

Homeland Security Radiation Detector



User's Guide

Standard Features

The RD-9000 radiation detector is designed for use by first responders in homeland security applications. It is usable in both portable and fixed locations. The detector is built for ease of use. No operator training or experience with lab instruments is required. Standard features include:

Simplified Controls

The internal microprocessor senses background radiation and sets appropriate trigger levels for alerts. Only two switches are provided. One sets "fast" mode for rapid detection of moving materials. The other controls the speech synthesizer. Slide potentiometers set volume levels for synthesized audio alerts and the traditional "Geiger click", or for a mixture of both.

Speech Synthesizer

The internal speech synthesizer comes programmed from the factory with multiple alert levels: "Low Level Radiation Alert", and "High Level Radiation Alert". Phrases such as "Monitoring" and "Radiation Subsided", and the actual number of counts per minute are spoken in a natural human voice.

LCD Display

A 160 character backlit LCD display provides reliable operation over a wide temperature range. LEDs provide visual queues.

Internal Battery, AC Charger/Supply, Power Save

The detector can be operated from a 12-14V DC power supply, such as the accessory circuit in a vehicle. An external AC power supply is also provided. Either will charge the internal battery. Battery life measured from full charge is approximately 10 hours with the cover open and 21 hours with the cover closed at background radiation levels.

Standard GM Detector

A standard halogen quenched GM tube is installed inside the case. This detector provides a good combination of sensitivity and reliability for most applications. An external probe is optional for high sensitivity applications. Estimated tube lifetime is five years. The tube is easy to replace and will continue to operate after it's lifetime at reduced sensitivity.

Optional Features

Radio Interface Cables

The detector can automatically transmit synthesized warnings via radio. A custom interface cable connects the detector to your radio. In the event of a radiological incident, this allows responders to remain a safe distance away from radiation while still monitoring levels remotely via radio.

Call Forwarder

The DLI Call Forwarder can be connected directly to the radiation detector. This allows radiation levels to be monitored remotely via the public telephone network.

External Scintillation Probe

An optional Sodium Iodide (NaI) probe is available for high sensitivity applications. This probe adds the ability to detect trace amounts of radioactive material. The hand held probe is useful for spotting material placed in baggage as well as medical materials, etc.

Custom Recordings and Firmware

Custom recordings are available at a nominal charge. For example, "Low Level Radiation Alert" may be replaced with "Relocate baggage to screening area". Custom programming is also available.

Sample Radioisotopes

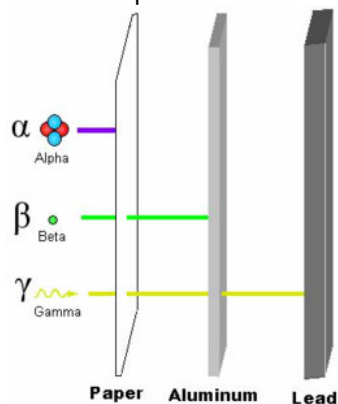
Safe, low level radioisotope samples are available for test and training purposes. These sources are exempt from NRC shipping requirements and can be shipped overnight from DLI.

At DLI, we listen to customers. Please offer suggestions. Features and specifications are subject to change. Contact physics@digital-loggers.com for information on the above options.

Types of Radiation Detected

Three types of radiation are detectable. Alpha, Beta, and Gamma. Gamma rays are the most penetrating and the detector is most sensitive to these. Gamma rays are most likely to be detected in homeland security applications. The most likely source of radioactive material used in a terrorist incident is said to be radioactive medical waste since it is relatively easy to obtain.

The detector is reasonably sensitive to beta radiation, and relatively insensitive to Alpha. Various materials can be used to shield these radioactive particles:



Dose Rate Reading

Radiation is measured in two ways: rate and cumulative dose. Rate is the current level of radiation. Dosage is the total accumulated amount of radiation you (or the detector) have been exposed to. The detector measures both the current rate or radiation rate and dosage.

Radiation rate is measured in counts per minute and in mRem/hour. Each count represents the detection of one radioactive particle.

The detector displays counts per second, as well as the total counts over the last 10 seconds and over the last 60 seconds. Readings update each second.

Background counts occur sporadically due to natural external radiation sources. To compensate for these, the detector performs a 60 second count immediately upon power-up to determine the background radiation level in your location. To skip the background count, set the response switch to "fast".

Cumulative Dose Reading

The cumulative dose is displayed by default in microrems. One million microrems equals one rem. This measurement is a combination of the amount of radiation and the radiation's effect on the human body. In SI units, 10mSieverts = 1 rem.

The cumulative dose is measured since the detector was last powered up. To zero the cumulative dose reading, switch the unit off and disconnect any external power.

Switches and Controls

To change a switch setting, first pull up gently on the cap of the switch to unlock it, then flip the switch. This locking mechanism prevents inadvertent switching.

Two switches are provided to control operating modes of the detector:

SYNTH SWITCH - Sets the speech synthesizer mode

VERBOSE Continuous spoken counts and alerts

ALARMS ONLY Spoken alerts only in alarm condition

RESPONSE SWITCH - Sets the response rate of the detector

FAST Alarms occur immediately with no compensation for background radiation

NORMAL Alarms are delayed until continued radiation is detected. Trigger levels are set based on background radiation.

The **BAT OFF** switch is used to shut down battery power to the detector. The detector will continue to operate if external power is provided even when this switch is OFF. The battery is charged automatically any time external power is applied.

Two sliders adjust the volume level of the synthesizer and the Geiger clicks.

Operation with Cover Open

When the cover is opened, the LCD display is updated with the most current readings. The backlight is enabled continuously. "Geiger clicks" can be heard through the speaker.

Operation with Cover Closed

Close the cover to extend battery life in portable applications. When the power switch is on, the detector continues to operate with the cover closed. The "Geiger click" is disabled and the LCD is powered down to extend battery life. When the cover is closed, audio alerts continue to operate.

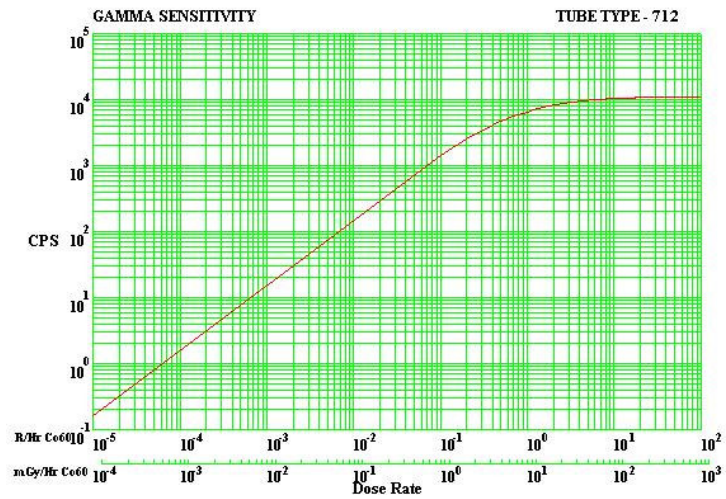
Battery Charging / Mobile Operation

The battery will charge at any time external power is applied. Allow 8 hours charge time to ensure a full charge. Typical battery life is 10 hours with the cover open, and 21 hours with the cover closed. The detector will continue to operate while being charged from either an AC charger or a mobile 12 VDC supply source.

GM Detector Specifications

The internal detector is an LND model 712 G/M tube with the following specifications:

Operating Temperature Range	-40 to +75 C
Maximum Length	1.94" / 49.2mm
Effective Diameter	.36" / 9.1mm
Effective Length	1.5" / 38.1mm
Maximum Diameter	.59" / 15.1mm
Cathode Material	446 Stainless
Fill Gas	Ne Quenched Halogen



External Connections

A DB-25 connector labeled is provided to interface with external alarms, radios, telephones, etc. This information is provided for technicians who interface the detector with alarm systems, radios, etc. Feel free to contact Digital Loggers, Inc. for technical assistance.

RADIO CONTROL

Pin 1 = Radio Relay NC
Pin 14 = Radio Relay NO
Pin 2 = Relay COM

AUDIO OUTPUT (SINGLE ENDED)

Pin 3 = Audio output
(line level)

DATA LINES (4800 BAUD SERIAL)

Pin 16 = TXD
(TTL serial output)
Pin 4 = RXD
(TTL serial input)

FLASH REPROGRAMMING PINS

Pin 17 = MISO
Pin 5 = SCK
Pin 18 = RESET-
Pin 6 = MOSI

AUDIO INPUT (FOR REPROGRAMMING)

Pin 7 = Speech input for
programming

POWER OUTPUT

Pin 20 = +12 volts
Pin 8 = +5 volts

EXTERNAL SPEAKER OUTPUT

Pin 21 = Speaker +
Pin 9 = Speaker -

EXTERNAL PROBE INPUTS

Pin 10 = External detector
pulse input
Pin 23 = External Detector
enable input

MISC PROGRAMMING INPUTS

Pin 11 = EOM- end-of-
message output
Pin 24 = PD6 - message
programming
Pin 12 = PD5 - message
programming
Pin 25 = PMODE1 -
msg programming
Pin 13 = PMODE2 -
msg programming

Limited One Year Warranty

The terms of this warranty may be legally binding. If you do not agree to the terms listed below, return the product immediately in original unopened condition for a full refund. The purchaser assumes the entire risk as to the results and performance of the unit. DLI warrants this detector to be free from major defects. No agency, country, or local certifications are included with this unit. It is the responsibility of the user to obtain such certifications if they are necessary. DLI's entire liability and exclusive remedy as to defective hardware shall be, at DLI's option, either (a) return of the purchase price or (b) replacement or repair of the hardware that does not meet DLI's quality control standards and has been returned through proper RMA procedures. DLI's liability for repair or replacement is to DLI's customer ONLY. WARRANTY SERVICE DOES NOT INCLUDE SOFTWARE OR HARDWARE UPGRADES. No warranty service will be provided without an original invoice from DLI and an RMA number provided by technical support. RMA material must be shipped prepaid to DLI. RMA numbers are valid for 15 days from date of issue. This warranty does not cover products modified, subjected to rough handling, or used in applications for which they were not originally intended. No oral advice or verbal warranties made by DLI's employees, dealers, or distributors shall in any way increase the scope of this warranty. DLI makes no warranty as to merchantability or fitness for any particular purpose. DLI assumes no liability for incidental or consequential damages arising from the use or inability to use this product. This warranty gives you specific legal rights. You may also have other rights that vary from state to state. Since some states do not allow the exclusion of liability for consequential damages, some of the above limitations may not apply to you.



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Updated October 18, 2007