Fluorescence

Cary Eclipse
Guaranteed Specifications

Cary Eclipse Fluorescence Spectrophotometer

The Cary Eclipse Fluorescence spectrophotometer is manufactured according to a Quality system certified to ISO-9001. The guaranteed specifications are listed below and are based on the ±4 sigma statistical confidence level of the final acceptance tests performed at the factory.

Principle

Computer controlled ratioing fluorescence spectrophotometer with measurement modes for fluorescence, phosphorescence, chemiluminescence and bioluminescence. Czerny-Turner 0.125 m monochromators, 190–1100 nm wavelength range, fixed selectable SBW from 1.5–20 nm, full spectrum Xe pulse lamp single source with exceptionally long life, horizontal beam geometry, dual R928 PM tubes. All reflective optical system with quartz overcoated optics, Schwarzschild source optics for increased energy throughput and precise imaging and focusing, scan rates from 0.01–24 000 nm/min, 80 data points per second maximum measurement rate in fluorescence mode, non-measurement phase stepping wavelength drive, room light immunity in fluorescence mode, centrally controlled by PC with Windows® 98 or NT operating systems.

Source	Xe pulse lamp with exceptionally long lifetime, pulsed at 80 Hz. Pulse width at half peak height ~ 2 µs, peak power equivalent to 75 kW.
Monochromators	Excitation: Czerny-Turner, f3.6, 0.125 m focal length Emission: Czerny-Turner, f3.6, 0.125 m focal length
Gratings	Excitation: 30 x 35 mm, 1200 l/mm, blaze at 370 nm Emission: 30 x 35 mm, 1200 l/mm, blaze at 440 nm
Wavelength range (nm)	Mechanical Excitation: 190–1100 nm. Zero order selectable. Emission: 190–1100 nm. Zero order selectable.
	Operational Excitation: 200–900 nm with standard PM tube. Zero order selectable. Emission: 200–900 nm with standard PM tube. Zero order selectable.
Wavelength accuracy (nm)	± 1.5 nm
Wavelength reproducibility (nm)	± 0.2 nm
Detectors	High performance R928 photomultiplier detectors. Separate R928 PMT for reference signal.
Sensitivity (Raman Band of Water)	>500:1 RMS, 500 nm excitation, excitation and emission slits 10 nm, 1 sec Signal Averaging time. >750:1 RMS, 350 nm excitation, excitation and emission slits 10 nm, 1 sec Signal Averaging time.
Minimum sample volume	0.5 mL (using standard 10 mm fluorescence cell)
Instrument dimensions	608 x 644 x 271 mm (W x D x H)
Sample compartment dimensions	198 x 273 x 205 mm (W x D x H)
Sample compartment access	Front and top
Instrument purging	Sample compartment windows and sample compartment
Instrument weight	30 kg

Recommended Environmental Conditions

Instrument storage	5-45 °C at 20–80% relative humidity, non-condensing, altitude <2133 m.
Instrument operation	Below 853 metres altitude: 10-35 °C, 8–80% relative humidity, non-condensing.
	Between 853 and 2133 metres altitude: 0-25 °C, 8–80% relative humidity, non-condensing
Instrument electrical requirements	Voltage range 85–264 V AC Mains frequency 50–60 Hz, ± 1 Hz VA rating 180 VA

Operational

Spectral bandwidth	Excitation: 1.5, 2.5, 5, 10, 20 nm and 10 nm round Emission: 1.5, 2.5, 5, 10, 20 nm and 10 nm round
Limiting resolution	<1.5 nm
Filters	Excitation Computer selectable filters including 2 bandpass filters (250–395 nm, 335–620 nm), 2 cuttoff filters (550 nm, 695 nm), a shutter and open beam position.
	Emission Computer selectable filters including 1 bandpass filter (250–395), 4 cutoff filters (295, 360, 430 and 550 nm), a 3% attenuator, a shutter and an open beam position.
Signal averaging	Fluorescence 0.0125 to 999 sec Phosphorescence 1 µsec to 10 sec (Gate time) Bio/Chemi-luminescence 40 µsec to 10 sec (Gate time)
Wavelength scan speed	0.010–24 000 nm
Maximum slew speed	24000 nm/min (400 nm/sec)
Maximum scan rate	24000/1839080/240000/228 (nm/min)/(cm^{-1}/min)/(Å/min)/(eV/min)
Data interval	nm: 0.15–30 cm^{-1}: 9.3711–140.0566 Å: 1.5-300 eV: 0.0012–0.0174
Photometric display	± 1000 arbitrary units (a.u.)
Gain	Selection of Low, Medium and High with manual control from 400–1000 V in increments of 1 V. Maximum sensitivity ~ 5000 times that of Low.
Data collection rate (kinetics studies)	points per min per cell
	1 cell: 4800 points
	4 cells: 6 points
	4 cells (0.0125 sec SAT, 0.013 sec Dwell time): 55 points
Repetitive scanning	Maximum number of cycles 1000 Maximum cycle time (min) 1000
Temperature monitors (using the Temperature Probe Accessory)	Temperature probe inside cuvette

Software Functionality

Operating system	Windows 98/NT®
Graphical display	• Up to 100 display boxes • You can retrieve the appropriate Method file with a Data file • The Batch file concept stores Data, Method and Report files in one file • Display options include Grids, Multiple Line types, graphics legend • Data files can be displayed overlaid in one box or as single files in individual boxes • Graph labels and bitmaps, including chemical structures, can be displayed and saved with data files (fonts and size are selectable) • Peak labeling: Specify X, Y or both X&Y. Specify orientation of labels and number of decimal places.
Prescan	Finds the optimum Excitation and Emission wavelengths for the sample as well as identifying Rayleigh, 2nd order and Raman scattering.
File association	Files can be automatically opened by clicking on the file name within Windows.
File conversion	• You can import files in Cary WinUV, ASCII XY formats and GRAMS format • You can export Cary Eclipse files as ASCII (*.CSV format), ASCII with Audit log format and GRAMS format
File system	• Methods, Reports and Data can be saved as individual files or saved together in a Batch file which includes the selected graphical display setup • The number of files that can be stored is limited only by hard disk capacity • File names have a four-letter extension and follow Windows association conventions • Data is stored with Audit Log to track how the data was collected

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Software Functionality continued

File, drag and drop	Files can be dragged and dropped into the appropriate Cary Eclipse application for easy opening of data.
File, icon association	You can create Windows shortcuts on the desktop to Cary Eclipse applications, including automatically loading a method or a data file.
Graphical cursor	Selections include: Tracking, Track intensity, Ruler, Peaks, Valleys and Free.
Multiple applications	More than one Cary Eclipse application (or multiple copies of one application) may be run at any time, allowing method development or data review and manipulation while the instrument is collecting. Only one application can control the instrument at one time.
Built-in programming language	Applications Development Language (ADL), which is based upon Visual Basic for Applications (VBA), enables the software to be tailored for specific applications.
Sample detector PMT voltage	• Provides the ability to increase the signal without changing the resolution by opening slits • Controlled by selection of Low, Medium, High or a manual selection from 400–1000 V
Email	• Data files can automatically be emailed to a colleague after a run • When the instrument completes the experiment, it will notify you via email

Scan Application

Corrected spectra	• Excitation correction provided as standard • Emission correction up to 600 nm easily determined • Correction factors can be obtained in ASCII format • Long wavelength correction (> 600 nm) optional
Scan modes	• Excitation, Emission and Synchronous scans available • 3D data collection available in all above scanning modes
3D scan	• Export to Grams 3D provided • Built-in contour plots as standard • Grams 3D package included
CAT mode scanning	Spectra are continuously averaged with user-defined number of scans to average
Signal to Noise mode scanning	Data automatically collected with a constant level of precision at each wavelength
Ordinate modes	Intensity in arbitrary units (a.u.), polarization (p) and anisotropy (r)
Abscissa modes	nm, cm^{-1}, Å and eV. Wavenumber and eV mode are linear in scanning, i.e., data points are evenly spaced over the entire spectrum
Cursor mode	Track, track at specific intensity value, track peaks, track valleys or track peaks and valleys
Reports	Include: all peaks, maximum peak, XY data
Maths, on line calculations	The built-in Maths module offers +,-,/,x, log and square root functions as well as: • Smooth (Savitzky Golay, Moving Average and Boxcar) • Mean • Normalize • Integrate • Corrected spectra • 1st to 4th Derivative • Convert to polarization or anisotropy

Single Wavelength Measurements

Sample averaging	You can elect to report the mean of multiple readings of a sample solution or report the mean of multiple sample aliquots of the sample solution.
Ordinate modes	Intensity in arbitrary units (a.u.) polarization (p) and anisotropy (r)
Sample names	Samples names can be entered before the run or can be imported as a text file.
User specified data collection	Data can be collected at a single wavelength or at multi-wavelengths (up to six excitation and emission pairs) and combinations of wavelengths using the user collect function

Kinetics Application

Data comments	The User Data Form enables entry of information about the samples analyzed, e.g., pH, temperature, quencher concentrations.
Plot Fits	• Kinetics rate plots can be displayed with the data and stored • A difference plot can be created
Number of stages	• Up to five data collection stages may be defined, to allow the rate of data collection to be varied over the kinetics run • Multiple-order fits can be performed within a single kinetics trace
Cursor modes	• Point to point slope • Least squares slope • Free • Tracking
Extend collection time during run	You can change the stop time of the run without stopping the data collection.
Fastest data collection for single cells	80 points/sec in Fluorescence mode.
Min/Max collection time	0.01 to 20000 min (~14 days).
Pause control	You can pause the collection to add a reagent to the cuvettes.
Synchronized start	Allows immediate collection of data after reagents are added.
Temperature monitoring	Using either the temperature monitor in the Multicell Holder itself or up to two temperature probes inside the cuvettes when the optional Temperature probe accessory is fitted.
Temperature data storage	Temperature readings are stored with the data.
User specified data collection	Data can be collected at a single wavelength or at multi-wavelengths (up to six excitation and emission pairs), and combinations of wavelengths using the user collect function.

Lifetimes Application

Data comments	The User Data Form enables entry of information about the samples analyzed, e.g., pH, temperature, quencher concentrations
Plot Fits	• Single and Double exponential fits are provided • A difference plot can also be created
Cursor modes	• Point to point slope • Least squares slope • Free • Tracking
Data collection	Data is collected in real time for Gate times > 40 µs
Time resolution	Minimum Gate time of 1 µs
Temperature monitoring	Using either the temperature monitor in the Multicell Holder itself or up to two temperature probes inside cuvettes when the optional Temperature probe accessory is fitted
Temperature data storage	Temperature readings are stored with the data
User-specified data collection	Data can be collected at a single wavelength or at multi-wavelengths (up to six), and combinations of wavelengths using the user collect function.

Concentration Application

Calibration curve fits	Selections include: Linear, Linear direct and Quadratic curve fits
Import Sample names	Sample names can be imported in ASCII format from a disk or LAN system
Standards	1–30 standards
Replicates	Up to five replicates of each sample and up to five replicates of each standard may be performed
Sample/standard averaging	• Up to 3 samples/standards can be averaged • Standards and samples can be set independently
User specified data collection	Single wavelength(s) measurements with on-line calculations can be performed on data collected using +, -, /, x functions
Weight/Volume correction	You can correct concentration results for weight/volume differences between the sample and the nominal weight/volume in the method

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Software Customization

	The Application Development Language (ADL) is a simple but powerful programming language built into the Cary Eclipse software. It allows the Cary Eclipse instrument to perform almost any application.
Application modification	The presence of ADL 'Hooks' in all of the Cary Eclipse applications allows you to add functionality at certain points during an analysis. For example, when the Start button is pressed you can display a prompt for the user to add a reagent or perform some other task.
New applications	The ADL shell application can become a software package designed specifically for your measurements, turning the Cary Eclipse instrument into a dedicated analyzer. Alternatively, you can use the drop and drag capabilities of the ADL Dialog Editor to create a custom interface.
Online calculations	The User collect field on most Cary Eclipse applications means that you can perform calculations on the data as it is collected instead of waiting until the collection has finished.

Instrument Validation

	The Cary Eclipse Validate application is supplied as standard with all software packages. The tests it provides comply with ASTM methods and include certified standards. Also provided are factory performance tests and other specification tests. The results of all tests performed using the Instrument Validation package are automatically stored by the system.
Wavelength accuracy	• Xenon emission line • Holmium perchlorate (Certified standard)
Wavelength reproducibility	• Xenon emission line • Holmium perchlorate (Certified standard)
Spectral bandwidth accuracy	Xenon emission line
Zero %T accuracy	Closed emission shutter
Sensitivity	• S/N of Raman band of water at 350 nm and 500 nm excitation • LOD of fluorescein in 0.01M NaOH • LOD of Quinine Sulfate-dihydrate in 0.1N H_2SO_4 (ASTM)
Stray light	Ground silica screen
Photometric stability	Rhodamine B in PMMA
GLP functionality	Setting of privileges for users or groups of users. Allows protection of data and methods from change or deletion. Audit log saved with all data collected. Inclusion of operator name and Lab ID, data file name, report creation date and time, full documentation and parameters in reports.

Computers

The following configurations are suitable for operation of the Cary Eclipse software

Minimum	Intel Pentium processor (or compatible), 200 MHz processor, 32 M RAM, 200 MB free space on hard disk, 3.5" 1.44 MB floppy drive, Video card supporting 800 x 600, high color (16 bit) mode, Super VGA screen, 16 x CDROM drive and 16 bit sound card, Windows 101 key keyboard, Microsoft or compatible mouse, 1 spare AT bus 16 bit ISA or PCI expansion slot, Microsoft Windows 98 or NT (including service pack 4 or later). Microsoft Internet Explorer 4 or later should be installed on Windows NT systems. Note: If you are going to use 3D and contour plotting and presentation the PC should be equal or better that the recommended configuration.
Recommended	Intel Pentium II processor (equivalent or better processors are also suitable), at least 64 MB RAM, at least 500 MB free space on hard disk, 3.5" 1.44 MB floppy drive, video card supporting 800 x 600 high color (16 bit) mode, Super VGA screen (or better), 24x CDROM drive (or faster) and 16 bit sound card, Windows 101 key keyboard, Microsoft or compatible mouse, 1 spare AT bus 16 bit ISA or PCI expansion slot, Microsoft Windows 98 or NT (including service pack 4 or later), Microsoft Internet Explorer 4 or later should be installed on Windows NT systems.

Ordering Information

	For part numbers and other ordering details, please consult either your Varian Sales person or the parts and supplies catalog on Varian's Web site at http://www.varianinc.com

Varian Customer support policies

Warranty	Warranty on parts, labor and freight (one way) for 12 months. Warranty does not include on-site labor. Varian paid installation includes 90 days on-site warranty and the nine months workshop warranty as above. An extended three-year warranty is available. Two year Xenon Lamp module warranty. Covers total failure only (i.e., fails to strike)
Hardware support period	Seven years from the date of the last unit manufacture. After this time, parts and supplies will be provided if available.
Software support	Telediagnostic capability is available for some instrument models. Availability of telediagnostic problems will be issued free of charge. Software upgrades to add functionality will attract a fee. The customer is solely responsible for selecting a Varian instrument to achieve their desired support may vary according to location. Software upgrades to fix non-conformances or safety results or for particular applications.