

Smart Spectrograph SD512NIR



Preliminary – Available Q2 2006

Verity
INSTRUMENTS, INC.



Features and Benefits

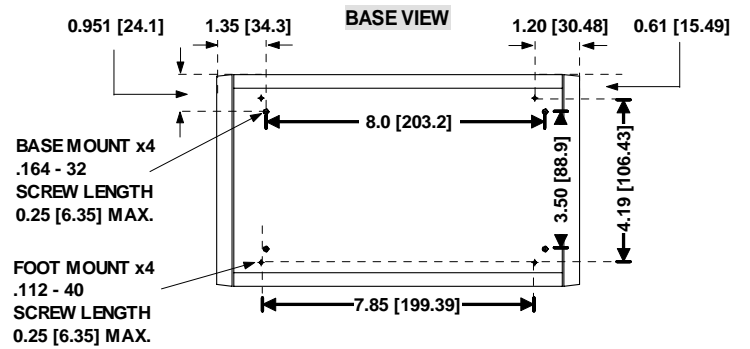
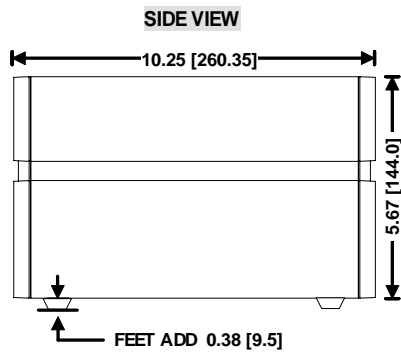
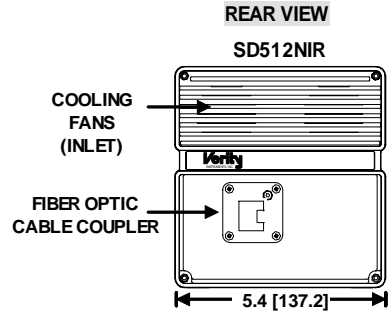
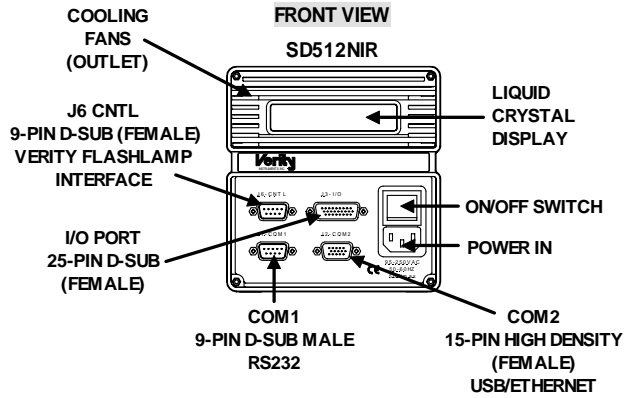
- Provides robust endpoint determination
- SpectraView™ software provides:
 - Variety of algorithms
 - Open algorithms and sequences for flexibility
 - Tool integration via Ethernet, RS232, and DI/O
- Use for endpoint detection, fault detection, and process diagnostics
- 900 nm–1700 nm range
- Same form factor as the SD1024D

Description

The SD512NIR Series spectrographs are optical emission monitors that integrate sophisticated embedded processors and software designed to provide intelligent instrument control, data acquisition and endpoint interface capabilities. The SD512NIR Series uses a common CPU board, application software and enclosure as the SD1024D Series.

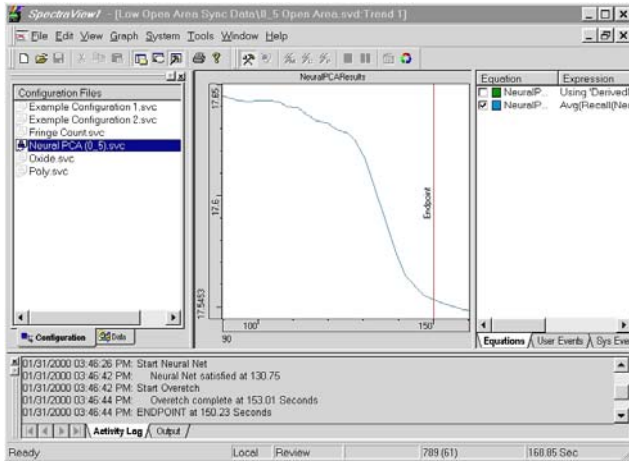
The SD512NIR was designed for demanding semiconductor process applications. Its optical system employs a 512-element, Linear Indium Gallium Arsenide Photodiode Array. The advantages of the SD512NIR include excellent sensitivity over the 900 – 1700 nm range, user-selectable high sensitivity and high dynamic range modes, a three-stage thermoelectric cooler which reduces thermal noise, and an integrated blocking filter which eliminates 2nd and higher orders.

Dimensions



Algorithms for Endpoint Detection

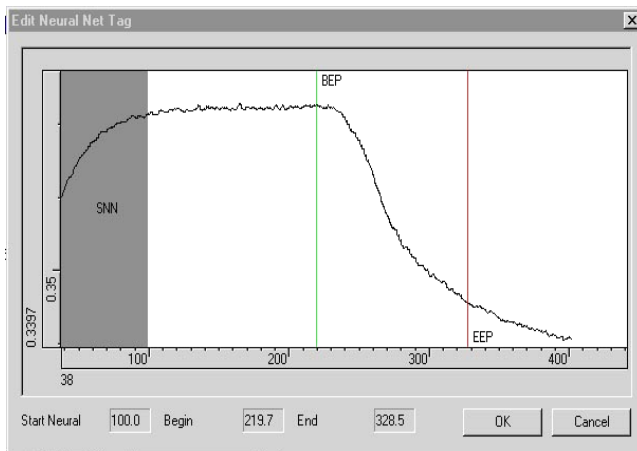
Verity Instruments provides a powerful suite of endpoint algorithms, including the multivariate Neural PCA algorithm, which can be processed with Verity's proprietary Neural Network pattern recognition software.



Neural PCA Multi-Wavelength Algorithm

Verity's endpoint-detection computations can employ robust algorithms such as the patent pending Neural PCA for multivariate, full-spectrum analysis.

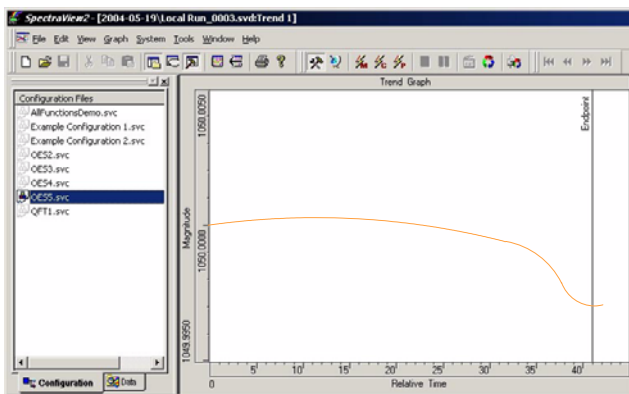
Data represented at left apply to a 0.5% exposed area contact etch using Verity's Neural PCA algorithm. Within the SpectraView™ endpoint software application, the Neural PCA endpoint trace can be processed using Neural Network or threshold-based methods.



Neural Network Algorithm

The Neural Network algorithm is used to analyze endpoint traces. The Neural Network uses proprietary techniques to recognize characteristic endpoint shapes in the trend line. This is performed in real time and the pattern recognition algorithm adapts to expected amplitude and duration changes in the endpoint trace during successive runs.

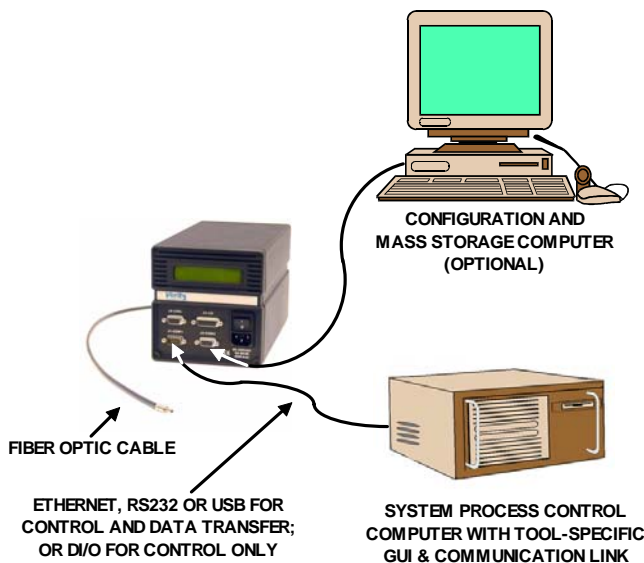
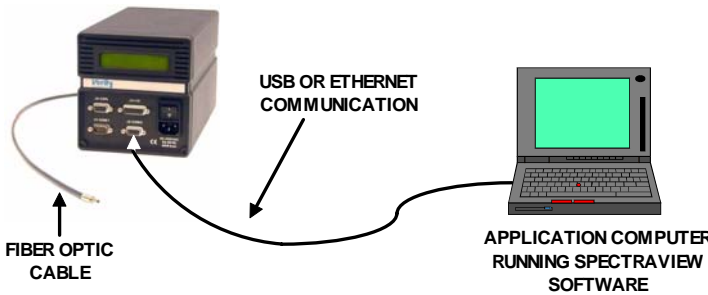
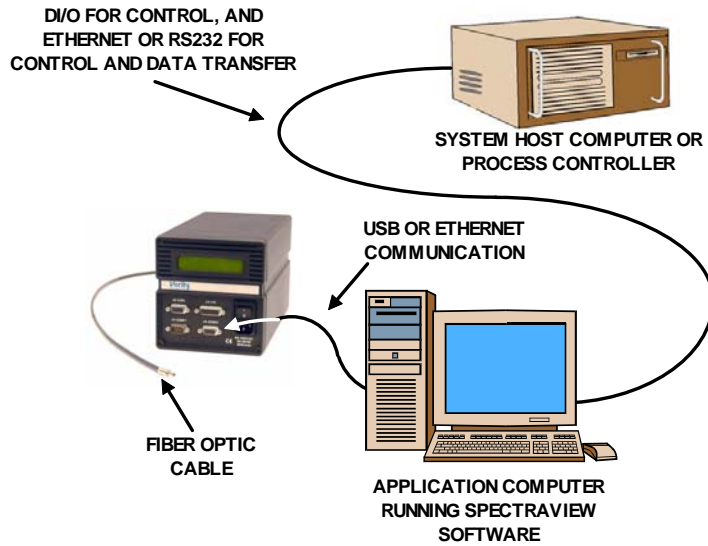
Unlike other types of neural networks, Verity's algorithm can be set up with only a few training runs. If a false positive or negative is found, it can easily be added to the training set for improved robustness. Process engineers using Verity's Neural Net software are freed from the burden associated with developing and testing threshold-based algorithms. In addition, data can be analyzed "on-the-fly" or replayed, reviewed, or reprocessed with SpectraView™.



Threshold-Based Algorithm

Using threshold-based algorithms, endpoint recognition is based upon the output rising above or below a preset level for a predetermined length of time. However, for demanding applications, the Neural Network algorithm is commonly selected over the threshold-based algorithm.

System Schematic



Partially Integrated Within a System

In a partially integrated configuration, an application computer is used to provide the user interface and data storage. Communication from the spectrograph to the application computer includes Ethernet or USB

Control between the application computer and the system host computer can be via DI/O and/or RS232, or DI/O and/or Ethernet. In some cases, it may be desirable to use DI/O for control communication and RS232 or Ethernet to provide a data stream of trend points to the system host computer.

Non-Integrated Configuration

When used for troubleshooting or plasma diagnostic applications, the spectrograph is frequently not integrated with the process tool. Communication to the application computer includes Ethernet or USB.

Fully Integrated Within a System

The following functionality is currently under development and the description below and at left is preliminary.

In a fully integrated configuration, the need for an application computer is eliminated. While this cost-effective configuration removes the need for the application computer, monitor and keyboard, it does require the development of a communication link to the spectrograph and a tool-specific graphical user interface (GUI). Alternatively, Verity's SpectraView™ software can be run as an instance within Windows 2000-based host computers to monitor the process. All endpoint algorithms reside on the spectrograph, thus avoiding overburdening the system host computer.

If full-spectrum data transfer to the system host computer is desired, data can be transferred via Ethernet or USB. Serial (RS232) should not be used if full spectra are needed. If required for control purposes, DI/O can be used in addition to the other protocols. A provision for data storage should be made if data from past runs are to be saved.

Specifications

Model Number	SD512NIR
Performance/Optics	
Range	900–1700nm
Resolution ¹	< or equal to 3.0nm
Detector	Linear Indium Gallium Arsenide Photodiode Array
Integration Time	1ms (2 ms with flashlamp) to 5 seconds
Dynamic Range	5000 to 1
Mechanical	
Slit Width	25 microns
Dimensions - inches (mm)	10.25 (260.0) x 5.4 (137.2) x 6.05 (153.5)
Weight	7 lbs (3.2 kg)
Integration	
Fiber Optic Connection	Custom Design
Power	95–250VAC, 50/60Hz 35W typical – 50W Max. 20-28VDC, 50W max. Optional
Standards	
Compliance	CE
Environmental	
Operating Temperature Range	32 (0°C) — 104 (40°C)
Storage Temperature Range	-4 (-20°C) — 140 (60°C)
Max. Humidity (Operation and Storage)	85% Non condensing

¹ Resolution — full width at half of maximum peak height, the maximum average of several measurements taken across the spectrum.

Application Computer Software

Algorithms	Algebraic, trigonometric, Boolean logic functions Threshold-based Multi-Wavelength Algorithm (Neural PCA) Neural Network Pattern Recognition
Application Software	SpectraView™
Application Software Platform	Windows 2000® or Windows XP
Communication from Application to Spectrograph	USB (only with Windows 2000) or Ethernet (Ethernet preferred)
Communication from Tool to Application Software	RS232 and/or DI/O, Ethernet and/or DI/O

Recommended Application Computer Requirements

Attribute	Specification
Platform Processor	Windows 2000® or Windows XP® Pentium 4 class CPU, 700Mhz or faster
Memory	(minimum, some advanced algorithms may require more processing power) 256MB or greater, 133Mhz BUS or faster (minimum, some advanced algorithms may require more memory)
Hard Drive Graphics	20GB minimum XGA (1024x768, 256Colors)
COM Port(s) to SD1024	USB or 10/100Ethernet (preferred)
COM Port(s) to Tool	RS232, Digital I/O or 10/100Ethernet

Communication Options

CABLES

For Single Spectrograph to Computer	Length	Part Number
Ethernet Cable ¹	14' (4.5m)	1004358-168
	20' (6m)	1004358-240
	50' (15m)	1004358-600
USB Cable	9' (2.6m)	1003275-108
	16' 5" (5m)	1003275-197

For Multiple Spectrographs to Computer	Length	Part Number
Ethernet Cable – PC to Hub: <i>Select only one</i>	1' (0.3m)	1004442-012
	7' (2m)	1004442-084
	14' (4m)	1004442-168
Ethernet Cable(s) – Hub to Spectrograph: <i>Select one per spectrograph</i>	6' (1.8m)	1004351-072
	14' (4m)	1004351-168
	20' (6m)	1004351-240
	25' (7.5m)	1004351-300
	30' (9m)	1004351-360
Ethernet Hub, including: 8 ports 10 Base-T 12VDC Adapter to 120VAC	Not applicable	TBD

¹ Ethernet Cable — each Spectrograph is shipped with a 9' (2.6m) Ethernet crossover cable (1004358-108) for updating of the embedded software. This same cable can be used for Spectrograph to Host PC communications, if desired.



2901 Eisenhower St.
Carrollton, TX. 75007

Phone: (972) 446-9990
Fax: (972) 446-9586

Email: Sales@verityinst.com

Web Address: <http://www.verityinst.com>