

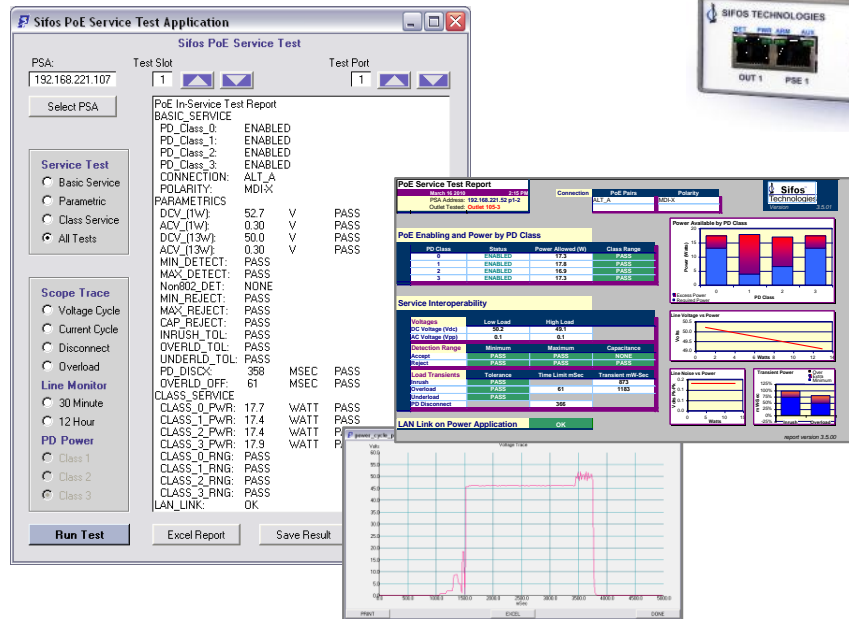


PoE Service Analyzer

In-Depth PoE Service Analysis

using the PowerSync[®] Analyzer

Product Overview



Key Features

- ❑ Analysis and Troubleshooting for PoE Installations
- ❑ Operate Locally or Remotely, In-Band or Out-of-Band
- ❑ Fully Automated Testing and Reporting
- ❑ Interoperability Qualification
- ❑ Assess Power Delivery at the PD by PD Class
- ❑ Verify PoE Service Safety Features
- ❑ Troubleshoot Intermittent PoE Service Problems
- ❑ Graphically View Signals and Waveforms at the PD Outlet
- ❑ Optional Sifos Automated 802.3at PSE Conformance Testing
- ❑ Software Hosted on Windows or Linux
- ❑ Rugged Carrying Case
- ❑ Forward Compatible* to 802.3at (25.5 Watt) Services
- ❑ Forward Compatible* to LLDP-Managed PoE Service

Verification, Simplified.

**There's a Whole Lot
More to PoE Than A
Line Voltage....**

**Assess Full 802.3
Compliant Service
to All Powered
Device
Connections....**

**Confidently Sort
Out PSE vs PD
Interoperability
Issues and Network
Power Limitations**

Overview

Power-over-Ethernet (PoE) is a pervasive technology with the promise of offering world-wide, industry standard power connectivity, intelligent power management, mission critical power backup, and the healthy elimination of numerous "wall wart" power modules. With the ability to serve 13 Watts of continuous power to each Powered Device (PD) today and a growth path toward 25.5 Watts in the near future, PoE is attracting greater numbers of applications ranging from phones, wireless access points, tag and card readers, to security cameras and industrial controls.

PoE technology is challenged with the delivery of robust and safe power over a cabling infrastructure that was designed primarily for low power, high frequency signals. The challenge of safe and effective PoE goes well beyond the ability to place a 50 Volt source onto a twisted pair LAN cable. Rather, the complete picture of PoE involves successful steady state and transient power delivery to every Powered Device in service coupled with the need to avoid damage to non-PoE network equipment as well as the tradeoffs of cost, power, heat, and batteries going into the telecommunications closet. As an open standard, IEEE 802.3 has enabled the proliferation of hundreds of PoE-capable switches and midspan injectors and even a greater variety and quantity of Powered Devices, thus placing ever increasing burden on device interoperability characteristics.

Sifos Technologies is the industry leader in PoE Equipment testing and analysis. The Sifos **PoE Service Analyzer** is a special application of the proven Sifos PowerSync® Analyzer to the specific task of assessing many critical PoE service attributes at the Powered Device service interface.

** The Sifos PSA-3002-SA Service Analyzer supports testing of Type-1 (13 watt) services. Future host software upgrades from Sifos will add support for qualifying Type-2 (25.5 watt) and LLDP-managed services.*

Comprehensive Service Outlet Testing

PoE Connection Characteristics
Line Voltage & Noise - Low PD Power
Line Voltage & Noise - High PD Power
Valid PD Detection Range
Invalid PD Rejection Range
Non-802.3 PD Detection
PD Startup Inrush Tolerance
PD Valid Overload Tolerance
PoE Voltage Removal Timing
PoE Overload Shutdown Verification
Power Capacity by PD Classification
PD Classification Interoperability
In-Band PoE Start-Up Link Drops
Intermittent PoE Service Analysis
Graphical Microsoft Excel Reporting

Visual PoE Analysis

Observe PoE Power Cycles in Voltage and Current, Disconnect Shutdowns, and Overload Shutdowns
Waveform Export to Microsoft Excel

Flexible Test Scenarios

Run Testing Locally from a Laptop
Run Testing via Out-Of-Band Network Connection
Run Testing via In-Band Network Connection Providing PoE Service

Future Proof*

Planned Software Upgrade for Type-2 (Class 4) PD Service Testing
Planned Software Upgrade for LLDP-Managed Service Testing

Independently Verify PSE Standards Conformance

Upgrade Option for Fully Automated IEEE 802.3at PSE Compliance Testing
Automated Test and Port Sequencing with Comprehensive, Colorful Microsoft Excel Spreadsheet Reporting and Statistics

Comprehensive PoE Service Access Tests

The Sifos Technologies PSA-3002-SA **PoE Service Analyzer** marries the Sifos **PSA-3002 Compact PowerSync® Analyzer** with specialized application software to enable the most comprehensive and fully automated testing available for PoE analysis and qualification at a Powered Device service access point. The tests available go well beyond standard power-up and line voltage measurements found in low cost, hand-held analyzers to fully assess interoperability risks, safety hazards, and PoE performance limitations at the connection to any Powered Device.

The PoE Service Analyzer provides fully automated testing in 3 categories:

Basic Service Tests evaluate the basic Power-over-Ethernet connection, reporting connection information such as powered pairs (including multiple PoE sources), power polarity, and the ability of the PoE service to power up typical (and nominal) Class 0, Class 1, Class 2, and Class 3 Powered Devices*.

Parameter	Description	Range of Outcomes
PD_Class_0:	Ability of service to power typical Class 0 PD	ENABLED / DISABLED
PD_Class_1:	Ability of service to power typical Class 1 PD	ENABLED / DISABLED
PD_Class_2:	Ability of service to power typical Class 2 PD	ENABLED / DISABLED
PD_Class_3:	Ability of service to power typical Class 3 PD	ENABLED / DISABLED
PD_Class_4:	(Future Capability)	
CONNECTION:	Powered Cable Pairs (number of services)	ALT A, ALT B, ALT A+B (redundant)
POLARITY:	Power Polarity (per Powered Pair)	MDI (positive) / MDI-X (negative)

Parametric Tests report a number of parameters of the PoE service that are relevant to interoperability of all PD's at the PoE service outlet. Additionally, certain safety related behaviors of the PoE service are analyzed. Information collected includes line voltages (DC and AC) at power extremes, detection signature range verification, rejection signature range verification, inrush and overload tolerance of the PoE connection, disconnect timing, and overload timing response of the PoE connection. In performing these tests, the PowerSync® Analyzer is utilized to emulate a wide range of IEEE 802.3 PoE compliant steady state and transient Powered Device behaviors.

Parameter	Description	Range of Outcomes
DCV_(1W):	PoE Line Voltage to Low Power PD <i>to assure valid line voltage to low power PD (36 to 57 VDC)</i>	0 - 60 VDC PASS / FAIL
ACV_(1W):	PoE Line Noise to Low Power PD <i>to assure "clean" DC line voltage to low power PD (< 0.5 Vpp)</i>	0 - 5 VAC PASS / FAIL
DCV_(13W)*:	PoE Line Voltage to Type-1 Maximum Load PD <i>to assure valid line voltage to high power PD (36 to 57 VDC)</i>	0 - 60 VDC PASS / FAIL
ACV_(13W)*:	PoE Line Noise to Type-1 Maximum Load PD <i>to assure "clean" DC line voltage to high power PD (< 0.5 Vpp)</i>	0 - 5 VAC PASS / FAIL
MIN_DETECT:	Power Applied to Valid Low-End PD Signature <i>to assure all Valid PD's are detected properly (24 Kohm)</i>	PASS / FAIL
MAX_DETECT:	Power Applied to Valid High-End PD Signature <i>to assure all Valid PD's are detected properly (26 Kohm)</i>	PASS / FAIL
Non802_DET:	Power Applied to Capacitive Load, Non-802.3at PD <i>to note capability of PSE to power many "legacy" PD's</i>	NONE / Non802-Detect
MIN_REJECT:	Rejection of Invalid Low-End PD Signature <i>to assure that non-PoE devices do not get powered (15 Kohm)</i>	PASS / FAIL
MAX_REJECT:	Rejection of Invalid High-End PD Signature <i>to assure that non-PoE devices do not get powered (33 Kohm)</i>	PASS / FAIL
CAP_REJECT:	Rejection of Highly Capacitive PD Signature <i>to assure that non-PoE devices do not get powered</i>	PASS / FAIL
INRUSH_TOL:	Tolerance of Service to Worst Case Allowable Startup Load <i>to assure proper startup of all compliant PD's (400 mA, 45 msec)</i>	PASS / FAIL
OVERLD_TOL:	Tolerance of Service to Maximum Transient Overload <i>to assure power maintained to compliant PD's (400 mA, 45 msec)</i>	PASS / FAIL
PD_DISCX:	Power Removal Timing on PD Disconnect <i>to assure PoE service will not damage non-PD's (300 - 400 msec)</i>	0 to 1500 msec PASS / FAIL
OVERLD_OFF:	Power Removal Timing on PD Overload Shutdown <i>to assure PoE Service will not damage cables and connections (50-75 msec)</i>	0 to 1500 msec PASS / FAIL

Classification Service Tests report the behavior of the PoE service connection to each PD classification. Information reported includes maximum power capacity available by PD classification as well as the ability of the PoE connection to deliver the appropriate power capacity to PD classification signatures that are borderline for each PD classification.

Parameter	Description	Range of Outcomes
CLASS_0_PWR:	Power Available to a nominal PD Classifying as Class 0 <i>to assure a minimum of 12.95 watts is available to PD</i>	0 to 20 Watts PASS / FAIL
CLASS_1_PWR:	Power Available to a nominal PD Classifying as Class 1 <i>to assure a minimum of 3.84 watts is available to PD</i>	0 to 20 Watts PASS / FAIL
CLASS_2_PWR:	Power Available to a nominal PD Classifying as Class 2 <i>to assure a minimum of 6.49 watts is available to PD</i>	0 to 20 Watts PASS / FAIL
CLASS_3_PWR:	Power Available to a nominal PD Classifying as Class 3 <i>to assure a minimum of 12.95 watts is available to PD</i>	0 to 20 Watts PASS / FAIL
CLASS_4_PWR:	<i>(Future Capability)</i>	
CLASS_0_RNG:	Power Available to PD with Borderline Class 0 Signatures <i>to assure all Class 0 PD's receive the same power allocation</i>	PASS / FAIL
CLASS_1_RNG:	Power Available to PD with Borderline Class 1 Signatures <i>to assure all Class 1 PD's receive the same power allocation</i>	PASS / FAIL
CLASS_2_RNG:	Power Available to PD with Borderline Class 2 Signatures <i>to assure all Class 2 PD's receive the same power allocation</i>	PASS / FAIL
CLASS_3_RNG:	Power Available to PD with Borderline Class 3 Signatures <i>to assure all Class 3 PD's receive the same power allocation</i>	PASS / FAIL
CLASS_4_RNG:	<i>(Future Capability)</i>	

* **Note:** By the IEEE 802.3at standard, PD's are classified by power utilization according to the table below. PD's are responsible for "signaling" this classification prior to receiving power from the PoE enabled network connection.

Classification	PD Maximum Power Requirement
0	0.44 to 13.0 Watts
1	0.44 to 3.8 Watts
2	3.8 to 6.5 Watts
3	6.5 to 13.0 Watts
4	13.0 to 25.5 Watts

PoE Service Test Reporting

The Sifos PoE Service Analyzer includes a colorful Microsoft Excel Test Report that can be automatically produced upon completion of the full set of PoE Service Access Tests. The report performs limit checking and color formatting of each test outcome. It also presents a graphical depiction both required and available power to each PD Class, PoE line voltage and line noise across PD power levels, and transient (burst) power performance of the PoE service.

The screenshot displays the Sifos Technologies PoE Service Analyzer interface. It includes a main report window with sections for:

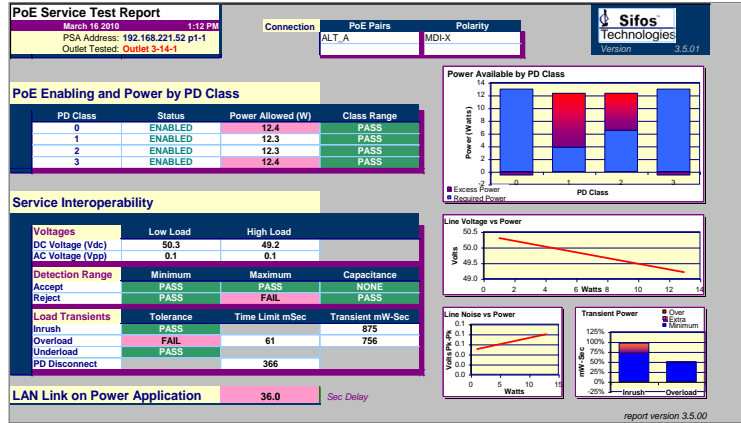
- PoE Enabling and Power by PD Class:** A table showing PD Class (0, 1, 2, 3), Status (ENABLED), Power Allowed (W) (19.2, 5.7, 9.9, 19.2), and Class Range (PASS).
- Service Interoperability:** A table with columns for Voltages (Low Load, High Load), Detection Range (Accept, Reject), Load Transients (Inrush, Overload, Underload, PD Disconnect), and their respective results (PASS).
- Graphs:**
 - Power Available by PD Class:** A bar chart showing Power (Watts) vs PD Class (0, 1, 2, 3) with Excess Power (red) and Required Power (blue).
 - Line Voltage vs Power:** A line graph showing Voltage (V) vs Power (Watts) from 0 to 14 Watts.
 - Line Noise vs Power:** A line graph showing Voltage (V) vs Power (Watts) from 0 to 15 Watts.
 - Transient Power:** A bar chart showing mW/Sec vs Inrush and Overload, with Over (red), Extra (blue), and Minimum (green) power levels.
- LAN Link on Power Application:** A status indicator showing OK.

On the right, a Notepad window displays the **PoE In-Service Test Report** text output, including parameters like DCV, ACV, MIN_DETECT, and CLASS_PWR/RNG results for each class.

PoE Service Spreadsheet Report, Fully Compliant Service

The Microsoft Excel spreadsheet report includes time and date of testing, as well as notation of the test instrument (IP Address and Test Port) utilized. Users may enter test site or outlet information into the report header.

Additionally, if an **In-Band** test configuration is utilized (see PoE Service Test Configurations below) and the Ethernet LAN link is found to drop and return as PoE power is applied or removed, a link delay parameter will be provided to note the time delay that might occur between a PD power-up and actual link communications.

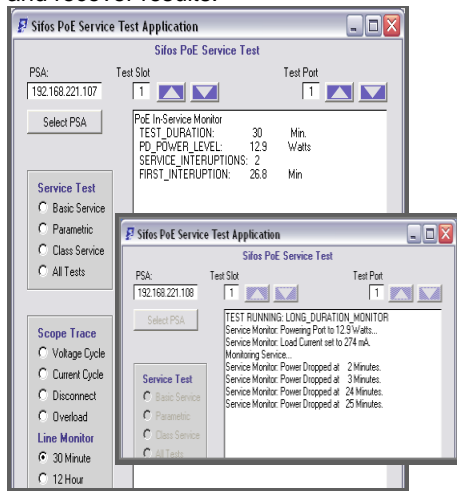


Text reports may also be produced when running all or a subset of the PoE Service Access Tests. These reports are also time-date stamped and carry much of the same information included in the spreadsheet report.

PoE Service Spreadsheet Report, Partially-Compliant Service

PoE Intermittent Service Detection

The PoE Service Analyzer also includes an automated Line Monitor designed to capture intermittent service drop-outs. This test may be configured to run with PD Class 1, Class 2, or Class 3 emulation. Users select between a 30 minute test and a 12 hour test, though in either case, user's have the option to terminate monitoring at any time and recover results.

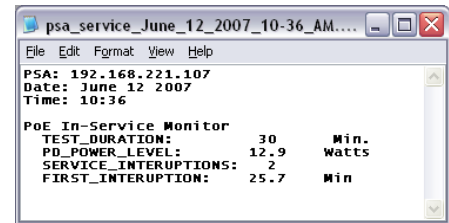


PoE Service Line Monitor

Intermittent Service Detection is sensitive to power drops that are either instantaneous or of longer durations. The test will report a count of observed drops as well as the elapsed time until the first observed service drop-out.

Testing for intermittent PoE service at any test site or outlet may can be beneficial both for assessing intermittent connections and for capturing PSE behaviors at a particular outlet when power demands or other intermittent transitions are exceeding total output power capacity across a range of PoE served devices.

Line Monitor Test Reports can be saved to a time-date stamped text file upon test completion.



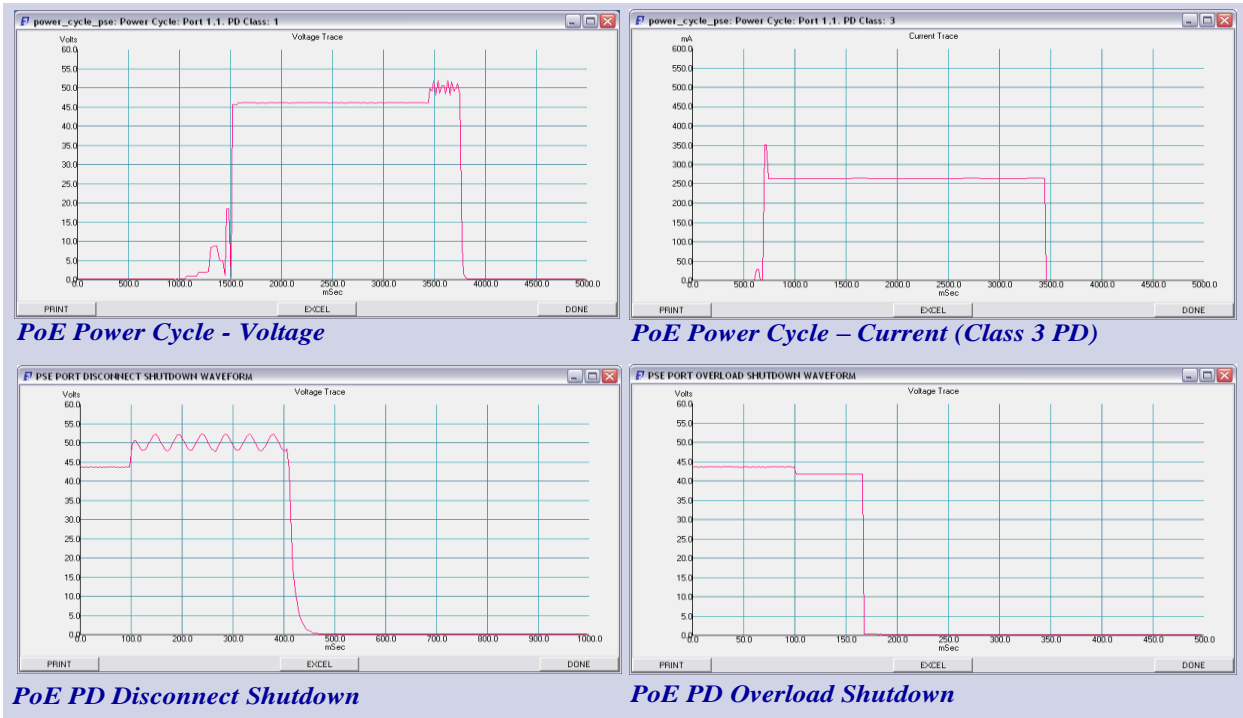
PoE Line Monitor Report

Visual PoE Analysis

Another unique feature of the Sifos PoE Service Analyzer is the ability to produce graphical waveforms of controlled PoE events. These waveforms can be useful for observing problem behaviors.

Two Power-Cycle waveforms are included to observe the full cycle of an ordinary PoE power-up and PD disconnect power-down captured over a 5 second time interval. One waveform looks at line voltage while the other records electrical current flow. Both can be configured to run with PD Class 1, Class 2, or Class 3 emulation. Users with an introductory understanding of PoE technology can observe and analyze detection signaling, classification signaling, the powered line state, and PSE response to a PD disconnect.

Two additional waveforms available are Disconnect Shutdown and Overload Shutdown. These waveforms may utilized to visualize the PD service outlet response to either a PD disconnect or a PD transient overload condition. Both conditions should result in power removal in order to prevent damage to network devices when plugged into



PoE Power Cycle - Voltage

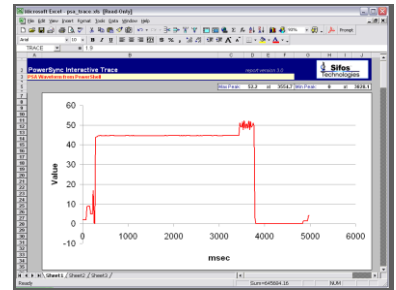
PoE Power Cycle - Current (Class 3 PD)

PoE PD Disconnect Shutdown

PoE PD Overload Shutdown

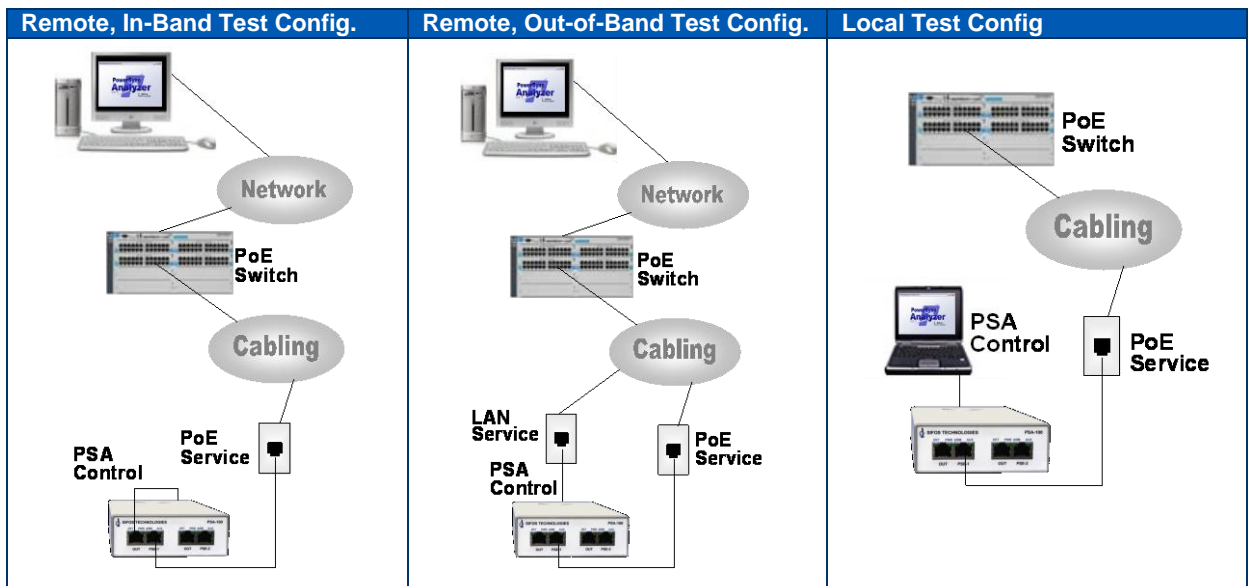
the service outlet. The disconnect shutdown should occur in approximately a half second while the overload shutdown should occur in less than one tenth of a second, regardless of PD Classification selected.

Following waveform capture, waveforms may be printed or imported to Microsoft Excel for further analysis.



Voltage Cycle Waveform - Excel

PoE Service Test Configurations



The PoE Service Analyzer can be configured in any of several ways to enable testing of PoE Service. In common to all configurations, the **PSA-3002-SA PoE Service Analyzer** is connected wherever the PD is to be connected. The PSA-3002-SA requires power from an AC outlet or may be powered from a USB port on a PC. It may also be powered from an optionally available pocket-sized rechargeable battery pack via the USB connector. The PSA-3002-SA is controlled over a LAN (Ethernet 10/100BaseT) and may be assigned a user-selected fixed IP address for this purpose or may be configured to acquire an address via DHCP.

Remote In-Band Configuration: In this configuration, the PSA-3002-SA is controlled over the network using the *same* connection that carries the PoE service to be tested. PoE Service Test software is designed to tolerate temporary LAN communications drop-outs that may occur as the power service is initiated or removed over the course of PoE Service testing. The software host may be a Microsoft Windows PC or Linux Workstation collocated on the same network. The network must be configured to allow Telnet protocols.

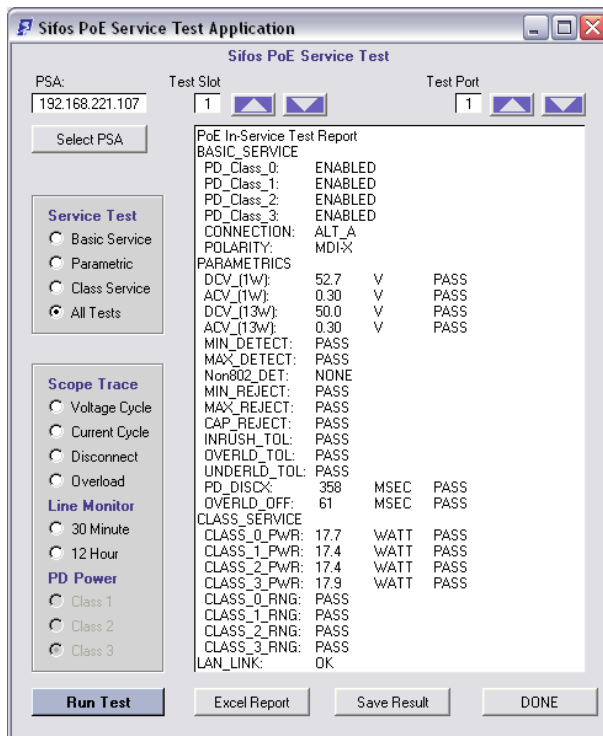
Remote Out-of-Band Configuration: In this configuration, the PSA-3002-SA is controlled over the network using a *different* connection from that carrying the PoE Service to be tested. This configuration will overcome any time delays or other uncertainties that might develop with PoE LAN service as it is subjected to various test conditions. Some PoE enabled switches, for example, will suspend LAN communications for 30 seconds or more with each application and removal of PoE power.

Local Test Configuration: In this configuration, the PSA-3002-SA is controlled directly from a laptop or PC in the same locality as the PoE service being tested. This configuration is convenient for moving the instrument around and testing a number of remote service points in succession. Typically, this mode requires a fixed IP address.

PSA Interactive and the PoE Service Analyzer

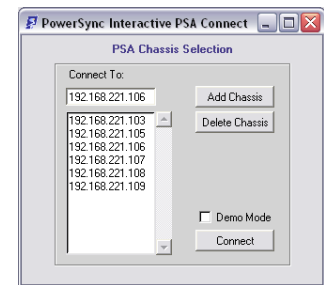
PSA Interactive is the graphical user interface software for controlling the PSA-3002-SA PoE Service Analyzer. PSA Interactive is built on top of a Tcl/Tk framework that also includes PowerShell, a Tcl or Wish based command shell for control of the analyzer.

PSA Interactive opens directly to a **Sifos PoE Service Test** window when connected to a PSA-3002-SA. The PoE Service Test menu may be used to select from one or more PowerSync® Analyzers using their respective fixed IP addresses and to select and run automated tests and waveform displays.



Sifos PoE Service Analyzer Software

Within the PoE Service Test window are controls to select and connect to a PowerSync Analyzer (**Select PSA**), and to further select the Test Slot and Test Port. **Select PSA** will open another dialog box that enables addition or selection of a known PSA instrument.



PSA Selection Dialog

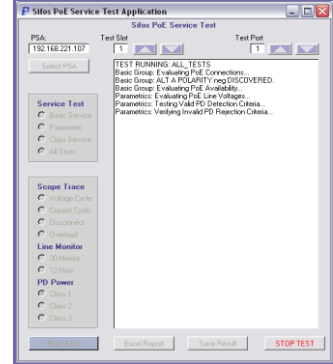
The **Test Slot** will always be "1" for the PSA-3002-SA. (Note: **Test Slot** can range from 1 to 12 when using PoE Service Test module with the chassis-based PSA-3000 PowerSync® Analyzer.)

The **Test Port** may be selected as "1" or "2" for the PSA-3002-SA since there are in fact 2 identical test ports available on each PSA-3002 Compact PowerSync® Analyzer.

Simple radio button controls allow the selection of a specific test group or the optional selection of **All Tests**. Each of the test groups are described in [Comprehensive PoE Service Access Tests](#) above.

Visual waveforms are selected using one of the **Scope Trace** radio buttons. Each of the four traces was described above. The **Line Monitor** offers **30 Minute** and a **12 Hour** intermittency testing options. **Scope Traces** and **Line Monitor** measurements require the selection of a **PD Power**, or load, to emulate as these measurements are run. A **Class 1** PD represents a 3.8 Watt device, a **Class 2** PD represents a 6.5 Watt device, and a **Class 3** PD emulates a 13 Watt device. Note that the PD classification selections are disabled for the **PoE Service Tests** since those tests cycle through all PD classes during the course of testing.

Run Test initiates the **PoE Service Test**, **Scope Trace**, or **Line Monitor** selected. As the test runs, test status information will be presented. PoE Service Tests and the Line Monitor may be terminated mid-test by the **Stop Test** button as those tests and measurements execute. In the event **Stop Test** is pressed, the accumulated results captured will be presented in the results window.



Service Test Running

The **Excel Report** button is only available upon completion of **All Service Tests**. This button will open the PoE Service Spreadsheet Report described earlier.

Test results may be optionally saved to a textual report file by selecting the **Save Results** button. This will open a brief dialog to state the time-date stamped name and location of the saved report file.

Comprehensive PSE Validation

The PSA-3002-SA PoE Service Analyzer may be optionally configured with fully automated Power Sourcing Equipment (PSE) conformance test software. This is the same tool used by many PoE switch manufacturers throughout the industry to fully assess the IEEE 802.3at specification compliance of PSE ports.

For further information regarding PSE Conformance Testing, see the Sifos data sheet [Sifos Technologies, Compact PowerSync Analyzer Product Overview](#).

Ordering Information

PSA-3002-SA PoE Service Analyzer including PSA-3002 Compact PowerSync® Analyzer and PSA Interactive Software for PoE Service Analysis.

Accessories Included: Hard-Shell Carrying Case
Configuration Guide and CD
PoE Service Analyzer Reference Manual
Power Module
LAN and RS-232 Cables

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