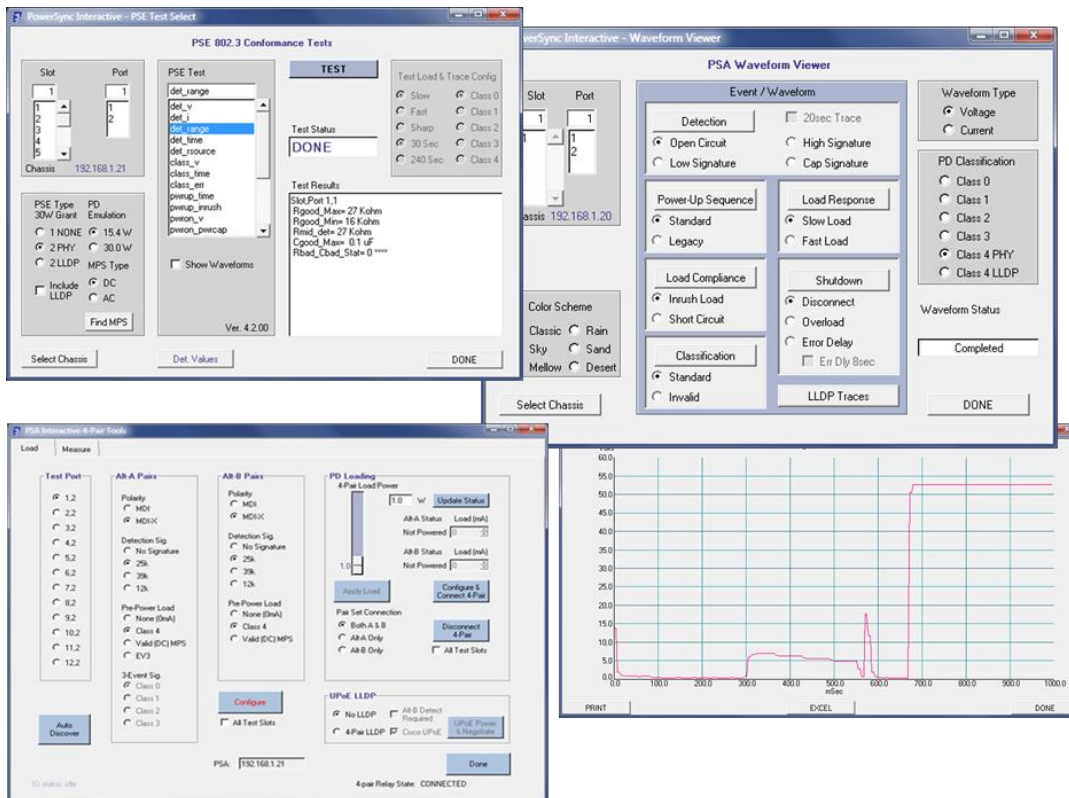
PSA Interactive Menus for PSE Conformance Selected Test, Standard One-Button Waveform Analysis, and Pre-802.3bt 4-Pair PSE Signature and Load Configuration

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PowerShell PSA Tcl/Tk Interface

The PowerShell PSA Scripting Environment provides a high level, interactive means to control and program automated test sequences for the PSA-3000 PowerSync Analyzer. PowerShell enables fully automated testing suites that span multiple ports, blades, and instruments. Built upon the popular Tool Command Language (Tcl), it offers an extensive and extensible programming language well suited for automated testing.

PowerShell PSA provides a complete API for the PSA-3000 including high level commands that execute and sequence standard **802.3 PSE Conformance** and **Multi-Port System Test** suites. PowerShell PSA commands access all of the resources of the PSA-3000 and enable the rapid development of highly customized test scripts. PowerShell PSA supports off-line script development and debug through its robust built-in emulation mode.

PowerShell PSA libraries can be integrated into broader Tcl environments that interlace traditional network transmission tests with Power-over-Ethernet tests. This enables seamless integration of custom or standard PSE tests with existing Tcl-based test suites.

Other features offered by the PowerShell PSA environment include:

- Interpretive command execution (no compilation, easy debug)
- Simple, intuitive PowerSync Analyzer commands (API)
- Integrated and extensive command "help" features
- Fast test execution speeds
- DUT-specific configuration files to configure settings
- Sequencing of test suite sequences
- DUT-specific report routing
- Use sided-by-side with PSA Interactive GUI
- Notepad++ Editor Extension for PowerShell PSA Development
- Command-Knowledgeable Wish Console with PSA waveform viewer capability
- Traditional Tcl Command Console
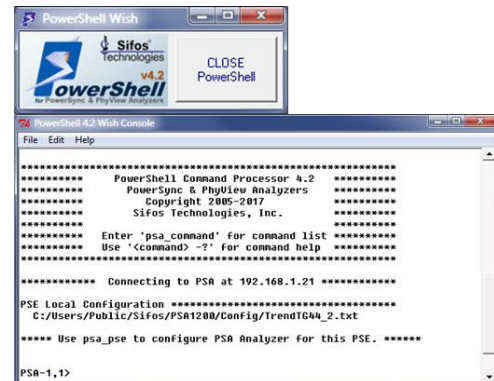
PowerShell Wish Console

IEEE 802.3 PSE Conformance Test Suite

The IEEE 802.3at PSE Conformance Test Suite is a library of **fully automated, flexibly sequenced,** and **self-adapting** tests that provide a high degree of specification compliance testing on PSE ports without the need for any external instrumentation. The PSE Conformance Test Suite may be used to fully assess interoperability of one or more PSE ports given a single button press or single command. Colorful Microsoft Excel spreadsheet reports analyze all test results relative to IEEE 802.3at specification parameters, flagging failures and compiling statistics.

The PSE Conformance Test Suite serves as a virtual industry standard for PSE specification compliance. Testing can be completed without deep, internal knowledge of the 802.3at standard and without high expertise in PSA-3000 capabilities. Test coverage **exceeds 95%** of 802.3at PSE PICS.

See Sifos datasheet, **PSE Conformance Test Product Overview**, for further information about this test suite.

PSE Multi-Port Suite

While IEEE 802.3at describes a PSE as a single port device, most PSE's are multi-port systems such as Ethernet switches. This fact leads to the need for system test methods and tools to assess PSE behavior across a multitude of ports. The **PSE Multi-Port Suite** offers two fundamental testing capabilities that address this need.

Multi-Port PD Emulation turns every PSA-3000 test port into an emulated Powered Device where behaviors such as static power load, PD classification, line power loss, and even PoE LLDP protocol characteristics are modeled simultaneously across as many as 192 PSA ports. Type-1 (≤ 13W) and Type-2 (≤ 25.5W) PD's may be emulated. See Sifos datasheet, **Multi-Port Live PD Emulation Overview**, for further information on Live PD Emulation.

The **Multi-Port Test Suite** is a set of fully automated tests and reporting that takes the PSA-3000 into the realm of fully automated 802.3at PSE System Power Management and Multi-Port Stimulus-Response testing. The Multi-Port Test Suite assesses system-wide behaviors only observable when many IEEE 802.3at PD's are powered by a PSE. The 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. Results are presented in colorful, graphical spreadsheet reports. See Sifos datasheet, **Multi-Port 2 Test Suite Overview**, for further information about this test suite.

PoE LLDP Emulation and Analysis

The PSA-3000 includes a subsystem designed to flexibly emulate LLDP capable PD's on a per test port basis. Fully automated tools enable capture and analysis of protocol and protocol timing between the PSE and the PD.

See *Sifos* datasheet, **LLDP Emulation and Analysis Overview**, for further information on this topic.

LLDP Protocol Trace

Multi-Port High Throughput PSE Verification

The PSA-3000 is provided with a sample PSE automated test script, **psa_quick_test**, that recovers critical PoE parameters from PSE ports with an effective test throughput of less than 15 seconds per tested port. This application can be used in both QA and manufacturing test to *rapidly* qualify PSE functional performance.

Important features of the **psa_quick_test** include:

- **Source Code Provided**: May be used as is, may be modified, or may be used as template script
- Scans 4 to 8 PSE ports per test cycle
- Tests **Type-1, Type-2** (**2-event**), and **Type-2** (**LLDP***) PSE's
- Validates PoE **Detection Acceptance** and **Rejection** Ranges
- Measures PSE **Port Voltage** at min. and max. load conditions
- Determines **Power Capacity** in Watts and mA
- Assesses **Disconnect Power Removal** response and timing
- Assesses **Overload Power Removal** and **Power-Type Threshold**
- Assesses **LLDP Power Allocations*** and associated timing
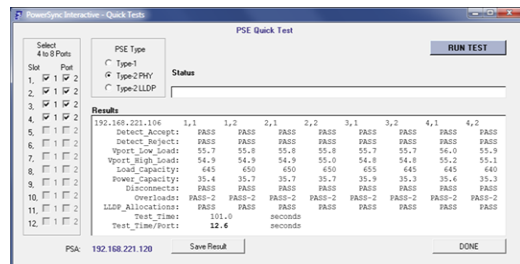
Typical test times will range from 8 to 14 seconds per port tested, even when testing Type-2 LLDP capable PSE's.

PSA Quick Test Menu

```
PSA-1,1>psa_quick_test 1,1 1,2 2,1 2,2 3,1 3,2 4,1 4,2  type-2 lldp
TESTING WITH 192.168.221.106 ON PORTS 1,1 1,2 2,1 2,2 3,1 3,2 4,1 4,2
EVALUATING DETECTION REJECT SIGNATURES...
EVALUATING DETECTION ACCEPT, LOW LOAD Vport, AND DISCONNECTS...
EVALUATING DETECTION ACCEPT, HIGH LOAD Vport, CAPACITY, & OVERLOADS...
ASSESSING LLDP POWER-UPS...
REQUESTING FULL TYPE-2 POWER...
ASSESSING LLDP ALLOCATIONS...

    192.168.221.106     1,1      1,2      2,1      2,2      3,1      3,2      4,1      4,2
       Detect_Accept:   PASS     PASS     PASS     PASS     PASS     PASS     PASS     PASS
       Detect_Reject:   PASS     PASS     PASS     PASS     PASS     PASS     PASS     PASS
      Vport_Low_Load:   55.7     55.8     55.8     55.8     55.7     55.7     56.0     55.9
     Vport_High_Load:   54.9     54.9     54.9     55.0     54.8     54.8     55.2     55.1
       Load_Capacity:    645      650      650      650      655      645      645      640
      Power_Capacity:   35.4     35.7     35.7     35.7     35.9     35.3     35.6     35.3
         Disconnects:   PASS     PASS     PASS     PASS     PASS     PASS     PASS     PASS
           Overloads: PASS-2   PASS-2   PASS-2   PASS-2   PASS-2   PASS-2   PASS-2   PASS-2
    LLDP_Allocations:   PASS     PASS     PASS     PASS     PASS     PASS     PASS     PASS
           Test_Time:   101.0       seconds
      Test_Time/Port:    12.6       seconds
```

Automated Manufacturing/QA PowerShell Test Script, **psa_quick_test**

*Note: *LLDP testing requires PoE LLDP Emulation and Analysis feature*.

PoE Service Analyzer Application

The PoE Service Analyzer is a special automated test and reporting application to enable comprehensive parametric and interoperability analysis at any PD connection point in a PoE enabled wiring plant. The testing supports 802.3at Type-1 and Type-2, including Type-2 with LLDP, PoE services.

See Sifos datasheet, **PoE Service Analyzer Product Overview**, for further information regarding the PoE Service Analyzer.
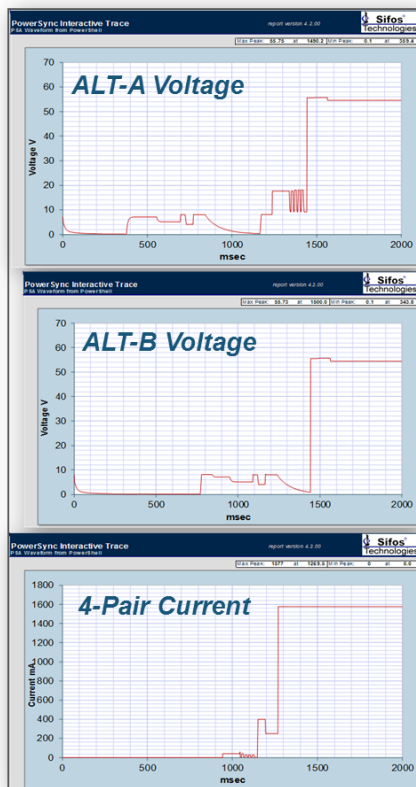

Service Analyzer Report

802.3bt Powering Emulations & Analysis

The PSA-3000 with **PSA-3202** test blades is hardware and firmware ready for IEEE 802.3bt PSE testing and PD emulation. Features for analysis of 802.3bt PSE's include:

- 4-Pair Testing from **Either** Port 1 or Port 2
- Emulate 802.3bt **Single** and **Dual Detection** Signatures
- Accurately and Flexibly Emulate 802.3bt **Class 5**, **6**, **7**, and **8 Single Signature** PD's with 4-Pair Loading Over 99 Watts per Test Blade (Up to 12 test blades per PSA chassis)
- Accurately and Flexibly Emulate 802.3bt **Dual Class 1**, **2**, **3**, **4**, and **5 Signature** PD's with Class and Load defined per Pairset
- Accurately Emulate 802.3bt **Pair Unbalance** Loads from 0% to 100%
- Accurately Emulate 802.3bt **Auto-Class** Signatures and Loading
- Reliable Multi-Event Edge Transition De-bouncing
- Accurately Emulate Minimum DC MPS Low-Power Loading Cases

Each of these features are available in PowerShell PSA version 4.2 (*see above*).   Over time, they will be incorporated into PSA Interactive and eventually into fully automated test suites for 802.3bt PSE Conformance and Multi-Port System testing.   Additionally, LLDP will be extended to support PoE LLDP extensions associated with the 802.3bt standard.

The waveforms here depict two 802.3bt emulated power-ups performed using a single command, **power_bt** in PowerShell PSA. One power-up is an emulated 802.3bt Class 8 PD drawing 90 watts while the second power-up emulates an 802.3bt dual Class 5 PD that also draws 90W at the PSE.

These waveforms are optionally produced by the **power_bt** command.

802.3bt Class 8, 90W Power-Up
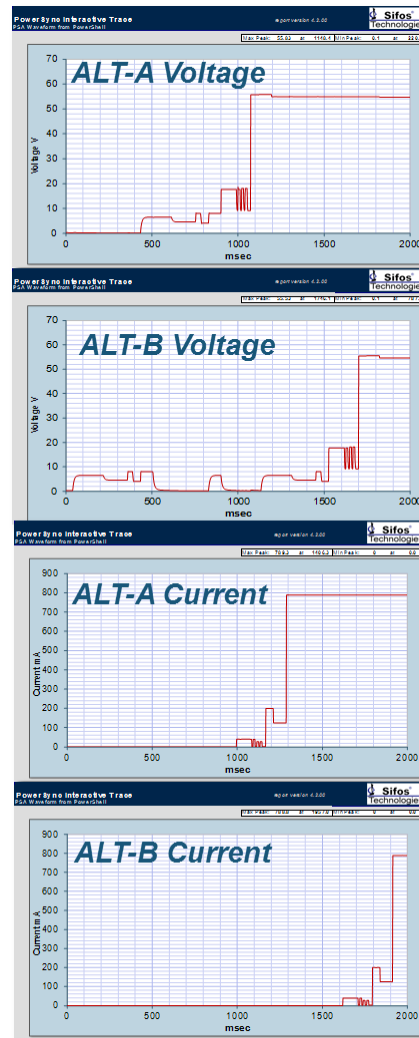
802.3bt Dual Class 5, 90W Power-Up

Technical Data: PSA-3000

LAN Interface Specifications			
Operating Mode	**Signal Path**	**Parameter**	**Specification**
Data Through Mode	PSE-# to OUT-#	Connections	RJ45
		Data Rates and Signaling	10/100/1000BaseT/2.5GBaseT *5GBase-T, 10GBase-T with minor impairment*
		Latency	None - Passively Coupled
		Impedance	100Ω, Balanced
		Pair-Pair Isolation	≥ 36dB @ 100MHz
		Insertion Loss	≤ 2dB, 0.1MHz to 100 MHz
		Insertion Loss Variation	≤ 0.75dB, 0.1MHz to 100 MHz
		Return Loss (THRU port terminated into 100Ω)	≤ -24dB, 1MHz to 100MHz

LAN Interface Specifications

Operating Mode	Signal Path	Parameter	Specification
Data Connect (LLDP Emulation) Mode	PSE-# to Blade Transceiver	Connection	RJ45
		Data Rate and Signaling	10/100Base-T
		Orientation	MDI End Point
		Protocol	802.1ab, 802.3bc, 802.3at
		Impedance	100Ω, Balanced
		Return Loss	$\leq$-20dB, 1MHz to 100MHz

PoE Port Connections

Operating Mode	Dependency	Parameter	Selections
2-Pair Power	Port 1 and Port 2 operate independently	Powered Pair	ALT-A or ALT-B
		Polarity	MDI or MDI-X
4-Pair Power: **PSA-3202**	Connect to Port 1 (*Port 2 disabled*) or Connect to Port 2 (*Port 1 disabled*)	ALT-A Polarity (Port 2)	MDI or MDI-X
		ALT-B Polarity (Port 1)	MDI or MDI-X
		Detection Signature Type	**Single** (Port 1) or **Dual** (Port 1 and Port 2)
4-Pair Power: **PSA-3102** or **PSA-3002**	Connect to Port 2 (*Port 1 disabled*)	ALT-A Polarity (Port 2)	MDI or MDI-X
		ALT-B Polarity (Port 1)	MDI or MDI-X

Detection and AC MPS Specifications

Description	Conditions	Parameter	Specification
Detection Resistance	Vport = 2.5VDC - 12VDC, Port Connected, Transition Current Load = 0	Range	9 KΩ to 39 KΩ
		Resolution	1 KW
		Accuracy vs Setting $\Delta V / \Delta I$ at 4.5 Volt Spacing	$\pm$1.75% + 300Ω
Detection Capacitance	Vport = 2.5VDC - 12VDC, Port Connected, Transition Current Load = 0	Range	0.14, 5, 7, 11mF
		Accuracy	$\pm$15%
Detection Signature Cut-Off Threshold	Port Connected	Vport	12V $\pm$ 2%
AC MPS Signature	Vport = 12VDC - 60VDC, Port Connected	AC Impedance	24KΩ || (0.1μF + 330Ω)
		Resistance Accuracy $\Delta V / \Delta I$ at 2 Volt Spacing	22.8KΩ $\pm$ 250Ω
	Port Isolated	AC Impedance (< 500 Hz) AC Impedance (< 120 Hz)	> 1.1 MΩ > 3.0 MΩ

Current Load Specifications

Description	Conditions	Parameter	Specification
Load Current	Per Powered (or classifying) Pair	Range	**PSA-3202**: 0 to 950 mA **PSA-3102**: 0 to 750 mA
		Resolution	0.25 mA
		Accuracy	$\pm$ (0.5% setting + 0.25mA)
		Slew Rates	> 4mA / μsec
		Activation Voltage	15V, Rising Vport
		De-Activation Voltage	14V, Falling Vport
Transition (Mark Region) Current	Load Current Active, Per Powered Pair	Range	0 to 400 mA
		Resolution	0.25 mA
		Accuracy	$\pm$ (0.5% setting + 0.25mA)
		Slew Rates	> 4mA / μsec
		Activation Voltage	14V, Falling Vport
		De-Activation Voltage	PSA-3202: 4.5V, Falling Vport PSA-3102: 6V, Falling Vport
Multi-Event Classification (*Not available to **PSA-3102***)	Multi-Event Activated, Vport > 15VDC	802.3bt Signatures Emulated	Single Signature Class 5 - 8 Dual Signature Class 1 - 5
		Non-Standard Signatures	Class Current per Event
		802.3bt Auto-Class	2mA @ 80msec of LCE1

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Current Load Specifications

Description	Conditions	Parameter	Specification
		Multi-Event Activation	**psa_connect** or **mclass**
		Multi-Event Deactivation	**psa_disconnect** or **mclass**
		Multi-Event Timeout	100 msec @ > 15V
		Event Start Glitch De-bounce	150μsec
		Mark and Idle Transition Glitch De-bounce	500μsec
		Event Count Reset Condition	< 4.5V for > 500μsec
		Power-On Expiration (default)	115 msec
Configurable Load Transient	Vport > 15VDC	Sequential Load Steps	2
		Transient Sequence Repeats	0 to 4
		Load Step 1 Range	0 to 1800 mA
		Load Step 2 Range	**PSA-3202**: 0 to 950 mA **PSA-3102**: 0 to 750 mA
		Resolution (0 – 1023 mA)	0.25 mA
		Resolution > 1023 mA	0.50 mA
		Accuracy	± (1% setting + 0.5mA)
		Slew Rate	< 10mA / μsec
		Step 1 Duration < 1024 mA	200 μsec to 1 sec
		Step 1 Duration > 1023 mA	200 μsec to 80 msec

		Step 2 Duration
		    Load Step 1 < 1024 mA
		    Load Step 1 > 1023 mA
			20 μsec to 1 sec (or persist)
			1 sec

		Step Resolution	100 μs
		Trigger Modes: < 1024 mA > 1023 mA	Immediate, Edge, Event Immediate
		Active Load Resistance	37 Ω
		Foldback Suppression Min. Port Voltage (@ 400mA)	30 VDC
		Foldback Suppression Duration	Step 1 + Step 2 Duration

DC Metering Specifications

Description	Conditions	Parameter	Specification
Voltage Meter	Average, Max-Peak, Min-Peak, Scope Trace	Voltage Range	0 - 60V
		Aperture or Trace Length	256 Samples (10ms, 20ms, 0ms…10s)
		Extended Trace Length[3]	1024 Samples (200ms, 2s, 4s, 8s, 20s)
		Sample Rates	39.1 μsec - 39.1 msec (1,2,5 steps)
		Resolution	16 mV
		Displayed Resolution	Avg & Peak: 2 decimal places O-scope Traces: 25 mV
		Accuracy[1]	> 30VDC: ± (1.5% reading + 16mV) < 30VDC: ± (2.0% reading + 16 mV)
		Measurement Triggers	Immediate, Edge, Event, Power-Up (*traces only*)
Current Meter	Average, Max-Peak, Min-Peak, Scope Trace	Current Range	0 – 2000 mA
		Aperture or Trace Length	256 Samples (10ms, 20ms, 50ms…10s)
		Extended Trace Length[3]	1024 Samples (200ms, 2s, 4s, 8s, 20s)
		Sample Rates	39.1 μsec - 39.1 msec (1,2,5 steps)
		Resolution (0– 1023 mA)	0.25mA
		Resolution (1024–2000 mA)	0.5mA
		Accuracy[2]	± (0.5% reading + 0.5mA)
		Triggers	Immediate, Edge, Event, Power-Up (*traces only*)

1. Does not include Voltage drop due to cable losses and 0.45Ω maximum test port input resistance.
2. Does not include Port-Connected MPS current, which is approximately (Vport - 12V)/24kΩ.
3. Scope Traces only - require PSA controller firmware 3.10 or newer and test port firmware 3.14 or newer.

AC Metering Specifications

Description	Conditions	Parameter	Specification
AC Peak-Peak Meter	Low Band, VDC= 40-57V	Accuracy, 25Hz – 325Hz	-15%, +11%
		Accuracy, 50Hz – 300Hz	-7.5%, +11%
	High Band, VDC= 40-57V	Accuracy, 2.5KHz – 250KHz	-15%, +7%
		Accuracy, 20KHz – 250KHz	-6%, +7%
	Full Band, VDC= 40-57V	Accuracy, 50Hz – 250KHz	-7.5%, +8.5%
	All Bands, VDC= 40-57V	Resolution	1mV
		Range	1Vp-p
		Input Impedance	0.05μF[1]

1. Input impedance models the lowest possible PD input capacitance – measurements are therefore affected by the effective source impedance of the PSE, including any frequency specific variations in that source impedance.

Triggering Specifications

Description	Conditions	Parameter	Specification
Edge & Event Triggers	All Modes	Range	0.25V - 59.5V
		Resolution	0.125 mV
		Accuracy (relative to DC Meter)	± 0.0625 mV
		Trig1 to Meter or Transient Latency	~ 50 μsecs
		Event Trigger Latency	< 500 μsecs
	Trigger Noise Immunity	Pre-Trigger Qualification Time (Voltage below Rising threshold or above Falling threshold)	1.5 msec
		Normal Mode Edge Noise Rejection	125 mV
		Noisy Mode Edge Noise Rejection	500 mV

Time Interval Metering Specifications

Description	Conditions	Parameter	Specification
Time Interval Meter	Microsecond scale	Time Range	4 – 26200 μs
		Time Resolution	1 μsec
		Time Accuracy	± 2 μsecs
		Min. Resolvable Time Interval	~ 4 μsecs
	Millisecond scale	Time Range	2-6550 msec
		Time Resolution	0.1 msec
		Time Accuracy	± 1 msec
		Min. Resolvable Time Interval	2 msec
	Second Scale	Time Range	0.1 – 16.1 sec
		Time Resolution	0.1 sec
		Time Accuracy	± 50 msec
		Min. Resolvable Time Interval	0.1 sec
	Triggering & Noise Immunity	Start Trigger	Edge or Event
		Stop Trigger	Edge
		Normal Mode Edge Noise Rejection	125 mV
		Noisy Mode Edge Noise Rejection	500 mV

LED Indicators – PSA-3202

LED Label	Parameter	Description
LINK	LLDP Link Status & Activity	**GREEN:** Linked at 100Base-Tx for LLDP, Blink with Activity **AMBER:** Linked at 10Base-T for LLDP, Blink with Activity **OFF**: Unlinked (or Disconnected)
PD	PoE Power Status	**GREEN**: PSE powered with Vport > 36 VDC **AMBER**: Valid 802.3 Detection Signature Connected (No PSE Power) **OFF**: PSE not powered & PD signature not connected
4PR	Test Port Mode	**GREEN:** Test port configured for 4-Pair powering **AMBER**: Opposite test port configured for 4-Pair powering **OFF:** Test port configured for 2-Pair powering
COM	Communications	**ON**: Indicates active communications with test port
*For **PSA-3102** LED Indicators, see Section 2 of PSA-3000 Technical Reference Manual.*		

Programming and Control

Description	Specification
Interface	Ethernet 10/100BaseT (*Telnet Port 23 protocols*) **NOTE**: The **Console** interface is for IP Address config only.
Host Requirements	PC running Microsoft Windows XP, Vista, 7, 8, 10, or Linux PC (Fedora, SUSE, Debian)
Control Environment	Sifos PowerShell PSA or PSA-Interactive
Recommended Network Latency:	< 5 msec

Physical and Environmental

Description	Specification
Dimensions	19"W x 5.25"H x 12"L (3U Rack Mount)
Weight	20.4 lbs. (Fully Populated with PSA-3x02 Cards)
Power	100VAC-240VAC, 50-60 Hz, 1.35A Max.
Ambient Operating Temperature	0°C to 40°C (≤ 100W combined PoE loading per test blade or 50W per test port)
Storage Temperature	-20°C to 85°C
Operating Humidity	5% to 95% RH, Non-Condensing.

Certifications

Description	North America	Europe & International
Emissions	FCC Part 15, Class A	Meets EN55011 VCCI, AS/NZS 3548, ICES-001
Safety	CSA Listed (CSA22.2 No. 61010)	Meets EN61010-1 CB Scheme IEC 61010-1
European Commission		Low Voltage Directive (2014/35/EU) Electromagnetic Compatibility Directive (2014/30/EU) **CE Marking** Directive (93/68/EEC)

FCC Statement: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Ordering Information

PSA-3000, PowerSync Analyzer 3000 Chassis & Controller, PowerShell PSA, and PSA Interactive Software

PSA-3202, Dual Port PSE Test Blade for IEEE 802.3at, IEEE 802.3bt, & Pre-802.3bt 4-Pair Testing

PSA-LLDP, LLDP Emulation and Analysis Feature for One PSA-3000 Instrument (*Up to 24 Test Ports*)

PSA-CT, IEEE 802.3at PSE Conformance Test Suite for One PSA Instrument (*Up to 24 Test Ports*)

PSA-TS1, IEEE 802.3at PSE Conformance Suite Tracking Service for One Year for One PSA Instrument

PSA-TS2, IEEE 802.3at PSE Conformance Suite Tracking Service for Two Years for One PSA Instrument

PSA-MPT, IEEE 802.3at PSE Multi-Port Suite for One PSA Instrument (Up to 24 Test Ports)

Accessories Included:
- Installation Guide & Configuration Chart
- PowerSync Analyzer Reference Manual (Binder and CD)
- Power Cord
- Cross-Over Ethernet Cable
- RS-232 or USB Cable

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