INSTALLATION AND OPERATING INSTRUCTIONS FOR THE

# MiniRad-DX

PERSONAL RADIATION DETECTOR

Version 7 March 2024

Firmware Release 113



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D-tect Systems A Division of Ludlum Measurements, Inc. 313 W. 12800 South, Ste 302 Draper, UT 84020 <u>www.dtectsystems.com</u>



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# 1 Introduction

The MiniRad-DX is a handheld PRD (personal radiation detector) that detects emissions from radioactive material. The MiniRad-DX system can operate as a stand-alone detector or as the roving detection part of a larger MiniRad-DX and Rad-DX network for monitoring a building or facility.

The MiniRad-DX is not intended to be used as a personal dosimeter.

The MiniRad-DX is not certified for explosive atmospheres.

The firmware release at the time of this manual is version 113.

## 1.1 Key Features

### **Device Highlights**

- High sensitivity detector (CsI scintillator with PMT)
- Operator selectable alarm levels (password controlled)
- Two bright, high-resolution display screens
- Real-time dose rate graph
- Units displayed in REMs per hour, Sieverts per hour, or counts per second
- 130 hours between recharge (depending on options selected)
- Integrated GPS for complete logging of dose rate, location, and time
- Vibrate or audio alarm
- Designed to be ANSI N42.32, N42.33 and N42.42 compliant

## **D-tect SensorNet (Mesh) Network**

- Integrated mesh radio
- 2.4 GHz, 15 selectable channels
- Network range between devices is 1000m RF line-of-sight
- Up to 50 devices per network
- Easy to set-up and modify network
- Interoperable with DX Link mesh relays for extended wireless range

## With Network Integration

- Real-time control and monitoring of an entire network via smartphone, PC, or tablet
- Network can include Rad-DX area monitors and Rad-DXG portal monitors
- Autologging every time a MiniRad-DX comes within range of its DX network it will upload time, position, and alarm data no user interaction required

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# 2 Configuration

## 2.1 Box Contents



Figure 1: MiniRad-DX Handheld Radiation Detector

Other hardware components packaged with each MiniRad-DX include:





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# 2.2 Networking Options

For information on networking the MiniRad-DX, see the manual for the desired monitoring software (DX-View desktop or DX-Dashboard web).

## 2.3 Software Monitoring Options

Two different software applications are available to monitor and configure MiniRad-DX radiation detectors.

## 2.3.1 DX-View Software

The DX-View is a PC-based software application used for configuring and monitoring your MiniRad-DX and Rad-DX radiation detectors. The DX-View software is also used to view and download data from one or more devices. Using this software, you can set radiation alarm levels, view a real-time graph, download historical data, and more. For more information, please refer to the DX-View manual at <a href="http://www.dtectsystems.com/downloads.html">http://www.dtectsystems.com/downloads.html</a>.

## 2.3.2 DX-Dashboard and DX-Dashboard Setup Tool

The DX-Dashboard is a web server application, which can be used to monitor and control a Rad-DX network remotely. It runs on either the D-tect Cloud Server or on the DX Network Assistant (if installed at your facility). Using the DX-Dashboard, you can access your Rad-DX network using any web-enabled device (smartphones, tablets, PCs). The DX-Dashboard Setup Tool is needed to initially configure devices in the Rad-DX family to connect to the DX Cloud Server. For more information about this software, go to <a href="http://www.dtectsystems.com/downloads.html">http://www.dtectsystems.com/downloads.html</a> and download the DX-Dashboard manual.

**Note:** For MiniRad-DX devices to communicate on the DX-Dashboard software, one Rad-DX device in the network needs to be connected to your network via Wi-Fi or Ethernet.

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# 3 Operation

The MiniRad-DX can operate in a stand-alone mode with information displayed directly on the device's front and top screens. Options for the MiniRad-DX, such as screen brightness, screen sleep timers, and radiation units, can be set up using the following process:

1. The Home Screen will appear on the LCD screen after pressing the power button to power on the device or wake it up after it enters a low-power consumption sleep mode.

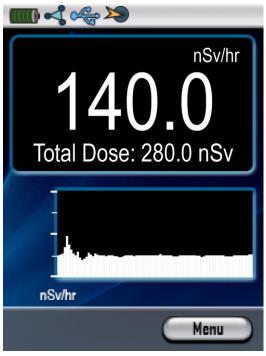


Figure 2: LCD Front Screen: Dose Rate and Graph

- 2. Pushing the upper right (power) button on the keypad again will open the menu screen.
- 3. To toggle through the different screens, use the directional buttons on the keypad. Pressing the upper left button will take you back to the main menu.

# 3.1 Maximizing Battery Life

The MiniRad-DX battery can last up to 130 hours with the mesh radio turned off, the GPS capability turned off, and displays set to sleep after one minute. Turning up screen brightness, keeping displays on longer, turning on the mesh radio, or turning on GPS will shorten battery life. Monitor the battery icon in the upper left corner of the front display to determine when it is time to recharge the MiniRad-DX.

# 3.2 Recharging the MiniRad-DX

Charge the MiniRad-DX by connecting it through the USB cable to a PC or a USB wall charger.

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## 3.3 Startup

To power on your MiniRad-DX, press and hold the power button for about 1 second. The first screen to appear will be the Home screen. Use the buttons located below the front LCD screen to navigate through the available menu screens.



**Figure 3: Power Button** 

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## 3.4 Communication Icons

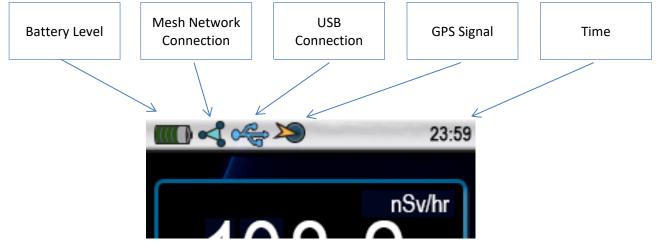
The appearance of any network connection icon indicates that the device is currently connected and active through the referenced connection.

**Battery:** The battery icon is split into 5 segments. Each segment represents 20 percent of the total capacity of the battery. This icon will change to a battery symbol with a lightning bolt when the MiniRad-DX is plugged into a USB port. This indicates that the device is charging. When 20 percent or less of the battery is remaining, the icon will turn red, indicating a low battery.

**Mesh Network:** The mesh network symbol indicates that the MiniRad-DX is connected to a greater network of devices in the Rad-DX product line.

**USB:** The USB icon indicates that the MiniRad-DX is communicating directly with the DX-View configuration software.

**GPS:** The GPS symbol indicates that your MiniRad-DX has determined its location. GPS must be turned on to acquire a location.



**Time:** The current time can be displayed in a 12-hour or 24-hour format.

Figure 4: Status and Communication Icons

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# 3.5 Graph Screen

The lower window on the Home screen displays the detected radiation levels in a graph with a timeline of 90 seconds.

The numerical dose rate and the graph window display a dose rate with a 15 second average background filter. The background filter may be adjusted by using the DX-View software.

When the device is powered on, the graph shows an average one second dose rate for the first 30 seconds.

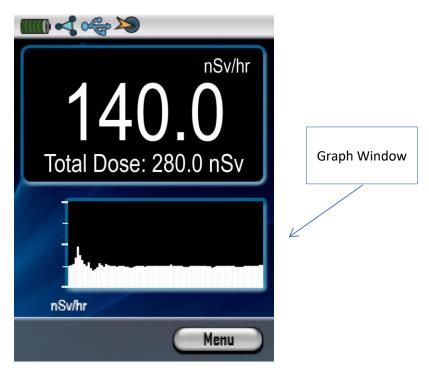


Figure 5: Front Screen Graph

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## 3.6 Main Menu Screen

The main menu screen can be accessed by pressing the upper right navigation button on the keypad. The available options inside the menu are Device, GPS, Alerts and Display. Use the directional keys on the keypad to open any specific submenu. Use the upper left navigation button to return to the main menu from the submenu screens. Press the upper left button again to close the main menu and return to the home screen.

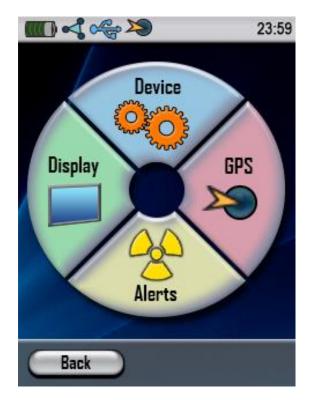


Figure 6: Menu Screen

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# 3.7 Device Menu

The device menu displays device specific information including the device name, firmware version, battery state, mesh signal strength, and current mesh channel.

### **Adjustable Parameters**

Parameter	Range	Default Value
Display Units	mrem/hr, CPS, μSv/hr	mrem/hr
Mesh Enable	On, Off	On

Device Name Mi	ni rad-DX
Firmware	38
Battery	100%
Units	mrem/hr
Network	
Mesh Enabled	i 📃 🖊
Signal	100%
Channel	25

Figure 7: Device Menu

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## 3.8 GPS Menu

The GPS feature can be toggled on and off in this menu. The GPS feature is for outdoor use, but it can be used anytime the device is in view of at least three satellites. The time it takes for the device to receive latitude and longitude coordinates can vary and is dependent on your location.

Please note that the alarm thresholds are not adjustable on the device; however, they are adjustable with the use of the DX-View software.

### Settable Parameters

Parameter	Range	Default Value
GPS Enable	On, Off	Off

GPS Latitude	Degrees	Minutes
Longitude	Degrees	Minutes
GPS Enab	led	

Figure 8: GPS Menu

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# 3.9 Alerts Menu

When the MiniRad-DX senses gamma or x-ray radiation, the front LCD screen will display the alarm level and dose rate. The top screen will display either the dose rate or a 0-9 alarm level depending on configuration, and the sound and vibration alarms will be activated.

The sound and vibration features can be turned on and off, and the different alarm thresholds are also reported in this menu. Through the DX-View software, an administrator can freeze the sound and vibration settings so they are not adjustable in the device.

#### **Settable Parameters**

Parameter	Range	Default Value
Alert Vibration	On, Off	On
Alert Sound	On, Off	On

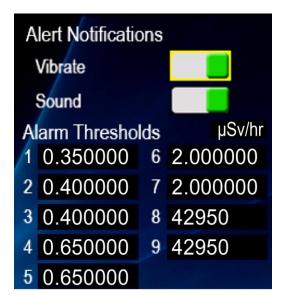


Figure 9: Alerts Menu

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## 3.9.1 Accumulative Dose

To view the total dose, the MiniRad-DX device needs to be configured with the DX-View software. See the DX-View Manual version 3 or later for more information.

The MiniRad-DX measures accumulative dose levels for each device and displays them on the home screen.

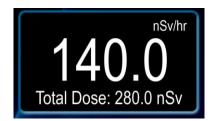


Figure 10: Home Screen with Accumulative Dose

To view the settings which have been configured in DX-View. Press the menu button. Then use the circular button to navigate to the Alerts menu. Navigate to the "Alarm Threshold" label and push right or left to switch between "Alarm Thresholds" and "Total Dose Levels."



Figure 11: Total Dose Levels

Press the power button in this view to reset the dose counter.

Alert Notifications			
Vibrate			
Reset total	dose		
Yes	No		

Figure 12: Reset Dose

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When the accumulated dose exceeds the alarm threshold settings, an alarm will sound, causing the device to vibrate and sound the audio alarms, if configured to do so. Also, the Total Dose Alert notice will appear on the screen. Press the top right button to acknowledge the alarm. The alarm will stop, but the Total Dose Caution message will stay on the screen.

Press the Reset Dose button on the device in the Alerts/Alarm Thresholds menu to reset the alarm.

## 3.9.2 Alarm Options

The different levels of alarm thresholds are shown in the Alerts Menu. As the radiation level increases and the device measures radiation doses above each limit, the alarm will sound more frequently and the alarm level will be displayed in the upper left corner of the dose rate screen.



Figure 13: Home Screen with Alarm Triggered

## 3.9.3 Setting Alarm Levels

Alarm levels can be set on the MiniRad-DX using either the DX-View or DX-Dashboard software.

Alarm Level	mrem/hr	uSv/hr
Low	0.035	0.35
Medium	0.055	0.55
High	0.1	1.0
Very High	0.2	2.0

Figure 14: Default Alarm Levels

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## 3.9.4 Optional 1 – 9 Top Display

The top screen can be configured to display 1 - 9 alarm levels. All 9 alarm levels can be modified by the user with the DX-View software.

Alarm Level	mrem/hr	uSv/hr
1	0.035	0.35
2	0.04	0.4
3	0.055	0.55
4	0.065	0.65
5	0.1	1
6	0.2	2
7	0.35	3.5
8	0.6	6
9	1.1	11

Figure 15: Optional 1 - 9 Alarm Level Default Settings

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## 3.10 Display Menu

This menu allows the user to customize the device's display settings. Both screen brightness and sleep settings will affect the battery life of the MiniRad-DX.

## 3.10.1 Date & Time Settings

The default time setting for the MiniRad-DX is GMT (Greenwich Mean Time). Use the DX-View software to set the date and desired time zone.

Parameter	Range	Default Value
Time Format	12hr, 24hr	12hr
Top Screen Sleep	30 sec, 1 min, 5 min, Never	1 min
Front Screen Sleep	30 sec, 1 min, 5 min, Never	30 sec
Brightness Meter	Nine step slider	Step 6 of 9

### Settable Parameters



Figure 16: Display Menu

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## 3.10.2 Sleep Modes

There are 4 options for setting sleep timers for each screen. The timers for the two screens can be set independently of one another. The sleep timer options are: 30 seconds, 1 minute, 5 minutes, and never. Enabling sleep modes allows for the device to function longer between charges.

Regardless of the sleep settings, the MiniRad-DX will sound alarms and then wake the displays if radiation above the set threshold is encountered.

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## 3.11 Effective Center of Detector

The target symbol on the back label of the MiniRad-DX represents the most sensitive portion of the detector, which is also referred to as the effective center of detection. Always point the back of the detector toward the material or item you are measuring or scanning.

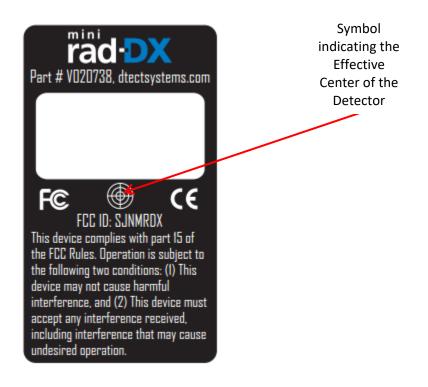


Figure 17: Effective Center of Detector

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# 3.12 USB Port

The USB port is located on the back of the detector behind the black rubber protective cover, and has two primary functions—charging the internal battery and communicating directly to your PC running the DX-View software. Connect the USB cable to the MiniRad-DX and the USB power adapter, and then insert the USB power adapter into an electrical outlet to charge the internal battery. Connect the USB cable to the MiniRad-DX and to your PC running the DX-View software to configure and set alarm settings on the MiniRad-DX.



Figure 18: USB port location under protective cover

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# 4 Specifications

Specification	MiniRad-DX		
Detectors	6 cm <sup>3</sup> CsI(Na) scintillation crystal with a PMT		
Communication	D-tect SensorNet mesh network, USB		
Power	Lithium Ion Battery (Rechargeable)		
Battery Life	130 hrs (depending on options selected) <sup>(1)</sup>		
Detection Speed	1 second		
Dose Rate Range	1 μrem/hr - 85 mrem/hr (0.01 μSv – 0.85 mSv/hr).		
Sensitivity (137Cs)	1.93 cps/μrem/hr (193 cps/μSv/hr)		
Dose Rate Response (137Cs)	Less than 20%		
Energy Range	59 keV – 2 MeV		
Display	<ul> <li>Two advanced displays to provide a rich user interface along with a quick display for detection status.</li> <li>Main Display         <ul> <li>Type: Transflective TFT LCD</li> <li>Resolution: 320 x 240</li> <li>Color Depth: 18-bits providing up to 262,144 color rendering</li> </ul> </li> <li>Top Display         <ul> <li>Type: Organic LED</li> <li>Resolution: 128 x 64</li> </ul> </li> </ul>		
Display Units	(μ – m)rem/hr, (n – m)Sv/hr, CPS		
Alarm Volume	> 85 dB (A-weighted in free air) at 30cm		
Humidity	95% at 35 °C non-condensing		
Temperature	-20 °C to 50 °C		
Dimensions	62 mm x 31 mm x 107 mm (2.44" x 1.22" x 4.21")		
Weight	172.9 g (6.1 oz)		
Environment	IP65 rated		
Regulatory	FCC and CE Compliant Designed to meet ANSI N42.32 <sup>(2)</sup> and N42.33 requirements		

#### Table 2: MiniRad-DX Specifications

- (1) Battery life testing was completed with GPS and SensorNet radio turned off. Enabling these features will reduce actual battery life.
- (2) The MiniRad-DX uses a built-in rechargeable battery that, due to safety concerns, is not replaceable. Therefore, D-tect claims an exemption from ANSI 42.32 Section 5.15.1.

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# 5 Compliance Requirements

This device complies with part 15 of the FCC rules and Industry Canada ICES-003. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Idustrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

IMPORTANT! Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT! Tous les changements ou modifications pas expressément approuvés par la partie responsible de la conformité ont pu vider l'autorité de l'utilisateur pour actioner cet equipment.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

**Note:** 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. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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## **FCC Radiation Exposure Statement**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

For Industry Canada

### Important Note:

## **Radiation Exposure Statement:**

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

## Note Importante: (Pour l'utilisation de dispositifs mobiles) Declaration d'exposition aus radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipment doit être installé et utilisé avec un mimimum de 20 cm de distance entre la source de rayonnement et votre corps.

## 6 Technical Support

For any technical questions, you are encouraged to contact your distributor, or you may also contact us directly.

Phone: 801-260-4000

## Email: techsupport@dtectsystems.com

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# 7 Warranty for D-tect System Products

#### 1. What this Warranty Covers and for How Long

D-tect Systems ("D-tect Systems") warrants this device (the "Product") against defects in materials and workmanship under normal use for a period of two years 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 ancillary and/or consumable products including but not limited to batteries, calibration sources, straps, and shipping cases. D-tect Systems, at its option, will at no charge either repair, replace or refund the purchase price of any Products that do not conform with this warranty. Repair may include the replacement of parts with functionally equivalent reconditioned or new parts. Replacement may include providing a functionally equivalent Certified Reconditioned/Pre-owned or a new Product. Products that have been repaired or replaced are warranted for the balance of the original warranty period or for 90 days from the date that the repaired or replaced Product is received by you, whichever is longer. All Products for which replacements have been provided will become D-tect Systems property.

#### 2. Other Warranty Conditions

This warranty is D-tect Systems' complete warranty for the Product. 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.

If D-tect Systems agrees to perform services requested and approved by the customer that are not included in either the Limited or Extended Warranty, these services will be billed to the customer at D-tect Systems' standard prices and terms.

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.

#### 3. What This Warranty Does Not Cover

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

b. Normal "wear and tear" of the Product such as scratches, scuffs, and marks on the LCD, case and other external features.

c. Cracked or broken displays, buttons, or damage to other externally exposed parts caused by abnormal use and/or abuse of the Product.

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

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

#### 4. How to Get Warranty Service

To get warranty service, please contact your distributor or D-tect Systems at <u>www.dtectsystems.com</u> .

You will receive directions on how to mail the Product to D-tect Systems. All Products shipped to D-tect Systems must be shipped with freight and insurance prepaid. Along with the Product you must include a receipt, bill of sale,

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or some other comparable proof of purchase, a written description of the problem and, most importantly, your address and telephone number. If additional information is needed, please contact D-tect Systems at the web address indicated above.

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