RADIATION SOLUTIONS INC

RS-400 SERIES SECURITY RADIATION PORTAL MONITORING SYSTEMS

- Gamma and Gamma/Neutron systems for security applications
- Vehicle/Container monitoring suitable for both Dynamic "Free-Flow" and "Stop-at-Booth" operations
- Remote control and verification capability
- Uses advanced digital technologies for high reliability and performance
- NASVD analysis on spectral data permits Isotope classification and hi-quality NORM identification and rejection
- Remote troubleshooting of defective components enabling semi-skilled on-site module replacement for fast, cost-effective maintenance
- Automatic, continuous calibration ensures system performance is maximized
- Fully integrated with multiple imaging systems as required
- Extended "reach-back" support for alarm analysis and support

With unique "adapt to the application" engineering, RSI's RS-400 Series of Radiation Portal Monitoring Systems are designed specially for demanding security applications such as ports and border crossings.

HIGH PERFORMANCE, MINIMUM FALSE ALARMS.
RS-400 Series SECURITY

The RS-400 Series Security Radiation Portal Monitoring Systems are fully digital Gamma/Neutron systems specially designed for demanding security applications at ports and border crossings. These systems combine high performance with minimum false and nuisance alarms through advanced digital technology and spectral analysis.

RSI's unique NASVD (Noise Adjusted Singular Value Decomposition) analysis on the PVT spectral data provides high quality NORM identification and rejection therefore minimising the need for secondary inspections. These systems also use Isotope Classification providing the Supervisor and Reachback even more detailed information on radiation alarms.

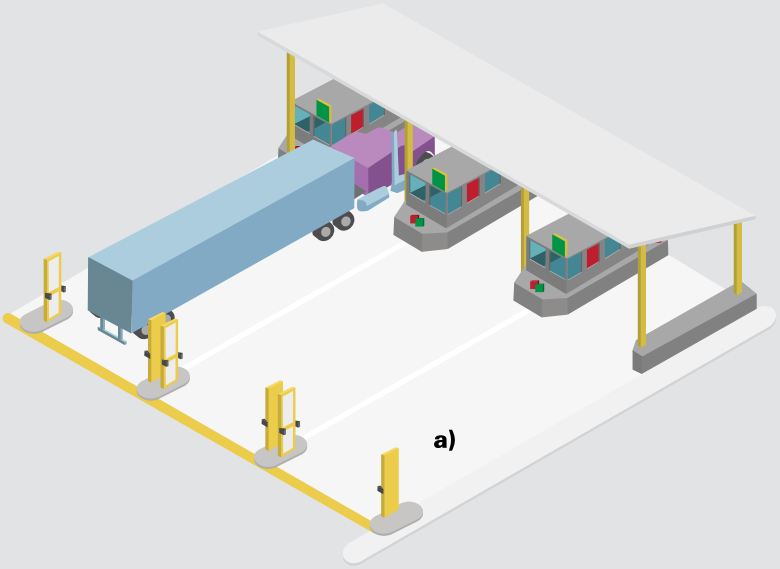
The modular design make the system easily configurable to suit even the most demanding application and at the same time permit fast maintenance for minimum downtime. Local user interaction can be by audio/visual annunciator or by touch-screen display and printer as required.

The Ethernet connectivity to user networks permit fully integrated system operation and supervisory overview on all installed systems. An additional Image Processing Unit handles up to four high quality cameras for positive identification of the vehicle/container and integrates the images with the radiation data.

These systems utilize advanced health monitoring and diagnostics to give the user the easiest to operate system possible including automatic verification and continuous tracking of detection performance. Each detector panel is self-sufficient and communicates via RS-485 to the controller with support for up to 14 detector panels.

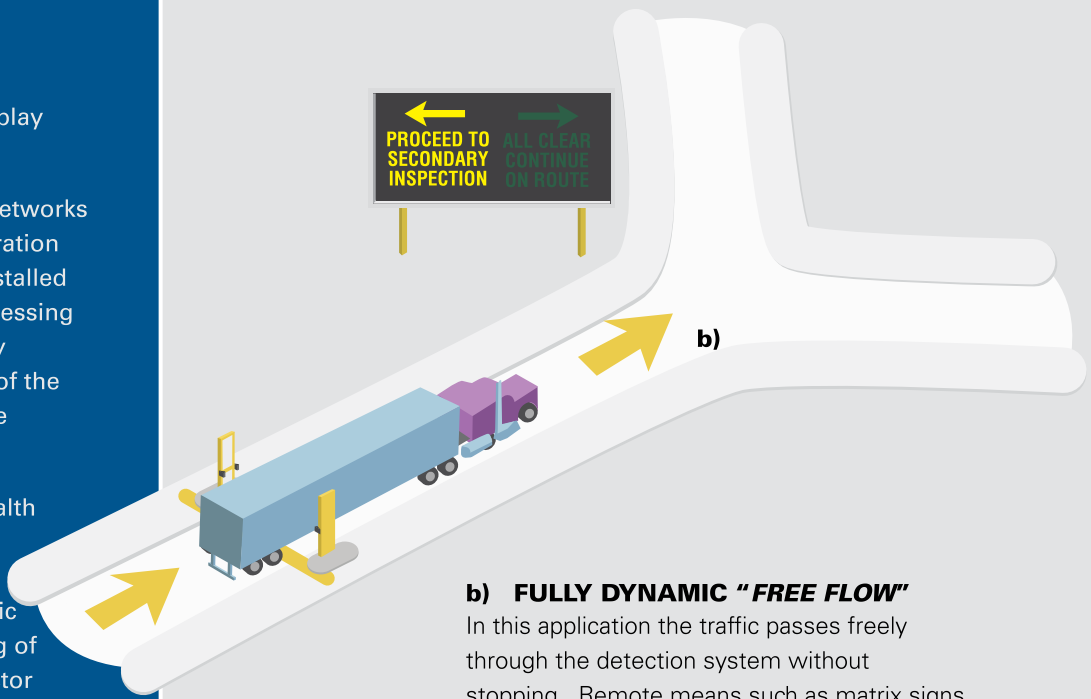
MODES OF OPERATION

STOP AT BOOTH vs FREE FLOW



a) *"STOP at BOOTH"*

Each incoming lane has a portal detection system and the vehicle passes through the portal then stops at the Customs booth. The Customs officer interacts with the driver should further instructions be needed such as diversion to secondary inspection for further assessment.



b) FULLY DYNAMIC *"FREE FLOW"*

In this application the traffic passes freely through the detection system without stopping. Remote means such as matrix signs advises the driver if it is necessary to go to secondary inspection for further assessment. Multiple cameras and advanced image capture are used to identify the vehicle remotely.

DETECTOR PANEL ENCLOSURE

RSI has developed an easy to open aluminium enclosure with an optimum thickness aluminium lid for high performance and long life with Ingress Protection Rating up to IP-66. A special latch system with key lock to prevent unauthorized access makes the enclosures very easy to open for any required maintenance. RSI has integrated special honeycomb thermal protection into the lid and all sides of the enclosure to ensure the automatic Gain stabilization can handle all extreme weather conditions.

The RS-400 Series Security Radiation Portal Monitoring System enclosures combine both Gamma and/or Neutron detection. The standard detector panels have integrated Steel shielding around the PVT for superior gamma detection performance, however, this performance can be further enhanced with lead shielding. Optional Fiberglass lids improve low energy performance or stainless steel enclosure are available on request.

MODULAR electronics units inside each detector enclosure:

- **SGN** module - 4096 channel PVT spectrometer with integrated coincidence noise suppression on all PMTs plus Neutron detection input.
- **VPM** - Vehicle Presence Module supporting up to optical sensors.
- **SIM** – Module to integrate data from SGN and VPM modules and interfaces via RS-485 to the system controller.

GAMMA DETECTION

The RS-400 Series Security Radiation Portal Monitoring Systems offer various sizes of high quality PVT scintillator. The RS-472 and RS-483 series uses RSI's standard 2.25" PVT with multiple 2" PMT's whereas the RS-492 series uses 4" PVT with multiple 3.5" PMT's for even better performance. All systems utilise RSI's proprietary automatic GAIN stabilization in each GAMMA module using natural isotopes in the local background. In addition the detection performance is monitored over time for each individual PMT in the system without the need for external (check) sources. Preventive maintenance can be scheduled before degradation starts affecting the required minimum sensitivity level.

- **RS-472** - 1512ci (24.8L) - 2.25" thick PVT scintillators with 4 x 2" PMTs
- **RS-483** - 2205ci (36.1L) - 2.25" thick PVT scintillators with 3 x 2" PMTs
- **RS-484** - 2205ci (36.1L) - 2.25" thick PVT scintillators with 4 x 2" PMTs
- **RS-492** - 3920ci (64.2L) - 4" thick PVT scintillators with 2 x 3.5" PMTs

NEUTRON DETECTION

The systems Neutron detection utilizes 2" diameter BF3 Neutron tubes as a standard. Typically these tubes with 72" active length are mounted in an HDPE flat moderator with a maximum space for 3 tubes. For the RS-472 systems 32" active length tubes are used. BF3 gas is considered toxic however the human health threat is mitigated by using low pressure gas and absorbents to capture the gas in case of leakage.

Other available options for Neutron detection are:

- **He3** - not commercially useable except in specialty applications or Upgrade applications using existing He3 tubes.
- **WSF** - Wave length Shifting Fibers is a new technology for Neutron detection. This technology is proven in various test programs however it has lower Gamma Interference Rejection than He3/BF3 tubes.
- **Boron lined tubes** - new Neutron detectors have become available using Boron-lined tubes. This newly accepted technology is usable for normal performance systems in stop-at-booth applications but cannot be easily utilized in Free-Flow systems because of their high speed requirement.

CONTROLLER(S)

C1 CONTROLLER
Single Unit

- Durable aluminium enclosure, temp range -40 to +60 deg C, fully weatherproof box to IP-66
- High speed Industrial CPU running embedded Windows CE
- Full LAN connectivity
- External touch-screen display and printer capability if required
- External audio/visual annunciator if required
- Build-in GPS receiver with external GPS antenna
- 110/230VAC or 48VDC operation
- Suitable for remote connection at the detectors or inside a Control building, depending on local logistics of operation

19" RACK CONTROLLER
Managing Multiple Units

- Standard 19" rack enclosure, temp range -20 to +50 deg C, IP-30 rated
- High speed Industrial CPU running embedded Windows CE
- Full LAN connectivity
- External touch-screen display and printer capability if required
- External audio/visual annunciator If required
- Build-in GPS receiver with external GPS antenna
- 48VDC operation or 110/230VAC with mains converter

19" RACK IMAGE PROCESSOR

- Standard 19" rack enclosure, temp range -20 to +50 deg C, IP-30 rated
- High speed Industrial CPU running embedded Windows CE
- 4 PoE ports for IP Camera connection
- 3 External LAN connections
- USB port
- Integrated LPR (Licence Plate recognition) image analysis
- Fully synchronised and triggered image storage for accurate container ID
- All system imaging is integrated with the Radiation data at a central server computer
- 48VDC operation or 110/230VAC with mains converter

CAMERAS & LIGHTING

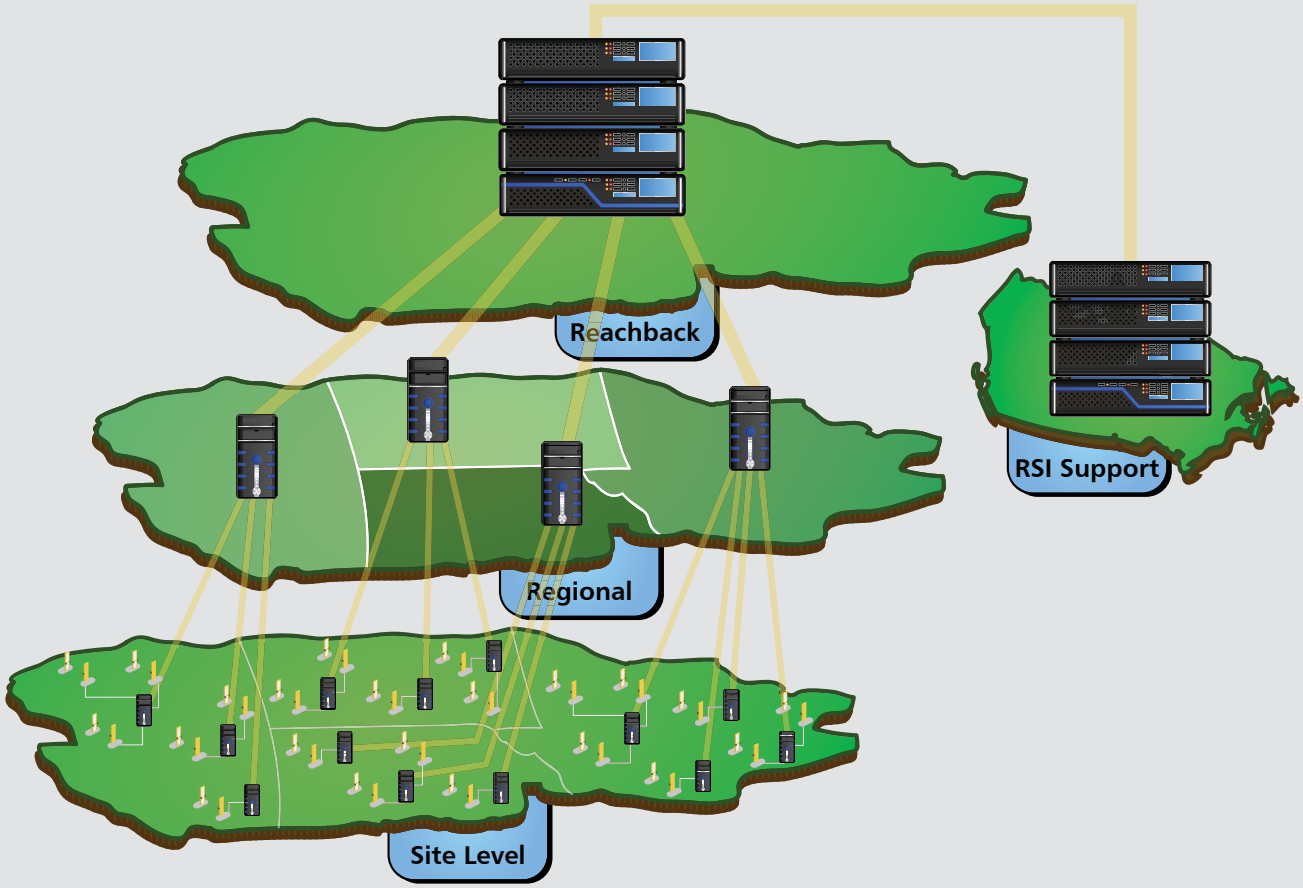
No matter how sophisticated a radiation detection system is, it is not effective unless the vehicle travelling through it can be identified.

For the critical timing of the images RSI has developed an Image Processor Unit with PoE inputs for up to 4 digital cameras. One Image Processor Unit is required for each radiation detection system.

The camera inputs are typically used for front license plate reading, two side cameras for Container number reading and back-door camera for rear license plate and/or container number reading. In all applications RSI can provide for accurate images including Automatic License Plate as well as hi definition image viewing for Container Number Recognition.

NETWORKING CAPABILITY

MULTI-SYSTEM, MULTI-USER DESIGN



PERFORMANCE

SPECTRAL MEASURMENT

The RS-400 series Security Radiation Portal Monitoring Systems use RSI's state-of-the-art spectrometer design with the latest digital FPGA/DSP technology. This allows for full spectral measurement with High signal throughput and a large dynamic range for up to 4 PMT's. RSI's proprietary spectral analysis method NASVD uses the spectral information to isolate and detect radioactive signatures even if heavily shielded or deeply buried in the load. This advanced analysis technique offers very high levels of detection typically 2 - 5x higher than traditional Total Count Systems.

ISOTOPE CLASSIFICATION

In the last 5 years RSI has invested substantial R&D resources to develop a reliable isotope classification capability in PVT based systems. Previously it was felt that Nuclide ID was not practical on low resolution PVT scintillators however RSI's proprietary detector hardware and NASVD analysis have shown an excellent level of Nuclide ID capability. The isotope classification assists the supervisor in threat assessment and potential for the requirement of secondary inspection. In addition this data is of significant benefit to Reachback in determining threats.

NORM IDENTIFICATION

RSI also utilizes the Isotope Classification data to reliably differentiate NORM alarms from other radiation alarms without impairing the system's ability to detect deeply buried threat sources. The possibility to reject alarms originating from NORM material is seriously reducing the need for secondary inspections.

TECHNICAL SPECIFICATION - DETECTOR PANELS

GAMMA DETECTION

- **RS-472** - 2.25" thick - 1500ci PVT (actual=1512ci = 24.75L) coupled to 2x 2" PMTs at ONE end (total = 2 PMTs/PVT)
- **RS-483** - 2.25" thick - 2200ci PVT (actual=2205ci = 36.1L) coupled to 3 x 2" PMTs at ONE end (total = 3 PMTs/PVT)
- **RS-484** - 2.25" thick - 2200ci PVT (actual=2205ci = 36.1L) coupled to 2 x 2" PMTs at EACH end (total = 4 PMTs/PVT)
- **RS-492** - 4" thick - 4000ci PVT (actual=3920ci = 64.2L) coupled to 3.5" PMT at EACH end (total = 2PMTs/PVT)
- **SHIELDING** - Standard Gamma module has internal integrated Steel shielding to improve sensitivity and collimation - LT model relies on external shielding only. Additional lead shielding is an available option.

NEUTRON DETECTION

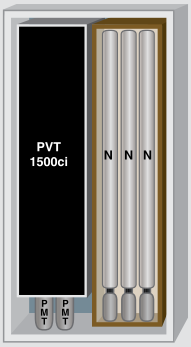
- 2" diam x 72" (32" for RS-472) active length BF3 tubes mounted in an HDPE flat moderator with a maximum space for 3 tubes are offered as standard solution.
- Optionally WLS, Boron tubes or support for Customer supplied He3.
- Optionally Dual QUAD moderators for BF3 tubes for improved Neutron performance

ENCLOSURE

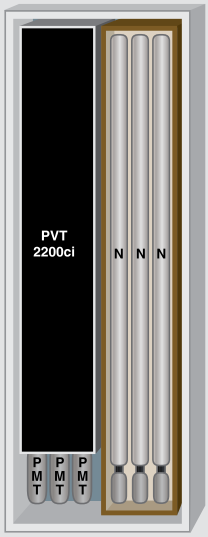
- Size
  RS-472 - 60" x 31" x 7.2" (1524mm x 787mm x 183mm)
  RS-483, 484, 492 - 87.5" x 33.5" x 8" (2223mm x 851 x 203mm)
- Wider enclosures available for special applications when more neutron tubes are required
- Detector weight
  RS-483 and **RS-484** - typically 600lbs (not including detector shroud)
  LT model, no internal shielding - 400 lbs

ENVIRONMENTAL

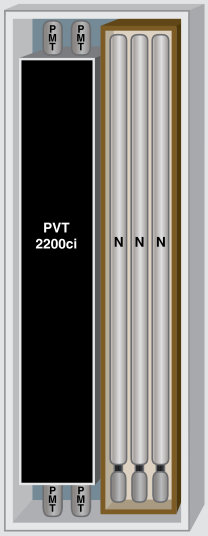
- Temperature range -40°C to +50°C



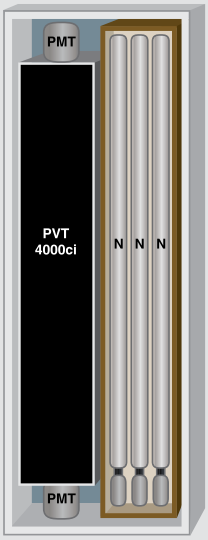
RS-472



RS-483



RS-484



RS-492

HOW TO ORDER

E.g. **RS-484 GN / 4 / 8800 / 12H / CFH**

RS-484	GN	4	8800	12H	CFH
Model number	Detector and enclosure options	Number of panels in the system	Total volume of PVT in the system	Number and type of Neutron detectors	Specific request
RS-472 RS-483 RS-484 RS-492	**G** = Gamma **N** = Neutron **W** = Wide enclosure **Lt** = Light weight enclosure	Ranging from 1 - 14 panels		**B** = BF3 **H** = He3 **WS** = Wave length shifter **Bo** = Boron counters	**CFH** = Customer Furnished He3

RADIATION SOLUTIONS INC

Corporate Head Office
386 Watline Avenue
Mississauga, Ontario, Canada L4Z 1X2
Tel +1 905-890-1111
Fax +1 905-890-1964
e-mail **sales@radiationsolutions.ca**