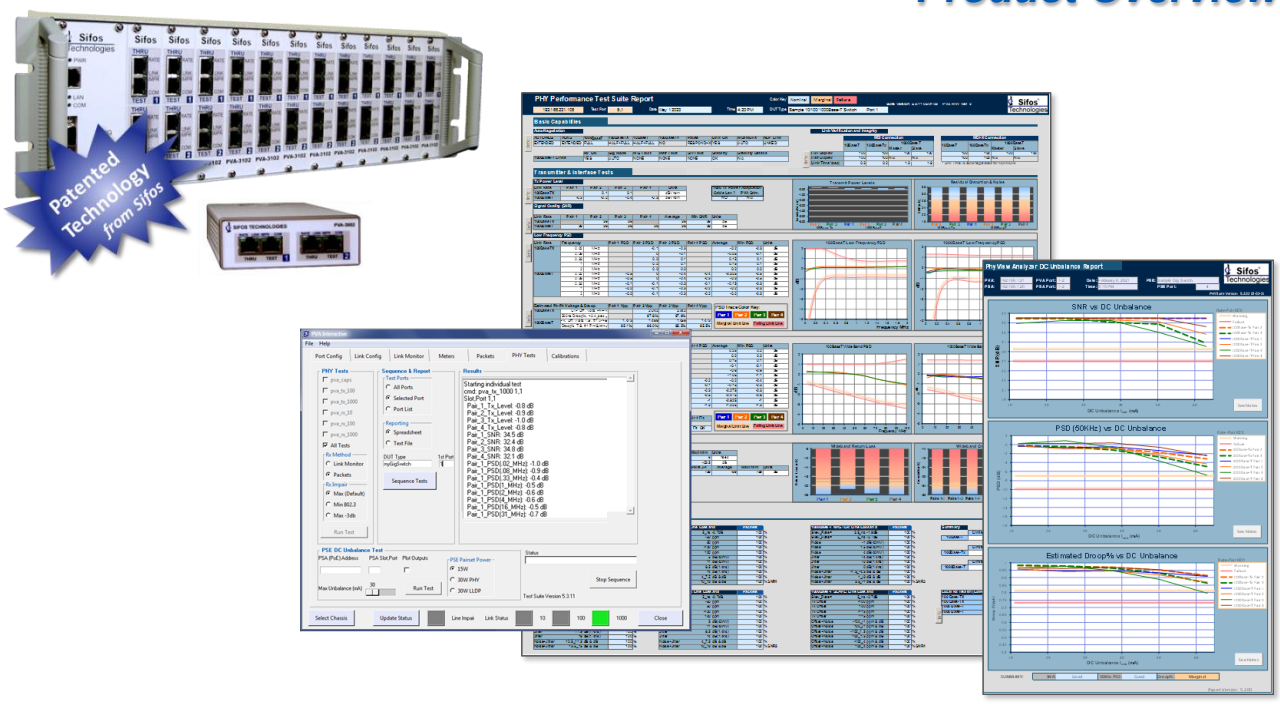
PVA-PTS

PHY Performance Test Suite

for the **PhyView® Analyzer**

Product Overview



Key Features

- **Comprehensive 10/100/1000 Physical Layer Analysis Simplified**
  Just *Plug…..Run…..Analyze*
- **Automatically Sequence Up To 24 DUT Ports per PVA-3000 Chassis**
  That's *96 Gigabit Pairs* ***and*** *48 10/100BaseT Pairs!*
- **Automatically Examine All PHY Performance Margins**
  Transmitted Signal Integrity
  Receiver Performance Under Stress
  Physical Interface Characteristics
- **No Scopes, No Fixtures, No Probes, No Test Modes, No Cable Spools!**
  Test Any LAN Interface, Anywhere
  Capture Actual Behaviors After the Test Signals are Turned Off
- **Fully Automated PSE DC Unbalance Analysis**
  Assess PSE Tolerance of DC Unbalance Levels
  Integrated With Sifos PowerSync Analyzers
- **Colorful and Graphical Pop-Up Spreadsheet Reporting**
- **Supported on the PVA-3000 and PVA-3002 Instruments**

Verification, Simplified.

Any Port 10/100/1000

Switches/Hubs
Routers/Gateways
PSE's
WAP's
NIC's
Phones,
Repeaters…

Expose Hidden Defects

Find Defects That Packet Testing and Traditional 802.3 Testing Will Never See!

Comprehensive Performance Analysis WITHOUT

Scopes & Probes
Fixtures & Test Modes
Packet Analyzers
Generators & Network Analyzers

Full Automation

Sequence Pairs and Ports with One Button

Transmitter, Interface, & Receiver Tests

Colorful, Graphical Spreadsheet Reporting & Analysis

Overview

The PHY Performance Test Suite for the PhyView Analyzer* establishes a **new standard** for automated physical layer evaluation and qualification of 10/100/1000Base-T Ethernet Ports. The combination of the PhyView Analyzer and the PHY Performance Test Suite represents the only commercial solution for plug'n play analysis of Ethernet 10/100/1000 interfaces at the physical, or electrical signaling layer including both transmission and receiver performance analysis. No other solution offers the ease of use and degree of automation provided by the PHY Performance Test Suite.

Assure high confidence of 10/100/1000Base-T interface interoperability over all possible connection environments

The PHY Performance Test Suite performs true physical layer testing on a 10/100/1000Base-T interface. Testing at the physical layer is the only viable method for assessing the performance of an Ethernet interface in all possible connection environments that are allowed under IEEE 802.3 standards. The transmission and receiver performance tests with in the PHY Performance Test Suite go well beyond simple functional assessments to describe quantitative performance metrics and to characterize headroom relative to minimum compliance requirements. Stated simply, a 10/100/1000Base-T interface that achieves the top category in each of the PHY Performance Suite tests is an interface that will function properly across all conceivable 802.3 compliant link environments.

Identify Design or Manufacturing Defects that would evade ordinary Packet Flow testing and Traditional 802.3 testing

Ethernet packet flow testing, whether implemented using a commercial packet generator instrument or simply using other uncharacterized product ports, is largely insensitive to many potential physical layer defects that would disrupt link performance under more extreme conditions. Defects in connection paths, magnetics, terminations, PHY devices, and PHY support circuits manifest in many ways that are only mildly disruptive to interface performance. Some defects only appear in one configuration state, e.g. MDI or gigabit SLAVE, but not in any other configuration modes. The PHY Performance Test Suite automatically imposes all configuration states and auto-negotiation outcomes, then assesses performance in each of those modes with full sensitivity to both mild and severe defects. Further, because the test suite does not rely on transceiver test modes, any transceiver behaviors that change after test signals are turned off will be observed.

Ethernet 10/100/1000 PHY Expertise….Not Required

10/100/1000Base-T physical layer characteristics are complex and are governed by an array of IEEE 802.3 standards. Traditional physical layer testing as defined by those standards is laborious and requires considerable expertise in order to obtain reasonable accuracies and to interpret measurement results. 802.3 standards are vague and indirect regarding receiver testing methods and acceptance criteria thus imposing even greater burden on test expertise. With the PHY Performance Test Suite and the PhyView Analyzer, 10/100/1000Base-T testing is simple: *Plug….Start Test…Read Report* on one or more ports. Test reports clearly indicate any problem areas, delineating and categorizing defects into transmitter versus passive interface versus receiver, and marginal versus severe magnitudes.

Verification, Simplified.

* *For further information about the PhyView Analyzer, see the Sifos PVA-3000 datasheet.*

PHY Performance Test Suite Coverage

The PHY Performance Test Suite automatically scans one or more ports-under-test to assess link capabilities and basic link stability, signal transmission characteristics, passive interface characteristics, and receiver performance. Signal transmission characteristics include wideband signal power, residual distortion, power spectral distortion, and pair timing skew along with derivative estimates of peak-peak voltage, droop, rise/fall time, and pulse mask fit. Passive interface characteristics evaluated include wideband return loss (or impedance match) and wideband crosstalk between wire pairs. Receiver performance involves the automatic insertion of various physical impairments modeling worst-case link characteristics followed by the assessment of receiver function in the presence of those physical impairments.

The PHY Performance Test Suite consists of the following tests:

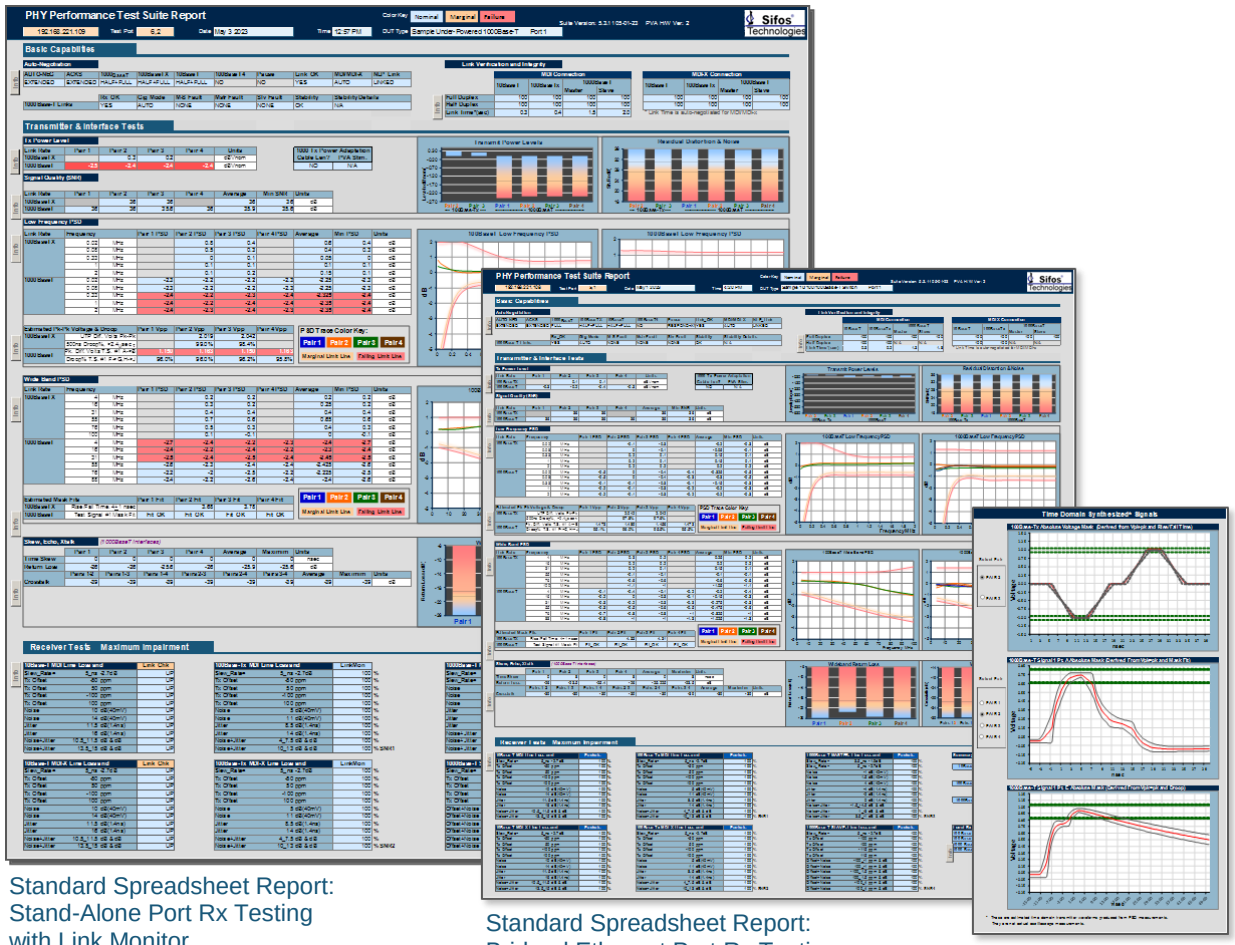
PHY Test	Description	Reported Parameters
PHY Capabilities	Assesses PHY advertised capabilities for 100Base-Tx and 1000Base-T. Assesses Auto-MDI/MDI-X & MASTER/SLAVE resolution ability and produces various indicators of Auto-Negotiation problems. Evaluates precision Auto-Neg and link-up timing to assess Auto-Neg interoperability and stability. Verifies forced link-up modes with link stability measurements and warns of unstable link conditions caused by port-under-test receiver issues.	**Auto-Negotiation Parameters** *(10BaseT, 100BaseTx & 1000BaseT)* **Auto-Neg & Linkup Precision Timing** *(20msec resolved connect-to-link timing for to forced 10,100, 1000Base-T links)* **Link Stability Count** *(10BaseT, 100BaseTx, 1000BaseT, Full vs Half Duplex, MDI vs MDI-X, Master vs Slave).* **Auto-Neg Stability**
100Base-Tx Transmission Analysis	Evaluates Transmitted Signal Characteristics of a 100BaseTx transmitter both in MDI and MDI-X configurations. Standard spreadsheet report utilizes correlation formulas to estimate per-pair **IEEE 802.3 Parameters Vpk-pk**, **Droop**, and **Rise/Fall Time**.	**Wideband Power** *(Rx Pair 2, 3)* **SNR (Residual Distortion)** *(Pair 2, 3)* **Low Frequency PSD** *(20KHz-2MHz, Pair 2, 3)* **Wide Band PSD** *(4MHz – 100MHz, Pair 2, 3)*
1000Base-T Transmission & Interface Analysis	Evaluates Transmitted Signal and Interface Characteristics of a 1000BaseT transmitter. Standard spreadsheet report utilizes correlation formulas to accurately estimate per-pair **IEEE 802.3 Parameters Vpk-pk** (Test Signal #1 Pt A to Pt B), **Droop%**, and **Pulse Mask Fit (**Test Signal #1 Pts A & Pt B). Analyzes low 1000Base-T transmit levels to see if they are induced by proprietary link-length assessments based either upon high incoming power or direct cable length measurements.	**Wideband Power** *(Pairs 1-4)* **Low Tx Power Link Adaptation** **SNR** *(Pairs 1-4)* **Low Frequency PSD** *(20KHz-2MHz, Pairs 1-4)* **Wide Band PSD** *(4MHz – 100MHz, Pairs 1-4)* **Time Skew** *(Pairs 1-4)* **Wideband Return Loss** *(Pairs 1-4)* **Crosstalk** *(Pairs 1-2, 1-3, 1-4, 2-3, 2-4, 3-4)*
10Base-T Receiver Analysis	Subjects DUT Receiver to IEEE worst case insertion loss impairment combined with minimum Tx level and slew, transmit frequency offsets, additive random noise, transmit frequency jitter, and combinations of random noise+jitter. Measures **Link Viability** or **Packet Transmission** (switches and hubs). Packet transmission method requires 2 bridged DUT ports or single ports with MAC-side loopback.	**Link Viability: "UP" or "DOWN"** *(Based on 400 link samples and 3 re-links over 20 seconds per impairment)* or **Packet Transmission %** *(Based on line rate transmission of 128,000 (default) packets to a switch or hub DUT)*
100Base-Tx Receiver Analysis	Subjects DUT Receiver to IEEE worst case insertion loss impairment combined with minimum Tx level and slew, maximum transmit frequency offsets, additive random noise, transmit frequency jitter, and combinations of random noise and jitter. Measures **Link Viability**, **Link Stability**, or **Packet Transmission**. Packet transmission requires 2 bridged DUT ports unless DUT supports MAC-side loopback. If not using Packet Transmission, Link Stability is reported only if DUT drops link and/or falls back to 10BaseT given >100% packet loss. Otherwise Link Viability is reported.	**Link Viability: "UP" or "DOWN"** *(Based on 400 link samples and 3 re-links over 20 seconds per impairment)* or **Link Stability: Link "UP" %** *(Based on 400 link samples and 3 re-links over 20 seconds per impairment)* or **Packet Transmission %** *(Based on line rate transmission of (default) 1,024,000 (default) packets to a switch or hub DUT)*
1000Base-T Receiver Analysis	Subjects DUT Receiver to IEEE worst case insertion loss impairment combined with minimum Tx level and slew, maximum transmit frequency offsets (slave), additive random noise (master), transmit frequency jitter (master), combinations of random noise and jitter (master), and combinations of frequency offset / random noise (slave). Measures **Link Stability** or **Packet Transmission** (switches and hubs). Packet transmission requires 2 bridged DUT ports	**Link Stability: Remote Rx "OK" %** *(Based on 1000 link samples 20 seconds per impairment. If DUT remote_rx_status is defective, will report* **Link Viability** *- see 100BaseTx test.)* or **Packet Transmission %** *(Based on line rate transmission of 10,240,000 (default) packets to a switch or hub DUT)*

The PhyView Standard Test Report

The PhyView Performance Suite produces a pop-up Microsoft Excel* spreadsheet report that adds graphical presentations of test results and colorized annotations of test limit excursions. Unlike a strict compliance test, many of the parameters captured by the PhyView Performance Suite are evaluated to "soft limits" that categorize performance into one of three ranges: Blue (or "Excellent"), Tan (or "Marginal"), and Red (or "Outside Specification Limits"). A Blue result typically indicates good headroom relative to 802.3 requirements, a Tan result indicates performance at the edge of specification limits, and a Red result indicates a probable failure relative to one or more 802.3 requirements. Graphs are designed to convey similar information using the same color scheme. Bar graphs that extend into the Blue region indicate nominal performance while line graphs include limit lines in Tan and Red.

Each page also produces synthesized versions of familiar test signals for 100Base-Tx and 1000Base-T with ability to select by wire pair for the port-under-test. These time-domain signals and masks are derived from PSD test data using empirical correlation formulas.

The report is structured such that each port-under-test tested creates a specific workbook tab (or page) dedicated to that port. Sequencing a 24 port switch would therefore cause a 24 tab workbook to automatically appear upon completion. Sequencing can be configured to specify a starting port number with the assumption that all subsequent test ports in the sequence are mapped to subsequent device-under-test ports.

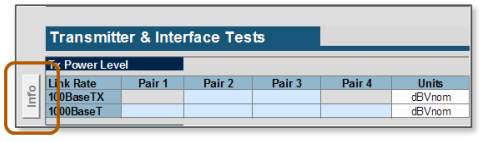


Standard Spreadsheet Report: Stand-Alone Port Rx Testing with Link Monitor

Standard Spreadsheet Report: Bridged Ethernet Port Rx Testing with Packet Flow.

Synthesized Test Signal Waveforms

The report includes a "**Notes**" page with detailed explanations of each test and parameter. The background information associated with each test is readily accessed by simply pressing the **Info** button on the report page adjacent to each set of test results.

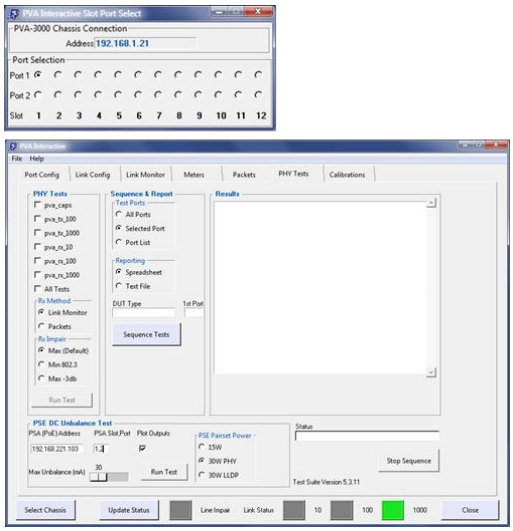


Test Information Access

* Requires Microsoft Office 2007 or newer.

One-Button Testing from PVA Interactive Software

Using **PVA Interactive** software that comes with the PhyView Analyzer, the PHY Performance Test Suite is accessed through the **PHY Tests** menu tab. Within this menu, users have the option to run individual tests or to sequence a selected group of tests on a selected range of ports to a standard spreadsheet or text-based report file. Sequencing up to 24 ports of physical layer testing can thus be accomplished very easily with as little as a single mouse click of the **Sequence Tests** button!



PVA Interactive Graphical User Interface

Users are also given flexibility to specify information about the DUT type and ports that are being tested so that report headers will present that information.

The PhyView Analyzer also includes a script automation environment, **PowerShell PSA**. Sequencing the PHY Performance Test Suite within PowerShell PSA is accomplished with a single command. Multiple test sequences can readily be scheduled from PowerShell PSA when testing more than a single DUT using one or more PhyView Analyzers.

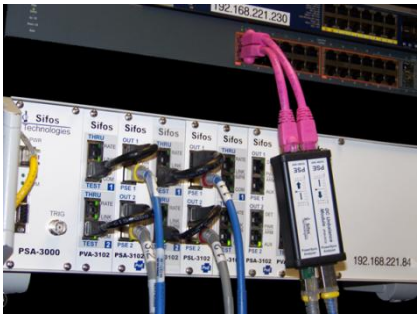
PowerShell PSA

PhyView Analyzer test port calibrations are required occasionally to insure accuracy in measurements of power spectral distortion, wideband return loss, and wideband crosstalk. Those calibrations are also fully automatic and can be sequenced from PVA Interactive or PowerShell PSA software.

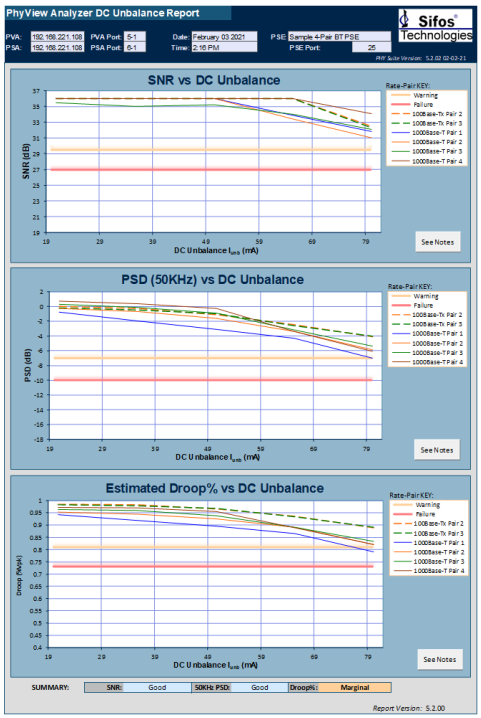
PHY Performance Test Suite: DC Unbalance Testing of 802.3at/802.3bt PSE's

A prime concern to developers of Power Sourcing Ethernet (PSE) ports is the *tolerance* of Ethernet magnetics to varying degrees of DC unbalance. DC Unbalance, that is the uneven split of DC current between both conductors of a wired pair, can occur for many reasons beyond the control of the PSE. Those reasons include unbalanced cabling, RJ-45 connection problems and powered device magnetic unbalance. Historically, the assessment of DC Unbalance tolerance has been extremely challenging to perform and therefore is often overlooked as a critical PSE performance characteristic.

The PHY Performance Test Suite includes a specialized application that combines a PhyView Analyzer test port with a Sifos PowerSync Analyzer test port to automatically survey and plot DC Unbalance Tolerance characteristics of any PSE port, including 4-Pair (802.3bt) powering ports, 2-Pair (802.3at) ports, including ports that require PoE LLDP to negotiate higher power levels. DC Unbalance tolerance testing includes the measurements of **Residual Distortion** (SNR) and **Low Frequency PSD** combined with the estimate of **Pulse Droop%** all performed as a function of DC Unbalance current magnitude. Measurements can be performed with bi-directional DC unbalance on **ALT-A and/or ALT-B** pairs with DC unbalance magnitudes ranging from 30mA to 80mA as the PSE delivers power levels up to 30 watts or more. Further information on the DC Unbalance Test is available in Sifos application note **DC Unbalance Tolerance in PSE's**.

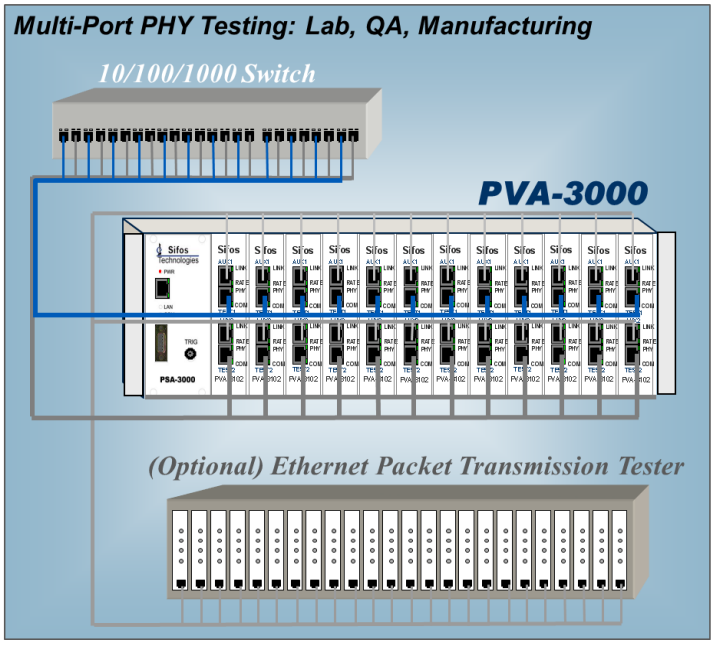


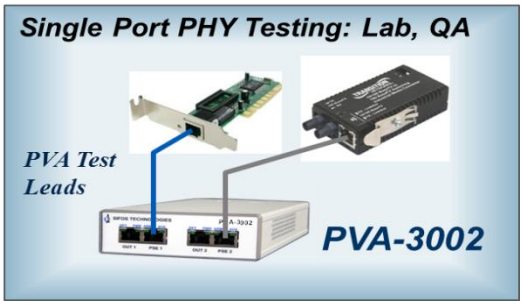
Automated DC Unbalance Setup

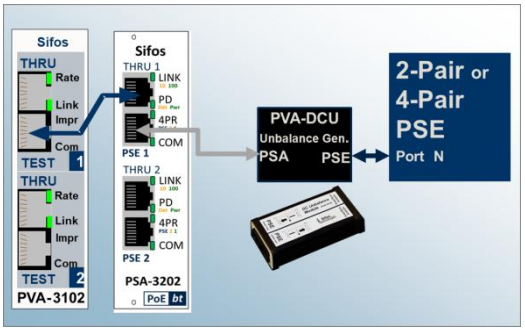


DC Unbalance Spreadsheet Report

PHY Performance Test Suite: Test Configurations







Ordering Information

The PHY Performance Test Suite is available as an instrument-specific security key code for the PVA-3000 and PVA-3002 instruments. The test suite may be activated at any time following the purchase of this security key code.

PVA-3000-PTS	PhyView Performance Test Suite* for a PSA-3000 Chassis
PVA-3002-PTS	PhyView Performance Test Suite* for PVA-3002 Compact PhyView Analyzer
PVA-PL4	In-Line Quad Passive Loss Module (1, 2, 4, & 8 dB)
PVA-LI4	In-Line Quad Line Impairment Module (3 Mismatches, 1 Crosstalk)
PVA-DCU	In-Line DC Unbalance Generator Module (ALT A+B Bias Fwd. and ALT A+B Bias Rev. Channels) for PSE DC Unbalance Tolerance Analysis

* Standard spreadsheet reporting requires Microsoft Excel version 2007 or later installed on a host PC.

For further information concerning the PhyView Analyzer, see the Sifos Technologies datasheet **PhyView Analyzer 3000 Product Overview**. *For further information concerning the PowerSync Analyzer, see the Sifos Technologies datasheet* **PowerSync Analyzer 3000 Product Overview**.

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See a video demonstration of the ***PHY Performance Test Suite*** *testing a 24-port Ethernet Switch at* www.sifos.com.

Verification, Simplified.

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