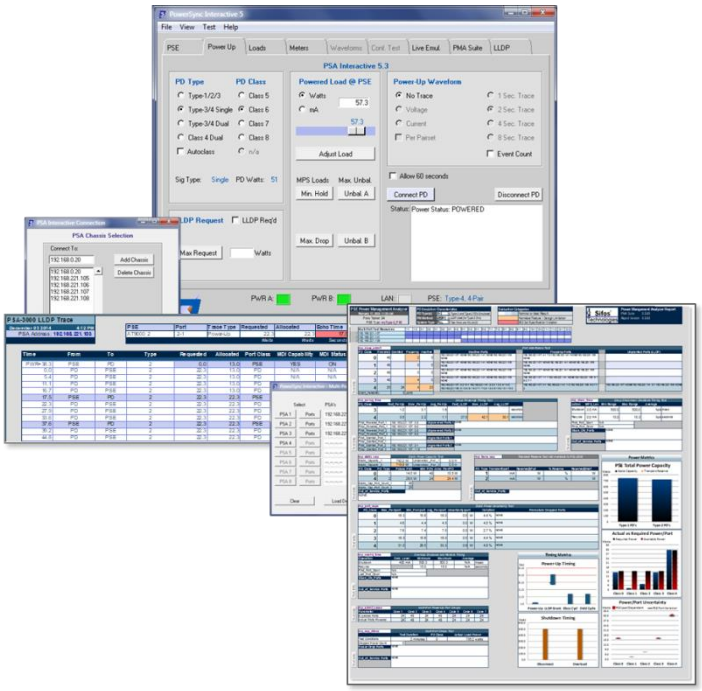
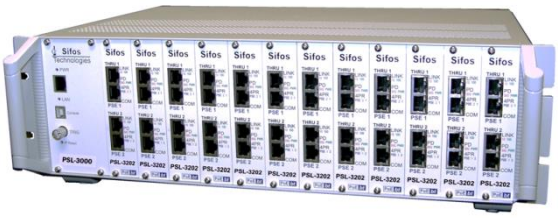
PSL-3000
PowerSync Programmable Load
IEEE 802.3at & 802.3bt Power over Ethernet

Product Overview





Key Features

- ❑ **Connect up to 24 802.3at / 802.3bt (4-Pair and 2-Pair) PSE Ports**
- ❑ **Continuous 2-Pair Loading > 47 Watts Per PSE Port x 24 Ports**
- ❑ **Continuous 4-Pair Loading > 99 Watts Per PSE Port x 12 Ports**
- ❑ **Flexible 802.3at / 802.3bt Powered Device Emulation Including PoE LLDP**
- ❑ **Unique, Fully Automated Multi-Port PSE System Analysis for 2-Pair PSE's**
- ❑ **One-Button Specification Limit Load Cases**
- ❑ **Automated PoE LLDP Protocol Analysis**
- ❑ **High Level Script Automation and Powerful Graphical User Interface**
- ❑ **DC Voltage, Current, and Power Metering on 2-Pair and 4-Pair PSE's**
- ❑ **Scalable Features, Cost-Efficient Architecture**
- ❑ **Supports PSE Packet Transmission Testing with PoE Loads**
- ❑ **Smart Fan Control – Runs Cool and Quiet**
- ❑ **Fully Certified Commercial Test Instrument, Extensively Documented**

Verification, *Simplified.*

IEEE 802.3at and 802.3bt PSE's

2-Pair Powering PSE's

4-Pair Powering PSE's

Endspan & Midspan PSE's

Fully Automated PSE System Power Management Test

2-Pair PSE Power Management Evaluation

System Stability Analysis including PoE LLDP

PSE Administrative Responses up to 192* 802.3at PD's

Automate QA, Manufacturing

Multi-Port Automation

Ready-to-Use, High Throughput Test Script

Commercial Test Instrumentation

Fully Certified

Factory Calibrated

Comprehensive Software and Documentation

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 testing and analysis of Power Sourcing Equipment (PSE) behaviors including basic compliance to the **IEEE 802.3at** and **802.3bt** specifications. Each PSL-3000 test port is an autonomous and fully isolated instrument offering stimulus and measurement resources for **2-Pair** PSE testing. Each test slot can be configured as an autonomous and fully isolated instrument for testing **802.3bt** and pre-standard **4-Pair** PSE's from either test port in that slot.

Loading 802.3bt PSE's

PSL-3000's are equipped with **PSL-3202** test blades that will emulate 802.3bt compliant PD's for the purpose of testing 802.3bt Type-3 and Type-4 PSE's providing over 90W of power using four wire pairs. **PSA 5.x** software opens the door to comprehensive 802.3bt PSE evaluation and automated test development. With several mouse clicks, virtually any 802.3bt PD can be emulated and PSE responses to a variety of PD emulations can be assessed. **One-button test loads** expose PSE's to 802.3bt specification limit loading conditions.

Automated 2-Pair PSE System Testing

PSA-3000's may be optioned via license key to run the one-of-a-kind **2-Pair 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. The fully automated **Power Management Analyzer Suite** for 2-pair PSE's 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 for 802.3at and 802.3bt

The IEEE **802.3at** and **802.3bt** specifications describe PSE's and Powered Devices (PD's) that communicate precise power demands and allocations using Ethernet layer 2 (LLDP) protocols. The PSA-3000 may be optioned via a license key to flexibly emulate PD's and to analyze the power negotiation protocols between PSE's and PD's.

Cost Effective, Scalable, and Backward Compatible

The PSL-3000 may be configured with 2 to 24 test ports, or alternatively with a fixed 24 test ports (**PSL-3224**) to further reduce per-port cost. Unlike most other low cost PSE load solutions, the PSL-3000 is a **fully certified** and factory calibrated commercial test instrument. Comprehensive and informative user documentation is a standard feature of the PSL-3000.

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

Verification, Simplified.

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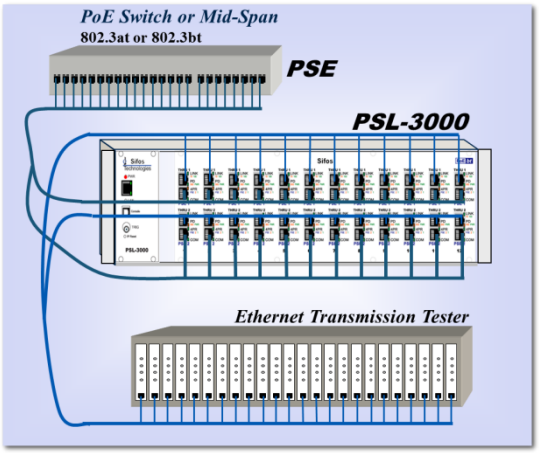
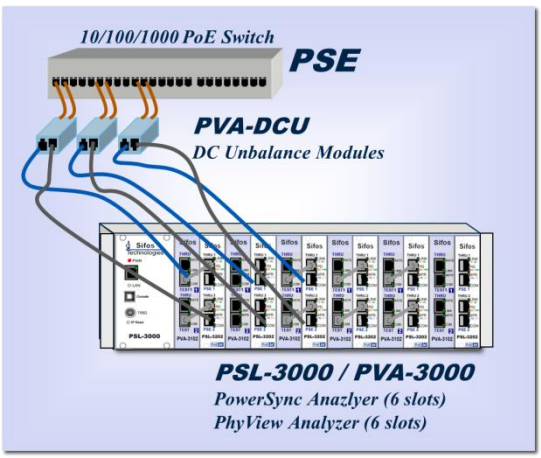
PowerSync Programmable Load Test Equipment Setups



PSE Multi-Port System QA, Manufacturing Test

PSE PoE & 10/100/1000 Physical Layer Analysis, PSE Magnetic Bias Tolerance



Flexible PD Emulation with Measurements (per Port)

Flexible 2-Pair & 4-Pair PD Detection & Class Emulation including 802.3bt Single and Dual Signature

Configurable Detection Resistance & Capacitance

Emulate 802.3at Classes 0-4

Emulate 802.3bt Classes 1-8 and Dual PD Classes 1-5

Emulate Proprietary 4-Pair PD's

Static DC Load Current to 950mA

Average DC Voltage Measurement

Average DC Current Measurement

Average DC Power Measurement

4-Pair Loading from Either Port of Each Test Slot

2-Pair PSE System & Multi-Port Testing*

Fully Automated Power Management Analyzer Suite for 2-Pair PSE's, including Type-2/3 LLDP capable 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**
- **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, Type-2 LLDP), 34W per port

LLDP*, PHY, Transmission Test Support

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

Fully Automated LLDP Protocol Traces and Analysis

Emulate 802.3at and 802.3bt LLDP Protocols

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 GUI for Rapid Setup and Intuitive Manual Testing

PowerShell Script Automation for Interactive Automated Test Development and Fast Test Execution

High Throughput, Multi-Port QA/Manufacturing Test Script Included

Extensive User Documentation

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

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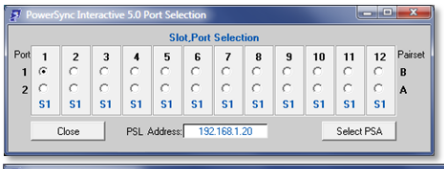
PSA Interactive Graphical User Interface

The Sifos **PSA Interactive** graphical user interface (GUI) is a flexible and powerful tool that enables users to access and manage many of the resources and testing functions available in a PSL-3000 instrument. **PSA 5.x** software introduces a second generation of PSA Interactive offering the following key features:

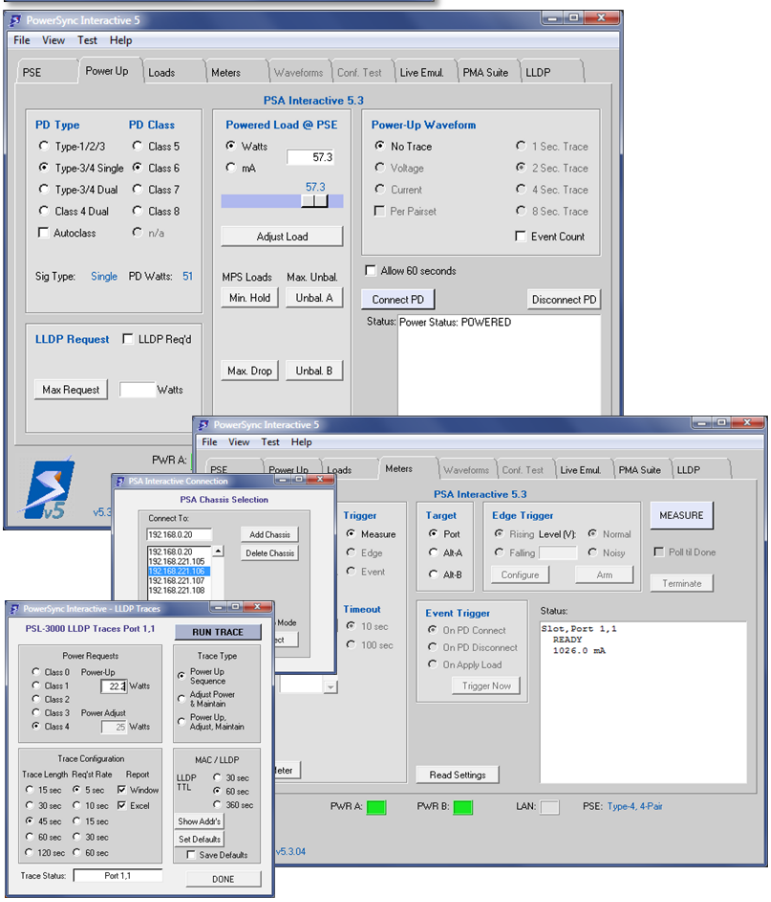
- Intelligent Management of **2-Pair** and **4-Pair** PSE Connections
- Seamless Integration Between **802.3at** and **802.3bt** PSE Testing Processes
- Seamless Integration of Newer PSL-3202 Test Blades and Older PSL-3102 Test Blades
- Ergonomic Tab Menu Scheme
- Flexible PD Emulations and PSE Stimulus-Response Assessments
- Full Support for All 802.3at Automated Test Suites and Analyses Previously Supported Under PSA 4.x Software
- Floorplan for Future 802.3bt Automated Test Suites

Included in the second generation PSA Interactive GUI is an intelligent **Slot-Port Selection Panel** and a tab menu window with nine tab menus:

- **PSE**: Learn, Declare, Load, and Save **PSE Attributes** that are essential to test port configuration and to automated test functions and utilities
- **Power Up**: Flexibly emulate and then connect **802.3at**, **802.3bt**, and **proprietary 4-Pair PD's** while capturing PSE responses to those connections
- **Loads**: Select and apply elemental signatures and static DC loads to **2-Pair** and **4-Pair** PSE's
- **Meters**: Configure and perform a wide variety of measurements on **2-Pair** and **4-Pair** PSE's
- **Waveforms**: (*One-Click waveforms are not available to the PSL-3000*)
- **Conf. Test**: (*The PSE Conformance Test Suite is not available to the PSL-3000*)
- **Live Emul***: Configure and emulate between 1 and 192 **802.3at** user-defined PD's including LLDP emulation
- **PMA Suite***: Configure and run the **802.3at** (**2-Pair**) PSE Power Management Analyzer Suite
- **LLDP**: Conf Configure and run **802.3bt** or **802.3at** LLDP protocol traces while emulating any 802.3 PD type including 802.3bt dual signature PD's



PSA Interactive Slot-Port Panel



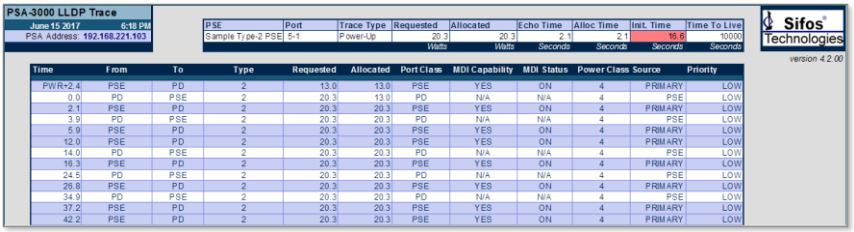
PSA Interactive Power-Up Emulation, Metering, and LLDP Tab Menus

* *See Sifos **PSL-3424** literature for Live PD Emulation and Power Management Analyzer Suite covering 802.3at (2-Pair) and 802.3bt (4-Pair) PSE's.*

802.3bt & 802.3at PoE LLDP Emulation and Analysis

The PSL-3000 includes a subsystem designed to flexibly emulate **802.3bt** and **802.3at** 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 & Analysis for the PowerSync Analyzer**.



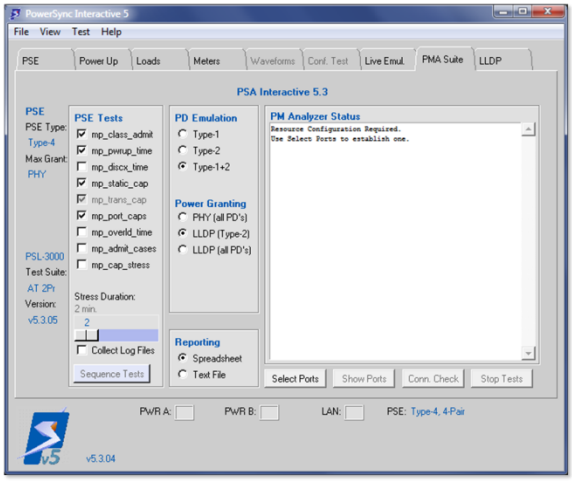
LLDP Protocol Trace

PSE Multi-Port Suite for 2-Pair 802.3bt & 802.3at PSE's

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 PSL-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 **Power Management (PM) Analyzer Suite** is a set of fully automated tests and reporting that takes the PSA-3000 into the realm of fully automated 2-Pair PSE System Power Management and Multi-Port Stimulus-Response testing. The PM Analyzer 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, 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, **PSE PM Analyzer Suite for PSA,PSL-3000 Overview**.



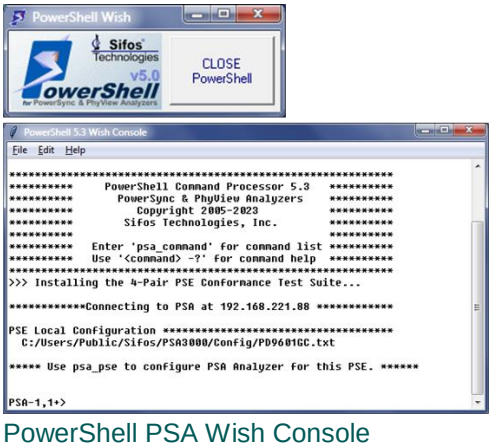
Power Management Analyzer Suite Menu

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 PSL-3000 PowerSync Programmable Load. PowerShell PSA enables fully automated testing suites that span multiple ports, blades, and instruments. Built upon the powerful and extensible Tool Command Language (Tcl), it offers an effective programming language well suited for automated testing.

PowerShell PSA provides a complete API for the PSL-3000 instrument including an extensive command set that ranges from elemental resource configurations to high level automated tests and test sequencers. Starting with PSA software version 5.0, PowerShell PSA seamlessly manages transitions between 802.3at (2-Pair) PSE testing and 802.3bt (4-Pair) PSE testing. Many PowerShell PSA commands and utilities automatically take on personalities governed by test port configurations (for example, **2-Pair** versus **4-Pair** and 4-Pair signature type).

PowerShell PSA 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:



PowerShell PSA Wish Console

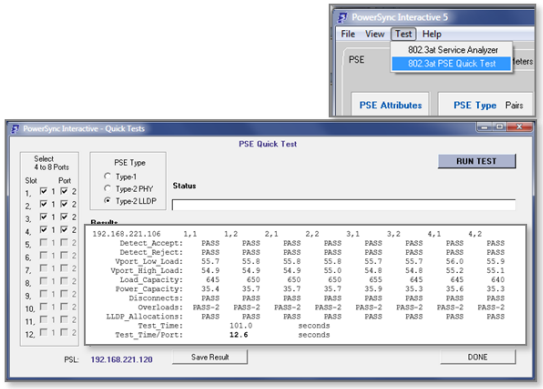
- Interpretive command execution (no compilation, easy debug)
- Simple, intuitive PowerSync Analyzer commands (API)
- Integrated and extensive command “help” features
- Fast test execution speeds
- Smart prompt that tracks selected test port configuration
- Command-Knowledgeable Wish Console
- Notepad++ Editor Extension for PowerShell PSA script editing and debugging
- Flexible test suite sequencing including compound sequences
- Traditional Tcl Command Console
- Extensive PowerShell PSA command documentation

2-Pair Multi-Port High Throughput PSE Verification

The PSL-3000 and PSL-3224 are provided with a sample PSE automated test script, **psl_quick_test**, that recovers several important PoE parameters from PSE ports with an effective test throughput of less than 30 seconds per tested port. This application can be used as is, or with user modifications, in both QA and manufacturing test to rapidly qualify PSE functional performance.

Important features of the **psl_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 minimum and maximum load conditions
- Determines **Power Capacity** in Watts and mA
- Assesses **Disconnect Power Removal** response
- Assesses **Overload Power Removal** and Power-Type Threshold
- Assesses **LLDP Power Allocations***



PSL Quick Test in PSA Interactive

Typical test times will range from 20 to 30 seconds per port tested, even when testing Type-2 LLDP capable PSE’s.

```
PSA-1,1>psl_quick_test 1,1 1,2 2,1 2,2 3,1 3,2 4,1 4,2  type-2 lldp
* LLDP PSE testing requires PoE LLDP Emulation and Analysis feature license.
EVALUATING DETECTION REJECT SIGNATURES...
EVALUATING DETECTION REJECT, 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...

    192.168.221.120     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:    53.3     53.4     53.3     53.4     53.4     53.3     53.8     53.4
    Vport_High_Load:    52.2     52.4     52.2     52.4     52.3     52.2     52.7     52.4
      Load_Capacity:     655      655      655      655      655      645      650      650
     Power_Capacity:    34.2     34.3     34.2     34.3     34.3     33.7     34.3     34.1
        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:       220.0         seconds
     Test_Time/Port:       27.5         seconds
```

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

Technical Data: PSL-3000 & PSL-3224

LAN Interface Specifications

Operating Mode	Signal Path	Parameter	Specification
Data Through Mode	PSE-# to THRU-#	Connections	RJ45
		Data Rates and Signaling	10/100/1000/2.5G/5G/10GBase-T
		Latency	None - Passively Coupled
		Impedance	100Ω, Balanced
		Insertion Loss	≤ 2dB (0.1 to 100MHz) ≤ 7dB (0.1 to 500MHz)
		Pair to Pair Isolation	≥30dB (0.1 to 100MHz) ≥15dB (0.1 to 500MHz)
		Equivalent Length Cat6A Cable / Test Port	~ 15 Meters (typical)*
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, 802.3bt
		Impedance	100Ω, Balanced
		Return Loss	≤-20dB, 1MHz to 100MHz

* This figure should be doubled for snaked data path testing with PoE using test port pairs. Does not account for potential impairments introduced with PoE DC currents on long cables such as effects of DC Unbalance on link partner magnetics.

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: PSL-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: PSL-3102	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
All	Any Conductor referenced to Any Other Conductor	Maximum Input Voltage	±60 VDC
	Any Conductor referenced to RJ-45 Shield	Maximum Input Voltage	±60 VDC

Detection and AC MPS Specifications

Description	Conditions	Parameter	Specification
Detection Resistance	Vport = 2.5VDC - 12VDC, Port Connected	Range	9 KΩ to 39 KΩ
		Resolution	1 KΩ
		Accuracy vs Setting $\Delta V / \Delta I$ at 4.5 Volt Spacing	±1.75% + 300Ω
Detection Capacitance	Vport = 2.5VDC - 12VDC, Port Connected	Range	0.14, 5, 7, 11μF
		Accuracy	±15%
Detection Signature Cut-Off Threshold	Port Connected	Vport	12V ± 2%
AC MPS Signature	Vport = 12VDC - 60VDC, Port Connected	AC Impedance	$24K\Omega \parallel (0.1\mu F + 330\Omega)$
		Resistance Accuracy $\Delta V / \Delta I$ at 2 Volt Spacing	22.8KΩ ± 250Ω
	Port Isolated	AC Impedance (≤ 500 Hz) AC Impedance (≤ 120 Hz)	≥ 1.1 MΩ ≥ 3.0 MΩ

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Current Load Specifications

Description	Conditions	Parameter	Specification
Load Current	Per Powered (or classifying) Pairset	Range	**PSL-3202**: 0 to 950 mA **PSL-3102**: 0 to 750 mA
	Per Powered (or classifying) Pairset	Resolution	1.00 mA
		Accuracy	± (0.5% setting + 1 mA)
		Slew Rates	> 4mA / µsec
		Activation Voltage	15V, Rising Vport
		De-Activation Voltage	14V, Falling Vport
Transition (Mark Region) Current (*PSL-3202, PSL-3224 Only*)	Load Current Activated, Per Powered (or classifying) Pairset	Range	0 to 400 mA
		Resolution	1.0 mA
		Accuracy	± (2.0% setting + 1mA)
		Slew Rates	> 4mA / µsec
		Activation Voltage	14V, Falling Vport
		De-Activation Voltage	4.5V, Falling Vport
Multi-Event Classification (*Not available to **PSL-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
		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

DC Metering Specifications

Description	Conditions	Parameter	Specification
Voltage Meter	Average	Voltage Range	0 - 60V
		Sample Averaging	256 Samples
		Sample Rate (100 msec Period) Sample Rate (1 sec Period)	390 msec 3.9 msec
		Resolution	100 mV
		Accuracy[1]	± (2% reading +100mV)
Current Meter	Average (per pairset)	Current Range[3]	0 – 1000 mA
		Sample Averaging	256 Samples
		Sample Rate (100 msec Period) Sample Rate (1 sec Period)	390 msec 3.9 msec
		Resolution[3]	1.00 mA
		Accuracy[2]	± (2% reading + 1.0 mA)
Power Meter	DC power measurements are the product of DC voltage and DC current measurements performed separately		

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. With 4-Pair measurements, Current Range and Resolution are both doubled.

LED Indicators

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 **PSL-3102** LED Indicators, see Section 3 of PSL-3000 Technical Reference Manual.*		

Programming and Control	
Description	**Specification**
Interface	Ethernet 10/100BaseT **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 PL
Recommended Network Latency:	< 20 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 PSL-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**
Safety	**CSA Listed** (CSA22.2 No. 61010)	EN61010-1 (Test & Measurement Equipment)
Emissions	FCC Part 15, Class A ICES-001	EN55011 (Class A Radiated Emissions) EN61326-1 (EMC) VCCI, AS/NZS 3548
European Commission		Low Voltage Directive (2014/35/EU) Electromagnetic Compatibility Directive (2014/30/EU) RoHS 2 Directive (2011/65/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

PSL-3000, PowerSync Programmable Load 3000 Chassis and Controller including PowerShell PSA and PSA Interactive Software

PSL-3202, Dual Port PSE Load Blade for IEEE 802.3at, IEEE 802.3bt, and Pre-802.3bt 4-Pair Testing

PSL-3224, PowerSync Programmable Load 3000 Chassis and Controller including 12 PSL-3202 Load Blades, PowerShell PSA, and PSA Interactive Software

PSL-LLDP, IEEE 802.3at/802.3bt LLDP Emulation and Analysis Feature for One PSL Address (*Up to 24 Test Ports*)

PSL-3000-MPT, PSE Multi-Port Suite for 2-Pair powering PSE's including Multi-Port Live PD Emulation and the Power Management Analyzer Suite for one **PSL-3000** Address* (*up to 24 test ports*)

HCopy-Manual, Hardcopy of PSL-3000 Technical Reference Manual

Accessories Included:

- PSA Software (CD, USB Stick)
- PSA Installation Guide (Hardcopy, CD, USB Stick) & Quick Start Guide for Phone
- PSL-3000 Technical Reference Manual (Softcopy, CD and USB Stick)
- Power Cord
- Cross-Over Ethernet Cable
- USB 2.0 Cable

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Verification, Simplified.

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