

FEATURES & BENEFITS

- Revolutionary all-fiber design
- High speed sweep [up to 5 m/sec]
- Thickness measurement of multi-layered materials to 1 μm
- Sweep range 7mm
- Arbitrary probe length--no probe path matching required
- Single or dual wave models
- Dual wave design for increased sweep accuracy
- Single wave ideal for scattering use
- Dual wave ideal for discreet use
- Standard SMF for probe
- Improved reliability with all-fiber Piezo-based sweeper
- Quick warm-up time
- Self-calibrating [dual wave]
- Easy-to-use LightView™ software

The **OPTIPHASE® HSR-3000** High Speed Reflectometer delivers precise non-contact measurements of multi-layer materials and scattering media. Packed with productivity features, the HSR-3000 is a powerful tool for research, production process control and QA thickness and/or scatter measurement.

Speed and Accuracy

Designed with our unique all-fiber autocorrelator architecture, the HSR-3000 sets the new standard in speed, accuracy and ease of use for OCDR applications. The HSR-3000 directs light at the material or media surface[s] through a fiber probe and collects the reflection[s] or back-scattered light from each surface. These return wave patterns are referenced to the probe tip, processed with an [interferometric] sweeping autocorrelator and electronically converted to precise measurements of thickness or displacement that are displayed in the LightView™ screen.

With a standard sweep speed of 400 mm/sec, [high speed option to 5 m/sec] the HSR-3000 significantly reduces measurement time and increases productivity. With precision levels of 1 μm for discrete boundary materials, new levels of quality and control can be achieved, increasing the potential cost savings and ROI.

Productivity through ease-of-use

The HSR-3000 is designed so that the interferometric reference reflection is external to the instrument [built into the probe]. This allows significant measurement flexibility, allowing probe fibers of any length. This capability of the HSR-3000 eliminates the need for path matching and makes changing probes for different measurement applications quick and easy. A short warm-up time of as little as 10 minutes also means you get to work faster.

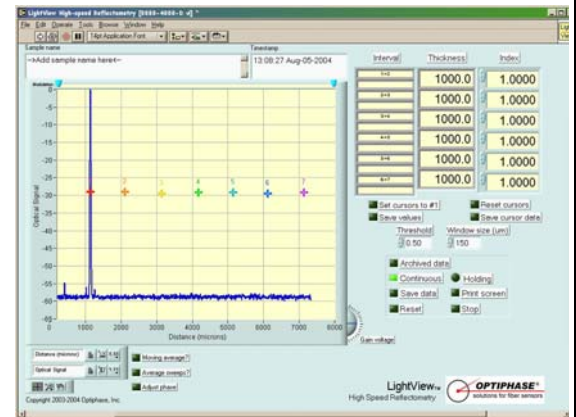
Optiphase's LightView™ software presents an effective graphical user interface that allows you to control, monitor, gather and record your real-time measurements, the way you want to. The HSR-3000 provides continuous scanning with user selectable data averaging. With up to 6 user-defined indexes of refractions, multiple layer application accuracy is assured. And with the on-screen auto-peak location cursor function, you can quickly and easily select the boundary reflections you are interested in. You can even have LightView™ automatically measure the peak-to-peak distances for thickness. Data collection with LightView™ is flexible and fast. Any data set can be saved uniquely and reviewed later with LightView™ or with Excel. File naming conventions are user defined.

Increased Reliability

The HSR-3000 is an all-fiber autocorrelator design offering many advantages over scanning Michelson designs. These include: 1) No polarization adjustments required; 2) Standard SMF probe interface; and 3) Arbitrary probe lengths. Additionally, by inserting a stable second coherent wavelength [Dual Wave model], the HSR-3000 attains a self-calibrating feature, eliminating the need for regularly scheduled service.



HSR-3000 High Speed Reflectometer



LightView™ software is a powerful, easy-to-use tool designed to put the user in control of the instrument and its measurements. Once measured and collected, data is easily identified and stored.

APPLICATIONS & USES

INDUSTRY	TYPE OF MEASUREMENT	SCATTERING	DISCREET BOUNDARY
Pharmaceutical	<ul style="list-style-type: none"> • Particle sizing [milling] • Chemical reaction diagnostics • Blister pack thickness 	<ul style="list-style-type: none"> ✓ ✓ 	<ul style="list-style-type: none"> ✓
Chemical	<ul style="list-style-type: none"> • Multi-layer films 		<ul style="list-style-type: none"> ✓
Film	<ul style="list-style-type: none"> • Liquids, coatings 		<ul style="list-style-type: none"> ✓
Biomedical	<ul style="list-style-type: none"> • Scatter media, tissue boundaries, imaging 	<ul style="list-style-type: none"> ✓ 	<ul style="list-style-type: none"> ✓
Manufacturing	<ul style="list-style-type: none"> • Material Thickness, QC 		<ul style="list-style-type: none"> ✓

LightView™

- Real-time control of HSR-3000
- Set-up parameters
- Real-time display of reflection waveform
- Up to 6 indexes of refraction
- On-screen cursors
- Automatic peak-to-peak thickness [distance] calculation
- High resolution data records
- Export data to Excel
- LabVIEW 6.1 compatible
- Windows 2000/NT/XP

SPECIFICATIONS

PHYSICAL

Dimensions / Weight	5.2" H x 17.7" W x 20" D 25 Lbs.
Power	100/120/220/240 VAC selectable 47-63Hz, fused
Optical Interfaces	FC/APC, wide key
Front Panel Electronic Monitor Points [BNC]	
Sweep Signal	Drive waveform 25% scale of input to HV amp
Sync Signal	TTL level synchronized with sweep display
Linear Out	Interferogram signal
Log Out	Envelope of Interferogram, Log Scale
Warm-up time	10 minutes
Items Supplied With Unit	Line cord, 68 conductor NI DAQ cable, Probe fiber with 4% (FC/APC to FC/PC jumper) LightView™ software

OPTICAL

Compatible Fiber	SMF-28 (9/125 μm)
Broadband Source (Standard)	SLD, 1.3 μm ± 30 nm, 50 nm FWHM, 500 μW
Broadband Source (Option)	SLD, 1.3 μm ± 30 nm, power up to 15 mW
Reference Source, Dual Wave	DFB Laser, 1539 nm Typ.
Loss, probe to receiver, Dual Wave	11 Db, typical
Loss, probe to receiver, Single Wave	7 dB, typical

MEASUREMENT

OCDR Resolution	Related to optical source spectral width, typically transform limited to within 10% [see note 1]
Thickness Resolution (Dual Wave)	1 μm; cursor peak detect processing approach.

SWEEPER

Type	Push-pull Piezo based fiber stretchers
Sweep Waveform	Triangle wave, level adjustable.
Sweep Frequency	User adjustable through LightView™ Frequency Range [see note 2]
Maximum Sweep Range	7 mm (in air, index of 1)
Sweep Accuracy	Better than ± 2% half scale, ± 4% full scale
Sweep Offset	3.5 mm ± 1 mm [default setting]

ANALOG PROCESSOR

Optical Receiver	Signal Channel: PINFET Reference Channel: PIN-TIA
Gain Control	30 dB range, Controlled through GUI
Filtering	Board Programmable HP and LP, BP
Linear Output [interferogram signal]	Range ± 2 V
Log Output [interferogram envelope]	Range 0 - 2.5 V $V_{out} = 0.5 V \log_{10} (V_{linear out} / 32 \mu V)$
Signal to Noise Ratio	Dependent on optical return signals. Range is 50 to 70 dB

MODELS

HSR-3000-SW	Single-Wave High Speed Reflectometer
HSR-3000-DW	Dual-Wave High Speed Reflectometer

OPTIONS

Sweep Drive	High Speed Drive [see note 2]
Optical Source	Higher Power SLD, up to 15 mW

LightView™ PC REQUIREMENTS

CPU	1 GHz P5 or equivalent
Memory [RAM]	256Mbyte Min Recommended
Operating System	Windows 2000/NT/XP
DAQ Interface	NI 68 Pin I/O connector
NI DAQ PCI Interface Card	
HSR-3000-SW	6070E, 6052E, 6040E, 6032E, 6110E, 6111E
HSR-3000-DW	6111E

This instrument requires a PC to operate.

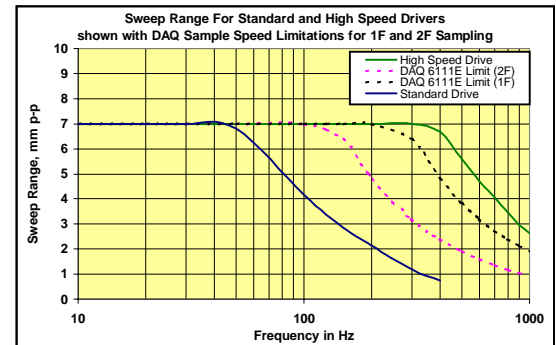
All trademarks and registrations are copyrights of their respective suppliers.

Note 1: OCDR Resolution

System resolution is optical source spectral-width dependent, roughly following the relationship $\Delta L = \lambda^2 / 2n\Delta\lambda$, where ΔL is the resolution, λ is the source spectral wavelength, $\Delta\lambda$ is the spectral width of the source [Full Width, Half Max] and n is the index of refraction of the medium the measurements are taken.

Note 2: Sweep Frequency

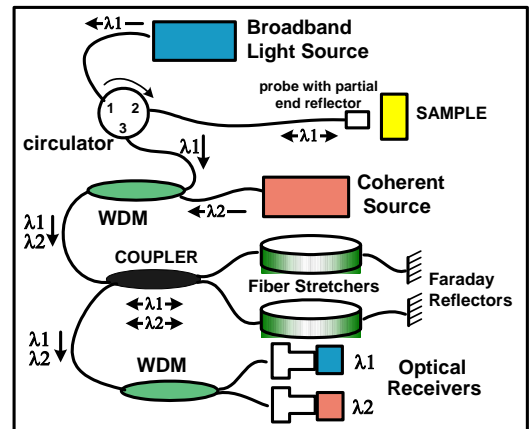
The default sweep frequency is user adjustable. Unit ships at a default 30 Hz. This frequency is compatible with the standard drive amplifier and offers a high SNR at the full range drive. The instrument is capable of higher sweep speeds when equipped with the High-Speed drive. The sweep speed ranges for both drivers as well as the DAQ 6111E limits are shown in the plot below.



Note 3: Sweep Offset

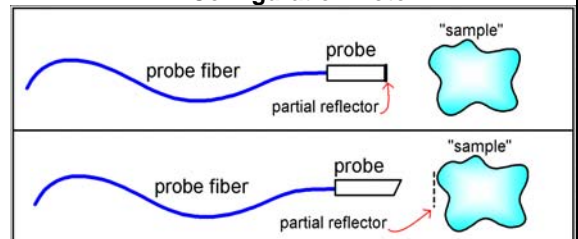
If you plan to operate the Reflectometer at less than the full sweep range, the intended sweep range should be specified at time of order. Optiphase will work with you to determine the optimum offset to be applied to the unit.

Dual Wave Autocorrelator Optical Diagram



Construction is all single mode fiber. Faraday reflectors ensure high visibility and minimize polarization dispersion.

Configuration Note



The Autocorrelator does not utilize a reference arm. A partial reflection is relied on at the end of the fiber probe [or other reflection in front of the sample] for the reference path. Most probe assembly designs can easily accommodate this.