

rad-D

Users Manual



Introduction

The rad-D is a security and inspection system that detects emissions from radioactive material. The rad-D can inspect large numbers of packages, vehicles, or personnel and can be used to guard doorways and driveways, to scan conveyor belts of luggage or packages, or to provide radiation detection on existing X-ray scanning machines.

The rad-D can operate completely stand-alone, providing the user with information via the rad-D Alarm Display Panel, or it can be integrated into a computer network, allowing for real-time display and monitoring of multiple rad-D systems, as well as integration with security command and control systems.

System Components

A rad-D system consists of one to four detectors (Figure 1), an Alarm Display Panel (Figure 2) and optional PRM Mounting Bracket (Figure 3). There are two types of detectors, a gamma detector and a neutron detector. The gamma detector detects gamma radiation and high-energy X-rays emitted from radioactive materials. Gamma detectors come in two varieties, a narrow-field of view detector and an omni-directional detector. The neutron detector detects neutrons emitted from a small number of very important radioactive materials. Any combination of one to four gamma and/or neutron detectors can be installed and monitored by a single Alarm Display Panel.



Figure 1. Each rad-D detector is 17.5" in length and 5" in diameter.



Figure 2. The Alarm Display Panel displays from up to 4 different detectors



Figure 3. Rad-D with PRM Mounting Bracket System

System Installation

General Installation:

Physically mount the detectors in accordance with the guidelines discussed below for each type of detector. A detector can be up to 50 feet away from the Alarm Display Panel. Connect the cable from each detector into any one of four detector ports on the Alarm Display Panel. The rad-D will automatically know which type of detector has been connected to the Alarm Display Panel. Connect the power cable to the Alarm Display Panel. When all cables are connected, plug the power cable into a wall plug.

When power is applied, the rad-D begins a 90 second warm-up sequence. During this time the rad-D is performing self-tests and calibrating to the natural radiation background environment. At the end of this phase, the Alarm Display Panel will begin showing radiation counts from the gamma and/or neutron detectors.

60 Hz and 50 Hz power

The rad-D can operate on both 60 Hz/110 VAC (United States) and 50 Hz/208 VAC power. The rad-D comes with a plug configured for U.S. power sockets. To use in a 50 Hz environment, attach a wall plug converter to convert the rad-D U.S. wall plug to the local country plug standard. The rad-D will automatically adjust to the power supplied.

Alarm Display Panel:

Locate the Alarm Display Panel near the operator or where it can be read easily, unless your rad-D is going to be read remotely via PC. The Alarm Display Panel must be within reach of a power plug and within 50 feet of all detectors.

If the rad-D is integrated as part of a computer network via its wireless Bluetooth interface, the receiving computer must be within 100 meters or less (depending on intervening walls) of the Alarm Display Panel. If the rad-D is integrated as part of a computer network via its Serial Port interface, the receiving computer must be connected using a single serial cable. The PC network displays rad-D information using the provided rad-D software. The data format and structure of the interface is also available on request, allowing the user to use create their own monitoring software.

Detector Installation Guidelines:

All detectors are mounted using two ½” screws separated by 4”. The detectors can be mounted in any orientation. Each detector has unique placement requirements for maximum efficiency.

- *Gamma Detector*, Omni-directional: Place this detector as close to the traffic area as possible to maximize its sensitivity. It can be oriented in any direction. This detector weighs approximately 8 pounds.
- *Gamma Detector*, Narrow Field-of-View: Aim the front of the detector at the target inspection area. The front is the end opposite the cable interface. The front is very thin aluminum, so care must be used to prevent dents or puncturing (neither, however, will degrade the operation of the unit. It just won't look as nice). The field-of-view is +/- 45° from the front. Ensure that the unit is as close as possible to the inspection area while still getting good coverage of the field-of-view. This detector weighs 30 lbs. Please take care when handling and mounting it to avoid injury to yourself or others. Always use safe lifting practices when moving heavy objects.
- *Neutron Detector*: To maximize neutron detection, place the detector as close as possible to the traffic area. It can be oriented in any direction. This detector weighs approximately 8 pounds.

PRM Mounting Bracket

- Detector, Following the detector mounting guidelines, mount the detector using the two 1/2" screws with the front end of the detector (opposite of the end with the controller cable) being closest to the Pan Control Adjustment Knob (**Figure 4**)
- Base, The base of the PRM comes with heavy duty earth magnet assemblies that will hold the PRM to a steel surface in any orientation and with any of the rad-D configurations.

The base can also be mounted directly to any surface by whatever means is necessary to ensure the bracket is securely in place and will hold the appropriate rad-D model.

- Mounting Arm, The "L" shaped riser can be attached to the solid swing arm facing any direction. The adjustment knob is compatible with all four sides of the solid swing arm and is used to tighten the riser to the swing arm. It is also used to adjust the height of the rad-D from the base. The height range is from 14" (356 mm) to 19" (483 mm).



Mounting on X-ray machines:

Typical rad-D installation on X-ray machines consist of a single narrow field-of-view gamma detector and one-or-more neutron detectors. Because the X-ray machine can generate scatter that can be detected by the gamma detector, to avoid false alarms please do not aim the front of the detector into the X-ray machine.

Either aim the gamma detector at the conveyor belt coming into the X-ray machine, or leaving the X-ray machine. Depending on the relative radiation noise from the X-ray machine (older machines tend to be noisier), the rad-D may have to be tuned with the X-ray machine in a one-time operation to eliminate false alarms. Inside the Alarm Display Panel is a 16-position switch that can be turned from position "0" to "15". From the factory the unit is set to "0", unless requested otherwise.

If the rad-D, when mounted, is alarming as a response to the X-ray machine:

- 1) *Unplug the rad-D*
- 2) *Open the back of the Alarm Display Panel by removing the (4) 2mm hex screws*
- 3) *Set the 16-position switch to a "1" using a small blade screwdriver*
- 4) *Close the Alarm Display Panel*
- 5) *Plug the rad-D into the wall socket*
- 6) *Check to see if the false alarm response from the X-ray machine has been eliminated.*

Usually a setting of "1" is sufficient for modern X-ray machines. If there are still false alarms, adjust the switch to a "2" using the process described above. If there are still false alarms, increase the switch one setting using the process described until the rad-D does not have a false alarm response to the X-ray machine.

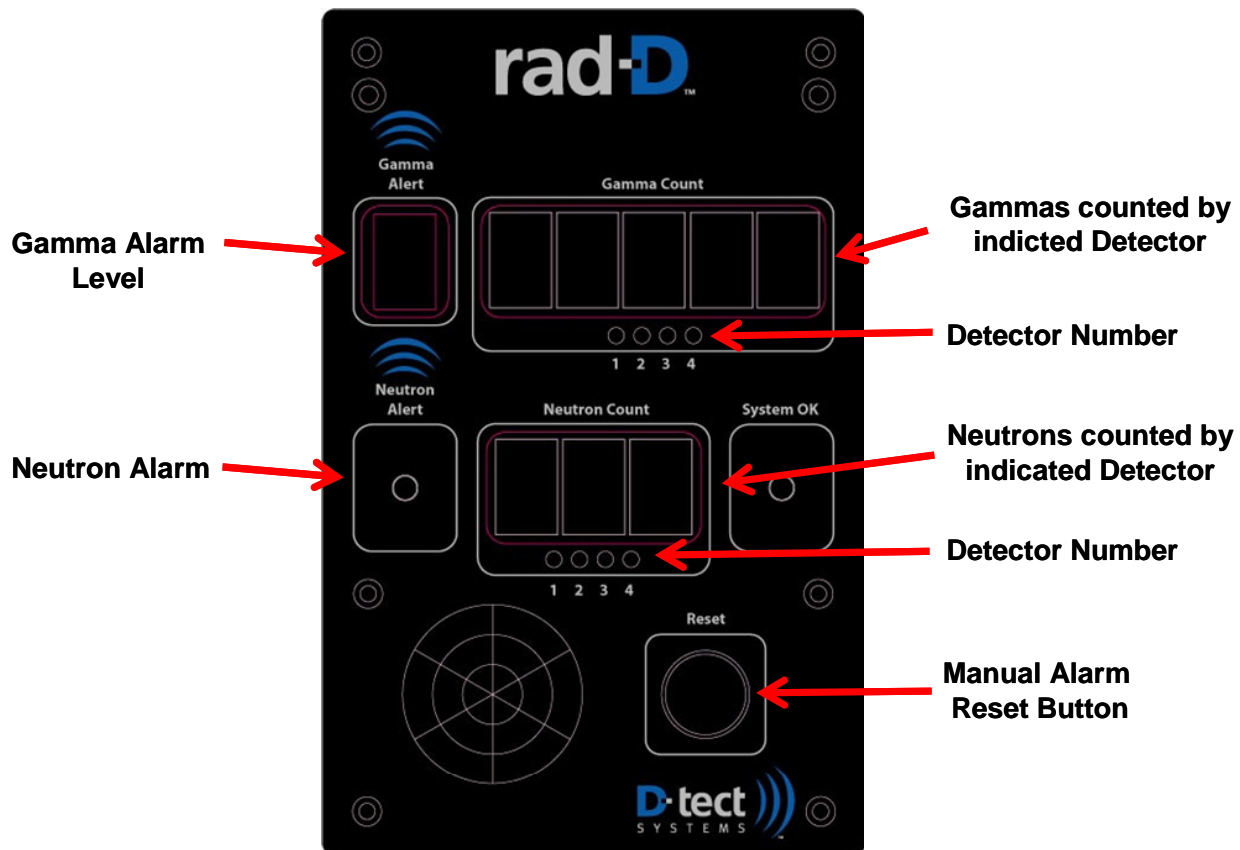
System Operation

Non-Alarming

When not alarming, the rad-D information panel displays the measured gamma counts per second and measured neutrons per second for each detector in a repeating display cycle. If your rad-D system consists of four gamma detectors, the display would show the gammas/second from detector #1, indicated by the 1st LED light below the gamma count display being lit. Then the gammas/second from detector #2 would be shown (accompanied by the second LED light being lit). The cycle would continue with the gammas/second measured by detectors #3 and #4 being shown and then would begin again with detector #1. A similar cycle would be shown if there were four neutron detectors. If you have a mixed combination of gammas and neutron detectors, then the detectors would be cycled similarly to the previous examples, except split between the gamma and neutron displays.

Alarms

During an alarm, the non-alarming detectors are no longer displayed. Instead the gamma or neutron count of the alarming unit is displayed, with the specific detector identified by the detector number light. If more than one gamma or neutron detector is alarming, the display shifts between the two. Both the gamma and neutron counter displays are real-time. When the radiation source moves on, they will go back to displaying normal levels. The Alarm Display Panel also has persistent alarm displays for gamma and neutron alarms. These will not clear to normal levels until reset, either using the manual button on the Alarm Display or via computer. The persistent gamma alarm displays the highest alarm level (1 through 9) that a detector measured. The persistent neutron alarm indicates an alarm, but does not display a level (any neutron source above natural background requires investigation).



Problems or Failure

Contact Laurus Systems at (410) 465-5888.

Warnings

Do not open any rad-D component while it is still plugged into a power source.
Please use proper care and good practices when lifting heavy rad-D components.

Notification

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules.

Limited Warranty for Products

What this Warranty Covers and for How Long

The Mission Research Corporation division, D-tect Systems listed below ("D-tect Systems"), warrants this device (the "Products") against defects in materials and workmanship under normal use for a period of one year from the date of purchase. This warranty extends to the first end-user purchaser only, and is not transferable. This warranty does not extend to other products, including batteries.

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This warranty is valid only in the United States and Canada, and D-tect Systems complete warranty for the Products. D-tect Systems assumes no obligation or liability for changes to this warranty unless made in writing and signed by an officer of D-tect Systems

D-tect Systems does not warrant any installation, maintenance, or Service that it did not perform. SERVICE WORK PERFORMED BY SERVICE CENTERS NOT AUTHORIZED BY D-TECT SYSTEMS TO PERFORM SUCH WORK WILL VOID THIS WARRANTY.

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Defects or damage resulting from: use of the Products onto hard surfaces, contact with water, rain or extreme humidity, contact with sand, dirt or the like, contact with extreme heat, spills of food or liquid, improper testing, operation, maintenance, installation, adjustment; or any alteration or modification of any kind.

Scratches or other damage to plastic surfaces, cracked displays, or other externally exposed parts caused by use of the Products

Products disassembled or repaired in such a manner as to adversely affect performance or prevent adequate inspection and testing to verify any warranty claim.

Products on which serial numbers or date tags have been removed, altered or obliterated.

How to Get Warranty Service

To get warranty service, please **call toll free 1-866-593-8328**

You will receive directions on how to mail the Products to D-tect Systems. All Products shipped to D-tect Systems Service Centers must be shipped with freight and insurance prepaid. Along with the Products you must include a receipt, bill of sale, or some other comparable proof of purchase, a written description of the problem and, most importantly, your address and telephone number. Products that are repaired or replaced under this warranty will be shipped to you at D-tect System's expense for the freight and insurance. If additional information is needed, please contact D-tect Systems at the address at the end of this warranty section.

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