Applications

- ***Geophysical, Uranium, Gas & Oil Exploration***
- ***Environmental:*** Lost Sources, Contamination
- ***Emergency Response:*** Nuclear Incident Response Teams
- ***Security:*** Customs, Military

RS-700 Carborne Gamma-Ray Spectrometer

Mobile Radiation Monitoring System

For Real-Time Search, Surveillance and Data Recording

Unique Features

- Full spectral data
- Built-in GPS receiver
- Audible and visual alarms (selectable thresholds)
- Ultra Compact
- Accepts multiple detectors - gamma and neutron
- Implements an Advanced Digital Spectrometer (ADS) or Multi-Channel Analyzer (MCA)
- Individual ADS for each detector
- Vehicle or airborne use
- Stand-alone (no local computer required) operation with internal data memory
- RadAssist software for user control, monitoring and recording
- Includes mapping displays with navigational position & definable radiation overlays (both breadcrumb and contour)
- Nuclide Identification
- Composite material detector case provides improved efficiency for the lower energies.

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AEGIS Instruments

Supplier of Geophysical Equipment to the Earth Science and Engineering Sectors

• RS-700 - In a class of it's own

The RS-700 is a self-contained gamma-ray and neutron (optional) radiation detection and monitoring system. It can be used in land vehicles, helicopters, UAVs or at a fixed location.

The system has a built-in GPS receiver to accurately locate each measurement. It is also supplied with the RadAssist survey software program for user control, monitoring and recording.

The system is flexible enough to permit real-time monitoring with a computer or operate in a stand alone configuration with the data being recorded internally and later retrieved. Alternatively, the data can be transmitted to a remote monitoring location.

The RS-700 utilizes advanced DSP / FPGA* technology and software techniques that provide laboratory levels of spectral performance that were previously unachievable on mobile platforms. Despite it's state-of-the-art technology, the RS-700 is extremely operator friendly and can be rapidly deployed. The system is also capable of unattended operation if required.

Transparent and automatic operation

The RS-700 with it's Advanced Digital Spectrometer (ADS) is a high resolution (1024 channel) gamma spectrometer that makes the measurement of both the naturally occurring and man made radioactive elements as transparent and automatic an operation as possible allowing the system to be operated by radiation non-specialists.

No test sources required for system stabilization

The RS-700 system uses multiple-peak gain stabilization using the naturally occurring isotopes of U, K and Th. Automatic spectral stabilization is achieved using advanced algorithms and the spectral signatures of these isotopes. The technique provides for a fast stabilization at start-up as well as maintaining stabilization during operation. This method applies regardless of the number of detectors.

*DSP = Digital Signal Processing
*FPGA = Field Programmable Gate Array

• Ease of use and operator friendly

The system is designed for minimal operator interaction and the RadAssist software provides a variety of monitoring displays indicating the radiation activity. A high level of self diagnostics and performance verification routines are implemented with automatic notification of any error conditions. With the multiple data verification methods implemented, the user is assured of the quality and accuracy of the data.

Key unique features

- **Accurate "the first time" technology**
  The advanced digital design using FPGA/DSP technology and signal processing provides a more stable operation, with less drift, producing a pure spectra that results in better data for you. In addition to the externally recorded data, the RS-700 series records internally the last 24 hours that can be easily retrieved if required.
- **Effectively no Dead-time** as each crystal has it's own A / D converter within it's own ADS.
- **1024 channel resolution** for any number of crystals at up to 10x per second.
- **Menu selectable** 1024, 512 or 256 channel output.
- **Individual crystal ADC and processing** resulting in improved pulse pile-up rejection, zero dead time, and a higher throughput.
- **Virtually no distortion,** each crystal output is fully linearized permitting multi-crystal summing without distortion.
- **Effectively no signal degradation** when summing an unlimited number of crystals - common on most current systems.
- **No radioactive test sources** required for system setup, or for system performance validation.
- **Extremely wide dynamic range** 250,000 cps for each crystal providing >20x improvement on signal throughput compared to older systems.
- **High level of self-diagnostics** with sophisticated error correction & reporting requiring less operator interaction.
- **Fully multi-peak automatic gain stabilization** on natural isotopes for worldwide use.

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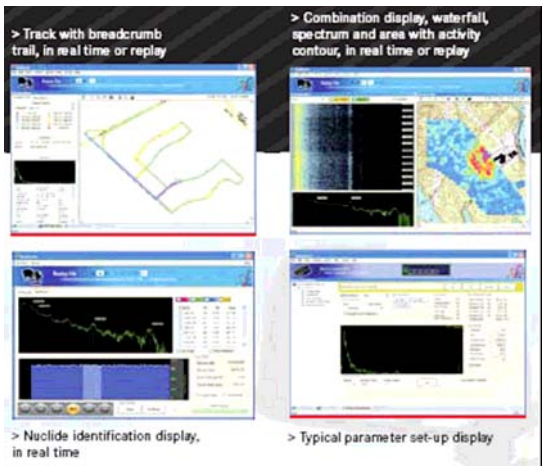


• RadAssist Software with mapping & Nuclide Identification features

RadAssist is a suite of utilities, running under Windows XP providing the user with control and monitoring capabilities. The software operates in real-time or in playback mode. Along with the functions above, the following outlines some of the additional features;

- **Set-up menus for operational parameters**
- **Display and Monitoring:**
  - 4 channel chart display with selectable items
  - Spectral waterfall excellent for highlighting
  - Navigation track with 'breadcrumb' trail
  - Contour plot
  - Mapping displays with selectable data overlays.
  - Nuclide identification
  - Alarm capability

• Advanced Digital Spectrometer (ADS)

The “heart” of the RS-700 system is the proprietary Advanced Digital Spectrometer (ADS) module. Each individual NaI crystal detector has it's own high speed (60 MHz) analog to digital converter and a DSP/FPGA processor assembly. This module converts the analog signal from the detector to a digital spectrum with a **1,000,000-channel** resolution. Using a unique detector energy calibration curve stored in the ADS module, the spectrum linearized and compressed to the system's native 1024 channel resolution.

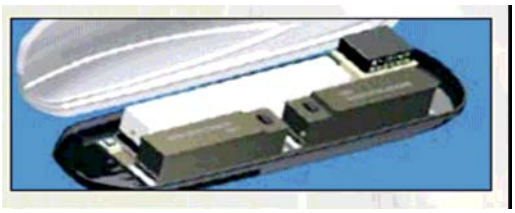
With high speed the adaptive DSP processing allows each pulse to be corrected if necessary without distortion at a very high data throughput rates - up to 250,000 cps / crystal detector. The combination of zero dead time, improved pulse pileup rejection, individual crystal linearization and accurate detector summation results in an exceptionally clean spectra.

This 1024 channel spectrum is unique in the industry as it is fully linearized, without changing the Poisson distribution performance. The exceptional advantage of this new proprietary process is that any number of individual detectors can be summed together with essentially no spectral degradation for subsequent data analysis.

This design permits essentially unlimited data throughput operation giving the system a very large dynamic range, often required in high count or special nuclear site surveillance situations.

• Detector technology for security and contraband applications

The RS-700 can also be configured with a single or dual model RSX-1 NaI gamma detector and a He tube array for neutron detection packaged in a vehicle roof-top carrier. Each gamma detector has its' own ADS and spectral summation of multiple detectors is performed without degradation or distortion.
The neutron detector utilizes techniques to eliminate 'noise' caused by vibration and high frequency EM interference.



Rapid detection and identification of radioactive materials are made more likely with the use of Sodium Iodide (NaI) detectors which provide improved sensitivity and nuclide identification capabilities than systems based upon plastic scintillators. The RS-700's sensitivity can be increased by readily adding up to three additional detectors and detection of Special Nuclear Materials (SNM) can be enhanced with the addition of the optional neutron detector.

Full multi-point linearization of the NaI crystal detector ensures uniform and accurate energy calibration allowing the peak detection and nuclide identification feature to be more reliable.

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Technical specifications

Spectrometer	
Channels	1024
Differential nonlinearity	<0.2% over top 99.5%
Integral nonlinearity	<0.01% over top 99.5%
Zero dead time	✓
Baseline restoration	Digital (IPBR) (2)
Pulse shaping	Digital (AOPS) (3)
Pile-up rejection	Digital (<40nS)
Pile-up contamination	<1% @ 250kcps
Sample rate	0.1-10 sec (1)
Timing	
Internal/External	
Gain stabilization	Automatic multi-peak
I/O	Ethernet
	RS-232 19200115200 bit/s
	USB memory stick
Outputs	
Composite spectrum	✓
Individual spectra	✓
State of health	✓
Inputs	
Detector configuration	✓
Operational parameters	✓
Trigger signal	✓
Calibration data	✓

Gamma Detector	
RSX-1	4L NaI(Tl)
RSX-3x3	0.4L NaI(Tl)
Energy resolution	<8.5% (4)
Neutron Detector	
Tube Size	2" x 32" active length ^{3} He
Tube pressure	2.7 atm (no transportation limits)
Moderator	Medium moderated for optimum performance
Power	
RSX-1 & RSX-3x3	9-40 VDC, 6 W
RS-701 Console	15 W
Weight	
RSX-1	22.7 kg (50 lb)
RSX-3x3	6.8 kg (15 lb)
RS-701 Console	6.8 kg (15 lb)
NSX- 4/4	27 kg (60 lb)
Rooftop Carrier	9 kg (20 lb)
Size	
RSX-1	731 mm x 162mm x 172mm (26.80in L x 6.4in W x 6.8in H)
RSX-3x3	381 mm x 101 mm x 101 mm (15in L x 4in W x 4in H)
NSX-4/4	1,176 mm x 177 mm x 177 mm (46.3in L x 7 in W x 7in H)
RS-701 Console	233 mm x 112 mm x 198 mm (9.2 in W x 4.4 in H x 7.8 in D)
Environmental	
Operating Temperature	-30° C to +45° C

Notes

(1) The RS-700 has no dead time in a traditional sense. A live time clock will be adjusted for loss of system-measured pile-up rejections to give an apparent dead time to ensure the absolute count rate is correct.

(2) IPBR - Individual Pulse Baseline Restoration. The baseline is established for each individual pulse for maximum pulse height accuracy.

(3) AOPS - Automatic Optimized Pulse Shaping. Pulses are continuously analyzed and the signal pulse shaping adjusted for optimum performance.

(4) Stated energy resolution is for new systems. Refurbished system performance depends on quality of Xtals supplied

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