INSTALLATION AND OPERATING INSTRUCTIONS FOR THE

mini rad-DX™

RADIATION DETECTION SYSTEM

D-tect SYSTEMS™

D-tect Systems Group
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Table of Contents

1 Introduction

The MiniRad-DX is a handheld security and inspection device 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.

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

Communication and Security

- Mini USB interface
- 128 bit AES encryption (D-tect SensorNet)

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

2 Getting Started Guides

Additional documentation, such as Getting Started, Installation, and Quick Start Guides, is available to help you setup your MiniRad-DX network of detectors. Software is also available for configuration and communication including the DX-View software and the DX Cloud Server Software (DX-Dashboard).

List of Quick Start and Installation Guides

- Rad-DX Radiation Detector Quick Start Guide
- DX-View Quick Start Guide
- DX-Dashboard Quick Start Guide

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3 Box Contents

Figure 1: MiniRad-DX Handheld Radiation Detector

Other hardware components packaged with each MiniRad-DX include:

		
Mini USB Cable	Holster	USB Power Adapter

Table 1: Additional MiniRad-DX Hardware

4 Software Options

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

4.1 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 http://www.dtectsystems.com/downloads.html.

4.2 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 http://www.dtectsystems.com/downloads.html and download the DX-Dashboard manual.

Note: In order 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.

5 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 and turning on GPS will require more frequent recharging. Monitor the battery icon in the upper left corner of the front display to determine when it is time to recharge the MiniRad-DX.

6 Recharging the MiniRad-DX

The MiniRad-DX is recharged through a USB connection. Either a USB port on a PC or a USB wall charger can be used to recharge the MiniRad-DX.

7 Startup

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

Figure 2: Power Button

8 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.

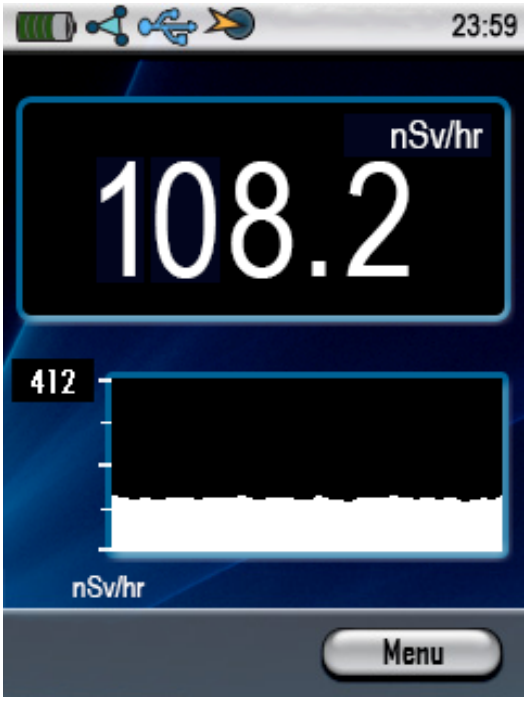

Figure 3: LCD Front Screen: Dose Rate and Graph

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

8.1 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% 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% or less of the battery is remaining the icon will change to 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 the 12 hour or 24 hour format.

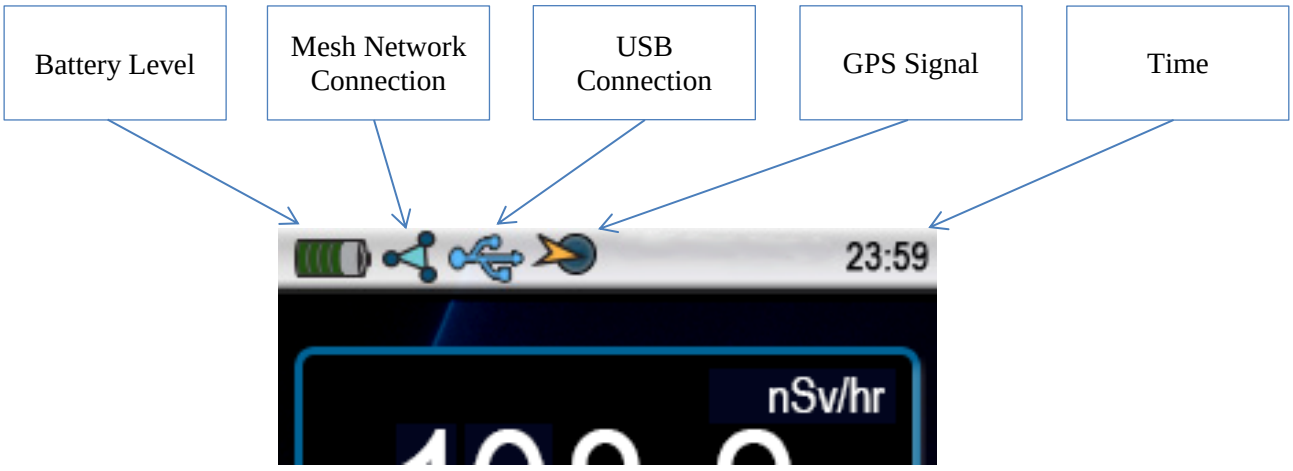

Figure 4: Communication Icons

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8.2 Graph Screen

The lower window on the Home screen displays the detected radiation levels in a convenient graph 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.

The graph shows a 1 second average for 30 seconds for the first 30 seconds once the device is first powered on.

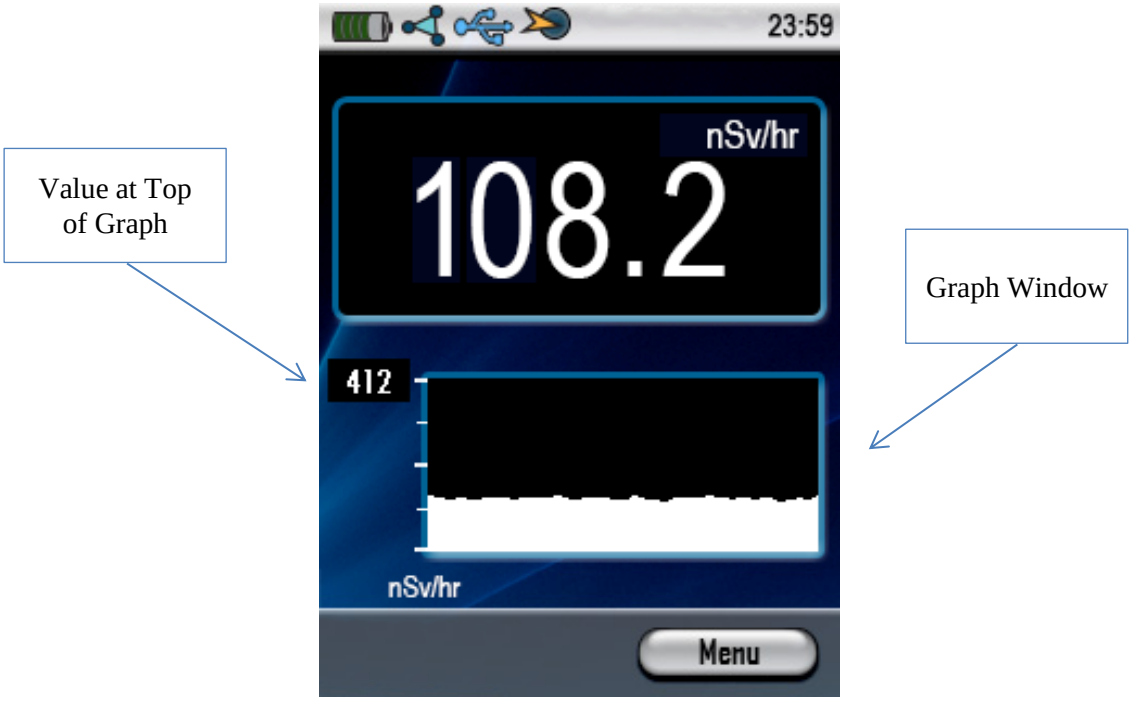

Figure 5: Front Screen Graph

8.3 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 that specific submenu. Use the upper left navigation button to return to the main menu from the submenu screens. Press the same button to close the main menu and return to the home screen.

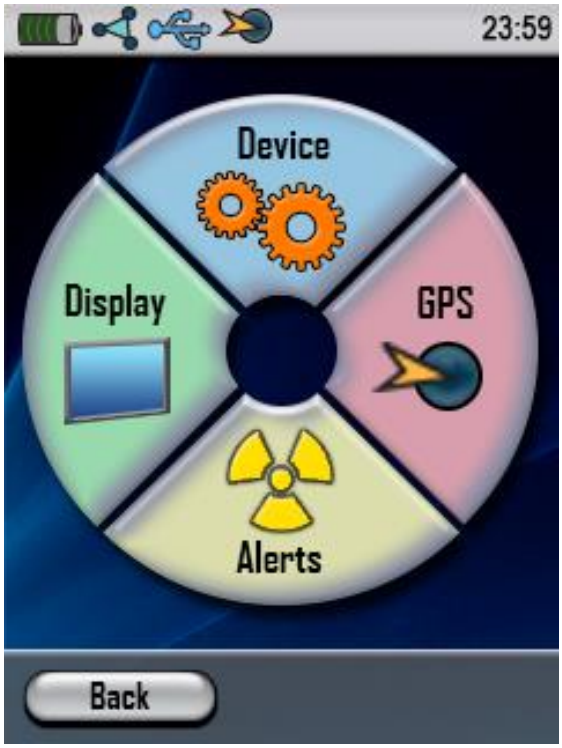

Figure 6: Menu Screen

8.4 Device Menu

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

Settable Parameters

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

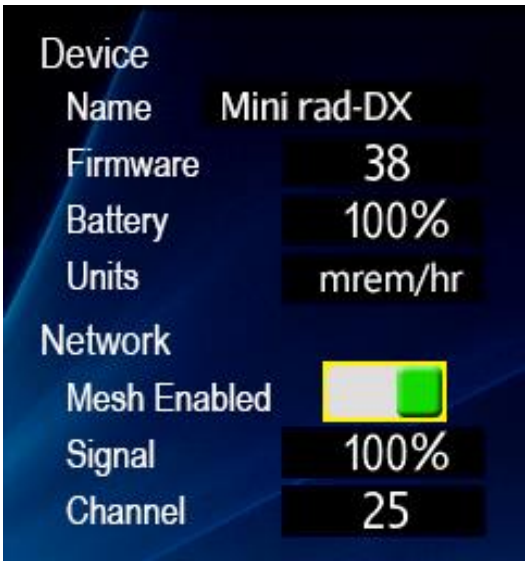

Figure 7: Device Menu

8.5 GPS Menu

The GPS feature can be toggled on and off in this menu. The GPS feature is for outdoor use or use when 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.

Settable Parameters

Parameter	Range	Default Value
GPS Enable	On, Off	Off

Figure 8: GPS Menu

8.6 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 also activate.

The sound and vibration features can be turned on and off, and the different alarm thresholds are also reported in this menu.

The vibration motor used in the MiniRad-DX rotates at 9500 rpm.

Settable Parameters

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

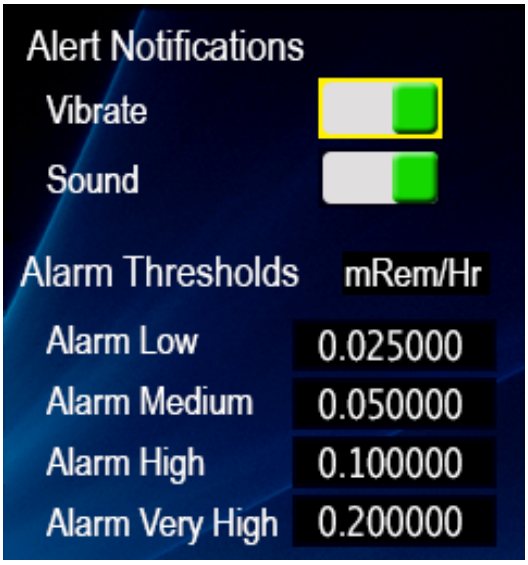

Figure 9: Alerts Menu

8.6.1 Accumulative Dose

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

The Mini Rad-DX measures accumulative dose levels for each device and displays it on the home screen.

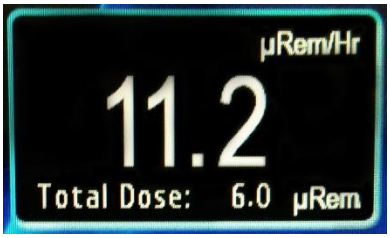

Figure 10: Home Screen with Accumulative Dose

In order to view the settings which have been configured with DX-View, first press the menu button and then use the circular button to navigate to the Alerts menu. Then 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.

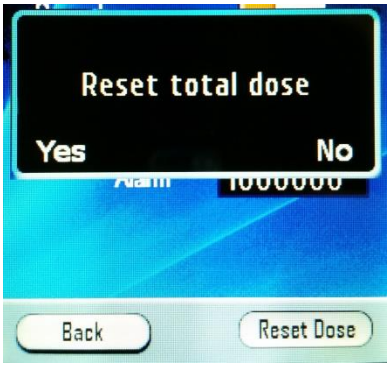

Figure 12: Reset Dose

When the accumulate dose exceeds the settings an alarm will occur 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 of the device. Press the top right button to acknowledge the alarm. The Mini Rad-DX will stop alarming, but the Total Dose Caution message will continue to appear on the screen.

Resetting the Total Dose Alarm can be done by pressing the Reset Dose button on the device in the Alerts/Alarm Thresholds menu.

8.6.2 Alarm Options

The different levels of alarm thresholds are reported in the Alerts Menu. As the radiation level increases and the device measures above each limit, the frequency of the alarming will increase and the alarm level will display in the upper left corner of the dose rate screen.

Figure 13: Home Screen with Alarm Triggered

8.6.3 Setting Alarm Levels

Alarm levels can be set on the MiniRad-DX using either the DX-View or DX-Dashboard software. Both are secured by password and prevent unauthorized modification of the alarm levels.

Alarm Level	mrem/hr	uSv/hr
Low	0.035	0.35
Medium	0.055	0.55
High	0.1	1
Very High	0.35	3.5

Figure 14: Default Alarm Levels

8.6.4 Optional 1 – 9 Top Display

The top screen can be configured to display 1 - 9 alarm levels similar to the original Mini Rad-D radiation detector. 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	0.55	0.55
4	0.65	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

8.7 Display Menu

This menu allows the user to customize the device's display settings. Both screen brightness and sleep settings will affect the time that the MiniRad-DX can operate between charges.

8.7.1 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 to set the desired time zone.

Settable Parameters

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

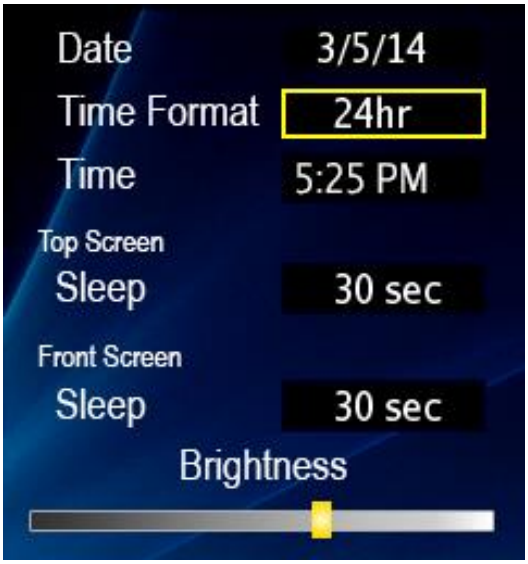

Figure 16: Display Menu

8.7.2 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 options are as follows: 30 seconds, 1 minute, 5 minutes, or never. Enabling sleep modes allows for the device to function longer between charges.

For example, say that a security guard is carrying a MiniRad-DX with them on their rounds through the building. Typical use would have them wearing the device on their belt. To preserve battery life, the front screen could be set to 1 minute of inactivity before shutting off and the top screen could be set to never sleep. This allows for continuous status monitoring through the top screen and turning on the front screen only whn further information is needed.

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

9 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.

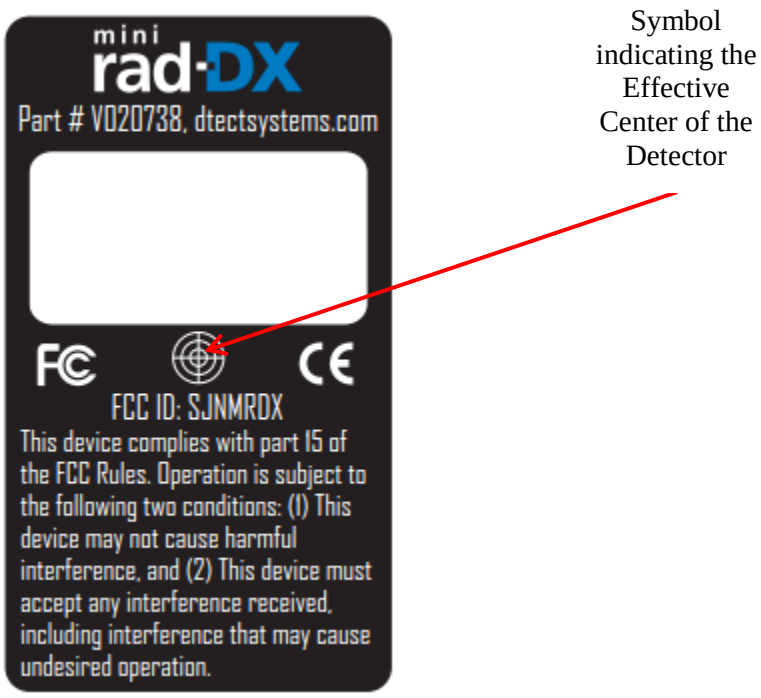

Figure 17: Effective Center of Detector

10 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

11 PC Connection and Network

D-tect DX-View Network: Using the DX-View PC software, a simple network of detectors in the Rad-DX family can be controlled and monitored from a PC as shown below by utilizing the DX Link USB radio and the Mesh communication network.

Figure 19: Basic PC Network

D-tect Cloud Network: For Wi-Fi and/or Ethernet based communication, the DX-Dashboard with either the D-tect Cloud Server or D-tect Network Assistant. can be used to monitor the Rad-DX family of devices. The D-tect Cloud Network is an easy method to control and monitor a network of detectors in the Rad-DX family. It also allows the detectors to be monitored via smartphone, tablet, or PC. Setting up your MiniRad-DX unit within the Cloud Network will require a PC with an internet connection and at least one Rad-DX to communicate Ethernet or WiFi with the D-tect Cloud network. All information sent over the Cloud is SSL encrypted.

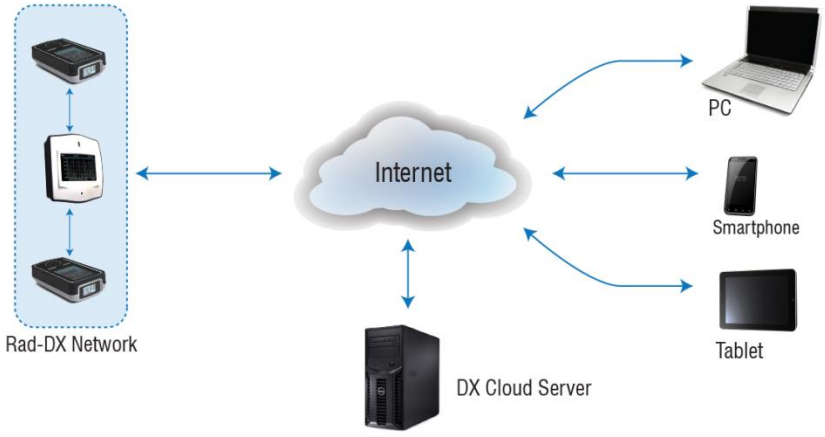

Figure 20: D-tect Cloud Network

DX Assistant: The DX Assistant appliance allows MiniRad-DX and Rad-DX devices to operate behind a firewall that blocks access to the internet. The DX Assistant is a computer that includes all the software needed to control and monitor the network of detectors. DX Assistant software can also be installed on a virtual machine on a local server.

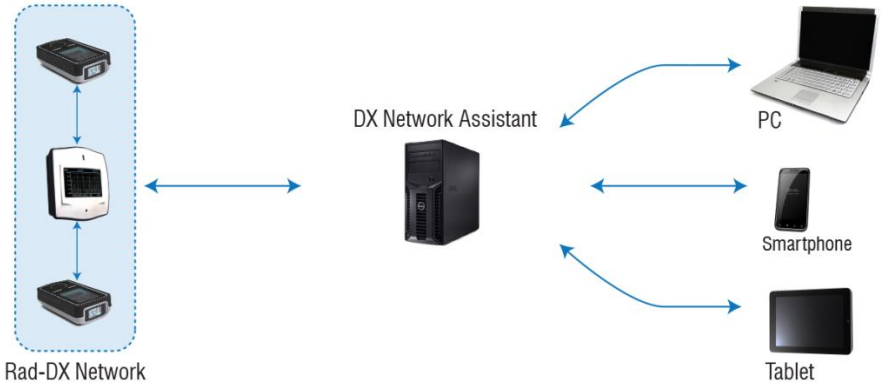

Figure 21: DX Assistant Network

A Rad-DX network can include Rad-DX area monitors, Rad-DXG gateway monitors, MiniRad-DX handheld units, and DX-Link repeater/gateway devices. An example of a DX-Dashboard monitoring screen (on a PC, tablet, or smart phone) is shown below.

Figure 22: Rad-DX Device Network Example

12 Specifications

Specification	MiniRad-DX
Detectors	6 cm^3 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) (1)
Detection Speed	1 second
Dose Rate Range	1 µrem/hr - 70 mrem/hr (0.01 µSv – 0.7 mSv/hr).
Sensitivity (^{137}Cs)	1.93 cps/µrem/hr (193 cps/µSv/hr)
Dose Rate Response (^{137}Cs)	Less than 20%
Energy Range	50 keV – 3 MeV

Display	Two advanced displays to provide a rich user interface along with a quick display for detection status.
	• Main Display
	  ○ Type: Transflective TFT LCD
	  ○ Resolution: 320 x 240
	  ○ Color Depth: 18-bits providing up to 262,144 color rendering
	• Top Display
	  ○ Type: Organic LED
	  ○ Resolution: 128 x 64

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(2) 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.

13 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) I'appareil ne doit pas produire de brouillage, et (2) I'utilisateur de I'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 I' autorité de I'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.

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.

14 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

15 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 www.dtectsystems.com .

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, 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.

5. General Provisions

THIS IS THE COMPLETE WARRANTY FOR THIS PRODUCT BY D-TECT SYSTEMS AND SETS FORTH YOUR EXCLUSIVE REMEDIES. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESS WARRANTIES. IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE GIVEN ONLY IF SPECIFICALLY REQUIRED BY APPLICABLE LAW. OTHERWISE, THEY ARE SPECIFICALLY EXCLUDED. IN NO EVENT SHALL D-TECT SYSTEMS BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT OR FOR ANY INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, TO THE FULL EXTENT THESE DAMAGES MAY BE DISCLAIMED BY LAW.

6. Patent and Software Provisions

D-tect Systems will defend at its own expense, any suit brought against you to the extent that it is based on a claim that the Products infringe a United States patent. D-tect Systems will pay those costs and damages finally awarded against you in any such suit which is attributable to any such claim. The defense and payments by D-tect Systems are conditioned on the following: (a) that you will notify D-tect Systems promptly in writing any notice of the claim; and (b) that D-tect Systems will have sole control of the defense of the suit and all negotiations for its settlement or compromise; and (c) should the Products become, or in D-tect System's opinion be likely to become, the subject of a claim of infringement of a United States patent, that you will permit D-tect Systems, at its option and expense, either: to procure for you the right to continue using the Products or parts; to replace or modify them so that they become non-infringing; or to grant you a credit for such Products or parts as depreciated and accept their return. The depreciation will be an equal amount per year over the lifetime of the Products, accessories, battery or parts as established by D-tect Systems.

D-tect Systems will have no liability to you with respect to any claim of patent infringement which is based upon the combination of the Products or parts furnished under this limited warranty with software, apparatus or devices not furnished by D-tect Systems. D-tect Systems will have no liability for the use of ancillary or peripheral equipment or software not furnished by D-tect Systems which is attached to or used in connection with the Products. The foregoing states the entire liability of D-tect Systems with respect to infringement of patents by the Products, accessories, batteries or any parts of them.

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