



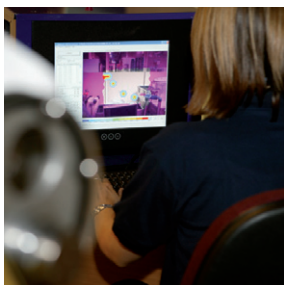
# Radscan<sup>®</sup> 800

4pi gamma imager

**Remotely locates and efficiently characterises gamma hotspots in a wide variety of environments**

## Operational features

- Saves cost by supporting optimisation of maintenance, refurbishment and decommissioning strategies.
- Saves operator dose uptake by reducing the requirements for manual area monitoring.
- Rapid deployment by a single operator achieved through comprehensive re-engineering and re-packaging.
- Deployment horizontally and inverted in addition to upright to satisfy a greatly increased application area.
- An improved lower energy limit which enables the detection of Am-241.
- In-situ analysis of gamma overlay images of all surveyed areas from a single automatic scan, even whilst a subsequent scan is in progress, or remotely from an office based computer.



The RadScan<sup>®</sup> 800 4pi Gamma Imager remotely locates and efficiently characterises gamma hotspots in a wide variety of environments including building surfaces, cells, in or on gloveboxes and process vessels.

The instrument maps and records the distribution and intensity of measured radiation using radiometric data and real-time colour video images which are viewed from a safe distance.

## Applications

The RadScan<sup>®</sup> 800 is a planning tool which saves cost and dose uptake by reducing project risk, supporting optioneering studies



and reducing the requirements for manual area monitoring, particularly in unknown or high dose fields.

The system saves cost and dose uptake in any environment in which the spatial distribution or intensity of gamma emitting radioactive material is needed.

The main users are Health Physicists, Decommissioning, Project and Planning Engineers or their staff. A typical application is in support of the radiological characterisation of a contaminated building or cell prior to maintenance, refurbishment, decommissioning or clean out.

## Deployment and operation

The Inspection Head can be deployed rapidly by a single operator on a lightweight, collapsible and height-adjustable tripod supplied as standard. It can be mounted on many other platforms including fixed or mobile stand, crane and Remote Operated Vehicle (ROV).

Alternatively, it may be mounted directly to a wall, floor or roof using its integral quick release coupling and flange. Deployment is achieved manually or remotely depending on the application.

*(continued overleaf)*



The detachable Detector Head is optimised for americium, uranium, plutonium, fission product and activation product gamma energies through the use of efficient tungsten shielding.

Set-up is achieved within a few seconds of the Inspection Head being deployed and system self-checking is automatic. Almost the entire environment is capable of being surveyed from a single deployment.

RadScan® 800 is operated from a remote, safe location using a PC-based Remote Workstation. On-screen information is presented using Windows NT™ 4.0 compatible software and includes a high definition colour video picture of the area



being surveyed. A circle, which represents the Field Of View (FOV) of the detector, is overlaid on to the video picture using colour software graphics. During an automatic scan, all frames of video are recorded and compressed on to the PC's hard disk. All associated geometrical and radiometric data is recorded in a Microsoft Access® database. All spectra are also recorded. The system is controlled using the keyboard's cursor keys and hula point. Communication and electrical power for and between the Inspection Head and Remote Workstation is via a single cable.

#### Software architecture

The software comprises a Data Acquisition package and a Data Analysis package which run as fully independent tasks. The Data Acquisition package requires all RadScan® 800's hardware to be present and is used to collect and record all data. The Data Analysis package is used to recall, display and analyse this data. It is invoked on the Remote Workstation from the Data Acquisition package and can be run whilst a subsequent automatic scan is in progress. Alternatively, as an option, the Data Analysis package can be used on a desk-top PC running under Windows NT™ 4.0.

#### Data acquisition package

All measurement parameters are configured from the Data Acquisition package. These include such options as the orientation of the deployed Inspection Head, the size of collimation and the Region(s) Of Interest (ROIs) within the energy spectrum.

Some important parameters, such as constants defining the system's energy calibration, are password protected to prevent unauthorised access.

Data can be acquired manually or automatically. At any time during manual scanning the operator can toggle between a display of the current video picture with circle representing the detector's FOV, and the current acquired spectrum from the detector's FOV. All status, geometric and radiometric data is permanently displayed and updated every second. Measurement data and its associated configuration is recorded to the PC when the user selects the 'Snapshot' facility.

Automatic scans are set up in one of two ways; driving the Inspection Head to the start and stop positions, or by defining its size and position by the currently displayed video picture. Upon entering the time of acquisition of data at each measurement position, an estimate for the duration of the scan is displayed. If accepted, the entire scan is performed automatically. At each measurement position, the count rate(s), angles and distance are recorded to a unique database. The acquired spectrum and video picture from each measurement position are also recorded to the hard disc.

#### Data analysis package

The Data Analysis package accepts, as its input, and post-processes the databases generated by the Data Acquisition package. Once a valid database is loaded, the operator can toggle at will between the display of a colour overlay image of the current scene, the original captured video frame of the same scene and the acquired spectrum from the measurement position in the detector's FOV. Status, geometric and radiometric data from the measurement position are also displayed.

The display is updated and repeated for all scanned measurement positions by the operator driving the system as if the hardware were present.

Data is retrieved from the database and presented to the operator in the form of a 'Virtual Scan' which shows an overlay image of every scanned video frame. The Virtual Scan is controlled using the keyboard's cursor keys.

The operator can choose to display data from any one of up to three, overlapping ROIs as configured in the Data Acquisition package.

A threshold for a selected ROI can be requested and the system will display a list of radiometric and geometric data for all measurement positions at which the count rate data in the ROI exceeds the threshold. The operator is able to select any measurement point within the list. Upon doing so, the display presents the colour overlay image of the selected point. The operator may continue with a Virtual Scan from this point or select another point.

The operator can also create new ROI(s) and post-process the acquired data to form

new ROI count rate(s). These may be used to search for previously unidentified hot spots.

The thresholds of the displayed count rate data of any overlay image can be set automatically or manually. The overlay image, video frame, radiometric, geometric and associated configuration data for any measurement position is recorded permanently using the 'Snapshot' facility. A two dimensional, angular contour plot of an entire scan for a selected ROI is performed by a Microsoft® Excel spreadsheet from the Data Analysis package when requested by the operator.

### Radiometric output modes

RadScan® 800 displays the count rate(s), corrected for dead-time, at the detector from objects within the detector's FOV from up to three, overlapping ROIs as configured in the Data Acquisition package. The count rate(s) is updated every second.

An operator can opt to correct the count rate(s) to what it would be if the object was at a range specified by the user. The operator can also scale the range corrected count rate(s) to assess whether a FOV contains more or less activity relative to another FOV. An estimate of the dose rate, Rapid Dose, at a range specified by the user from an equivalent point source at the centre of the FOV is permanently displayed.

### Energy calibration

Periodic energy calibration or calibration check is quickly and easily performed using common, sealed sources.

### Anti-contamination PVC hoods

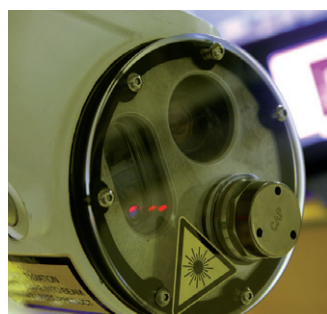
Disposable, purpose-designed PVC hoods are supplied as standard for use with the Inspection Head in contaminated environments.

### Tripod

A lightweight, collapsible and height-adjustable tripod is supplied as standard.

### Shipping crates

The RadScan® 800 is supplied with four re-usable and lockable, aluminium shipping crates as standard.



## Specification

<b>Detector Head size:</b>	H 285 mm x W x 205 mm x D 425 mm
<b>Detector Head mass:</b>	25 kg
<b>Inspection Head size:</b>	H 600 mm, rotates within a 670 mm diameter
<b>Inspection Head mass:</b>	45 kg (rapidly disassembles into components of 25 kg, 14 kg and 6 kg)
<b>Deployment orientation:</b>	Upright, inverted, horizontal downwards, horizontal upwards
<b>Deployment mechanism:</b>	13 kg, collapsible, height-adjustable tripod as standard (H 790/1040 mm, 865/1040 mm diameter footprint at min/max extension during use, H 830 mm x W 330 mm x D 300 mm when fully collapsed for ease of transportation) Wall, floor or roof mounted via standard flange
<b>Remote Workstation size:</b>	H 460 mm x W 515 mm x D 285 mm
<b>Remote Workstation mass:</b>	25 kg
<b>Remote Workstation monitor:</b>	Rugged 15" colour TFT
<b>Scanning angle:</b>	340° pan, -60° to +90° tilt
<b>Scanning speed:</b>	0.5°/sec pan/tilt (slow), 4°/sec pan/tilt (fast)
<b>Detector:</b>	Nal(Tl) scintillator with miniature photomultiplier tube
<b>Camera:</b>	3 lux, high definition colour CCD with 16x optical zoom lens, auto/man iris, auto/man focus
<b>Range finder:</b>	Red laserdiode (IEC 825-1:1993, Class 2; FDA 21CFR Ch.I §1040:1988, Class II)
<b>External data storage media:</b>	CD-RW; 1.44 MB, 3.5" floppy disc drive
<b>Operating system:</b>	Windows XP™
<b>Operating voltage:</b>	110 or 230V AC, 50/60 Hz, configured at shipment

## Performance

<b>Detection limits:</b>	<1 µCi for <sup>137</sup> Cs in FOV at 1 m (whole spectrum) <0.2 µCi for <sup>137</sup> Cs in FOV at 1 m (photopeak) <50 mg for Pu (~20 % <sup>240</sup> Pu) in FOV at 1m <1 g for <sup>235</sup> U in FOV at 1 m <2.5 µCi for <sup>241</sup> Am in FOV at 1 m
<b>Energy resolution (FWHM):</b>	~6/9.5/28/36 % at 1332/662/186/60 keV
<b>Operating range:</b>	<1 µCi to 0.5 Ci for <sup>137</sup> Cs in FOV at 1 m
<b>Energy range:</b>	~30 keV to ≥ 1500 keV
<b>Dynamic range in a single image:</b>	~300 for <sup>137</sup> Cs
<b>Dose rate envelope:</b>	0-500 mGy/hr for <sup>137</sup> Cs
<b>Detection range:</b>	Camera focal length; 0.01 m (wide)/1.0 m (tele) - ∞
<b>Range finder:</b>	0.3 - 30 m (natural surfaces)/100 m (brown reflector), ±5 mm or better
<b>Detector:</b>	0 - ∞ (useful upper limit determined by FOV)
<b>Angle of view:</b>	4°, 3° screw-on collimator extension, 2° screw-in collimator insert
<b>Collimator additions:</b>	Screw-in background correction plug
<b>Environmental:</b>	Inspection Head rated to IP65 once assembled; purpose designed PVC hood fitted over head to prevent contamination (3°, 2° collimators and background plug can be installed/removed in-situ without removing hood) Remote Workstation rated to IP31 (keyboard to IP65)
<b>Remote operation:</b>	Up to 40 m from Inspection Head as standard via a single cable with option of longer cable lengths