INSTALLATION AND OPERATING INSTRUCTIONS FOR THE

rad-DX™

RADIATION DETECTION SYSTEM

Including

DX-link

Version 13
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1   Introduction

The Rad-DX is a security and inspection system that detects emissions from radioactive material. The Rad-DX system can operate as a stand-alone detector or as part of a larger Rad-DX network for monitoring areas such as buildings or other facilities.

2   Installation and Configuration

2.1 System Components

There are several configurations available for Rad-DX systems. Four styles are available: black with LCD, black without LCD, white with LCD, and white without LCD.

Figure 1: Rad-DX Versions: black and white, LCD and non-LCD

Other hardware components packaged with each Rad-DX include:

Mounting Bracket	USB Cable
Wire Nuts and Mounting Screws	"Pigtail" Wire Harness
Power Cable (black or white depending on color of Rad-DX)	

Table 1: Additional Rad-DX Hardware

2.2 Installation and Setup of your Rad-DX

2.2.1 Physical Installation

The Rad-DX is designed to be either wired and mounted into an electrical junction box or attached to a wall in close proximity to an outlet.

2.2.1.1 Junction Box Method

Mounting a Rad-DX unit directly into a junction box requires the following steps:

Note: An electrician should complete the installation to ensure the quality of the installation and safety of the installer.

1. Mount the Rad-DX wall bracket onto the junction box using the screws included. If a non-standard junction box is being used, connect the wall bracket to the wall with drywall anchors or wood screws.
2. Connect the black wire from the "pigtail" wire harness to the black wire in the junction box. Connect the white wire from the wire harness to the white wire in the junction box.
3. Plug the wire harness into the back of the Rad-DX unit.
4. Press the Rad-DX onto the wall bracket and make sure it is secure. It will snap into place. The Rad-DX can be removed from the bracket by lifting the top tab with a flathead screwdriver.
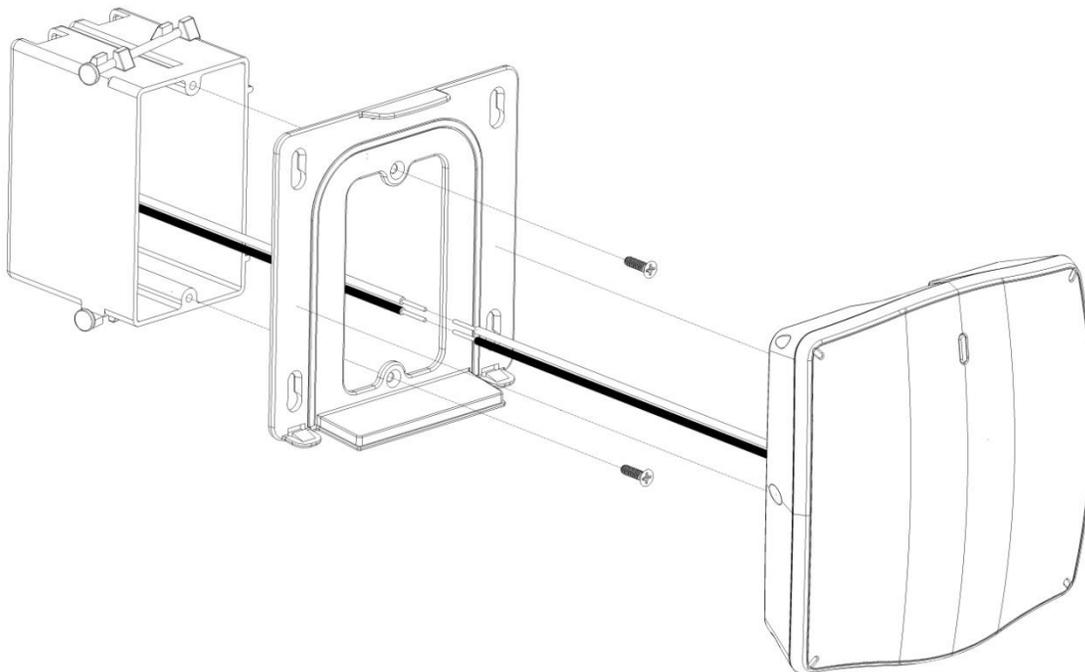

Figure 2: Junction Box Mounting Method

2.2.1.2 Plug-In Wall Mount Method

To power a Rad-DX unit with A/C power without connection to a junction box, follow these steps:

1. Mount the Rad-DX wall bracket to the wall using drywall anchors or wood screws.
2. Connect the A/C power cord to the Rad-DX. Then plug this cord into a nearby outlet.

Note: The plug-in wall method is meant for indoor installation. The IP65 rating does not apply to this method.

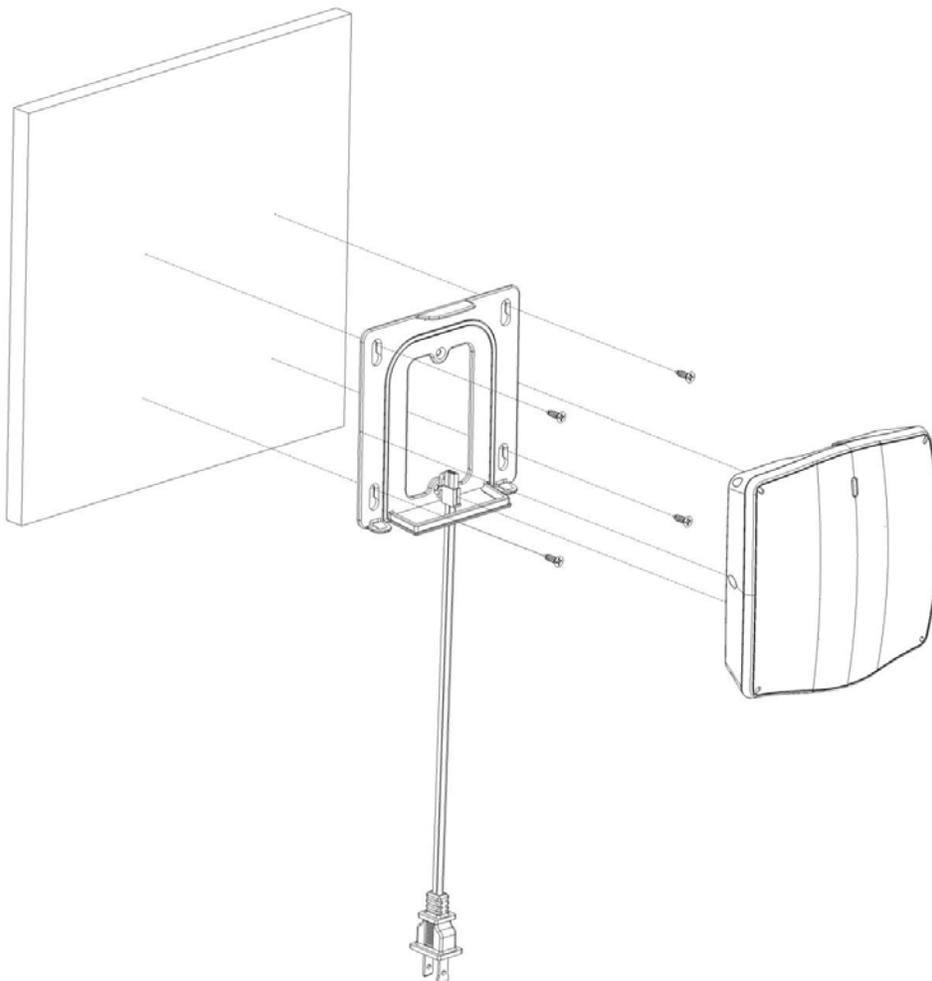3. Press the Rad-DX onto the wall bracket and make sure it is secure.

Figure 3: Plug-in Wall Mount Method

2.3 Networking Options

For information on using the Rad-DX in a network please refer to either the DX View desktop or DX Dashboard web manuals.

2.4 NEMA Enclosure Option

The Rad-DX can be mounted and sold in a NEMA enclosure that is designed to protect against environmental conditions. The NEMA enclosure also offers additional features to improve performance including two larger, higher gain antennas, a cooling fan, and a larger, longer-lasting backup battery.

The option to include the NEMA enclosure does change the standard Rad-DX case.

LCD Display Screen: The LCD display screen is not included.

Front Cover: The original front cover is removed to facilitate connecting the antennas and battery wires to the Rad-DX.

USB Cable: The USB cable used to initially configure each device comes already attached to the Rad-DX.

Figure 4: NEMA Enclosure

Figure 5: Inside the NEMA Enclosure

Integrated Fan: An integrated fan is mounted on the door of the enclosure. While AC power is connected to the enclosure, the fan continues to run, providing an improved, cooler operating temperature for the detector.

Larger, High Gain Antennas: The standard Rad-DX has two built-in antennas—one for Wi-Fi and the other for Mesh communication. The NEMA enclosure option comes with two larger, higher gain antennas, one for each communication type.

Larger Capacity Backup Battery: A larger capacity backup battery provides longer operating times in the event of a power outage. Once AC power is disconnected the cooling fan will stop, allowing for longer emergency operation.

3   Operation

3.1   Software Monitoring Options

Three different software applications are available to monitor and configure Rad-DX radiation detectors.

For more information, please see their respective user manuals.

3.1.1   DX-View Software

The DX-View is a PC-based software application used for configuring and monitoring your Rad-DX radiation detectors. The DX-View software is also used to view and download data from one or more Rad-DX radiation detectors. 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.

3.1.2   DX-Dashboard Software

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). For more information about this software, go to http://www.dtectsystems.com/downloads.html and download the DX-Dashboard manual.

3.1.3   DX-Assistant Network Server

The DX Assistant is a stand-alone local server specifically designed to support a network of Rad-DX radiation detectors inside your own protected firewall. This appliance comes installed with the DX-Dashboard software and allows for flexibility in configuring Rad-DX detectors to communicate via Ethernet, Wi-Fi, and Mesh networking options.

When setting up a DX network with the DX Assistant server, please refer to the DX Assistant Installation Guide for complete installation instructions.

3.2 Using the LCD Screen

The Rad-DX can operate in a stand-alone mode with information displayed on the LCD display. Options for the Rad-DX, such as display types and radiation units, can be set using the following process:

1. Connect the Rad-DX device to a power source, either by using the A/C plug or wiring it directly to the junction box (see Physical Installation, Section 2.2.1)
2. The following will appear on the LCD screen as the Rad-DX boots up.

Figure 6: Boot up Screen

3. The Dose Rate Screen will appear on the LCD screen after the booting sequence is complete.
4. The red lines shown below indicate the touch zone areas for each screen.
   - Reset the dose to zero by touching "Total radiation."
   - Touch "Dose Rate" to change the units displayed.
   - Change the time frame by touching the time frame displayed in the lower right of the bar graph screen. The graph can display measurements as they are taken within 1, 6 or 30 minute time slots.
5. To toggle through the different screens, touch anywhere else on the screen.
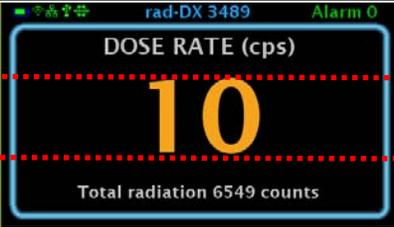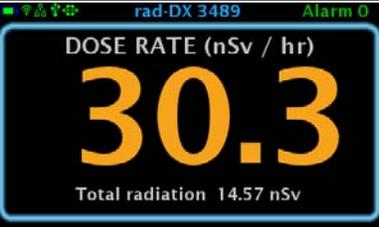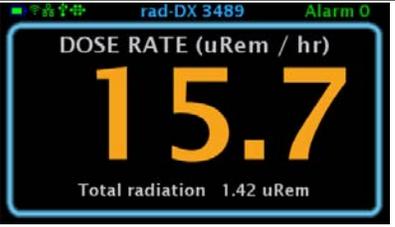
Dose Rate (cps)	Dose Rate (nSv/hr)	Dose Rate (uRem/hr)
Bar Graph (cps)	Bar Graph (nSv/hr)	Bar Graph (uRem/hr)
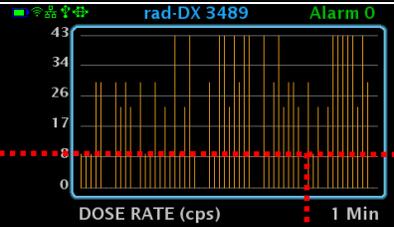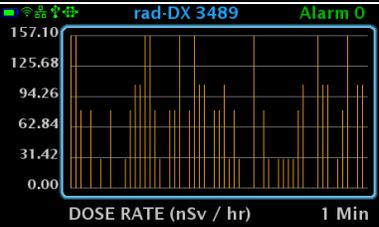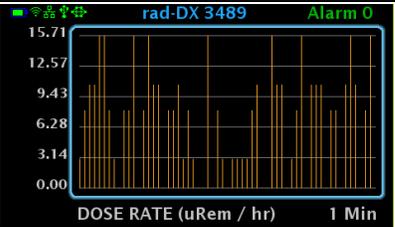
Table 2: LCD Screen Shots: Dose Rate and Bar Graph (CPS, nSv/hr, and uRem/hr)

3.2.1 Explanation of Networking Icons on the LCD Touch Screen

Battery Level	Wi-Fi Connection	Ethernet Connection	USB Connection	Mesh network Connection
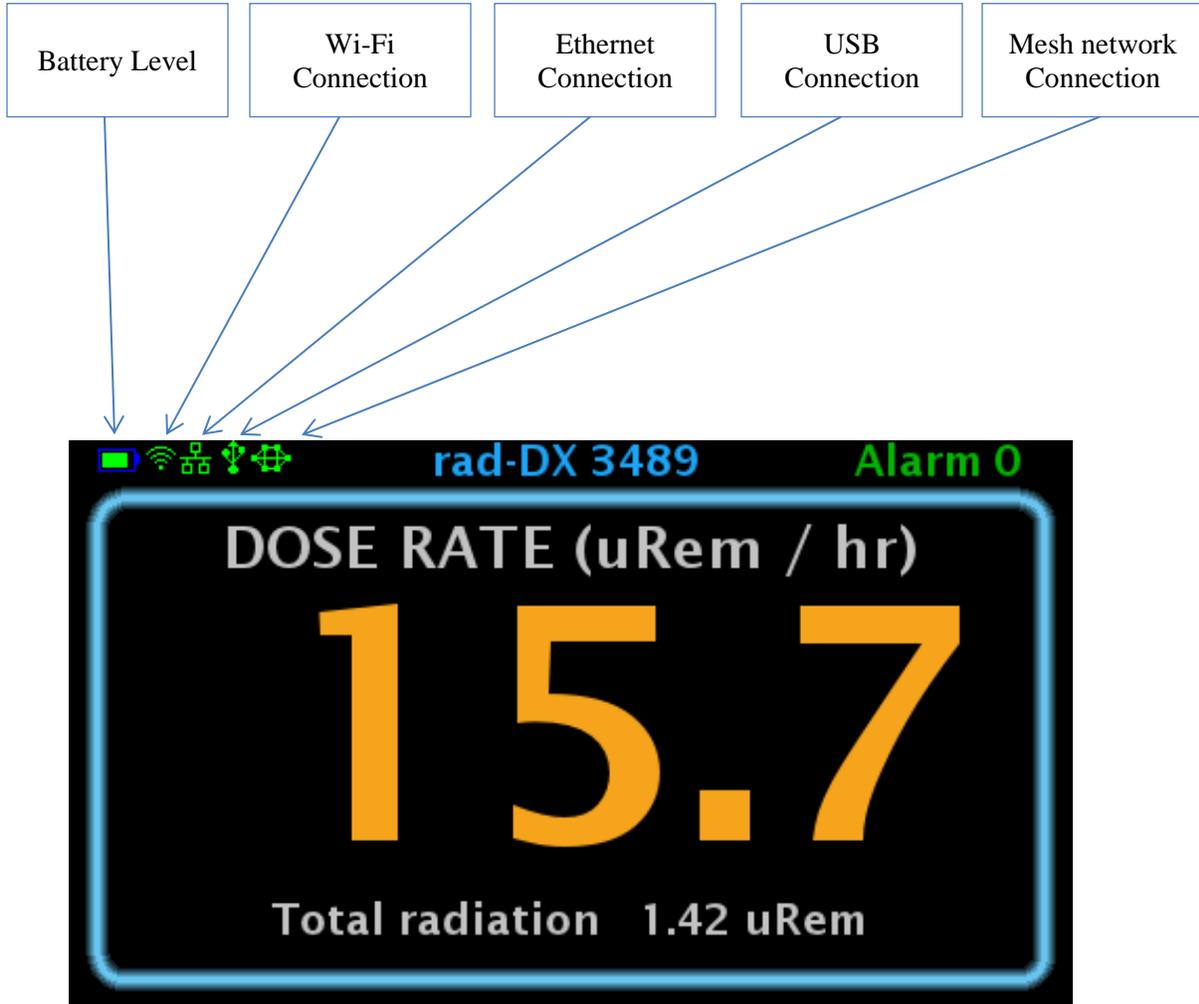
Figure 7: LCD Screen

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

4 Turning Off the Rad-DX

There are three ways to turn off or "Power Cycle" the Rad-DX. The first way is to simply unplug the power cable and allow the backup battery to die.

The second method is to insert a small paper clip into the small hole located on the back of the device. If the power cable is unplugged then the device will turn off. If the power cable is still connected, then the device will power cycle and turn back on.

The third method is to press and hold the battery icon located in the upper left-hand corner of the LCD screen for about 10 seconds, or until the device powers off. If the power cable is unplugged, then the device will turn off. If the power cable is still connected, then the device will power cycle and turn back on.

Note: This method requires that the device have firmware version 265 or higher.

Figure 8: Press and Hold the Battery Icon to Turn Off

5 Specifications

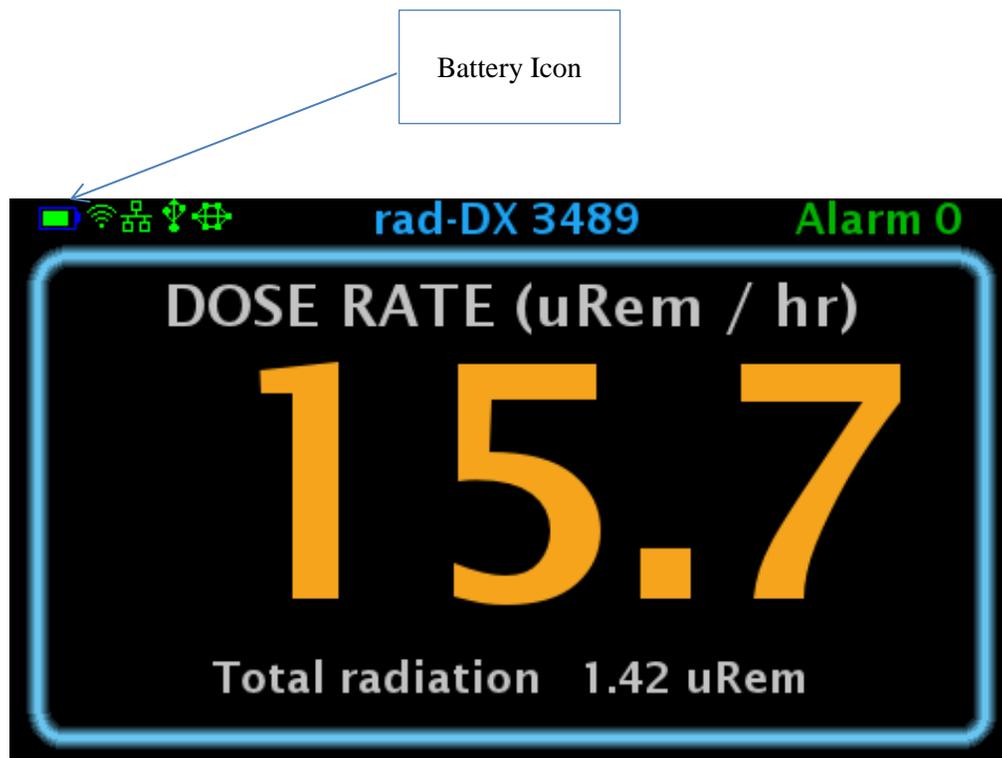|	
Detectors	6 cm^3 CsI scintillation crystal with a PMT
Communication	D-tect SensorNet, Wi-Fi, Ethernet, USB, optional DX-Link
Power	120/240V AC, 50/60 Hz 110/220V—Auto Detect
Installation	Mount directly to junction box, Standard power cord
Backup Power	Lithium-ion battery
Detection Speed	Less than 1 second
Dose Rate Range	1 µR/hr to 100 mR/hr (.01µSv/hr to 1mSv/hr) Optional HDD: 80 mR/hr to 50 R/hr (.8mSv to .5 Sv/hr) *Air-kerma dose conversion 1 R = 0.876 REM for per ANSI +N42 32-2006.
DR Linear Error	+/- 10% to Cs137
Energy Range	59 keV – 2 MeV
Display	LCD 4.3" Color TFT / Resolution 480 x 272 / Touch Screen
Units	µRem/hr, µSv/hr, CPS
Audible Alarm	Piezoelectric buzzer (with LCD Display version only)
Alarm Volume	> 98dB
Humidity	< 95% (non-condensing)
Dimensions	5.97" x 5.92" x 1.75" (15.2 cm x 15 cm x 4.4 cm)
Weight	Non-LCD version: 0.5 lb (0.2 kg) LCD version: 0.65 lb (0.3 kg)
Environment	IP65 rated for indoor/outdoor operation

Table 3: Rad-DX Specifications

5.1 Optional NEMA Enclosure Specifications

Communication	D-tect SensorNet Mesh network, Wi-Fi, Ethernet, USB, with Larger, Higher Gain Antennas
Power	120/240V AC, 50/60 Hz
Backup Power	3700 mAh Lithium-ion battery
Dimensions	15.32" x 11.32" x 5.6" (15.2 cm x 15 cm x 4.4 cm)
Weight	10.1 lbs. (4.58 kg)
Environment	IP NEMA Type 3R, 3RX

Table 4: NEMA Enclosure Specifications

6   DX-Link

The DX-Link is a small wireless USB communication device designed to facilitate mesh communication with one or more Rad-DX detectors.

Figure 9: DX-Link

The DX-Link's USB interface allows for multiple uses such as improving the strength of your Mesh network and improving communications with Rad-DX detectors. Below is an explanation for each use-case scenario.

6.1.1 Replace USB Cable

The DX-Link provides a direct communication link between a PC and a Rad-DX detector, thus eliminating the need to monitor and adjust the settings of a detector with the use of a USB cable. Please note that using a DX-Link to replace the USB cable can only be used with the DX-View software—not the DX-Dashboard software.

6.1.2 Gateway to PC using DX-View

The DX-Link can be used as a "gateway" while using the DX-View to monitor one or several Rad-DX detectors. If the DX-Link is inserted into a USB port on the PC, not only can you monitor, control, and download data from any Rad-DX detector as stated above, you can also view all detectors within the Mesh network.

In the same manner that a DX-Link can act as a gateway, a Rad-DX that is connected to a PC via a USB cable can also act as a gateway. Again, this can only be done using the DX-View on your PC.

6.1.3 Use as a Repeater

The DX-Link can also be used as a "repeater" to improve the range of a Mesh network. When one detector is out of range of the Mesh network, a DX-Link can be strategically placed between that detector and another detector that is within range, providing a path of communication. The DX-Link can be used as a repeater in both the DX-Dashboard and DX-View software.

The DX-Link comes with a USB power adapter for using the DX-Link as a repeater. In addition to using the USB power adapter, the DX-Link can also be powered by inserting it into any USB hub or USB port on any computer, including any computer not being used to monitor the radiation detectors. It will operate normally even if the DX-Link and the computer are not communicating.

Figure 10: Sample USB Power Adapter

Figure 11: DX-Link as a Repeater

You can now extend the range of communication between the Rad-DX and the monitoring PC. If more range is needed, add more DX-Link repeaters.

DX-Links can be used interchangeably as a gateway or a repeater as long as they are on the same mesh channel.

Also, Rad-DXs will also function as repeaters if incorporated into the Mesh network. And, you can monitor many Rad-DXs using the DX-View at once and you can have multiple repeaters in your mesh.

DX-Links used as repeaters can also be used as repeaters when Rad-DXs are communicating with the D-tect Cloud or D-tect Network Assistant servers.

7   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.

8   Software Usage Statement

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (http://www.openssl.org/)

9   Technical Support

For any technical questions please contact your distributor, or you may also contact us directly.

Phone: 801-260-4000

Email: techsupport@dtectsystems.com

10   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.

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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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