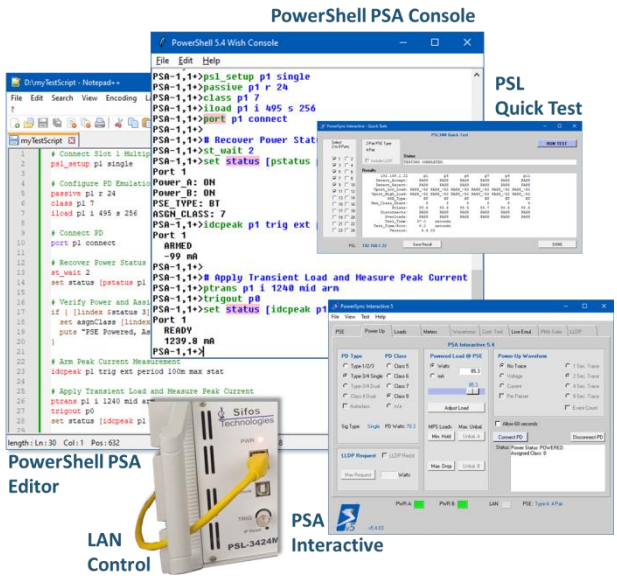
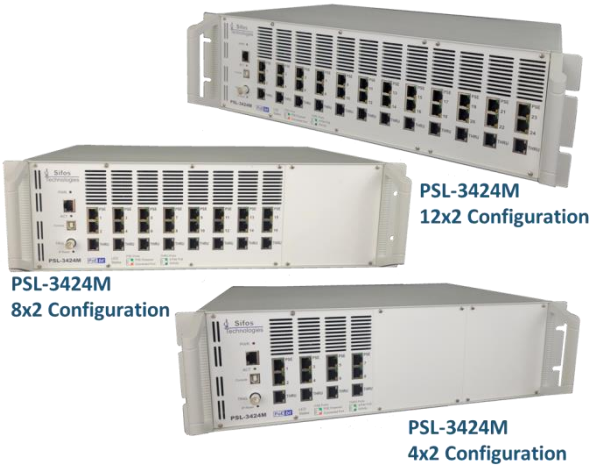
PSL-3424M

PowerSync Programmable Load

IEEE 802.3at & 802.3bt Power over Ethernet

Product Overview





Key Features

- ❑ **Connect up to 24 (2-Pair and/or 4-Pair) PSE ports**
- ❑ **Simultaneously Load up to 12 PSE ports**
- ❑ **Programmable Per-Port Loading to over 100W per Port**
- ❑ **Scalable: Configure as 4x2 (8) Ports, 8x2 (16) Ports, or 12x2 (24) Ports**
- ❑ **Emulate Class 0 – Class 8 PD's including Live PD Emulation**
- ❑ **LAN Data THRU port for packet and/or PHY testing under PoE Load**
- ❑ **ESD/EFT/Surge Hardened – Supports IEC 61000-4 Compliance Testing**
- ❑ **Automation Development Environment with PowerShell PSA**
- ❑ **Optional PSA Interactive Graphical User Interface, PSL Quick Test Multi-Port PSE Inspection Test, and Snaked Data + PoE Setup Menu**
- ❑ **Pairset Voltage Metering and Power Detection, 4-Pair Current Metering**
- ❑ **Programmable Load Transients and Inrush Loading**
- ❑ **Smart and Quiet Thermal Management**
- ❑ **Instrument Control over LAN (Ethernet)**
- ❑ **Embedded Power Supply, Safety and Emissions Certifications**

Verification, *Simplified.*

Industrial and Commercial PoE Switches

2-Pair Powering PSE's

4-Pair Powering PSE's

802.3at / 802.3bt Support

Automate QA, Manufacturing

High Level Automation Development Environment

Per-Blade Multiplexing Handles Up to 24 Ports

Control via Ethernet

Support Packet Test, PHY Test, Snaked Data Setups

Safety/Compliance QA of PSE's

IEC61000-4 Level 3 Protected Test Ports

Low RF Emissions

CSA Listing

Cost Effective PSE Loading

Sifos' Lowest Cost PSE Test Platform

Scalable from 8 to 24 Ports

Live PD Emulation Mimicking Banks of User-Defined PD's

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, Low Cost Solution

Sifos Technologies offers **one-box platforms** to facilitate analysis of Power Sourcing Equipment (PSE) behaviors. The **PSL-3424M** is Sifos' lowest cost, multi-port PSE test instrument supporting PSE loading and power stressing. Depending upon configuration, up to 12 ports can simultaneously load over 1200 combined watts, emulating 802.3at and 802.3bt single signature PD's advertising Class 0 to Class 8. With per-slot multiplexing, up to 24 PSE ports can be connected enabling automated test strategies covering 24, 16, or 8 port PSE's.

Perfect Fit for Industrial PSE Testing

PSL-3424M test ports are ESD/Surge/EFT protected to IEC 61000-4 Level 3 standards allowing multi-port connections to PSE's while they go through safety/compliance test procedures. Test ports provide flexible PD class emulation and power loading up to 100W per port. The instrument scales from 8 multiplexed PSE ports to 24 multiplexed PSE ports allowing lower cost solutions to smaller port-count applications.

Automation Ready

The PSL-3424M is provided with Sifos' **PowerShell PSA** scripting environment that includes a variety of commands and utilities to make short work of evaluating PSE ports. Automation test strategies can utilize the 2:1 test port multiplexing to scan more PSE ports or connect multiple PSE's to a single test instrument. Single commands carry out power-ups and virtual PD emulations of any Class 0 – Class 8 PD.

Features of Sifos High-End Testers

The PSL-3424M is managed over the LAN just like other members of the Sifos PSA-3000 family of PSE test instruments. The PSL-3424M runs cooling fans only when test port heating calls for it. An efficient cooling system then expels up to 1200 Watts without irritating, high frequency fans. The PSL-3424M is rack friendly and will tolerate equipment immediately on top and below the 3U sized instrument.

The PSL-3424M may be optioned for the **PSA Interactive** graphical user interface software for intuitive, interactive analysis including one-click emulated power-ups, synchronized load transient and meter measurements, multi-port **Live PD Emulation**, and access to the **PSL Quick Test** multi-port PSE functional test.

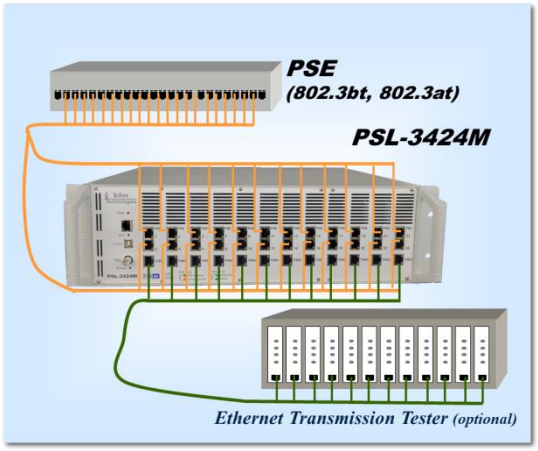
Commercial Grade Test Equipment

Like all Sifos test equipment, the PSL-3424M is safety (CSA) and environmentally (CE mark) certified. The PSL-3424M will support packet traffic up to 10GBase-T rates on DC isolated THRU ports. All technical capabilities are fully specified in technical datasheets.

Verification, *Simplified.*

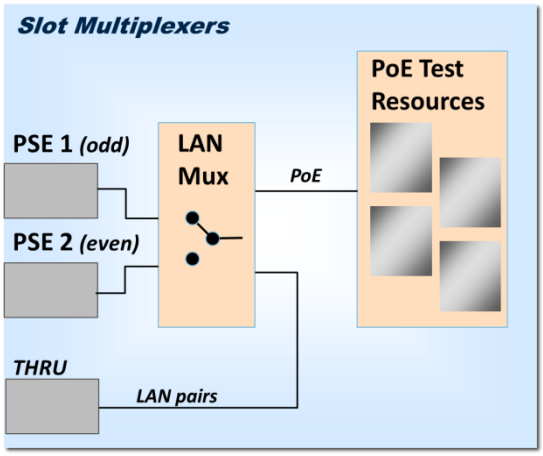
Example Applications

Data Link Testing with Full PoE Loading



Industrial PSE PoE Qualification

LAN Port Multiplexing



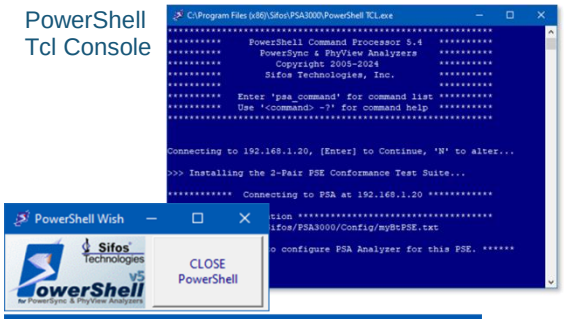
PD Emulation with Measurements (per Port)

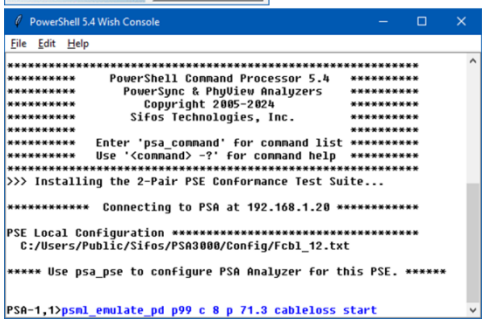
Flexible 2-Pair & 4-Pair PD Detection & Class Emulation of (Single Signature) Class 0 – 8 PD's
1 Valid & 1 Invalid Detection Signatures
Static Load Current to 975mA per pairset (1.95A total)
Average and Peak (Min/Max) DC Voltage Measurement
Average and Peak (Min/Max) DC Current Measurement
Average DC Power Measurement
Metering Apertures of 100msec or 1sec
Programmable Transients (5.5msec, 45msec, 100msec)
Synchronized Metering and Load Transients
Programmable Inrush Current
Multi-Port Live PD Emulation
Export / Import Hardware (Event) Trigger

Test Automation Ready

PowerShell PSA Wish and Tcl Consoles
Convenient LAN Control Port – Manage Across Network
Robust I/O Management – No Drivers Required
Interactive Command Environment
Interactive Debugging
Intuitive Commands with Comprehensive Help Menus
Powerful Utility Commands
Supported on Windows and Linux Platforms
Notepad++ PowerShell PSA Editor (Windows only)

PowerShell Tcl Console





PowerShell Wish Console

Slot Multiplexer

Form Automated Strategies that Test Ports in Groups
Test Two or More PSE's with One Physical Test Setup
Multiplex LAN Data Lines
Low Impairment Multiplexing

PowerShell PSA Tcl/Tk Interface

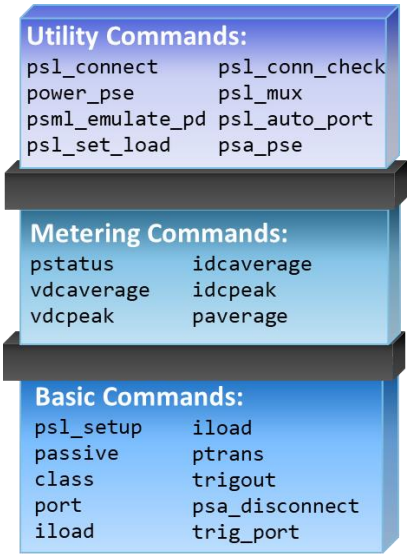
PowerShell PSA provides a complete and extensible API for the PSL-3424M instrument including a robust command set that ranges from elemental resource configurations to high level utilities. PowerShell PSA seamlessly manages transitions between 802.3at (2-Pair) PSE testing and 802.3bt (4-Pair) PSE testing.

Many PowerShell PSA commands and utilities automatically take on personalities governed by test port configurations (for example, **2-Pair** versus **4-Pair** PSE testing). Built upon the powerful and extensible Tool Command Language (Tcl/Tk), PowerShell PSA offers an effective programming language well suited for automated testing.

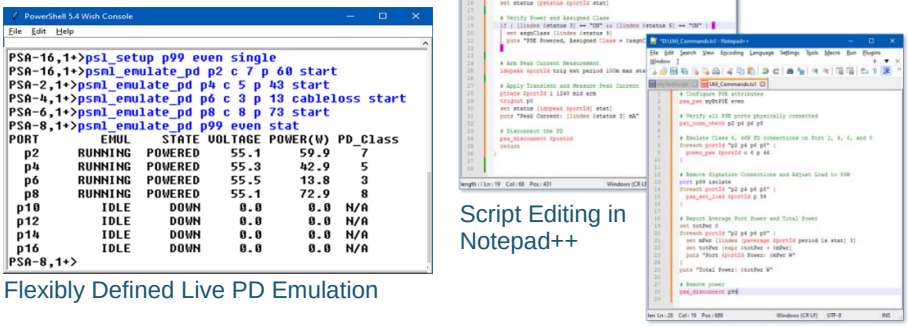
PowerShell PSA can be integrated into broader Tcl environments that interlace traditional network transmission tests with Power-over-Ethernet tests. This enables seamless integration of custom or standard PSE tests with existing Tcl-based test suites.

Other features offered by the PowerShell PSA environment include:

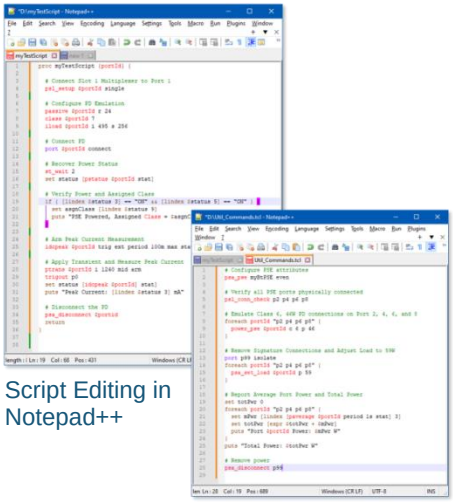
- Interpretive command execution (no compilation, easy debug)
- Simple, intuitive PSA/PSL-3000 family commands (API)
- Integrated and extensive command “help” features
- Low level resource management commands embedding all I/O management functions
- Mid-level and high level utility commands such as flexibly emulated power-ups, live PD Emulation, multi-port connection checking, power load adjustment, etc.
- 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
- Traditional Tcl Command Console
- Extensive PowerShell PSA command documentation
- Supported on Microsoft Windows and Linux



PSL-3424M Command Stack



Flexibly Defined Live PD Emulation

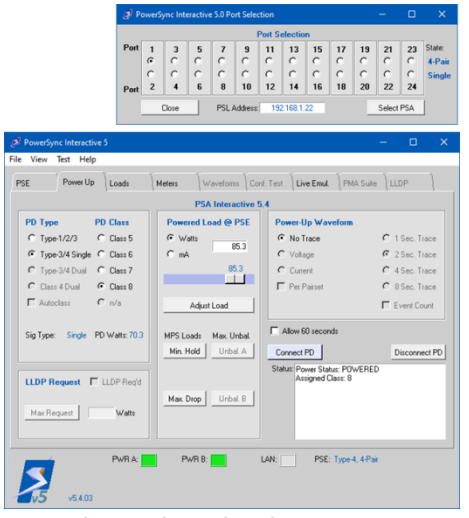


Script Editing in Notepad++

Optional PSA Interactive Graphical User Interface

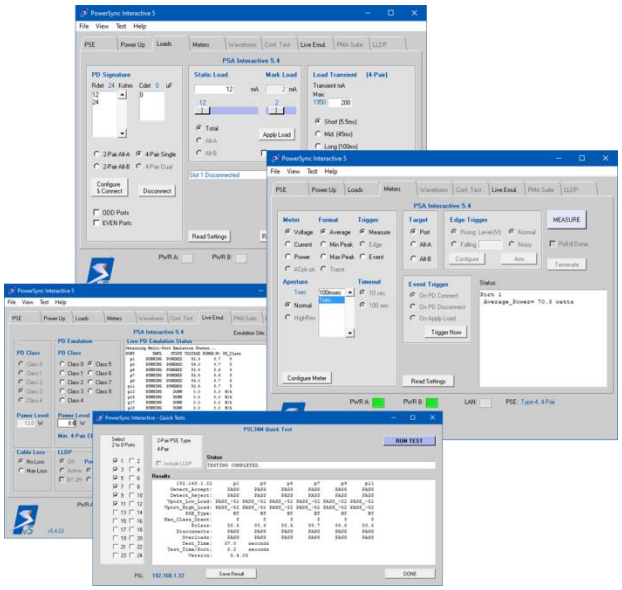
The same PSA Interactive graphical user interface software that manages the PowerSync Analyzer family of instruments is available as a license option to the PSL-3424M. PSA Interactive is tab-based menu system providing access to virtually all of the capabilities of PowerShell PSA. Using PSA Interactive, users can easily:

- Describe PSE attributes to PSA Software
- Perform one-click emulated PD power-ups to user-specified loads
- Modify static DC loads (current or power)
- Produce user-defined transient loads
- Perform one-click measurements of average, minimum peak, and maximum peak voltage and current
- Perform one-click measurements of average power
- Synchronize peak voltage and current measurements to load transients
- Synchronize measurements and transients across multiple ports



Port Select and Emulated Power-Up Menus

PSA Interactive also provides access to a **Live PD Emulation** menu that places a port or group of ports into a state of flexibly defined PD emulation useful for mimicking banks of user-defined PD's. With several mouse clicks, a bank of PD's can be "connected" to PSE ports so as those ports are enabled for PoE service, they will encounter those PD's.



Load Control, Metering, Live Emulation, Quick Test Menus

As with PowerShell PSA, PSA Interactive is supported on Microsoft Windows and Linux PC's.

PSL Quick Test and Snaked Data Traffic Testing

PSA Interactive provides access to a fully automated PSE port functional test program (**PSL Quick Test**) designed to test between two and eight ports at a time. PSL Quick Test rapidly characterizes PD detection and classification integrity, power capacity and output voltage integrity, and PD overload and disconnect processing. Test times, depending upon count of ports tested, will be under 10 seconds per port.

Included with PSL Quick Test is a specialized menu for configuring and validating **Data + PoE Traffic** testing setups. Using this menu, PD emulation and loading defined in the **Power Up** tab menu is executed on one or more test ports. Test ports specified in the traffic test configuration are verified for PSE connections and powering status during the data traffic testing.

Technical Data: PSL-3424M

LAN Interface Specifications

Multiplexer Setting	THRU Port	Parameter	Specification
Connected to Odd test port or Connected to Even test port	DC Isolated Connection to Odd Numbered test port or DC Isolated Connection to Even Numbered test port	Connections	RJ45
		Data Rates and Signaling	10/100/1000/2.5G/5G/10G Base-T
		Latency	None - Passively Coupled
		Impedance	100Ω, Balanced
		Insertion Loss	≤ 1.0dB (0.1 to 100MHz) ≤ 4.5dB (0.1 to 500MHz),
		Pair to Pair Isolation	≥ 33dB (0.1 to 100MHz) ≥ 15dB (0.1 to 500MHz)
		Equivalent Length Cat6A Cable / Test Port	~ 7 Meters (typical) *

* This figure should be doubled for snaked data path testing with PoE using test slot 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	Test Ports	Configuration	Specification
2-Pair PSE Loading	Any Port 1-24	ALT-A	Polarity MDI or MDI-X
		ALT-B	Polarity MDI or MDI-X
4-Pair PSE Loading	Any Port 1-24	Single Signature	ALT-A, MDI or MDI-X and ALT-B, MDI or MDI-X
All	Any Conductor referenced to Any Other Conductor	Maximum Continuous Input Voltage*	±60 VDC
	Any Conductor referenced to RJ-45 Shield	Maximum Continuous Input Voltage*	±60 VDC

* PSL-3424M PSE test ports are designed to tolerate ±1KV surge and EFT impulses.

Detection Specifications

Description	Conditions	Parameter	Specification
Detection Resistance	2-Pair and 4-Pair Dual Signature Vport = 2.5VDC - 10VDC ΔV / ΔI at 4.5 Volt Spacing below 9.25V Port "Connected"	Valid Signatures	24 KΩ
		Invalid Signatures	12 KΩ
		Valid Signature Accuracy (12KΩ)	12.0KΩ ±240Ω
		Valid Signature Accuracy (24KΩ)	24.0KΩ ±480Ω
		Cut-Out Voltage	13V ± 4%
Detection Capacitance	Vport = 2.5VDC – 57VDC	Pairset Capacitance	0.1μF
		Accuracy	±20%

Classification Specifications

Description	Conditions	Parameter	Specification
Classification Signatures	PSE Voltage Vport = 13 – 22.5 VDC	2-Pair Classes	0, 1, 2, 3, or 4
		4-Pair (Single Signature) Classes	1, 2, 3, 4, 5, 6, 7,or 8
Class Events	PSE Voltage Vport = 13 – 22.5 VDC	Class 0 current	2.5 ± 0.4mA
		Class 1 current	10.5 ± 0.4mA
		Class 2 current	18.5 ± 0.4mA
		Class 3 current	28.5 ± 0.7mA
		Class 4 current	40 ± 0.8mA
		Class Stability Timing	≤ 1 msec
Mark Event Load	PSE Voltage Vport = 4 – 12VDC Following Class Events	Resistance per Pairset	9.0KΩ ± 3.0KΩ
Class Reset		Reset Threshold	3.9 ± 0.9 VDC
		Minimum Time Duration	< 1 msec

Current Load Specifications

Description	Conditions	Parameter	Specification
Static Load Current	2-Pair PSE Loading	Range	0 to 975 mA
		Resolution	2.00 mA
	4-Pair PSE Loading	Range	0 to 1950 mA
		Resolution	2.00 mA
	2-Pair or 4-Pair PSE Loading	Slew Rates (100mA Step)	> 2.5mA / μsec
		Activation Voltage	39.2 ± 0.2 V, Rising Vport
		De-Activation Voltage	9.8 ± 0.1 V, Falling Vport
		Maximum 0mA Load Current	1 mA
		Default Inrush Current at Power-Up	40 mA per Pairset (80mA 4-Pair)
		Inrush Duration at Power-Up	100msec ± 1msec
		Inrush Current Range	0 to 975 mA per Pairset
Transient Load Current	2-Pair PSE Loading	Range	0 to 975 mA
		Resolution	1.00 mA
	4-Pair PSE Loading	Range	0 to 1950 mA
		Resolution	2.00 mA
	2-Pair or 4-Pair PSE Loading	Trigger Mode	**Immediate** or **Event Trigger**[1]
		Duration = "Short"	5.5 msec
		Duration = "Mid"	45 msec
		Duration = "Long"	100 msec
		Duration = "Hold"	Indefinite

1 **Event Trigger** is used to synchronize transient loads across test ports and also with meter measurements

DC Metering Specifications

Description	Modes	Parameter	Specification
Voltage Meter	Average, Max. Peak, or Min. Peak each Pairset	Voltage Range	0 - 58V
		Measurement Apertures	100 msec, 1 sec
		Sample Rate (100 msec aperture)	390 µsec
		Sample Rate (1 sec aperture)	3.9 msec
		Resolution	30 mV
		Accuracy: ≥ 5 VDC[1]	± (0.6% reading + 0.25 V)
		Accuracy: < 5VDC	± 2.0% reading -0.25V, + 0.5 V
		Trigger Modes	**Immediate** or **Event Trigger**[2]
Current Meter	2-Pair or Pairset Average, Max. Peak, or Min. Peak	Current Range	0 – 975 mA
		Resolution	0.5 mA
	4-Pair Average, Max. Peak, or Min. Peak	Current Range	0 – 1950 mA
		Resolution	0.5 mA
Current Meter	Average, Max. Peak, or Min. Peak 2-Pair or 4-Pair	Measurement Apertures	100 msec, 1 sec
		Sample Rate (100 msec aperture)	390 µsec
		Sample Rate (1 sec aperture)	3.9 msec
		Accuracy – 4 to 20 mA	± (10% reading – 0.8mA)
		Accuracy – 21 to 200 mA	± (3.1% reading – 1.1mA)
		Accuracy – 201 to 1950 mA	± (0.5% reading – 1.1mA)
		Trigger Modes	**Immediate** or **Event Trigger**[2]
Power Meter	2-Pair Average	Range	0 – 57 W
		Resolution	0.1 W
	4-Pair Average	Range	0 – 113 W
		Resolution	0.1 W
Power Meter	2-Pair or 4-Pair Average	Measurement Apertures	100 msec, 1 sec
		Sample Rate (100 msec aperture)	390 µsec
		Sample Rate (1 sec aperture)	3.9 msec
		Accuracy	± (2% reading + 0.1W)
		Trigger Mode	**Immediate**

1 Does not include Voltage drop due to cable losses and 0.3Ω maximum test port input resistance.
2 **Event Trigger** is used to synchronize meter measurements across test ports and also with transient loads

LED Indicators

LED	Parameter	Description
PSE Ports: Upper LED	PSE Power Status	**GREEN:** Port Powered **OFF**: Port Not Powered
PSE Ports: Lower LED	PSE Power Status	**AMBER**: Port Connected by Multiplexer **OFF**: Port Not Connected by Multiplexer
THUR Ports: Upper LED	Powered Pair Configuration	**GREEN**: PoE Resources Configured for 4-Pair PSE **OFF**: PoE Resources Configured for 2-Pair PSE
THUR Ports: Lower LED	Port Activity	**GREEN (blinking)**: Active Communications with Test Port **OFF**: No Communications with Test Port

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, 11, or Linux PC (Fedora, SUSE, Debian)
Control Environment	Sifos PowerShell PSA or PSA Interactive PL
Recommended Network Latency:	< 50 msec

Physical and Environmental	
Description	**Specification**
Dimensions	19"W x 5.25"H x 12"L (3U Rack Mount)
Weight (*with all 12 slots populated*)	19.6 lbs.
Power	100VAC-240VAC, 50-60 Hz, 1.35A Max.
Ambient Operating Temperature	0°C to 40°C (≤ 100W per test port)
Max Fan Air Flow	~100 CFM (8-Port config.), ~200 CFM (16-Port config.), ~300 CFM (24-Port config.)
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)	EN61010-2 (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) EN61326-1.2020 (Lab Equipment) 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-3424M-24, PowerSync Multiplexed Programmable Load Chassis and Controller including 24 multiplexed test ports and PowerShell PSA Software

PSL-3424M-16, PowerSync Multiplexed Programmable Load Chassis and Controller including 16 multiplexed test ports and PowerShell PSA Software

PSL-3424M-8, PowerSync Multiplexed Programmable Load Chassis and Controller including 8 multiplexed test ports and PowerShell PSA Software

PSL-3424M-PSAI, Optional Single Instrument Feature License for PSA Interactive graphical user interface software

PSL-3424M-QT, Optional Single Instrument Feature License for Automated Quick Inspection Test and Snaked Data Path Configuration applications (requires PSL-3424M-PSAI license)

HCopy-Manual, Hardcopy of PSL-3424M Technical Reference Manual

Accessories Included:

- PSA Software (CD, USB Stick)
- PSA Installation Guide (Hardcopy, CD, USB Stick) & Quick Start Guide for Phone
- PSL-3424M Technical Reference Manual (Softcopy, CD and USB Stick)
- Power Cord
- Cross-Over Ethernet Cable
- USB 2.0 Cable

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