

System 8000 Gamma Spectrometer

Premium Performance at a Price You Can Afford

- MCA, bias supply, amplifier all in one package
- Easy installation and setup
- No slots or reserved memory required in the PC
- Includes 32-bit QuantumMCA™ software

The System 8000 is a complete spectrometer in a single integrated package. It is designed to make gamma spectroscopy easy. The System 8000 has configurations with 8000 or 16,000 channels of spectrum memory. Each has a 0 to ± 5 kV bias supply and an analog pulse processor with 2 μ s, 4 μ s, and 8 μ s shaping times. Both configurations of the System 8000 have onboard Ethernet and RS-232 interfaces to make connection to the PC or network easy.

High Performance for Gamma Applications

The System 8000 gamma spectrometer has been engineered to give optimum performance in a wide range of applications with HPGe and Si(Li) detectors. The three computer-selectable time constants offer choices for high throughput applications, standard operation, and highest possible resolution. The shaping amplifier features 8th order triangular and Gaussian filters for minimum series noise and optimum resolution. Automatic noise discriminators and a gated baseline restorer with rate-adaptive restoration give the ultimate in stability even at the highest count rates. To provide the best possible pile-up rejection, even at the lowest energies, the fast channel has adaptive time constants which ensure maximum possible sensitivity. This translates into the best possible performance from your detector system. Computer control of all hardware functions complements the power and flexibility of the system.

Analytical Software

For qualitative analysis, the System 8000 includes QuantumMCA™ software at no additional charge. For those applications that require quantitative analysis, PGT offers the optional QuantumGold™. This package features an intuitive, user-friendly interface. The main screen is not cluttered with buttons and controls. Tool tips allow frequently used functions to be quickly and easily identified.



A fast hardware setup routine using Cs137 eliminates the hassles of manually adjusting the coarse and fine gains. There are also default parameters for the peak search routine and other steps of the analysis process. So, getting reliable answers quickly is not a problem.

For the user who wants to control the analytical process, QuantumGold will still be a pleasure to use. The Tools Setup window allows the fine-tuning of parameters associated with the analytical calculations. Some of these controls include peak search sensitivity, line matching for library-based identification of isotopes, and ROI definitions. The efficiency calibration process is as simple as selecting energy lines associated with the various calibration standards, and then pressing one button. The efficiency curve is generated along with a theoretical model for the response of the detector.

The gamma activity report includes all information associated with the analysis. Likewise, each spectrum data file contains all information associated with the calibration that was in effect at the time of acquisition.

Computer and Network Connectivity

QuantumMCA has a single hardware setup and search utility that establishes communication with PGT multichannel analyzers via Ethernet or RS-232. Ethernet capability allows users to enjoy the benefits of connecting to laboratory instruments from PCs on the local area network. The RS-232 interface offers quick and simple connection of the System 8000 directly to a PC in the field or other location where Ethernet is not available; an unused COM port is all that is needed.

Available Configurations

System 8016 with:

- 16,000 channels of spectrum memory
- Pulse shaping constants: 2 μ s, 4 μ s, and 8 μ s
- 0 to ± 5 kV bias supply

System 8008 with:

- 8,000 channels of spectrum memory
- Pulse shaping constants: 2 μ s, 4 μ s, and 8 μ s
- 0 to ± 5 kV bias supply

System 8004 (for X-ray applications) with:

- 4,000 channels of spectrum memory
- Pulse shaping constants: 6 μ s, 12 μ s, and 24 μ s
- 0 to ± 1 kV bias supply

System 8000 Description

ADC

- 8.12 μ s successive approximation ADC (14-bit resolution)
- Discriminators (PC adjusted): upper (0 to 105% of full scale) and lower (<1% to 105% of full scale) in 0.03% increments
- Zero adjustment \pm 2% in increments of 5 ppm (PC adjusted)
- Maximum throughput: 70,000 cps

Non-linearity:

- Differential non-linearity: $< \pm 1\%$ over top 99% of range
- Integral non-linearity: $< \pm 0.05\%$ over top 99% of range

Spectrum memory

- System 8008: 250, 1000, 2000, 4000, 8000 channels
- System 8016: 250, 1000, 2000, 4000, 8000, 16000 channels
- System 8004: 250, 1000, 2000, 4000 channels (X-ray system)
- Maximum counts per channel: $2^{31} - 1$ (i.e. 2.1E9)

Digital Stabilizer

- Internal ADC zero and gain stabilization
- PC controlled time constants
- Balanced channel and ROI centroid modes
- Gain: \pm 3% range
- Zero: \pm 1.25% range

Multichannel Scaling

- Input rate: 5 MHz
- Dwell time: 10 ms to 2.1E7 seconds
- Dead-time: 3 μ s between passes and 3 μ s between channels
- Signal sources: internal SCA, any ROI, external input

Amplifier

- Gaussian and triangular shaping of unipolar pulses (PC selectable)
- Acceptable input: pos./neg. pulses (step or tail) with rise times of 10ns to 500ns and decay times from $< 50\mu$ s to ∞
- Input: single-ended (BNC) or differential (BNC) (PC selectable)
- Shaping constants (PC selectable): 2 μ s, 4 μ s or 8 μ s (Gamma systems) or 6 μ s, 12 μ s, or 24 μ s (X-ray systems)
- Pole-zero provided for DCR type preamplifiers
- Pole-zero adjustment assistant eliminates need for oscilloscope
- Gain: from 4X to 1300X (PC control)
- Coarse gain: 4X, 8X, 32X, 64X, 128X, 256X, 512X
- Fine gain: 1 to 2.55X in increments of 0.0007X
- Common mode rejection ratio: \geq 500 (typically \geq 1000)
- Temperature instability:
 - Gain: guaranteed $\leq \pm 50$ ppm/ $^{\circ}$ C, typical < 25 ppm/ $^{\circ}$ C, 0 to 50 $^{\circ}$ C
 - Offset: guaranteed $\leq \pm 10$ mV/ $^{\circ}$ C
- Noise: $\leq \pm 0.05\%$ (typical $\leq \pm 0.025\%$)
- Baseline restorer:
 - Slow channel: rate adaptive with automatic threshold
 - Fast channel with automatic threshold
- Live-time correction modes: simple busy, Lowes, Gedcke-Hale, external

Counting presets

- Real time
- Integral of all ROIs
- Gross ROI statistics
- Total system counts
- Live time
- Integral of selected ROIs
- Net ROI statistics
- Total SCA counts

Battery backup for

- Spectrum
- Setup parameters
- Clock memory

Computer Control

- Ethernet 10/100 base T
- RS-232 baud rates: 2400, 9600, 19200, 38400, 57600, 115200
- Max. number units connected to PC: 8

Bias Supply

- 0 to ± 5 KV in 5V increments (Gamma systems) or 0 to ± 1 KV (X-ray systems)
- External shutdown capability (positive-true or negative-true polarity)
- Ripple: 20mV peak-to-peak
- Temperature instability: $\leq \pm 0.01\%$ / $^{\circ}$ C, 0 to 50 $^{\circ}$ C
- Bias polarity: internally jumper selected

Front panel indicators

- LEDs for Acquire, Event, Serial Com, AUX I/O in-use, Power, Shaping-constant, Bias-on, Polarity, Fault, PUR, Ethernet link, 100 Mbps, Collision
- Dead time meter: 3-color LED array

Rear panel controls and connectors

- Power switch
- SHV female connector for detector bias
- 2.5mm power jack
- Fuse housing
- 9-pin D female preamplifier power connector
- 9-pin D male RS-232 connector
- 15-pin D female pulse reset preamplifier interface
- 25-pin D female connector for ROI output
- 15-pin D auxiliary I/O connector, including external input for alarm and/or auto-shutdown
- Ethernet interface connector (RJ-45)
- Pole-zero adjustment on/off
- Pole-zero oscilloscope monitor switch
- One potentiometer for PZ adjustment of each shaping time (3 total)
- Input from detector preamplifier (BNC)
- Differential input from detector preamplifier (BNC)
- Amplifier output (BNC)
- ADC input (BNC) 0-10V unipolar or bipolar pulse
- ADC gate input (BNC) (coin. / anti-coin. / off) CMOS/TTL
- Pile-up reject input (BNC) CMOS/TTL
- Amp busy input for ext. amp. live-time corr. (BNC) CMOS/TTL
- SCA output CMOS/TTL
- Peak detect output (BNC) CMOS/TTL
- ADC busy out (BNC) CMOS/TTL

Power requirements

- 10-18 VDC, 18 watts, external
- 12V with the universal AC power converter provided

Weight

- 7.25lb (3.30kg)

Dimensions

- 10.5in. (26.7cm) wide
- 12.5in. (31.8cm) deep
- 4.5in. (11.5cm) tall

Software

- 32-bit QuantumMCA compatible with Windows[®] 95/98/NT

Accessories

- QuantumGold™ software for quantitative analysis
 - High-purity germanium detectors
 - Liquid nitrogen automatic fill system
 - Selection of signal, interface, and detector bias cables
- Doc. Ctr. No. SYS80000313000mlk

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