

Diode Array Rapid Spectral Detector plus Wavescan™ Software



LKB's Rapid Spectral Detector

Modern diode array technology demands higher standards in performance design

Despite the advance of refined and sophisticated equipment, real progress in HPLC has suffered from the lack of a universal UV detector that allows the analyst to optimize response, detection limits and resolution. Incomplete results continue to prevail. Continuous data can usually only be obtained at one pre-selected wavelength, which limits the amount of information available. Traditional spectrophotometric detectors only scan under stopped flow status. This form of serial measurement is tedious and slow, and leads to band broadening, which adversely affects separation and virtually precludes quantification. In addition, stopped flow scanning is impossible with modern fast LC using small particle size columns.

A MINOR BREAKTHROUGH

All of these factors have created a demand for a corresponding increase in measurement speed, and led to the introduction of the photodiode array detector.

Diode array technology allows for continuous spectral determination during elution, and because the process is rapid, the problems of stopped flow measurements are eliminated.

In theory diode array offers more advantages than earlier systems. In practice however, the conventional diode array detector presents the analyst with previously

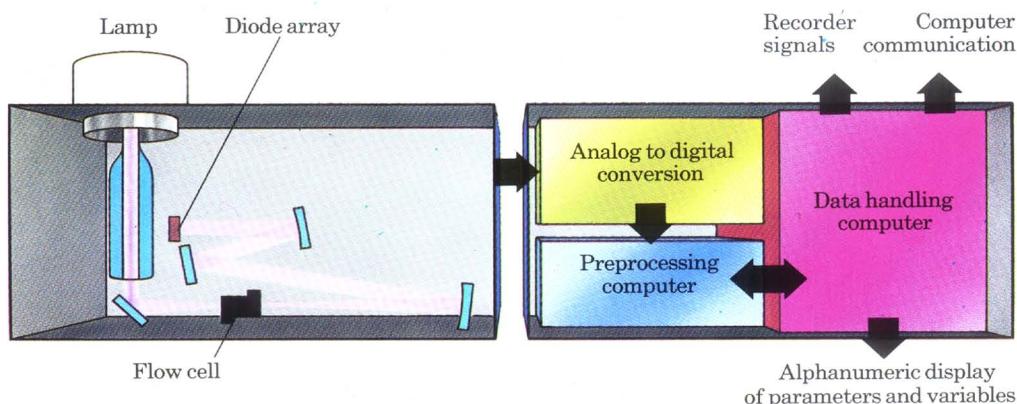
unidentified instrumentation and processing problems. These can encompass complex parameter setting, limited and even dubious information retrieval, as well as repetitive guesswork routines.

Achieving results with any real significance has literally forced the operator to use trial and error methods, inevitably leading to frequent reruns. Until now no generally successful technique has been developed for total storage, post-run data treatment and presentation of data from any diode array detector.

A MAJOR DEVELOPMENT

The Rapid Spectral Detector (RSD) simultaneously accesses total wavelength data, however fast your run, to instantly give you reliable peak purity control and positive peak identification. The RSD automatically acquires spectra at predetermined time intervals, or on the upslope, apex and downslope of every chromatographic peak—even with peaks eluting in less than one second.

Optimized speed, sensitivity and resolution now provide you with vastly increased information concerning sample components. Combine this with the ability to simultaneously detect widely differing compounds, and you'll be able for the first time ever, to uncompromisingly satisfy your demands in HPLC.





THE RAPID SPECTRAL DETECTOR

Specifically housed in two stacked units which separate optics and electronics, the Rapid Spectral Detector is modular, space-savingly compact and fully compatible with any HPLC instrumentation.

Unquestionably the most powerful stand-alone detector available, its built-in 16 bit dedicated computer lets you independently program up to four channels for fixed wavelength runs, wavelength bunching and ratios, time integrated spectra, spectral averaging and suppression.

THE COMPLETE UV SPECTRUM—190–370 NM...

Since the vast majority of known sample components do not absorb in the visible region of the spectrum, the RSD concentrates its detection capability to capture all spectra between 190 and 370 nm. This allows you to vary band-

width from 4 nm to 180 nm, and ensures optimal sensitivity across the complete UV spectrum. Going beyond this limit just leads to a sharp cut back in diode efficiency, which means increased noise and increased cost.

...WITH AN EFFECTIVE LIGHT SOURCE

Deuterium lamps do not perform well above 370 nm, where you can expect a seven fold decrease in relative response. At higher wavelengths the response decreases even further, and obviously makes it less attractive to extend the wavelength above 370 nm. Any attempt to amplify the emergent energy of such a lamp produces a corresponding increase in noise.

The alternative method is to use two light sources—deuterium and tungsten, but this technique leads to electro-

mechanical complexity and severe instability within the optical system. The result is a much slower spectral acquisition speed, signal deficiencies plus the need to use oversized flow cells. For these reasons LKB has specified a single temperature-controlled deuterium lamp, designed to provide highly stable output and optimal intensity across the complete UV spectrum. *The resultant specification for thermal drift is the guaranteed best.*

THE HIGHEST SPECTRAL RESOLUTION AVAILABLE

The quality of spectral output represents a fine balance between speed of acquisition, noise and resolution. Continuous parallel detection reads the complete array in only 12.5 milliseconds. And because we have specified as many as 256 diodes, you can now achieve greater spectral detail, much lower noise, and at the speed which captures all the information you need.

By concentrating the UV radiant energy across a

larger number of diodes, the RSD ensures a resolution of less than 1 nanometer per diode. This configuration is unique for diode array technology. It is the key to obtaining the highest spectral resolution available today.



OPTIMAL FLOW CELL GEOMETRY

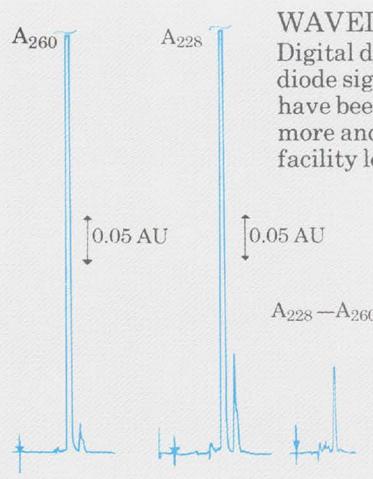
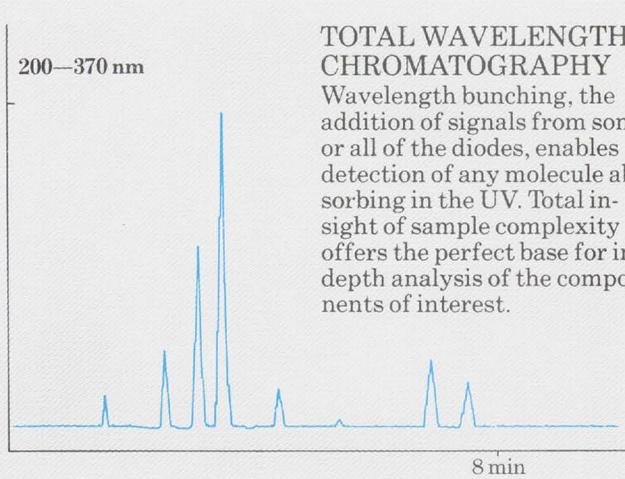
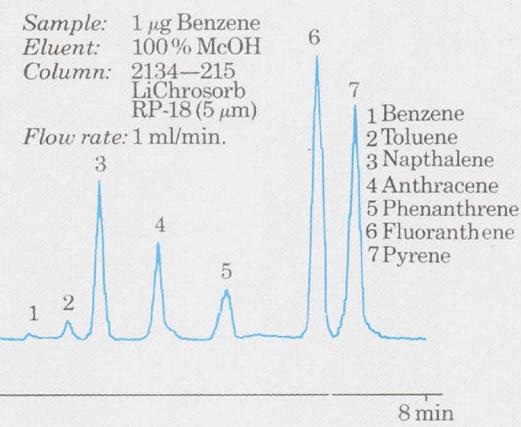
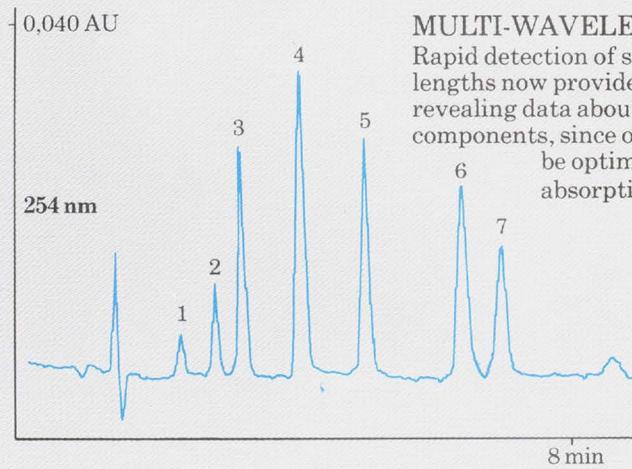
In designing an instrument compatible with current and anticipated future technology, the optical system is a major consideration. Fast efficient columns need a low volume, pressure proof flow cell with good washout characteristics.

The 5 μl, easily accessed quartz flow cell is the perfect choice for optimal flow geometry. It prevents band broadening, provides excellent performance and maintains chromatographic efficiency.

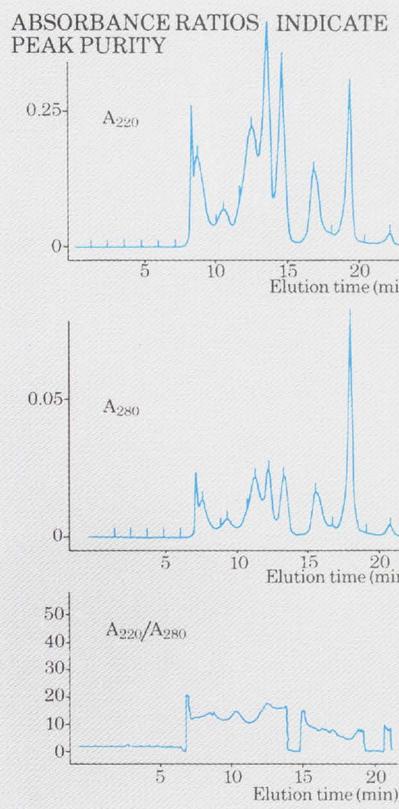
THE TOTAL ANSWER

LKB offers the only diode array detector with built-in access to an IBM Personal Computer or IBM compatible. This powerful and economic option enables you to dramatically expand your research potential with unfolding application possibilities. Through real time display, raw

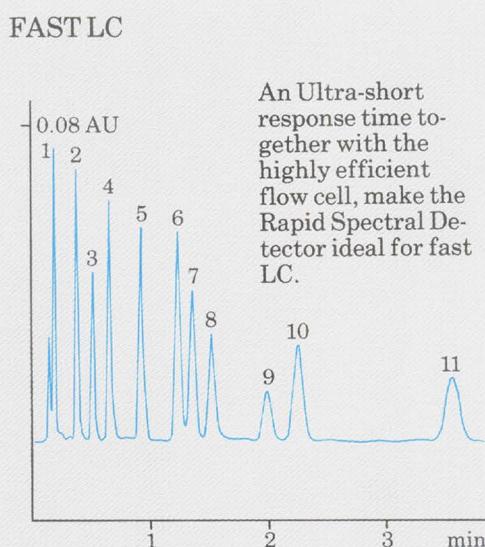
data storage and sophisticated Wavescan™ software, you'll get more comprehensive information, more easily used. The complete system presents you with the instant overview needed for fully effective analytical control.



WAVELENGTH MANIPULATION
Digital data allows you to easily manipulate diode signals. Spectroscopy based techniques have been developed to provide you with more and better quality information, and this facility lets you expand analytical potential even further.



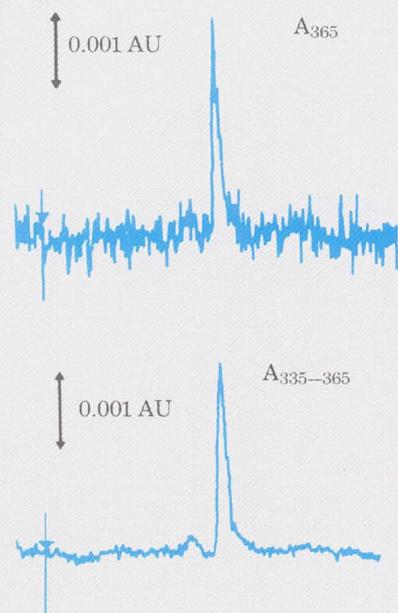
Sample: Thyroglobulin, γ -globulin, ovalbumin, cytochrome C, myoglobin, vitamin B-12, 0.6 mg in total
Eluent: 0.1 M NaH₂PO₄, pH = 6.5
Column: 2135–360 TSK-G 3000 SW
Flow rate: 1.3 ml/min



Sample:
1 Acetone
2 Benzene
3 Toluene
4 Naphthalene
5 Biphenyl
6 Fluorene
7 Phenanthrene
8 Anthracene
9 Fluoranthene
10 Pyrene
11 Chrysene

Eluent: MeOH:H₂O = 80:20
Column: LKB 2134–620 UltroPac ODS-2
Flow rate: 2.5 ml/min

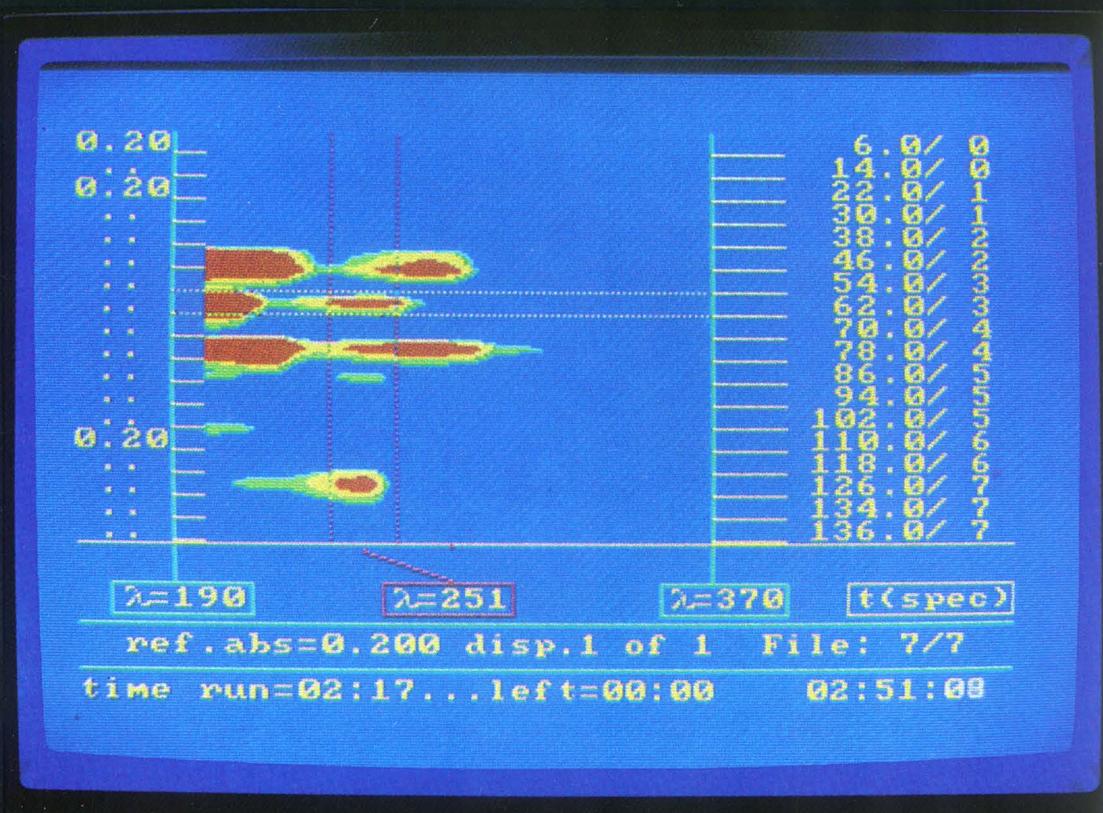
WAVELENGTH AVERAGING WITH A VARIABLE BANDWIDTH



Sample: 80 ng Mitomycin
Eluent: 0.01 M Na₂HPO₄, NaH₂PO₄, pH = 7.0 in 40% Methanol
Column: 2134–215 LiChrosorb RP-18 (5 µm), 4 × 250 mm
Flow rate: 1 ml/min



At the touch of a button you've got 3D chromatography. Perhaps you'll use it for routine recognition of sample character. But from a true analytical standpoint, 3D represents nothing more than a rough but rather pretty landscape, perhaps hiding peaks you can't see.

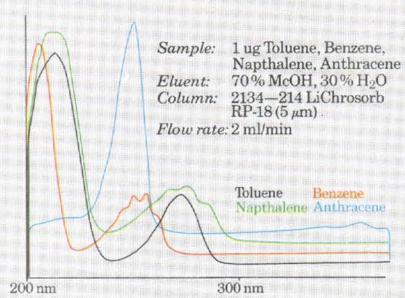
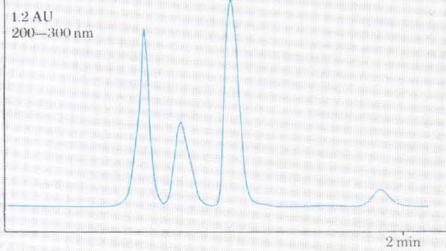


Getting around the panoramic view of 3D means converting the landscape into more communicative geography—an overview showing contour plots from on high, and at heights you select. This complete at-a-glance topography clearly indicates the levels of isoabsorbance in the UV after chromatographic separation. Sharply coloured isograms let you readily recognize each pattern, and provide you with a "spectro-chromatographic-fingerprint" for both accurate comparison and continued in-depth analysis.

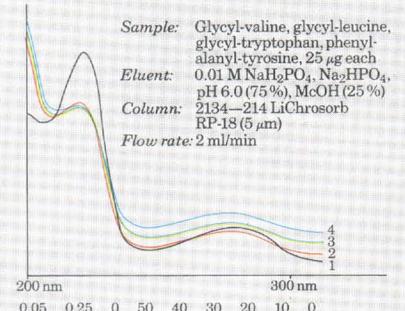
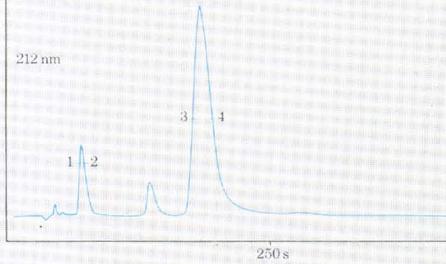
Meets your application needs today

explore and reanalyze

POSITIVE IDENTIFICATION

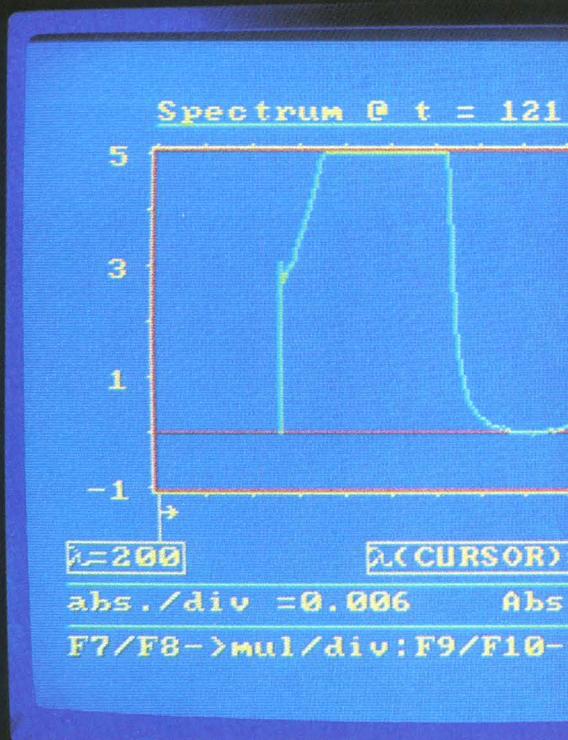


PEAK PURITY CONTROL



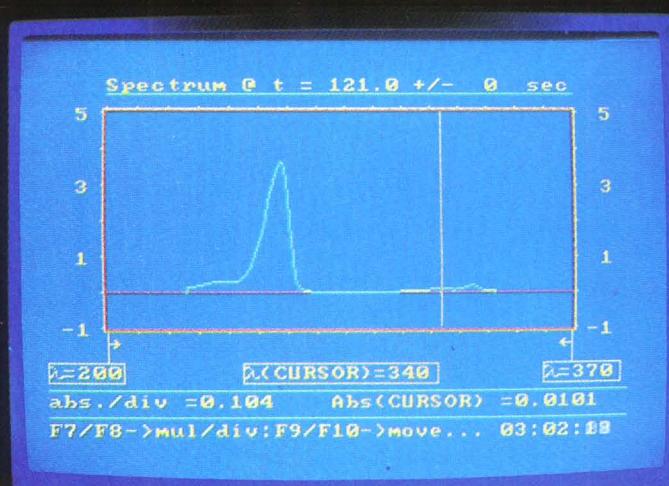
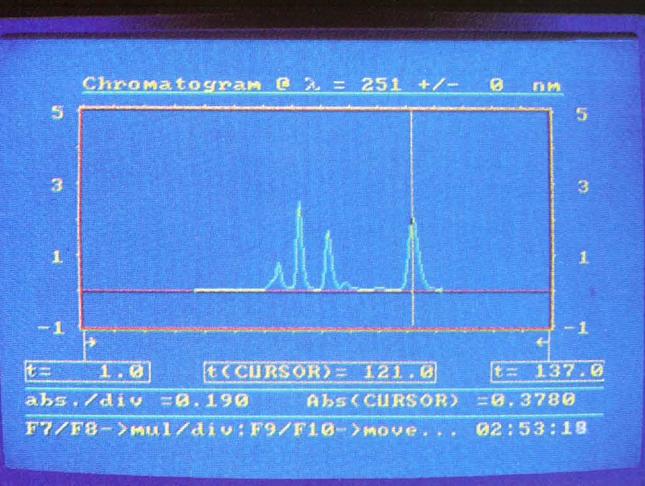
IN-DEPTH ANALYSIS THROUGH SPECTRAL DATA

Spectral data can be accessed by either manual command at predetermined time intervals, or programmed for automatic acquisition on the upslope, apex and downslope. Captured spectra can then be instantly overlaid and normalized for direct comparison. The video screen preview of each isogram indicates regions you may wish examine in closer detail. Using the time cursor, you're now ready to progressively track through the chromatogram and access spectra. These can be automatically stored for subsequent print-out. Spectral selection at peak maxima provides you with positive component identification. And peak purity control is easily achieved by letting you look at normalized spectra from any four points of your choice.



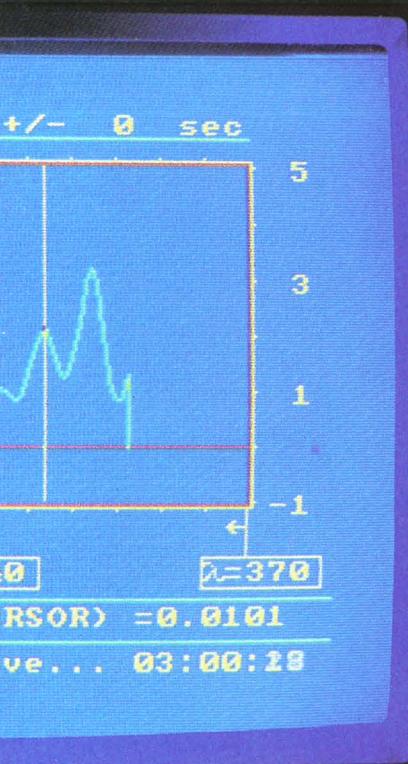
FINE DETAIL AT THE TOUCH OF A BUTTON

Chromatograms can be magnified in both the time and wavelength domains. The vertical cursor indicates peak retention time and maximum absorbance signals. Spectra can equally be enlarged in the wavelength domain. The cursor shows actual wavelength and absorbance values. The highly flexible modification of screen graphics allows the analyst to quickly and easily make the modifications needed in rapid and productive analysis.

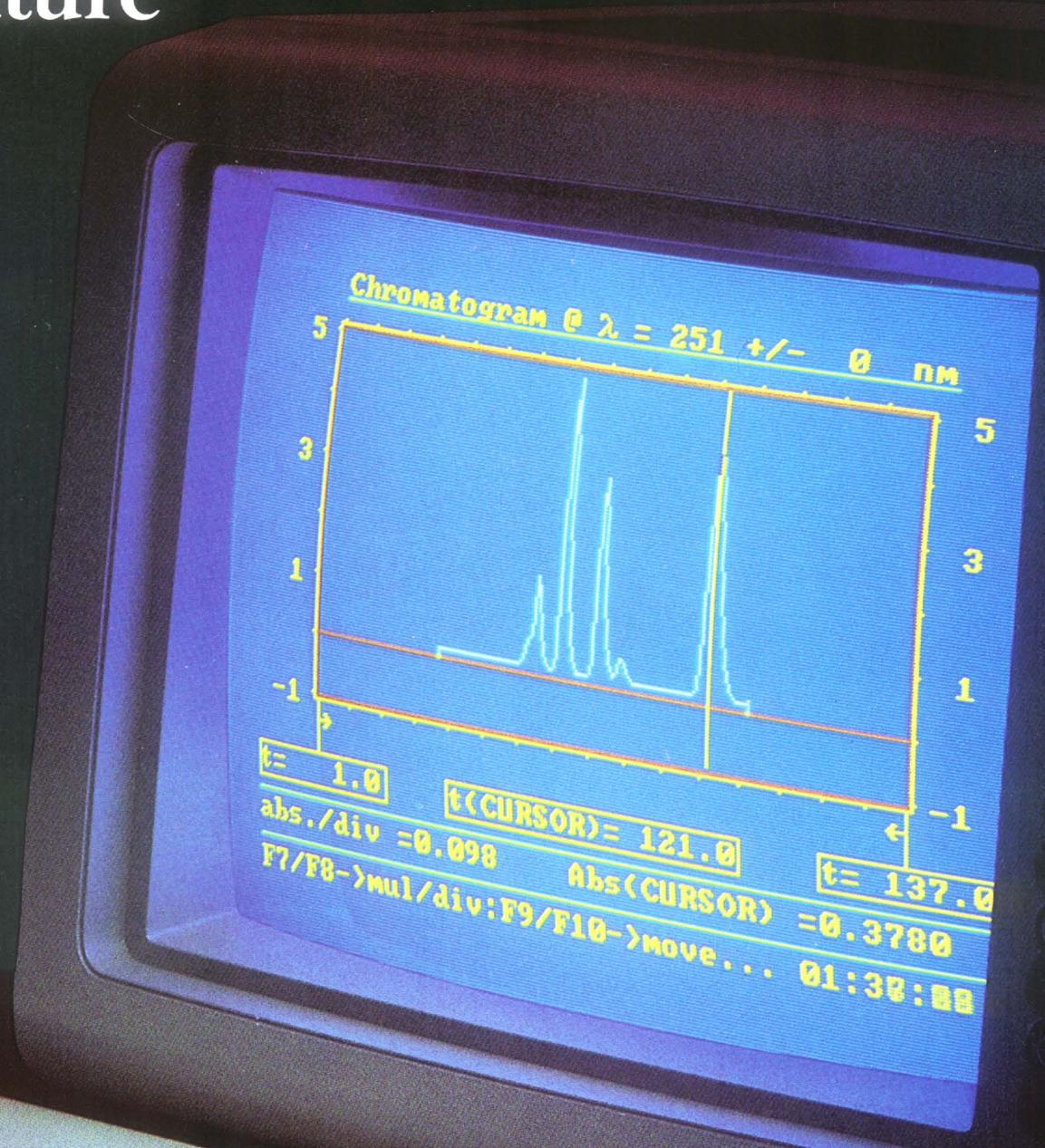


The isogram is your startpoint for developing further detailed information. You can now access optimal chromatograms and spectra—from storage—through the video screen—to hard colour copy. Cursors can be driven through the isogram in both the time and wavelength domains. Slicing time generates the spectrum, and slicing wavelength displays the chromatogram. This unique feature ensures that there's no risk for missing a peak, hidden or not.

y, yet gives you the power to probe,
ach for the future



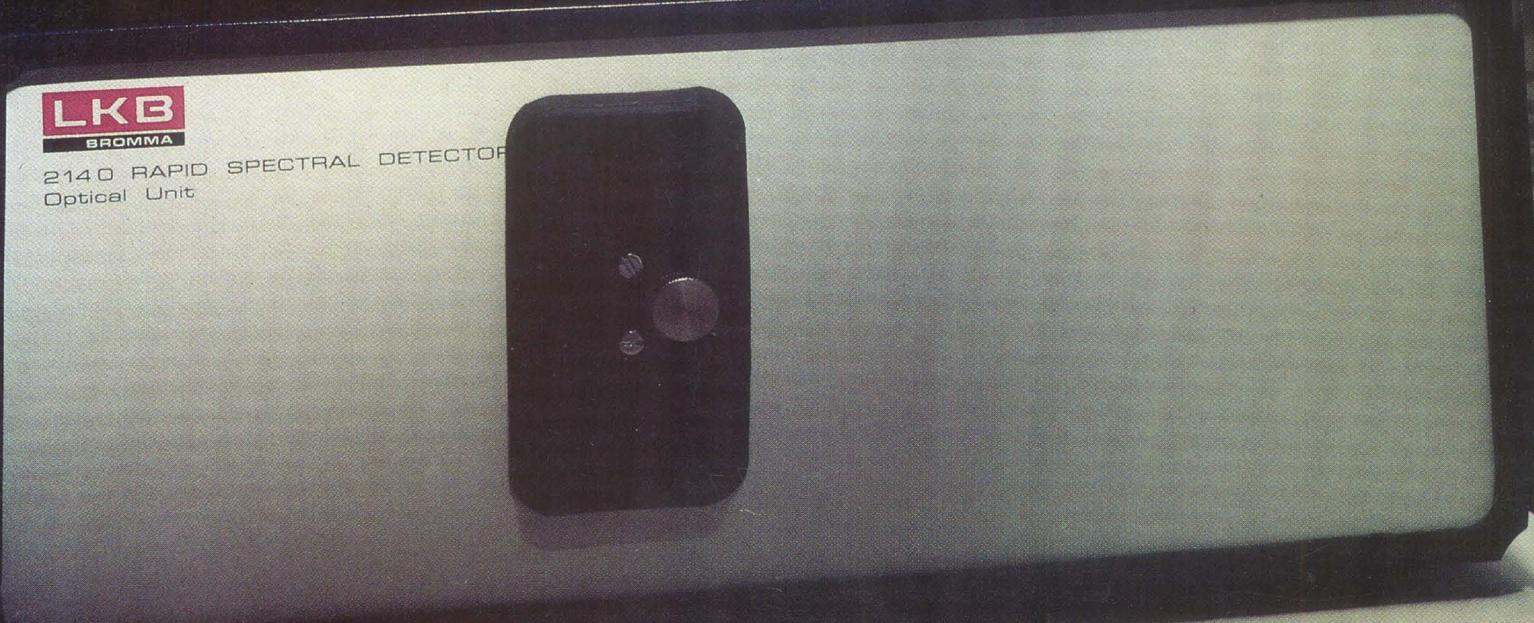
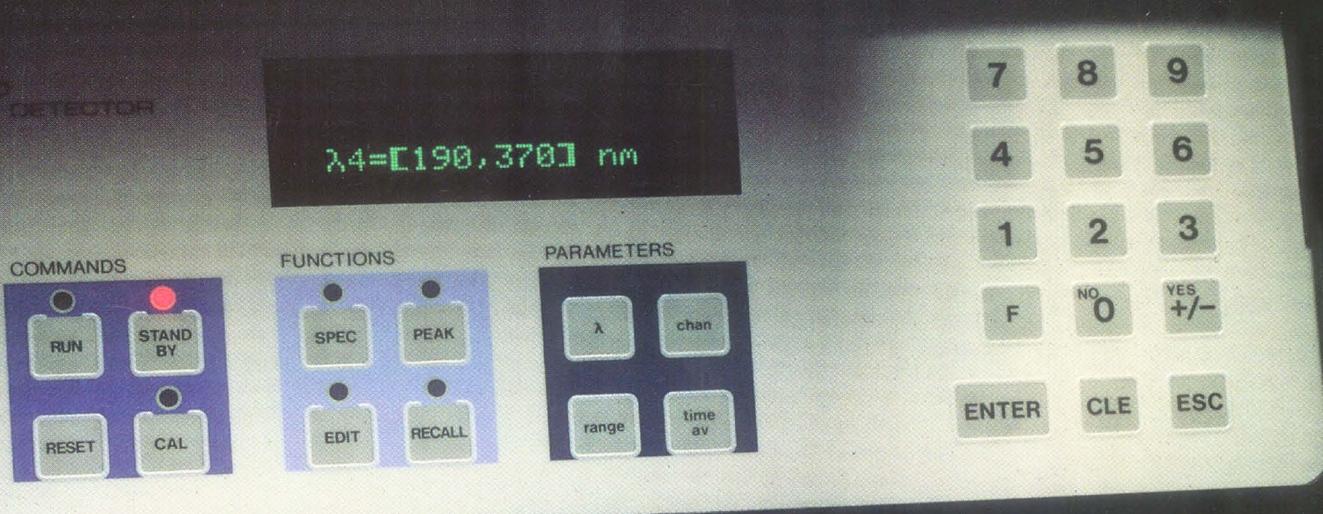
ON
rbsorbance and time dimensions.
and height, even for off-scale
rbsorbance and wavelength dimen-
rbsorbance values. Instant and
vides you with the fine detail



Acquire, process, display, store. with spectacular results, pr

Advanced computer technology lets you easily increase the power and versatility of your RSD, by giving you more effective control during the run, and virtually unlimited post-run data processing potential. Acknowledged as the established world standard, the high quality multi-purpose IBM PC offers you total storage, simplified retrieval and comprehensive manipulation, with real time display. And all in large-screen, high definition colour-graphics, for faster recognition and better discrimination. New plotting technology helps you even further. Automatic, full colour hard copy is also available to uniquely document and present your results.

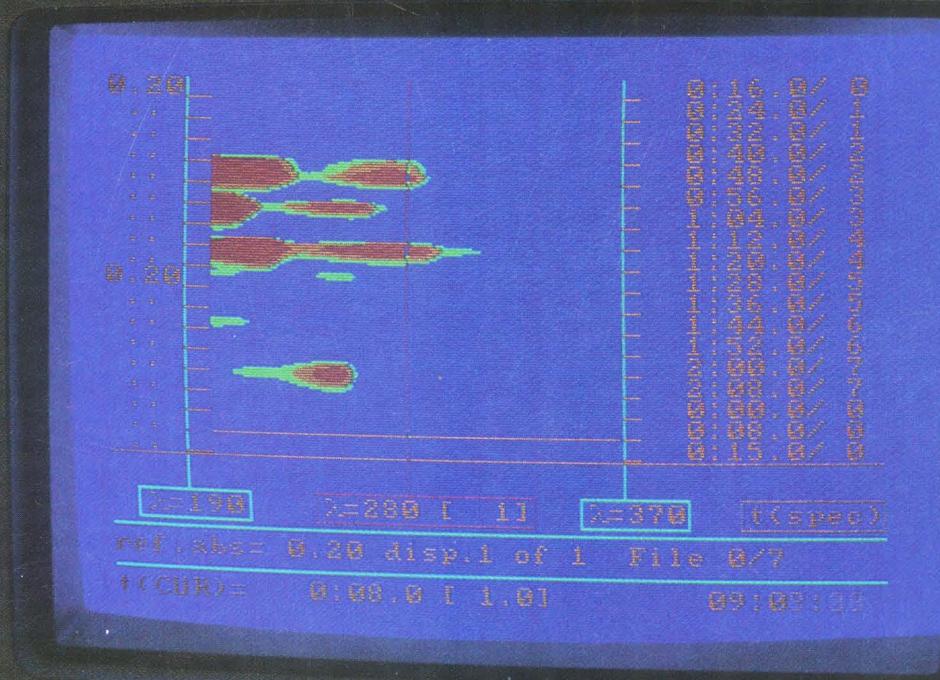
RAPID SPECTRAL DETECTOR - DATA UNIT. 16 bit dedicated microcomputer frees the RSD from extra computer power. Lets you program up to 4 channels for simultaneous output using options from LKB's range of potentiometric recorders. Buffer storage for 3 spectra during print-out.



RAPID SPECTRAL DETECTOR - OPTICAL UNIT.
Optimized light source, flow cell geometry and the array of
256 photodiodes capture all UV spectra in only 12.5 milliseconds.

manipulate and present data productivity and ease of use

IBM (PC, XT, AT)
COMPUTER



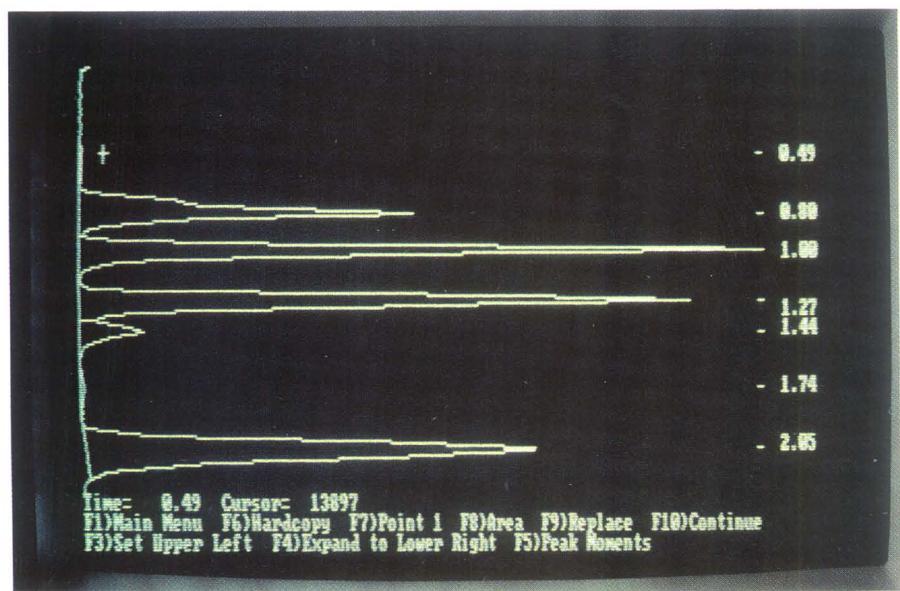
INK-JET PRINTER-PLOTTER
for automatic screen dumping to
full-colour hard copy.

Powerful wavescan software

Highly advanced chromatography software adds extra power to your computer based diode array detection system. Designed for the PC, XT, AT or any IBM compatible, Wavescan programs use a simple menu technique. Written for chemists, this versatile software can be learnt in minutes, is very easy to use and gives fast results. With access to multiple display formats, you'll now get considerably more information regarding sample identity and purity. The need for reruns is eliminated, and your total analysis time dramatically reduced.



ACCURATE PEAK INTEGRATION



Many diode array detection systems have conventional integration routines, which provide peak area measurement and quantification of sample amount. These methods however need time consuming, pre-run parameter definition, and cannot anticipate any unexpected deviation during the run.

Unlike other systems, Wavescan together with Nelson Analytical's Chromatography Software and the Rapid Spectral Detector let you select optimum integration parameters *after* the run. Regardless of sample type and run conditions, you can therefore achieve extremely accurate peak integration, without affecting original raw data.

The following features are included:

- Creation and editing of various integration methods, such as: area %, normalized area %, external or internal standards.
- Re-integration from stored raw data.
- Single or multiple point calibration.

automates routine quality control

- *Simultaneous comparison of up to 8 chromatograms.*
- *Calculation of ratio and difference between two chromatograms.*
- *Automatic update of calibration files from a calibration run.*

Your existing chromatography system (or LKB's autointelligent HPLC) can now be completely automated for maximum QC productivity. Wavescan offers you a unique post-run software processing capability. Detecting impurities at an unforeseen wavelength can now be done faster and more reliably.

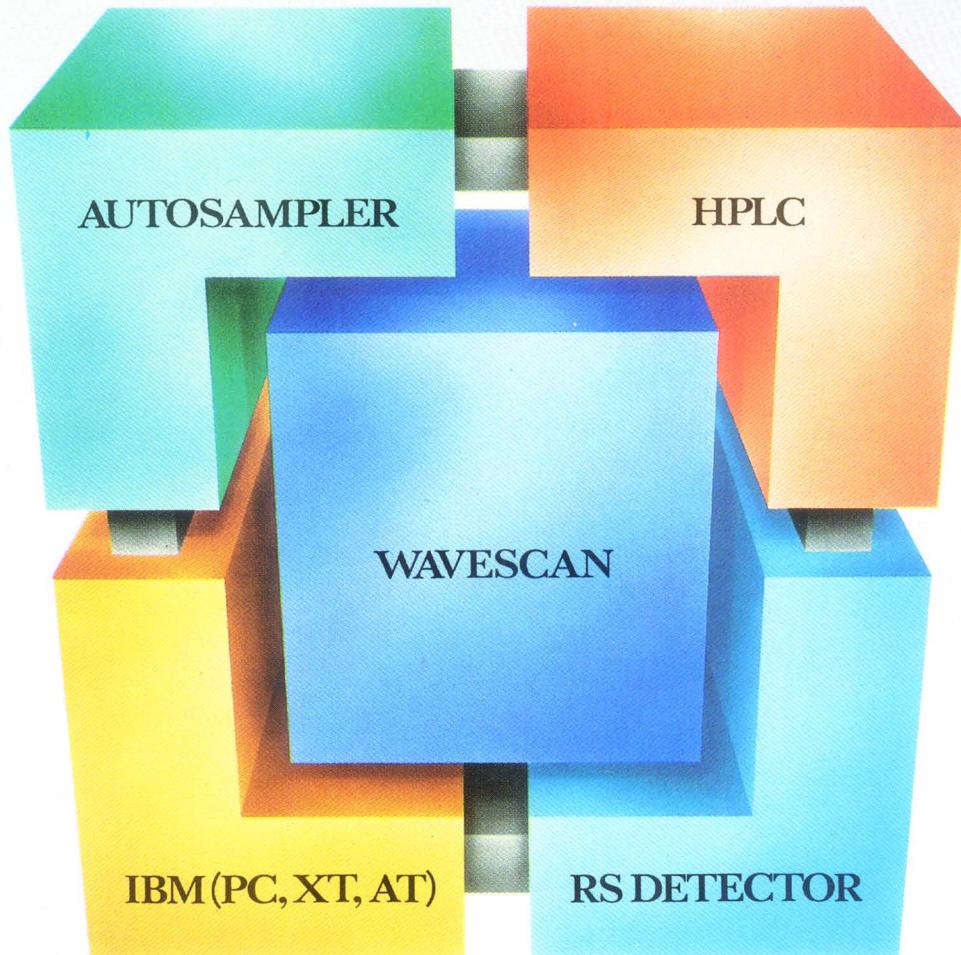
The hard disc storage of an IBM XT or AT personal computer exploits the enormous mass of spectro-chromatographic data transmitted from the Rapid Spectral Detector. Now the

powerful flexibility of Wavescan software enables you to set up totally unattended operation of routine analysis.

The increase in throughput, reliability and simplicity gives you an analytical follow-through no other system offers—a post-run processing power for authentic peak purity control and positive component identification.

Wavescan features:

- *Customized detection parameters for each particular sample type.*
- *Maximum 4000 spectra in one run.*
- *Wide choice of hard disc options for increased storage capacity.*
- *Automatic calibration between runs.*
- *Complete system control from an HPLC controller or external source.*



Technical Specification

<i>Wavelength range</i>	190–370 nm
<i>Accuracy</i>	± 0.9 nm
<i>Min bandwidth</i>	4 nm
<i>Max bandwidth</i>	180 nm
<i>Integration time</i>	0.2–10 s
<i>Noise</i>	3×10^{-4} AU (235 nm, 1 s integration time)
<i>Drift</i>	$< 3 \times 10^{-4}$ AU/h (235 nm)
<i>Thermal drift</i>	$< 5 \times 10^{-4}$ AU/ $^{\circ}$ C (235 nm)
<i>Recorder output</i>	Four programmable channels via optional 2140–110. Each channel can output 1) Chromatogram with variable bandwidth 2) Spectrum 3) Spectral Suppression 4) Logarithmic absorbance ratio

Data communication

Modified RS 232C interface for communication with IBM Personal Computer or IBM Personal Computer XT for post run evaluation. Baudrate 9600.

Flowcell

5 μ l volume
5 mm pathlength

Operating temperature

0–40 $^{\circ}$ C

Mains requirements

100, 115, 120, 220 or 240 V AC

Power consumption

150 W

Dimensions (W×D×H)

Optical unit: 370×370×160 mm

Data unit: 370×310×160 mm

Net weight

13 kg

Ordering Information

- 2140–011 Rapid Spectral Detector, optical and data units.
Complete with flowcell, lamp, mains and interconnecting cables. For 115 V, 50/60 Hz.
2140–012 Rapid Spectral Detector. As 2140–011 but for 220 V, 50/60 Hz.

Optional accessories

- 2140–100 Interface cable to IBM Personal Computer or IBM Personal Computer XT.
2140–110 D/A interface for output to potentiometric recorders or computing integrator.

- 2140–202 WAVESCAN software for acquisition, storage and postrun evaluation of spectral data on an IBM PC.
2140–250 WAVESCAN software for acquisition, storage and postrun evaluation of spectral data for IBM PC/XT.
2145–200 Chromatography Software for integration of chromatographic data on an IBM PC or IBM PC/XT.
2140–145 WAVESCAN Arealink. A software interface between 2140–202/250 WAVESCAN and 2145–200 Chromatography software.
2140–400 Deuterium lamp, complete with connecting leads.



THE INCENTIVE GROUP

CIRCLE 132 ON READER SERVICE CARD

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Over 60 qualified representatives throughout the world.

