

USING THE ACCURAD™ PRD

Personal radiation detectors (PRDs) are relatively simple radiation instruments that are designed to be the first line of defense during radiological and nuclear interdiction efforts. Their relative simplicity means that they can be deployed in large numbers for use by non-technical personnel who have received minimal training. This, in turn, makes it possible to cast a wide net in order to protect large events, large areas, or important infrastructure.

This being said, radiation and radioactivity are not uncommon. Nuclear medicine patients, naturally radioactive objects, legitimate industrial sources, vehicles carrying or delivering these sources, and many consumer products can cause alarms; adjudicating these alarms is an important aspect of radiological and nuclear (rad/nuc) interdiction operations. The majority of such alarms can be adjudicated by Tier III (less-trained) personnel using PRDs, but some require more sophisticated instruments used by more highly trained (Tier II) personnel; the manner in which various personnel and instruments are used and is called the Concept of Operations (CONOPS).

The Mirion AccuRad unit is the first PRD developed in close collaboration with first responders and state and federal law enforcement to fit seamlessly into their routines and address the most critical, in-the-field needs from a radiation detection device.



Example Concept of Operations

1. Tier III personnel are issued PRDs and instructed to perform surveys in areas of interest (e.g. security perimeter, near critical infrastructure, etc.)
2. Elevated dose rates and/or alarms are investigated to determine the source(s) and significance
3. If the abnormal readings cannot be adjudicated, a Tier II person using a radio-isotopic identifier (RIID) will be sent to the scene to help adjudicate the readings
4. If the Tier II person cannot adjudicate the alarm data will be sent to a Tier I facility for reachback
5. Additional assets will be deployed as necessary and appropriate (e.g. to secure the scene, to resolve criminal or malicious activities, etc.)

Example Instrument Use Procedures

INSTRUMENT USE — INTERDICTION

1. During interdiction operations, PRD users must be able to detect slight changes in radiation levels that might indicate the presence of radiological or nuclear weapons
 - a. Responders might also need to demonstrate compliance with applicable regulatory requirements
2. Personnel with PRDs will use their instruments to survey areas, objects, and members of the public
3. Any readings that are consistently elevated (2-3 times as high as normal background radiation) will be investigated to determine the source of the reading
4. Any alarms shall be reported according to departmental procedures and policies
5. If radiation dose rates reach or exceed 2 mR/hr, establish a radiological boundary and evacuate members of the public from within the boundary
6. If a threat is perceived, report immediately and establish a safety perimeter, evacuating all persons from within the perimeter. Call for the Bomb Squad if explosives are thought to be present.
 - a. The perimeter should be established at a dose rate of 2 mR/hr or as directed by the Bomb Squad, whichever distance is further

INSTRUMENT USE — ADJUDICATION

1. When an alarm or elevated radiation level is observed, the emergency response personnel must be able to determine whether or not the radioactive materials are innocent (e.g. a nuclear medicine patient) or malicious (e.g. a terrorist) and if they pose a possible threat to health and safety.
2. In the event of an alarm, investigate and adjudicate according to departmental procedures
 - a. If the elevated reading is from a person, the person will be interviewed while any items they might be carrying are checked for radioactivity; if the radioactivity is in the person's belongings, they should be further questioned
 - b. If the elevated reading is from a vehicle, determine if the radiation originates from the passenger compartment or from cargo space; if the radioactivity is located in the cargo space the vehicle and its occupants should be checked further
 - c. If the elevated reading is from a container, storage area, room, or another area, obtain a radiation dose rate reading and attempt to identify the radionuclide present (calling for a Tier II asset if necessary). Report the radiation dose rate, distance from the object or area from which the radiation is being emitted, the approximate size of the object (if possible), and the presence of any shielding materials.
3. If the investigation and radiological surveys suggest that the alarm is innocent (e.g. not due to criminal or malicious activities) release the person(s), vehicle(s), object(s), and/or area(s) in question and report according to departmental procedures
4. If the elevated radiation dose rates are not determined to be innocent, continue investigating (including calling for Tier II or Tier I assets as necessary) until the incident is resolved
 - a. Note: an incident might be potentially hazardous without being malicious (e.g. a lost radioactive source); in such cases, the scene should be secured and appropriate regulatory authorities contacted



Example Instrument Use Procedures (Cont.)

INSTRUMENT USE — RESPONSE

1. In the event of an attack using radiological or nuclear weapons or a radiological or nuclear accident responders' concerns shift from prevention to health and safety and (to a lesser degree) regulatory compliance.
2. The first persons arriving at the scene will notice radiation dose rates increasing as they approach, indicating the presence of radioactive materials.
 - a. The Mirion AccuRad™ PRD might start to alarm at distances of up to several hundred meters, depending on the source activity, terrain, and intervening structures
 - b. The Incident Commander should be informed of any radiation alarms
3. Immediate radiation safety actions should include
 - a. Establishing a Hot Zone boundary at a dose rate of about 2 mR/hr, using the PRD to measure radiation dose rates
 - b. Entering the Hot Zone for life-saving activities and to address the most serious concerns (e.g. firefighting, securing ruptured utility lines, etc.)
 - c. Personnel entering the Hot Zone should be issued radiation dosimetry and a PRD capable of measuring radiation dose rates as high as 100 R/hr or greater

Example Scenario 1: Event Security

SCENARIO

Intelligence indicates that a terrorist group is planning a major attack of some sort against an upcoming event in your city. One week before the event a high-activity radioactive source is stolen from a nearby medical facility. Local, state, and federal Tier II personnel are deployed to conduct surveys using mobile and backpack instruments. In addition, you are tasked with deploying Tier III personnel with PRDs at the event itself in case the terrorists are not detected by the Tier II assets.



INSTRUMENT DEPLOYMENT

1. PRDs are issued to Tier III personnel deployed to the event site and surrounding areas
 - a. Uniformed personnel may use PRD directly
 - b. Personnel in plain clothes should consider using PRD covertly by placing it in a pocket or backpack and using their smartphone application
2. Personnel with PRDs are assigned to
 - a. Access points to venue
 - b. Venue entrances and exits
 - c. Venue parking lot and grounds
 - d. Areas adjacent to the venue
 - e. Inside the venue (auditorium, restrooms, corridors, office space, etc.)
 - f. Rooftop
 - g. Other areas as determined by deployment commander
 - h. Identify the exact location of the source of any elevated radiation levels noted during mobile surveys (aerial, vehicular, or waterborne)

Example Scenario 2: Border Security

SCENARIO

A truck containing a high-activity radioactive source is hijacked. Although there has been no specific intelligence indicating a pending radiological attack, it is prudent to increase border security until the source is located or until the thieves have been caught. Local, state, and federal resources are dispatched to border crossings and known cross-border smuggling routes. Portal monitors are established at vehicle crossings, Tier II personnel are tasked with performing surveys using mobile and backpack instruments, and with adjudicating PRD alarms as necessary using RIIDs. Tier III personnel using PRDs are tasked with surveying personnel and vehicles at border crossings and at checkpoints located along major transportation routes.



INSTRUMENT DEPLOYMENT

1. PRDs are issued to Tier III personnel deployed to the border and nearby areas
2. Personnel with PRDs are deployed to:
 - a. Pedestrian border crossing stations, to scan all persons as they pass through the border crossing and to help adjudicate pedestrian portal monitor alarms
 - b. Vehicle border crossing stations, to scan all vehicles as they pass through the border crossing and to help adjudicate portal monitor alarms
 - c. Checkpoints several miles from the border to scan both people and vehicles
 - d. Known cross-border smuggling crossings to scan for elevated radiation dose rates from abandoned, smuggled, or secreted radioactive materials
 - e. Help identify the exact source(s) of elevated readings noted during aerial, waterborne, and vehicular surveys using mobile systems

Example Scenario 3: Critical Infrastructure Protection

SCENARIO

Owing to threats noted on social media, combined with minor attacks using handguns, security at a local electrical power generation plant and its associated transformer yard, the local electrical utility has requested additional security until things calm down. Since radiological threats have been in the news lately the security detail includes a rad/nuc team. The rad/nuc team includes local Tier II personnel performing surveys using mobile systems and backpacks, in addition to Tier III responders using PRDs.

INSTRUMENT DEPLOYMENT

1. PRDs are issued to uniformed Tier III personnel deployed to the security perimeter and to non-uniformed personnel deployed to the surrounding area
 - a. PRD surveys are performed on all persons approaching or crossing the security perimeter
 - b. Personnel deployed to the surrounding area perform PRD surveys of parked vehicles, storage areas, warehouses, mailboxes, waste receptacles, persons (pedestrians, drivers, and cyclists)
 - c. PRDs will be used to help identify the precise location(s) of the source(s) of any elevated radiation levels noted during surveys using mobile equipment

