ORTEC®

Detective-Remote™

Nuclear Threat Detection Software for Mobile Radiological Search Systems

"The right software, the right solution,
the right answer!"

AMETEK®
ADVANCED MEASUREMENT TECHNOLOGY

Detective-Remote™

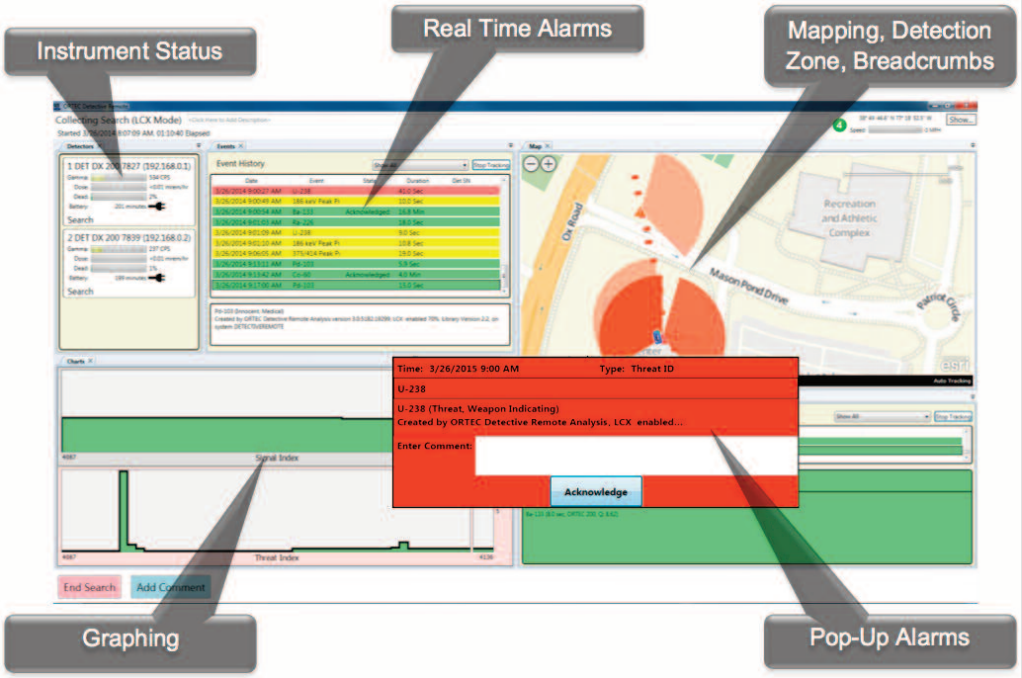
The ORTEC Detective-Remote software is a Windows®-based software application used in ORTEC's radiological search systems. It can be used with ORTEC Detective-200 radionuclide identifiers, or other compatible ORTEC portable identification instrument models, to perform accurate radioisotope identification for multiple applications. The analysis algorithms in the new Detective-Remote V4 software have been significantly improved based on testing ORTEC has performed (including tests with Special Nuclear Material). The system can be deployed for a variety of applications including wide area searches, vehicle monitoring (roadways, bridges or tunnels), pedestrian monitoring, or as a high efficiency nuclide identifier with excellent standoff detection. Detective-Remote software offers a universal search tool that can be configured to meet almost any CONOPS requirement.

Benefits	Features
Accurate Isotope Identification • Not effected by changing NORM Backgrounds. • Virtually no unidentified peaks. • Definitive Identification – When HPGe identifies a source, it is an accurate ID. • Flexible mapping capability to accurately locate the source.	• Excellent Resolution of HPGe (~40 times better than NaI). • New Updated Algorithms. • Comprehensive Library with 175 Radioisotopes. • Improved Global Mapping.
Enhanced Standoff Detection Distance • Detect SNM Sources at greater distances. • Much better at identifying shielded or masked radioisotopes. • Perform wide area searches in less time with better results.	• Superior resolution of HPGe allows much better signal to noise ratio and better standoff detection distance. • Tested and proven algorithms for HPGe based on extensive testing done with RIIDs and Portals.
Easy To Use • "One Click" built-in reporting capability automatically sends data to Reachback. • Easily readable, color coded alarms for threats, innocent sources, and NORM. • Easy to store data and replay previous surveys. • System self calibrates and monitors its own state of health. No need to calibrate.	• Designed based on customer feedback and voice of the customer surveys. • Easy to view screens and threat sources. • Automatically stabilizes on K-40 background to ensure system is properly calibrated.
Flexible Deployment Scenarios • Can be deployed in a variety of configurations such as wide area searches, choke points, vehicle monitoring, pedestrian monitoring and clandestine applications. • Detectors can be used in standalone mode (without the computer) and still ID sources.	• Configurable views provide customization to support various missions and CONOPS. • Small size and weight of individual Detective products combined with software that can accommodate a multitude of configurations.
Low Total Cost of Ownership • System monitors and maintains its calibrations based on background K-40. No need for costly recalibrations. • Fewer false positive alarms saves time and money by eliminating costly responses. • Detects threats that other systems may miss, minimizing false negative alarms.	• Designed to be operated by non technical personnel. • No periodic calibrations required. • Designed to minimize false positive alarms. • HPGe detectors provide better detection and identification of SNM threats.

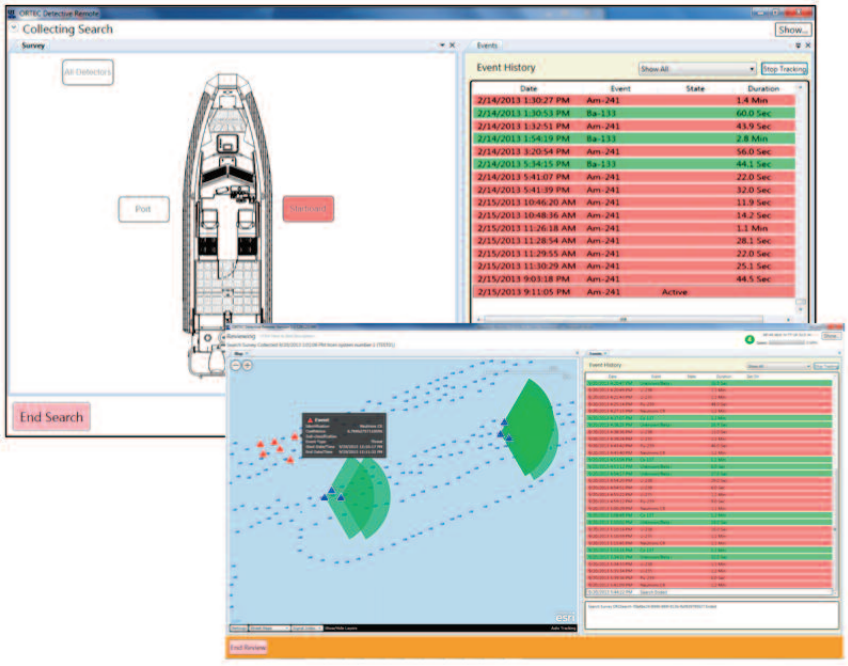
Detective-Remote™

Informative User Interface

Detective-Remote software is designed to be a simple to use application for operating hardware in mobile detection and identification applications. The system user interface is focused on three modes of operation, “Search”, “Stand-In”, and “Review”. Each mode of operation is slightly different but intentionally designed to support all phases of a nuclear search mission.



The Detective-Remote software application provides multiple levels of control and operation of the system. The standard configuration is “Search Mode” which is an easy user interface that monitors for radionuclides over several configurable integration times. The integration times can be set to accommodate multiple CONOPS where short and long count times may be required for a particular mission. The instrument collects one spectrum per second and runs the ID algorithm against a user selectable sliding average. This mode is more sensitive to sources which move relative to the instrument.



A Stand-In mode is also available in the Detective-Remote software to support longer acquisition times. The system collects a spectrum based on a long integration or acquisition time. This mode is ideal for operations that support interrogation or longer inspection times such as maritime searches or secondary scans.

A Review mode is available to provide users with a complete second by second timeline review of previously acquired surveys and searches. This mode is suitable for reviewing information about an alarm or event that requires adjudication.

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Detective-Remote in Use, the Simple Operator Interface

The Detective-Remote software system is easy to use with minimal training required. The system automatically begins collecting data and analyzing information in real time. If an alarm limit is exceeded, an alarm notification occurs showing the alarm condition. All alarms must be acknowledged or they will persist.

Data Collection, Analysis, and Storage Surveys

The Detective-Remote system performs radiation surveys that identify the source of radiation, based on the radionuclide identification library. A survey is a record of all the spectroscopic data, location data (if a GPS is being used), and analysis results collected over a period of time.

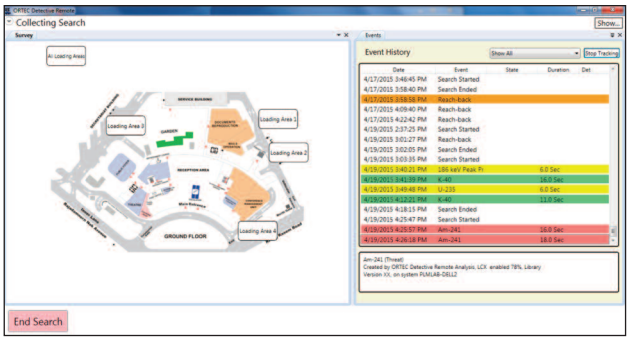
Survey Data Capture and Analysis

Whenever the User Interface and Analysis programs are running, and the Instrument(s) are transmitting data, the system continuously monitors all of the radionuclides in the library, and posts IDs and alarms as appropriate.

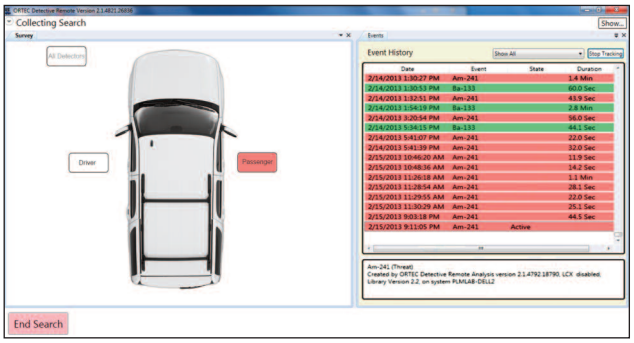
Each Detective instrument is polled approximately once per second. As mentioned earlier the algorithm combines the data from multiple detectors for the most sensitive and accurate detection and identifications.

The survey database records the following for complete retrieval:

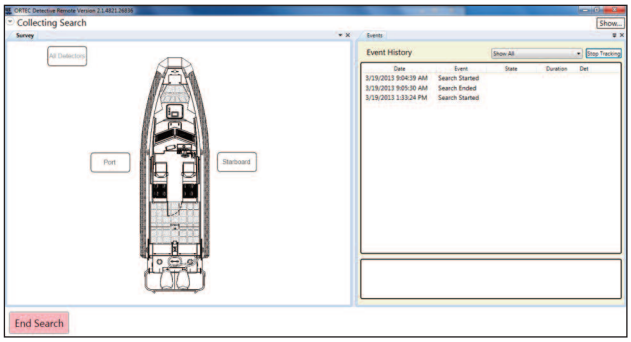
- Raw spectrum data from each detector, collected at least once per second.
- A list of the identifications that were present along with their confidence values and the combination of detectors and data integrators that produced each identification.
- The time and GPS coordinates associated with the data.
- Signal Index and Threat Index values.



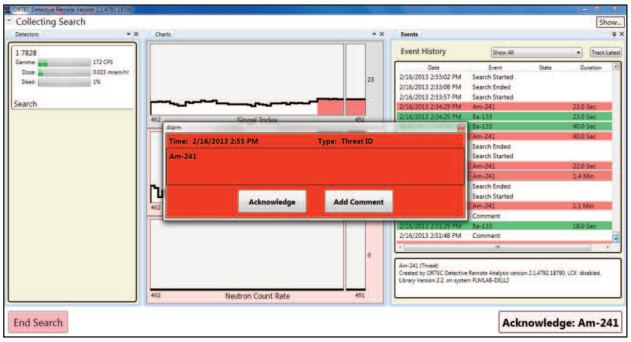
Mobile and Chokepoint Search



Area Monitoring Search



Maritime Search



Radiological Emergency Response Search

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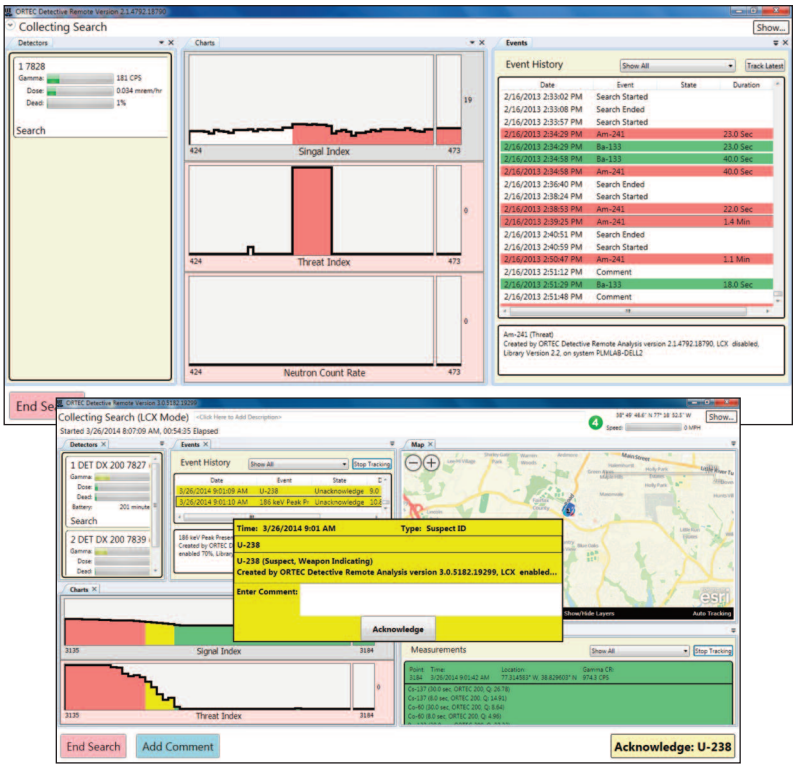
Threat and Signal Indexes

In the measurements tab (below), the lower part of the display shows "Threat" and "Signal" Indices in order to alert the operator to changes in the gamma-ray flux below the alarm level that might otherwise go unnoticed in a survey.

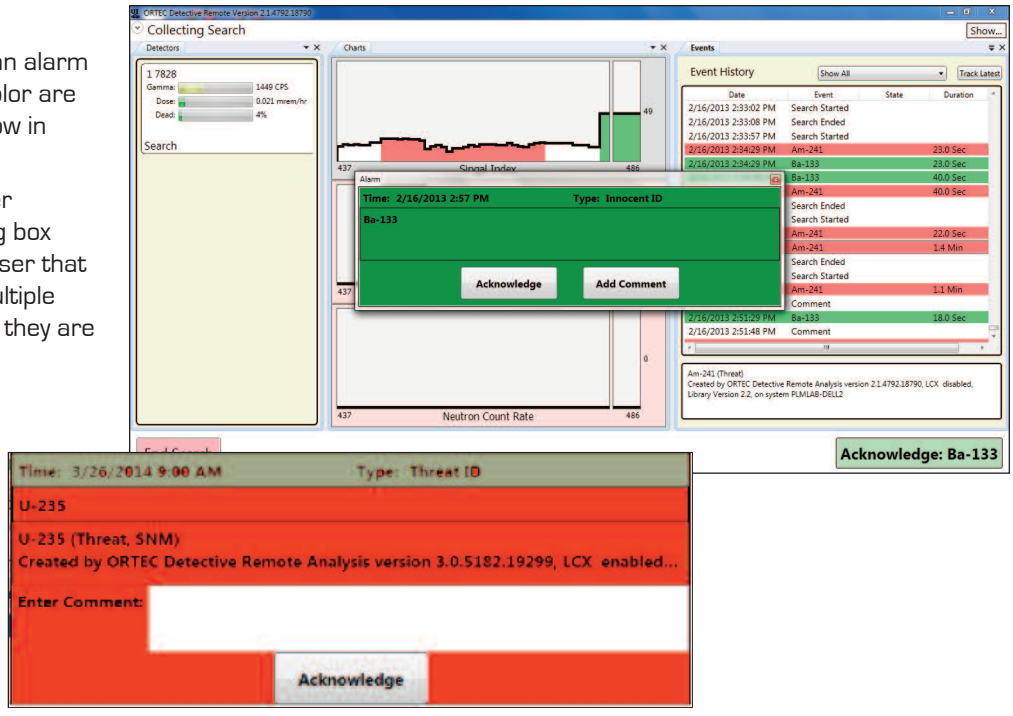
The Threat Index is an indication of the current highest peak confidence level currently occurring for any of the nuclides designated as "threat" in the table of nuclides. The Signal Index is similar, but count rate related. A raised Threat or Signal Index indicates where stationary measurements or further investigations should be performed.



Real-Time Alarm Indicator

Each time an alarm is generated, an alarm ID and the corresponding alarm color are posted in the Event or Alarm window in chronological order.

The application also provides a user configurable "POP-UP" alarm dialog box along with audio indicating to the user that an alarm event has occurred. If multiple alarms are generated at one time, they are presented highest priority first.



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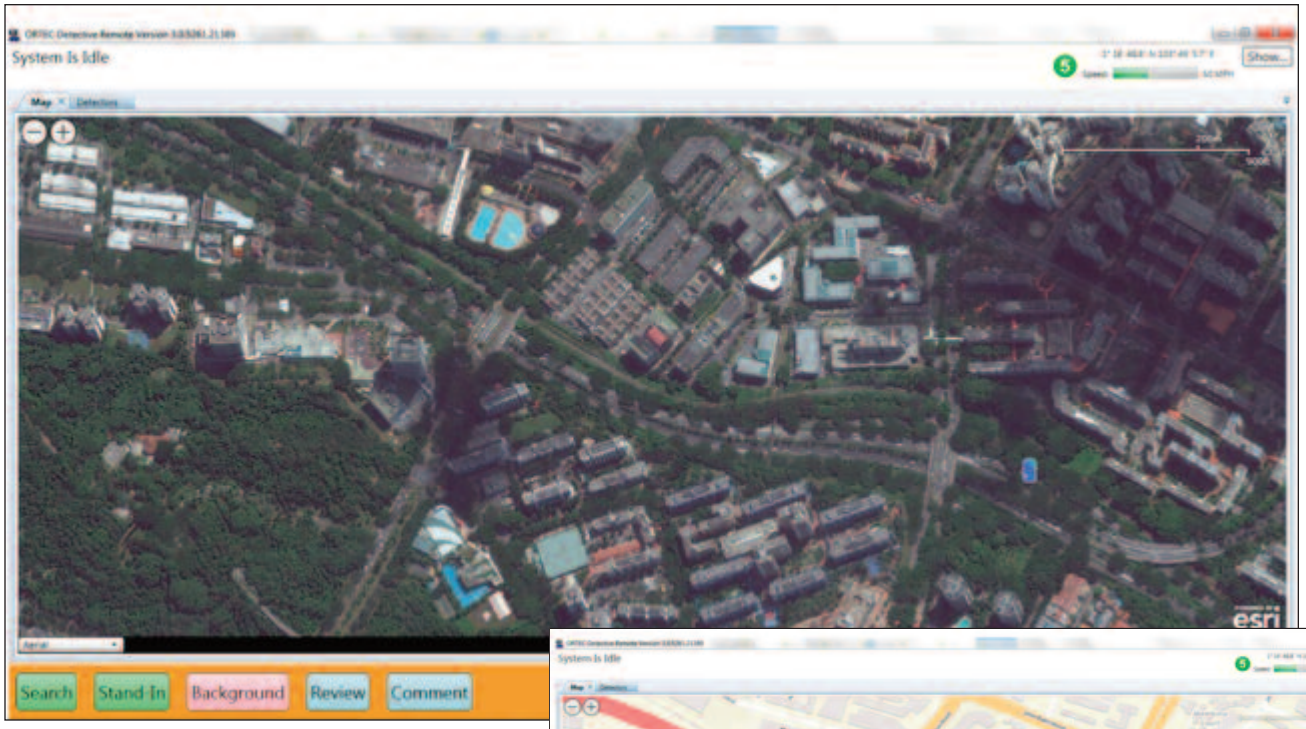
Detective-Remote in Use, Global Mapping Solution

The Detective-Remote Software includes a universal open mapping capability designed to support nuclear search anywhere in the world. The mapping capability supports Vector, Raster, and Online maps.

Online and Offline Map Availability

Detective-Remote provides users the ability to operate with offline and online map images. This ability provides easy "on the fly" switching between locally hosted road maps, and online aerial images.



User Configurable and Selectable Map Solutions

A new Map Server solution is now available to customers to ensure the high quality mapping needed for many search applications is available. The mapping service provides a complete global map set that is updated on a regular basis, and automatically updates the Detective-Remote systems when changes occur.

Detective-Remote mapping service also provides users the ability to add Google, Bing, and ESRI maps through a simple configuration utility.

Real-time and Historical Map View Capability

Detective-Remote offers a simple search and data reviewing tool. The software leverages the simple mapping interface and provides the user with all measurement and alarm data as well as the mapping history of the search.

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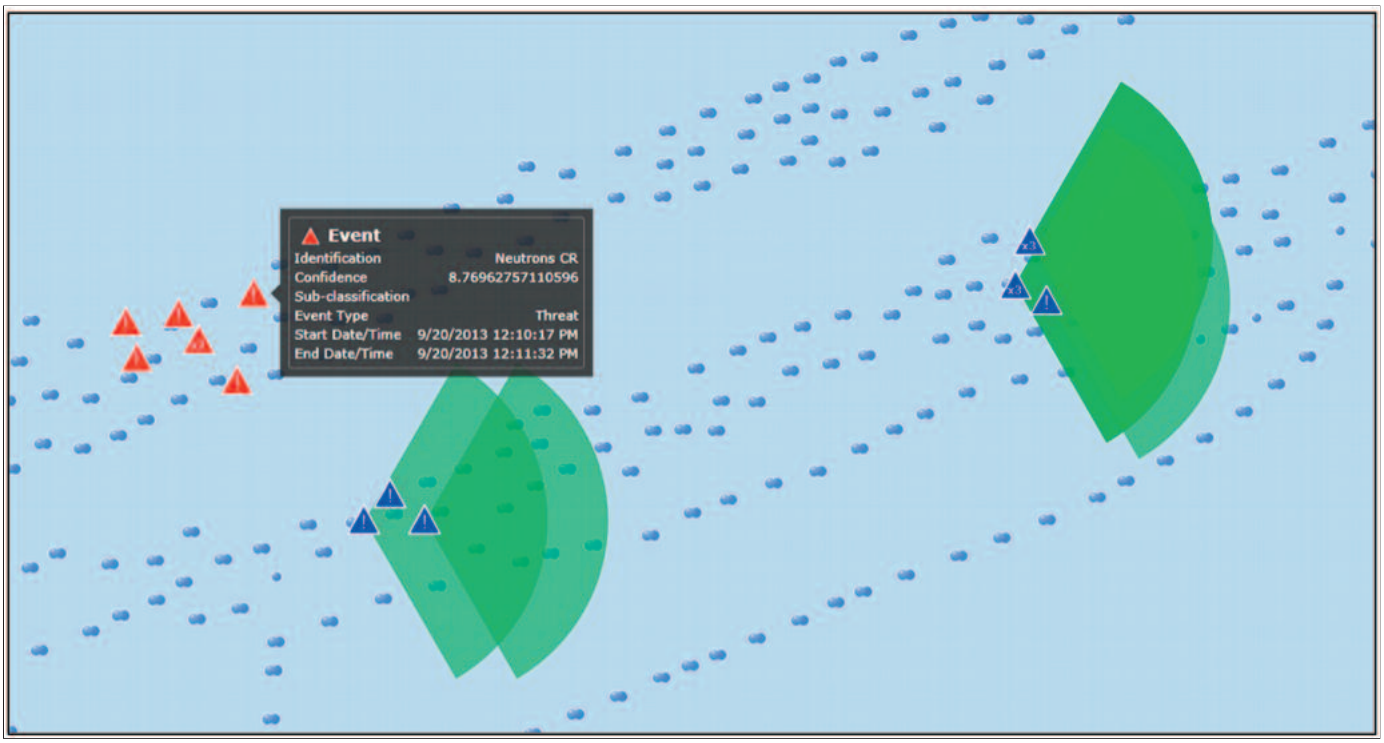
Alarm Icons, Breadcrumb Trail, Status

The Detective-Remote mapping solution is much more than a simple location of measurement data. It is a situational awareness tool to simplify a user's mission. Users can monitor alarms, measurements, and the count rate information completely from the mapping tab. It is not necessary to watch multiple screens, making it easier for users to perform multiple tasks.



Zoom In and Out Capability Including Truncated Alarms

The Detective-Remote mapping capability includes a truncated alarm icon to support zoom in and out functionality. As alarms can be present in a single location or area as the map is zoomed out, an alarm icon with a corresponding number provides the user with a representation of the number of alarms that exist at that location.

Zone of Detection

Detective-Remote includes a new mapping capability that will provide users an additional visual awareness feature that aids in determining the direction or location of an alarm. The Detection Zone capability is a simple, but very effective way of Indicating to users an estimated area of a potential threat based on an alarm. As users continue to drive in a specific direction, the Detection Zone will continue to show the area of search.

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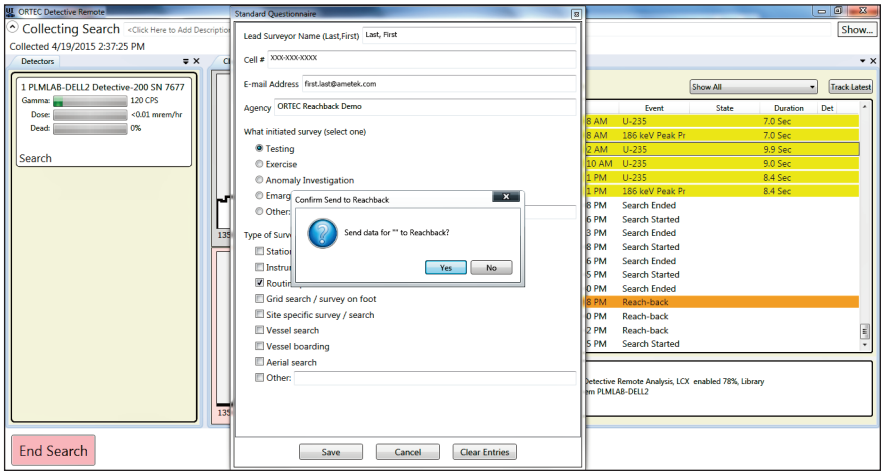
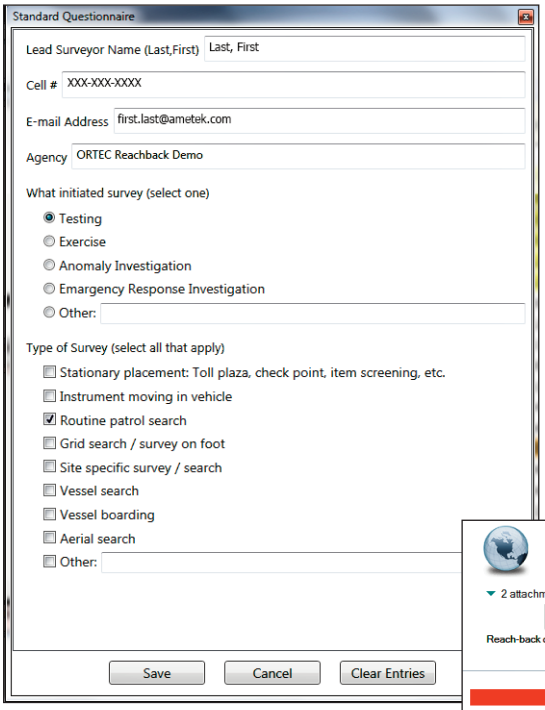
Reachback Process

Detective-Remote comes standard with an easy to use reachback process that enables users to quickly and easily send alarm information, spectroscopy data, and detailed parameters about the potential threat to fusion or command centers designated as reachback support service areas.



- Any alarm can be selected from the list of events and with a right click of the mouse or a touch screen selection will launch the reachback information form that the user can populate with his specific information about the alarm.
- All data and information associated with the alarm is packaged in a formatted email that can be sent to a pre-configured email address.

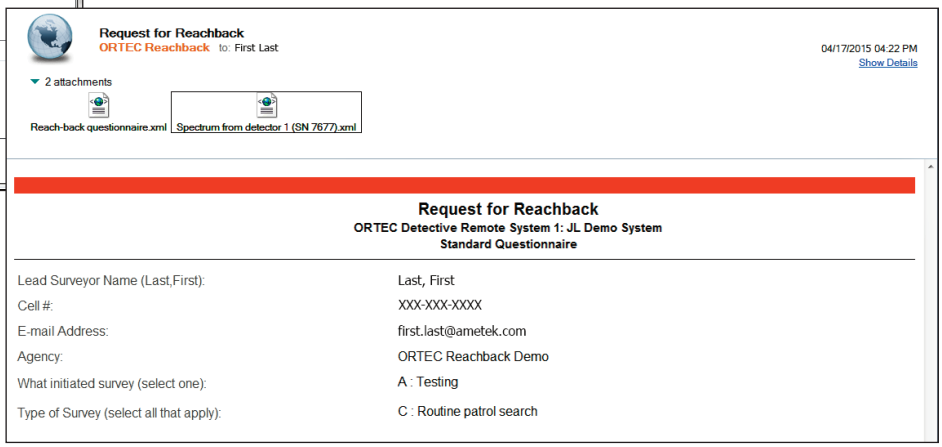


The integrated reachback process is designed to provide users with the ability to monitor, capture and send representative information about an alarm or suspect alarm with little to no typing for keyboard control.

- Users select the alarm from the event list
- Right click to run reachback
- A pre-configured form is opened for review by the user
- User presses “send”, and an email containing all of the spectra and associated information is sent to their pre-configured fusion center.

The reachback form is completely configurable and can contain specific information that an agency may want as part of their adjudication protocol.

The email containing the information required by the reachback personnel is simple and easy to recognize. The configuration supports multiple agencies operating in a single location.



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Detective-Remote Radionuclide Library

The following table lists the threat and innocent identifications for the standard identification mode.

THREAT	INNOCENT	INNOCENT	INNOCENT	INNOCENT	INNOCENT	INNOCENT
Am-241 (shielded)	Ac-225	Cf-252/Cf-249	Ga-64 (shielded)	Ir-192 (shielded)	Pd-103	Tc-99M
Am-241	Ac-227	Cm-242	Ga-67	Os-194/Ir-194	Rh-105	Te-132
Am-241 (59.5 keV)	Ag-110m	Cm-243	Ge-68/Ga-68	Ir-194 (shielded)	Ru-97	Tl-201
Enriched Uranium	Ar-41	Cm-244	Gd-153	K-40	Ru-106/Rh-106	Tl-200
HEU	As-72	Co-56 (shielded)	Gd-159	Kr-87	Po-210	Tl-202
Neutron Cr (0)	As-74	Co-55	Hf-181	Kr-88	Pr-144	Tl-204
Neutrons Present	At-211	Co-56	Hg-203	Kr-88 (shielded)	Ra-223	Th-229
Np-237	Au-198	Co-57	Ho-166m	La-140	Ra-226	Th-230
Pu-239	Ba-133	Co-58	Ho-166m (shielded)	Lu-172	Ru-103	Th-232
U-232	Ba-140	Co-60	Ho-166	Lu-176	Sb-124	Tm-170
U-233	Be-7	Cr-51	I-123	Lu-177	Sb-124 (shielded)	Tm-171
U-235	Bi-207	Cs-131	I-123 (shielded)	Lu-177M	Sb-125	U-232/Th-232
U-238	Bi-212 (Th232/U232 daughter)	Cs-134	I-124	Mn-52	Sb-127	W-188/Re-188
	Bi-214 (Ra226 daughter)	Cs-137	I-125	Mn-54	Sc-46	Xe-127
	Br-76	Cu-64	I-126	Mn-56	Se-75	Xe-133
Suspect (LCX Mode only)	Br-76 (shielded)	Cu-67/Ga-67	I-126 (shielded)	Mo-99	Sm-153	Xe-131M
186 Peak Present	Br-76 (heavily shielded)	Eu-152	I-131	Na-22	Sm-153 (shielded)	Xe-135
375/414 Peak Present	Br-77	Eu-154	I-131 (shielded)	Na-24	Sn-113	Y-88
	Ca-47	Eu-155	I-132	Nb-94	Sr-82/Rb-82	Y-91
	Cd-109	Eu-156	I-133	Nb-95	Sr-85	Yb-169
	Cd-115	F-18	I-134	Nb-96 (shielded)	Sr-89	Zn-65
	Ce-139	Neutrons on Fe	I-135	Nd-147	Sr-90/Sr-89/ Y-90	Zn-62
	Ce-141	Elevated radiation or beta emitter	In-111	Pa-231	Ta-182	Zr-95
	Ce-144	Ga-64	Ir-192	Pb-203	Tc-96	

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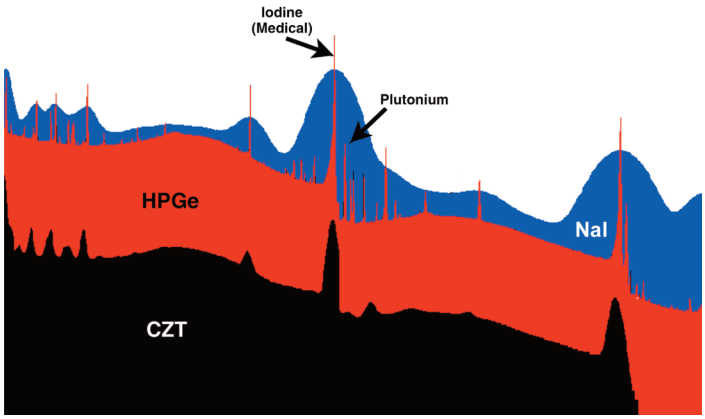
Issues when Searching for Nuclear Threat Sources

The capability to search for and identify radiological or nuclear threat sources is a challenging task, especially if the sources have been shielded or masked to avoid detection. It is even more challenging when searching in an urban environment where varying levels of innocent sources of radiation will almost always be present. These innocent radiation sources range from naturally occurring radioactive material (NORM) present in soils, rocks, and various building and roadway materials, to people who have recently had a medical diagnostic procedure with short-lived radiopharmaceuticals. It is important to be able to distinguish innocent medical or industrial radioactive sources from potential threat sources. ORTEC has met this difficult challenge by using large High Purity Germanium (HPGe) detectors with the new Detective-Remote Version 4 software. This combination greatly improves the performance and the fidelity over ORTEC's previous generation Radiation Search Systems. The new Detective Remote V4 software has completely revamped algorithms that benefit from all the testing ORTEC has done with high resolution hand-held RIIDs and spectroscopic portal monitors. Detective Remote V4 not only increases the passive stand-off detection distances, it allows better detection of shielded and masked threat sources, especially in major cities where background levels can constantly change.

When performing a wide area search, it is desirable to have a system that can find the specific threat source, without false alarms caused by changing NORM backgrounds or other medical/industrial radioisotopes. The ideal mobile nuclear search system detects and locate both innocent sources and threat sources in real time and correctly identifies each source.

To accomplish this task, ORTEC evaluated all available detector types and chose High Purity Germanium (HPGe) detectors because they offer superior standoff detection distances and are capable of nuclide specific identification with significantly fewer false positive results. ORTEC has developed a new ruggedized Detective-200 that builds on the success the Detective family of handheld RIIDs which have been widely deployed around the globe for nuclear interdiction. Due to the excellent sensitivity and selectivity, these instruments are better at detecting and identifying shielded or masked radioactive sources than methods employing other detector technologies. The advances ORTEC has made in ruggedizing HPGe detection systems has enabled these systems to be adapted for use in aerial, vehicular, or maritime search system configurations, or as fixed choke point monitors.



Nuclear interdiction systems require good sensitivity (necessary to find the source), coupled with high selectivity (for high-confidence source identification). The HPGe detectors used in ORTEC's mobile radiological search systems are the "gold-standard" for nuclear search and identification systems. They are highly sensitive and quickly confirm the presence of nuclear materials, while being optimally selective so that they can easily distinguish threat sources from naturally-occurring sources, or innocent sources such as medical radioisotopes. HPGe detectors have the highest resolution of any radiation detector available. An array of HPGe detectors not only has better ID capabilities than currently deployed technology, but the superior resolution extends the passive detection distance for SNM and shielded SNM.

Recent advances have revolutionized the applications where HPGe technology can be deployed. Advances in solid-state electronics and particularly in digital signal processing over the past few years have dramatically reduced the size, complexity, operating power, and cost of the electronics required to support HPGe detectors. ORTEC has developed and patented noise rejection techniques that minimize the electronic noise which may be encountered. ORTEC's high resolution HPGe detectors are designed to operate and survive the shock or vibration the system might encounter during deployments. ORTEC also has extensive experience in integrating and deploying miniature, low-power, high reliability cryogenic coolers which replace liquid nitrogen as the cooling, and has now developed a next generation Stirling cooler with an extremely long useful life and the ability to operate reliably for years

Detective-Remote™

While ORTEC hardware advances have been significant, the overall system performance relies heavily on sophisticated software algorithms to detect and identify nuclear threats. This is one area where ORTEC's capabilities are unparalleled in the industry. ORTEC has a team of nuclear physicists, software engineers, and applications experts who have combined technical resources over the past few years to significantly improve the performance of the SNM identification algorithms. After each government sponsored test ORTEC participates in, ORTEC revises and updates the software algorithms in our products. ORTEC recently made a major algorithm improvement in the Detective-Remote V4 software. In testing, the new Detective-Remote V4 software now accurately detects and identifies extremely low quantities of radioisotopes that previously would not have been detected.

ORTEC utilized their hardware and software expertise to develop the Detective-200, an integral component of the ORTEC Mobile Search System. The Detective-200 is a completely integrated HPGe detector system that builds on the success of the Detective family of products with over a thousand systems now deployed around the world. The Detective-200 incorporates a large HPGe crystal (85 mm x 30 mm), new Detective software algorithms, a ruggedized Stirling cooler, and signal processing electronics into a flexible package designed for extreme environments. The Detective-200 is designed to survive extremes in shock and vibration (drop test video available). The system is dustproof and waterproof, IP 67 compliant, and ANSI N42.43 compliant. Each detector module includes smart digital stabilization (to avoid gain shifts) and is capable of continuously self-monitoring. The modular design allows for maximum flexibility in configuring systems or sub-systems to mission-specific needs. Multiple Detective-200s may be configured into arrays and employed for specific applications.










Detective-Remote™

Ordering Information

DET-REMOTE-MOB-SYS
Detective-Remote software with Detective software update, Laptop computer, external GPS, and MAESTRO software.

DETDX-200-2
Includes 2 each DETDX-200 Ultra-High-Sensitivity, Ruggedized, Transportable HPGe Radioisotope Identifiers (Gamma Only) with AC/DC power adapter charger, automobile power cable, external battery kit, and wheeled transport case, and 1 each Detective-Remote software with Laptop computer, external GPS, and MAESTRO software.

DETDX-200-4
Includes 4 each DETDX-200 Ultra-High-Sensitivity, Ruggedized, Transportable HPGe Radioisotope Identifiers (Gamma Only) with AC/DC power adapter charger, automobile power cable, external battery kit, and wheeled transport case, and 1 each Detective-Remote software with Laptop computer, external GPS, and MAESTRO software.

Consult the factory for additional neutron detection options.

Specifications subject to change
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