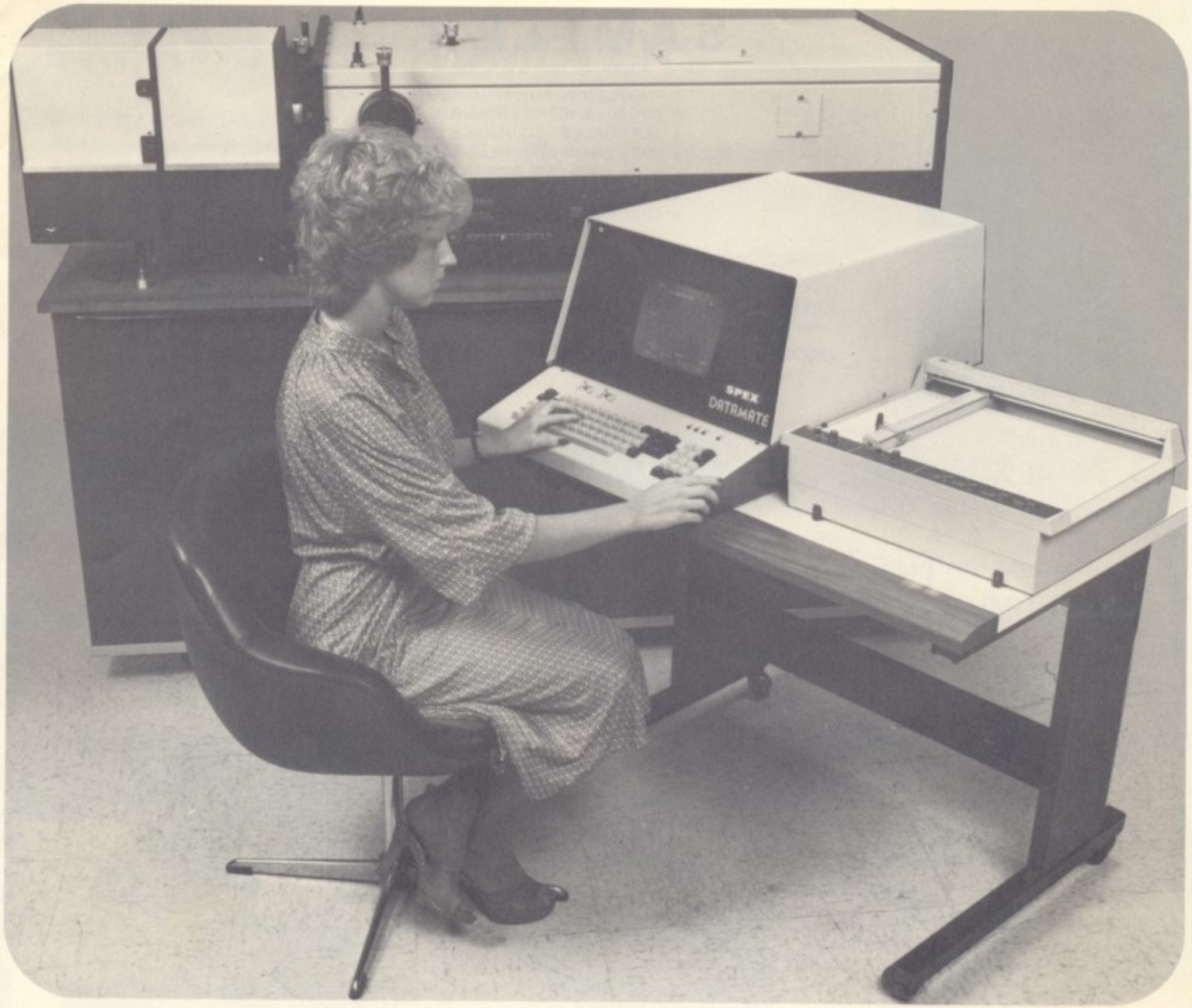


PARAMETER

START POS | INC/ RATE | REP SCAN | LASER LINE | SHUT HI | RECORD ON | MARKER ON | REMOTE

END POS | DWELL TIME | SCAN DELAY | | SHUT LOW | RECORD SCALE | MARKER PERIOD |

POSITION

ADJUST

REV FWD

7 8 9

4 5 6

MODE

CONT | BURST | | CNFG | CA

COMMAND

SCAN | TRIG SCAN | SET | PAUSE | HALT

EXAM | CLEAR | ENTER

Spextrometer Sampler

SPEX INDUSTRIES, INC./BOX 798/METUCHEN, N. J. 08840/☎ (201) 549-7144

SAMPLER OF SPEX

95

- WAVELENGTH OR WAVENUMBER READOUT
- FOCAL LENGTHS FROM 0.22 TO 1.26m
- ULTRAVIOLET TO VISIBLE TO INFRARED
- SPEX COMPUDRIVE DIGITAL DRIVE
- SINGLE AND DOUBLE MODELS
- EVACUABLE MODELS • SCANNING MODELS
- SPECTROGRAPH

CZERNY-TURNER MOUNT: minimizes astigmatism, coma, and spherical aberrations

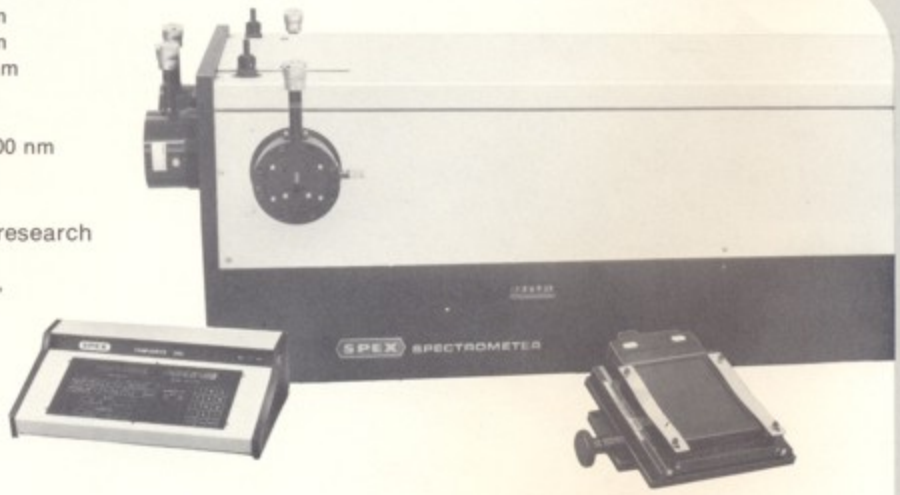
KINEMATIC GRATINGS: make life a bit easier when changing your mind or experiment

MODULAR CONSTRUCTION: provides versatility and updatability. We build out obsolescence.

1269

1.26-m SCANNING CZERNY-TURNER SPECTROMETER, f/9

for OPTIMUM		
	ACCURACY	0.05 nm
	REPEATABILITY	0.01 nm
	RESOLUTION	0.001 nm
	THROUGHPUT	
	VERSATILITY	
	RANGE	175-1500 nm



This 1269 is truly today's precision, research spectrometer, combining accuracy, repeatability, resolution, throughput, modularity,and compatibility with digital data processing accessories. A unique drive mechanism provides extremely small motor steps, very low scanning speeds, and the related performance advantages for a gamut of applications. And readout to thousandths of a nanometer is available

You can attain high-order, high resolution with an echelle grating. In-line and right-angle mounts for both entrance and exit slits make setups convenient even for an awkward sample or running two experiments consecutively. Or you can replace an exit slit with a camera (4" x 5" film/plate or Polaroid), polychromator, vidicon device, or silicon array.

Focal Length	1.26 m
Aperture	f/9
Spectral Range,	175-1500 nm (range can be extended to far IR with appropriate coarse gratings)

Practical Resolution **Gratings** (in kinematic mount)
85 000 at 579.1 nm Order 1 with 102 x 102 mm ruled area
95 000 at 579.1 nm Order 1 with 102 x 128 mm
95 000 at 579.1 nm Order 1 with 102 x 140 mm (holographic)
400 000 at 435.8 nm Order 13 with 102 x 156 nm (316 gr/mm echelle)

Scattered Light at 10 nm from 632.8 nm	10^{-6}
Dispersion	~0.65 nm/mm
Photographic Coverage	~70 mm
Wavelength Accuracy	±0.05 nm
Wavelength Precision	±0.01 nm
Wavelength Readout	0.01 nm on 5-digit mechanical counter

UVISIR® SPEXTROMETERS

SPECIFICATIONS

Performance characteristics are cast in terms of a 1200 groove/mm grating set to the first order and assume that the ambient temperature is maintained to ±0.5°C. All specifications are subject to change without notice.

ABOUT OUR PERSONNEL and POLICY

Our sales and service people are scientists serving scientists. They thrive on rising to challenges for technical information. Please ask for detailed specifications and data relative to your own work. Or perhaps you'd like to know what we've learned about scattered light. We'll be glad to tell you almost all we know.

1700 SERIES

3/4 or 1-meter CZERNY-TURNER SPECTROMETERS

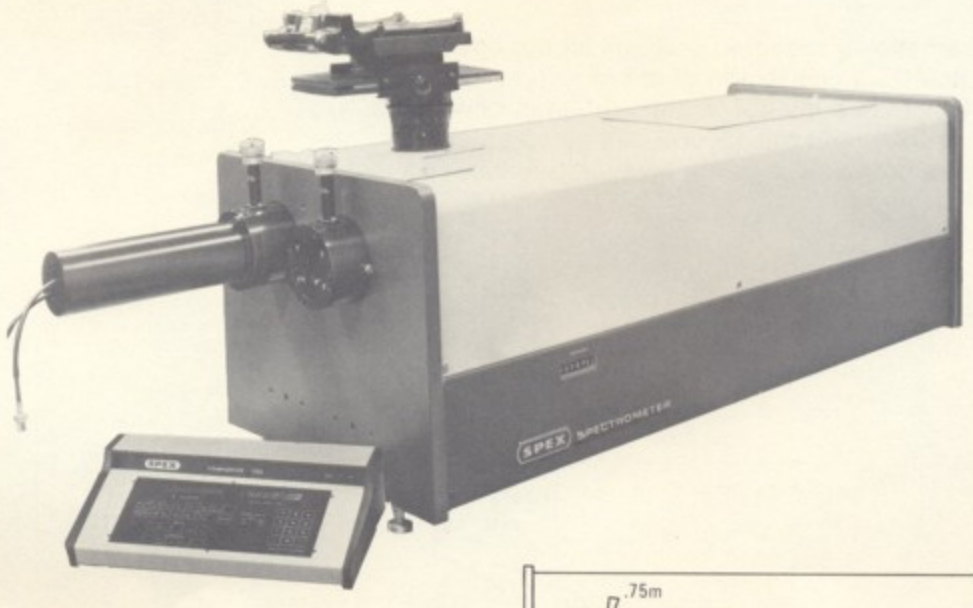
YOUR CHOICE of FOUR MODELS with unmatched dependability, scanning *nm* or *wavenumbers* since the early 60's in over 10^3 laboratories worldwide.

MODEL	FOCAL LENGTH	APERTURE*	SPECTRAL RANGE*	RESOLUTION*	DISPERSION*
1701	0.75m	f/7	25,000-10,000 cm^{-1}	1 cm^{-1} (a)	44 cm^{-1}/mm (b)
1702	0.75m	f/7	175-1,500 nm	0.01 nm	1.1 nm/mm
1703	1.0m	f/9	25,000-10,000 cm^{-1}	0.8 cm^{-1} (a)	32 cm^{-1}/mm (b)
1704	1.0m	f/9	175-1,500 nm	0.008 nm	0.8 nm/mm

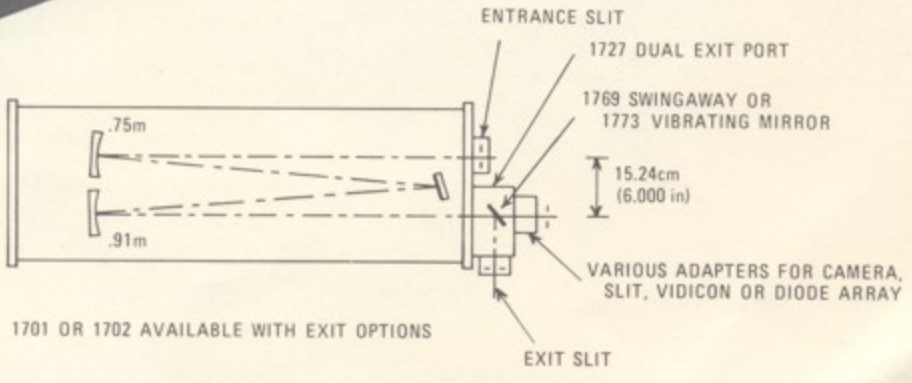
*with 102 x 102 mm grating

(a) at 15,969 cm^{-1} in 2nd order

(b) at 20,000 cm^{-1}



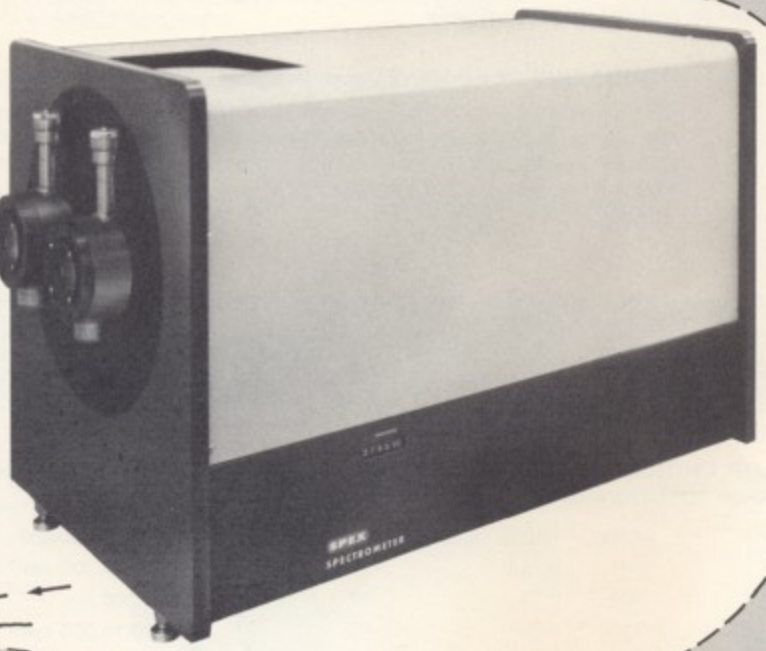
- HIGH PRECISION OPTICS AND MECHANICS
- UP TO 20 TIMES HIGHER SPEED THAN CONVENTIONAL SPECTROGRAPHS
- STEPS NIMBLY FROM UV TO FAR IR, PERFORMING AS MONOCHROMATOR, SPECTROMETER OR SPECTROGRAPH

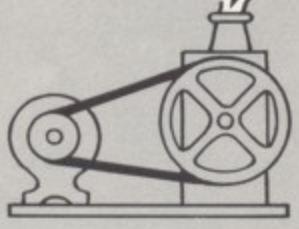


1701 OR 1702 AVAILABLE WITH EXIT OPTIONS

1500SP 0.75-m EVACUABLE SPECTROMETER

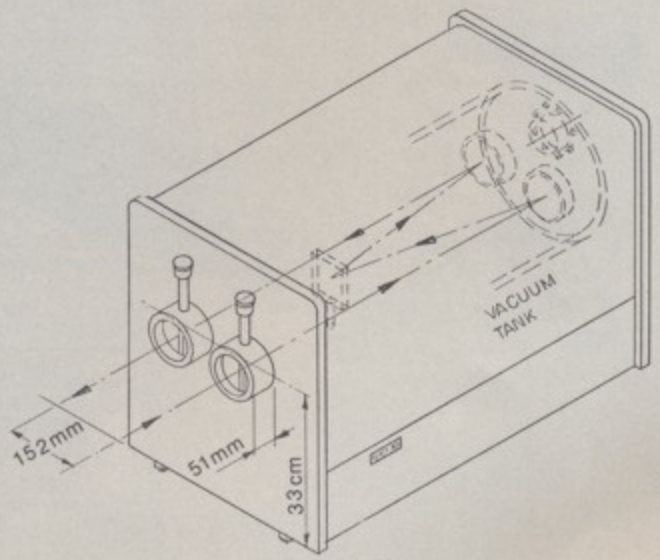
Already combining the utmost in accuracy, resolution and throughput, the 1500SP has the evacuable feature (ultimate vacuum 10^{-5} Torr) that provides operation over the broad region from about 110 nm in the VUV and up through the FIR. Straight (1511S) or curved (1511C) slits extend the range of applications and are 50 mm tall to extract full radiant power from sources. Gas flow is through the slit jaws only, so source and spectrometer can be operated without a window separator.





Kinematically mounted gratings let the operator switch from one region of the spectrum to another in less than a minute (excluding pump-down time, of course). And the 1500SP can be operated as a monochromator, a scanning spectrometer, or a fast spectrograph.

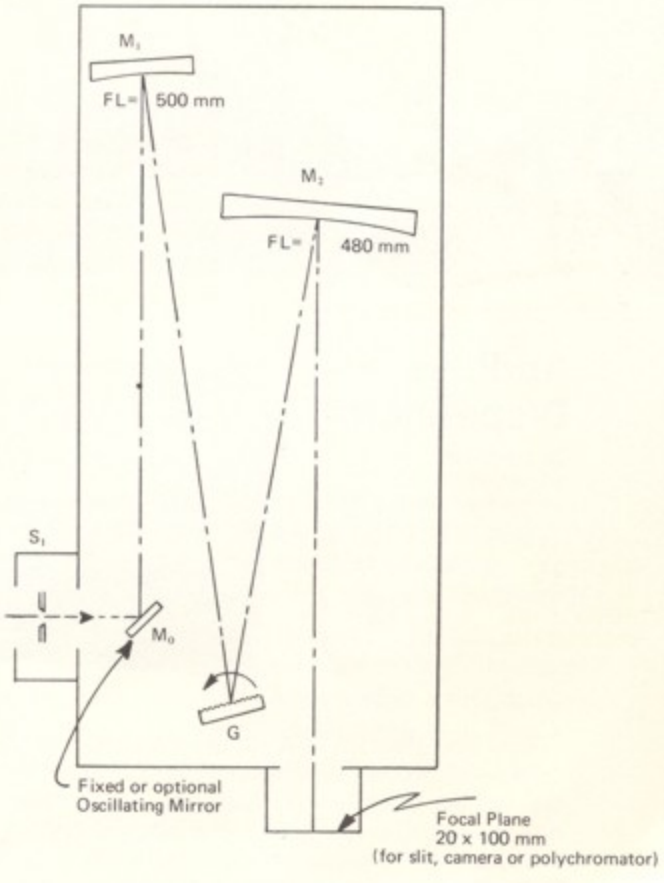
FOCAL LENGTH	0.75m
APERTURE	f/6.8
SPECTRAL RANGE	110-1500 nm
RESOLUTION	0.01 nm
DISPERSION	1.1 nm/mm



1870 0.5-m Czerny-Turner Spectrograph

FOCAL LENGTH	0.5 m
APERTURE	f/6.9 (64x64 mm grating)
	f/8.6 (50x50 mm grating)
SPECTRAL RANGE	175-1,280 nm
RESOLUTION	0.025 nm
DISPERSION	1.6 nm/mm

This multi-talented instrument not only incorporates an aberration-canceling optical layout but also provides a 90° angle between exit and entrance ports to make room for bulky experimental apparatus. Ideal for measurements in the UV through far IR, the 1870 becomes a scanning spectrometer with the addition of the 1872 Minidrive. Select a grating of 50x50 mm for unvignetted photographic spectra, or 64x64 mm for higher photo-electric speed. There's also a longer focal length mirror option for Vidicon, and a vibrating mirror assembly.



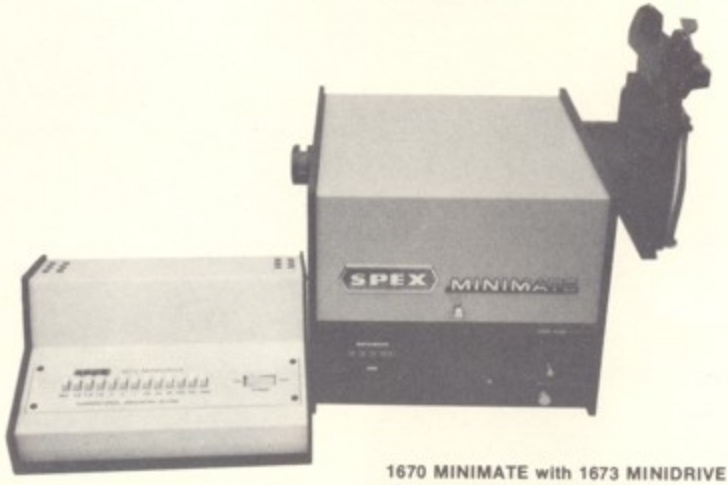
1670 MINIMATE

BUILDING-BLOCK UNIT FOR ASSEMBLING YOUR OWN

- SPECTROFLUOROMETER
- SPECTROPHOTOMETER
- "IMAGINOMETER"

The MINIMATE is a compact monochromator for general-purpose laboratory applications where high-intensity, spectrally pure radiation may be sought, anywhere between 175 nm and 40μm. Easily mated to a larger monochromator as a predispersor, the MINIMATE minimizes light scattering and problems with overlapping orders. And the distance between the mirrors in the basic Czerny-Turner mount eradicates rediffracted light, optimizing spectral purity.

focal length	220 mm
aperture	f/4
spectral range	175-1000 nm
dispersion	4 nm/mm 1672S, 1670
	2 nm/mm 1672



1670 MINIMATE with 1673 MINIDRIVE stepper-motor control, and 1674 CAMERA ADAPTER holding 1628 POLAROID FILM BACK

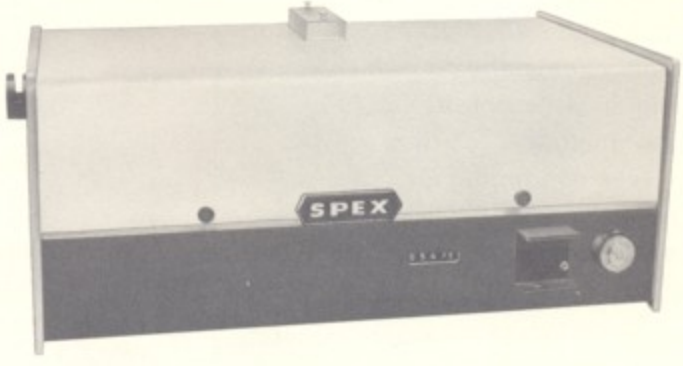
1672 DOUBLEMATE OR 1672S DOUBLEMATE

1672: for double-powered stray light reduction

1672S: for double-powered stray light reduction

Additive Dispersion

for maximum resolution or luminosity



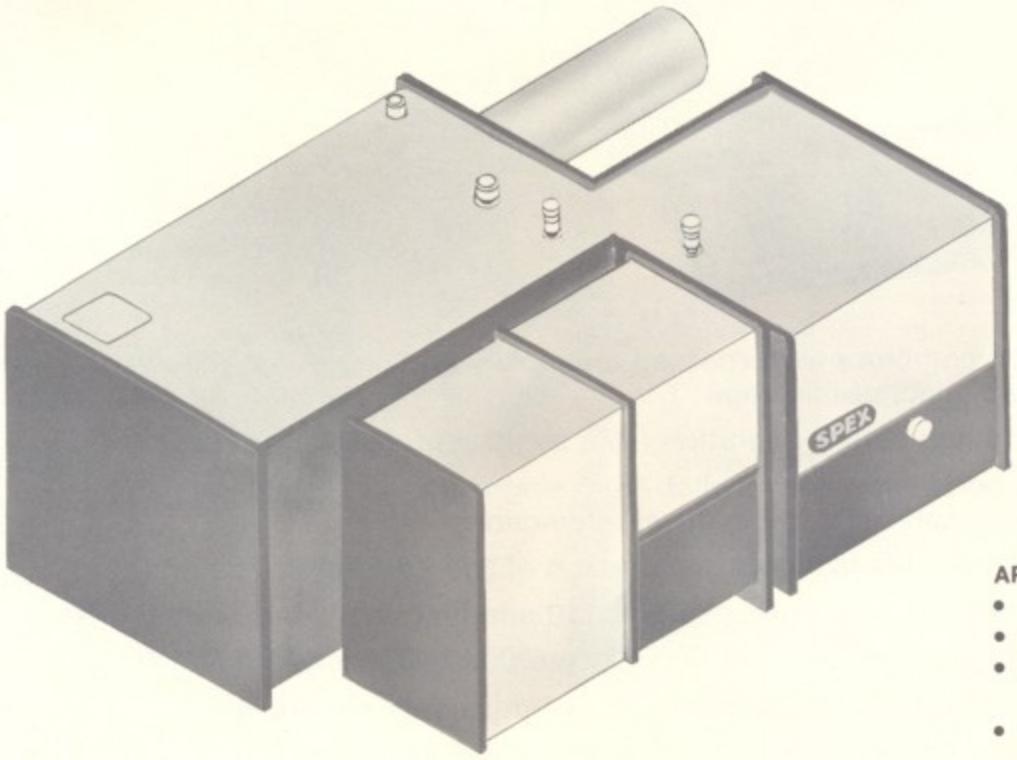
Subtractive Dispersion

for homogenized spectrum

The Doublemate is a unitized version of the "tandemized" Minimate monochromator system. As such, it maintains the same fast optical speed and excellent scattered light characteristics while providing greater accuracy. Light dispersed in the first monochromator is again dispersed in the second, slashing 10^{-5} stray light to 10^{-10}. Good cause for double monochromators to have become commonplace wherever small signals are measured in the presence of large backgrounds.

1877 TRIPLEMATE

- Optically fast • Inexpensive • Rugged Triple Spectrograph
- Operates from 185 nm through 1000 nm
- Provides utmost versatility with 150 to 3600 gr/mm turreted gratings
- Accepts cooled or uncooled vidicons and solid state arrays as well as photographic plates and Polaroid film
- Counter, in spectrograph stage, reads central wavelength of selected gratings; no need to compensate for spectral order or grating ruling constant



APPLICATIONS

- Raman spectroscopy
- Spectrofluorescence
- Micro optical emission analysis
- Kinetic studies

This 3-element spectrograph system, intended for multi-channel optical detectors, consists of a modified Czerny-Turner type, zero dispersion, double monochromator acting as a filter followed by a modified Czerny-Turner spectrograph. SPEX TRIPLEMATE combines excellent stray light properties with two essential additional features—conveniently variable dispersion at the focal plane and uniform illumination in a wide, flat, unvignetted focal plane.

The filter (first stage) is based on the design of the high performance SPEX 1403/1404 double monochromator with the first monochromator defining the system bandpass. The second monochromator is coupled in a subtractive dispersion mode, resulting in zero dispersion at the entrance slit of the spectrograph. Careful matching of focal length ratios of the filter stage and spectrograph mirrors minimizes vignetting and aberrations, and provides f/number matching.

The TRIPLEMATE achieves a relatively uniform intensity function over 25 mm of focal plane at an aperture of approximately f/6.3.

1403 WAVENUMBER DRIVE 1404 WAVELENGTH DRIVE 0.85m, f/7.8 DOUBLE SPECTROMETERS

Mixing or matching, you'll find the 1403 or 1404 modular-based systems one step ahead of the state of the art.

Be suspicious, be convinced. Send your problem sample, or better yet, bring yourself and sample to our Applications Laboratory for a demonstration and a few hours of shop talk that may advance your research program by months. Just try to give us a couple of weeks notice so we can keep everyone on schedule.

- ▶ Novel optical design combines unsurpassed luminosity and stray-light rejection, high resolution and broad spectral coverage
- ▶ Interchangeable gratings permit operation from UV through far IR
- ▶ Side and front exit ports allow easy switch from single channel (photomultiplier) to multichannel (photographic, TV, diode array) detection
- ▶ Side and front entrance slits facilitate comparison of two sources
- ▶ Choice of holographic or ruled gratings up to 110 mm high x 128 mm wide
- ▶ Thermostatting option offsets ambient temperature fluctuations
- ▶ Vibrating mirror attachment permits monitoring of transients and reactions
- ▶ Compatible with wide range of versatile, time-tested SPEXessories

TYPICAL APPLICATIONS

- ▷ Raman and other frequency-shifted scattering
- ▷ Production control of narrow-band interference filters
- ▷ High-resolution luminescence (excitation and emission)
- ▷ Exacting radiometry
- ▷ Inductively coupled plasma analysis for vanishingly low traces

	Model 1403	Model 1404
110 x 110 mm holographic gratings, 1800 groove/mm, set to order 1.		
Spectral Purity, I/I_0	$<10^{-14}$ at $>\Delta 20$ cm^{-1}	$<10^{-14}$ at $>\Delta 0.5$nm
With 514.5 nm Ar^+ laser source, bandpass 0.25 cm^{-1} (0.008 nm).		
Spectral Coverage	31000-11000 cm^{-1}	175-1040 nm
Dispersion at 514.5 nm	10 cm^{-1}/mm	.275 nm/mm
Resolution, Hg 579.1 nm (FWHM)	0.15 cm^{-1}	0.005 nm
Readout, 5 digits	cm^{-1} and Δcm^{-1}	nm
Accuracy	± 1 over 10000 cm^{-1}	± 0.1 over 500 nm
Repeatability	± 0.2 cm^{-1}	± 0.03 nm

RAMAN ILLUMINATOR

Companion to our Double Spectrometers

to optimize scattering experiments with gases, liquids, solids. A chamber for all reasons, whether single crystal or bulky furnace or dewar; visible or UV optics.

CONVENIENCE SPEXESSORIES

these catalog items are optional

PHOTOMULTIPLIER TUBES & HOUSINGS

THERMOELECTRIC CRYOSTATS

RAMAN ILLUMINATORS

RAPID SCAN ACCESSORIES

PHOTOMULTIPLIER PROTECTOR

PHOTODIODE ARRAY AND VIDICON ADAPTERS

THE THIRD MONOCHROMATOR

CD2 COMPUDRIVE

PERISCOPE VIEWER

DM1 DATAMATE

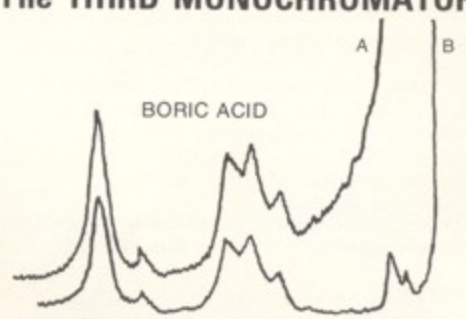
IR DETECTOR & HOUSING

SC32 SCAMP

CAMERAS AND ADAPTERS

a scanning spectrograph attached to the exit slit of a Spex double spectrometer

The THIRD MONOCHROMATOR



"B" with THIRD MONOCHROMATOR
"A" without THIRD MONOCHROMATOR

DM1 DATAMATE MICROPROCESSED SPECTROMETER CONTROLLER/ DATA ACQUISITION PROCESSOR

The SPEX DATAMATE is a fully integrated computer system for both routine and research applications in most areas of optical spectroscopy such as:

Absorption Fluorometric

Radiometry Phosphorimetric

Transmission Kinetic

Raman Differential

Through a full ASCII keyboard with alphanumeric-graphics CRT, the DATAMATE precisely controls any SPEX scanning spectrometer, based on state-of-the-art translator drive technology. In a multitude of different modes, DATAMATE synchronizes data acquisition to the spectrometer, accepting signals from one, two, or even four different detectors. High precision memory arrays greatly enhance the quality of spectrum acquisition, signal averaging and processing; prior to disk storage, hard copy output or transfer to other intelligent devices.

DATA ACQUISITION

- Memory for up to 16000 high precision data points (precision 1 part in 16,000,000)
- One to four data inputs, PC or DC
- Real-time arithmetic combination of detector inputs, e.g. ratios and differences
- On-line data processing with real time:
  - — integration
  - — logs
  - — plotting with event marker
  - — zero suppress
  - — auto dark count subtraction
- Keyboard selection of photomultiplier voltages

DISPLAYS

- Full alpha-numeric CRT displays all operating parameters:
  - — spectrometer position (wavelength/wavenumber)
  - — detector power supply voltages
  - — laser line, delta wavenumbers, and shutter control for Raman
  - — individual and combined detector readings updated continuously
  - — scanning, plotting and recording parameters
- Graphic display of two overlaid spectra with:
  - — two cursors
  - — instant x, y expansion
  - — labelled axes
  - — file labeling

SPECTROMETER

- Keyboard scan control of all SPEX spectrometers
- Unique translator drive for the best step resolution
- SET command automatically slews to a particular position
- Touch control for manual spectrometer positioning
- Multiscan up to four spectral regions
- Five scan modes: continuous, timed burst, or three trigger-burst modes
- Shutter control and drive-limit protection
- Control and synchronization of optical choppers and rotating sample holders.

DATA PROCESSING

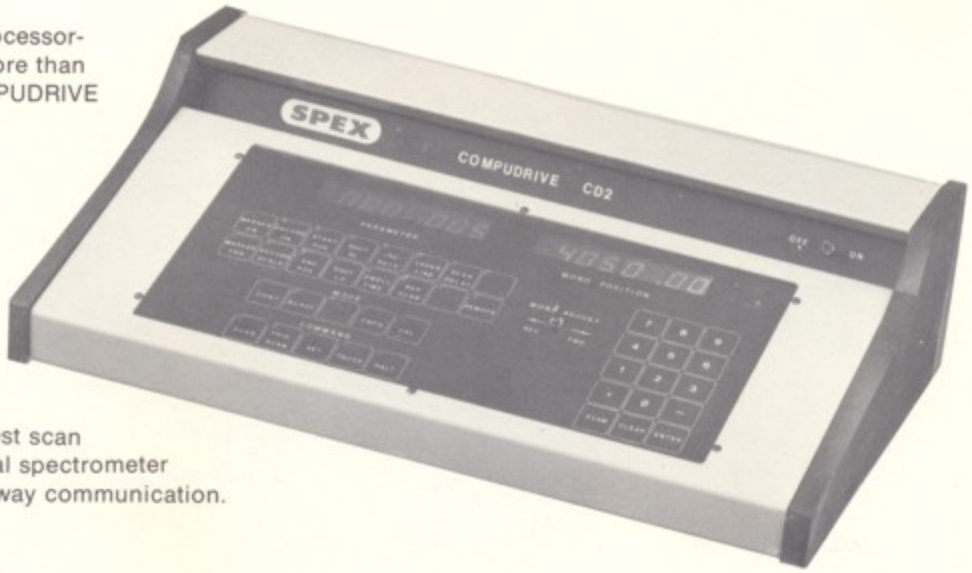
- Radiometric correction program
- A full complement of data manipulations:
  - — variable-point smoothing and derivatives (Savitsky-Golay)
  - — integration and peak areas
  - — log/antilog
  - — spectral combination (+, −, ×, ÷)
  - — peak/valley location
- Multitasking to plot/manipulate files *while* you scan and collect new data

DATA OUTPUT

- Prompting messages provide a built-in instruction manual
- Data-file management and display of eight variable-length spectra files
- Bulk storage on dual floppy disk
- Choice of permanent records:
  - — coupled Y-t recorder
  - — X-Y recorder
  - — CRT hard copier
- RS 232 interface

CD2 COMPUDRIVE MICROPROCESSED SCAN CONTROLLER

The COMPUDRIVE CD2 microprocessor-based scan controller is much more than a successor to our original COMPUDRIVE digital scanning drive system—a previous landmark in optical spectrometry. CD2 puts the reins for both the SPEX spectrometer and its slaved recorder into your hands along with also-handy tie-lines to a computer and other digital peripherals. In short: COMPUDRIVE CD2 provides the smallest step sizes and the greatest scan speed selection of any commercial spectrometer driver through key-activated two-way communication.



- Controls *any* new SPEX scanning spectrometer
- Calibrates for *any* grating, in *any* spectral order
- Unique Translator-drive system provides smallest available step sizes and widest selection of scan speeds
- 8-character LED display of scan parameters and prompting messages
- Continuous LED display of spectrometer position in nm, A, cm^{-1} or delta cm^{-1}
- Touch control for bi-directional manual drive
- SET command rapidly slews to a chosen position
- Multi-scan modes: continuous, burst, externally triggered
- Repetitive scanning with settable delays between scans
- PMT protection or auxilliary control for any designated spectral range
- Scan limit protection
- Self diagnostics
- BCD output of spectrometer position
- Trigger input starts a scan or ends dwell time (burst mode)
- TTL outputs report scan start, spectrometer movement, dwell period, and scan end for control of external devices.
- TTL outputs slave a SPEX recorder and its marker pen
- Optional RS 232 interface

Scan Parameters: Scanning in Continuous, Burst, or Triggered modes, between selected limits. Burst dwell from 0.01 to 10^8 seconds, or through external trigger. Burst increments from 0.01 to 10^5 scan units (nm, etc). Repeat up to 999 times, delays 0 to 10^8 seconds between repetitions.

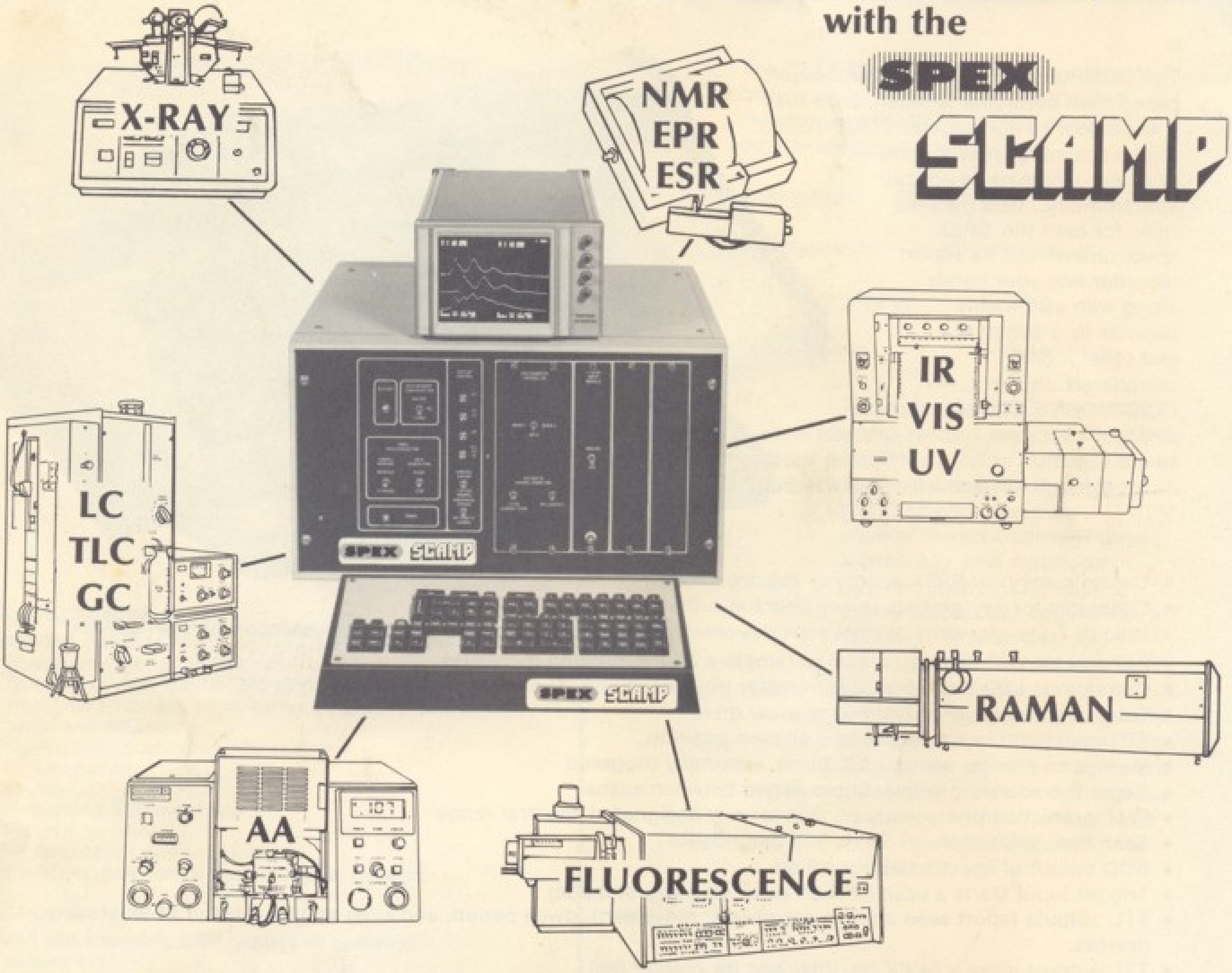
SCAN RATES

(actual rates are a function of individual spectrometer and gratings)

Instrument		Step Resolution	Continuous Scan Rates	
			Normal (Unramped)	HiSpeed (Ramped)*
1269	(1)	0.0002 nm	0.0002-0.8 nm/s	0.8-7.2 nm/s
1403	(2)	0.0025 cm^{-1}	0.0025-10 cm^{-1}/s	10-90 cm^{-1}/s
1404	(1)	0.00025 nm	0.00025-1 nm/s	1-9 nm/s
1701, 1703	(1)	0.0025 cm^{-1}	0.0025-10 cm^{-1}/s	10-90 cm^{-1}/s
1702, 1704	(1)	0.00025 nm	0.00025-1 nm/s	1-9 nm/s
1870	(1)	0.000125 nm	0.000125-0.5 nm/s	0.5-4.5 nm/s

(1) Equipped with 1200 gr/mm grating, first order.
(2) Equipped with 1800 gr/mm grating, first order.
*Recorder drive is not coupled at these scan rates.

Transform your lab into a powerful, automated instrument system with the SPEX SCAMP



- full alphanumerics keyboard
- multi-spectra storage and display
- fourier transforms
- n-point smoothing
- statistical analysis
- peak/valley location
- integrals, derivatives
- combine and compare spectra
- annotated plotting
- external device control

Instant interfacing to ANY analytical instrument up to 4 analog or BCD inputs.

Keystroke routines make data reduction a snap— ....and you can string them together for custom processing.

SPEX

INDUSTRIES, INC.

P.O. BOX 798
METUCHEN, N. J. 08840

☎ (201) 549-7144

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