



# HR2000+: New Electronics = Speed & Control

## Dynamic Electronics Gives You Control

The HR2000+ Spectrometer integrates a powerful analog-to-digital (A/D) converter, programmable electronics and a high-resolution optical bench. This innovative combination produces our fastest spectrometer yet and provides optical resolution to 0.035 nm (FWHM).

## 1,000 Full Spectral Scans/Second

The HR2000+ utilizes an onboard, 2-MHz A/D converter, which allows you to capture and transfer one full spectral scan into memory every millisecond when the spectrometer is interfaced to a PC via the USB port (a serial port interface is also available).

## Programmable Microcontroller

The HR2000+ has an onboard programmable microcontroller that provides flexibility in controlling the spectrometer and accessories. Through a new 30-pin connector, you can implement all operating parameters in the software, such as:

- controlling external light sources
- creating processes and routines
- retrieving data from external devices

The HR2000+ gives you access to 10 user-programmable digital I/Os for interfacing to other equipment; one analog input and one analog output; and a pulse generator for triggering other devices. (Programming the I/Os requires one of our device drivers or SpectraSuite Spectroscopy Platform Software.)

## "HR" Optical Bench

The HR2000+ is responsive from 200-1100 nm, but its specific range, resolution and sensitivity depend on your "HR" Optical Bench options. You select the grating, wavelength range, mirror coating, detector window and entrance aperture size. Choose from hundreds of accessories to create application-specific systems.

## High-resolution Applications

The HR2000+ is ideal for applications where fast reactions need to be monitored and high resolution is necessary, such as protein dynamics. For solution chemistry or for color measurements, the HR2000+ is more likely to fill your requirements.

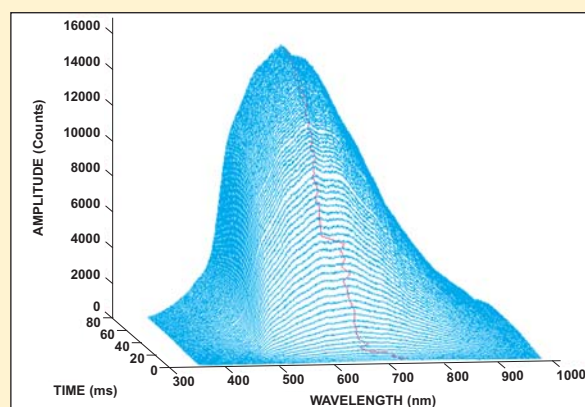
## Plug-and-Play Operation

The HR2000+ interfaces to a PC, PLC or other embedded controllers via USB 2.0 or serial port. When connected to a PC via the USB port, the HR2000+ does not require an external power supply -- the spectrometer draws its power from the PC. When operating via the serial port, the HR2000+ requires a power supply (not included). Data unique to each spectrometer are programmed into a memory chip on the HR2000+; software reads these values for easy setup and hot swapping among PCs.

HR2000+: \$3,499



## Monitoring LS-1 Start-up Condition



Above is the power-up data from our LS-1 Tungsten Halogen Light Source. The data was taken at 2-millisecond increments. The graph shows the tremendous amount of data generated with the HR2000+'s acquisition rate speed of 1000 spectra/sec.

## Specifications

Dimensions (in mm):	148.6 x 104.8 x 45.1
Weight:	570 grams
Detector:	Sony ILX511 linear silicon CCD array
Detector range:	200-1100 nm
Pixels:	2048 pixels, pixel size: of 14 $\mu$ m x 200 $\mu$ m
Signal-to-noise ratio:	250:1 (at full signal)
Dark noise:	3.2 RMS counts
Sensitivity:	400 nm: 75 photons/count, 600 nm: 41 photons/count
Optical bench design:	f/4, Symmetrical crossed Czerny-Turner
Entrance aperture:	5, 10, 25, 50, 100 or 200 $\mu$ m wide slits or fiber
Gratings:	14 gratings, UV through Shortwave NIR
Order-sorting filters:	OFLV and longpass OF-1 filters
Optical resolution:	~0.035-6.8 nm FWHM
Integration time:	1 ms to 65 seconds
Dynamic range:	2 x 10 <sup>8</sup> (system); 1300:1 for a single acquisition
Stray light:	<0.05% at 600 nm, <0.10% at 435 nm
Fiber optic connector:	SMA 905 to 0.22 numerical aperture single-strand fiber
Power consumption:	450 mA @ 5 VDC
Data transfer speed:	Full scans to memory every 1 ms with USB 2.0 port, 15 ms with USB 1.1 port, 200 ms with serial port
Inputs/Outputs:	10 onboard digital user-programmable GPIOs*
Analog channels:	One 13-bit analog input, One 9-bit analog output
Operating systems:	Windows 98/Me/2000/XP, Mac OS X and Linux using USB port; any 32-bit Windows OS using serial port
Computer interfaces:	USB 2.0 @ 480 Mbps (USB 1.1 compatible); RS-232 (2-wire) @ 115.2 K baud
Peripheral interfaces:	SPI (3-Wire); I <sup>2</sup> C inter-integrated circuit

\*Programming the GPIOs requires SpectraSuite Software, OmniDriver or one of our other device drivers.

