

RAD TAG

User Manual



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SIM-TEQ

Record of Changes

Revision	Date	Description of Modification	Modified Pages
0	March 2016	Initial Release	N/A
1	November 2016	Updated for Regulatory Approval	v-vi
2	January 2018	Screenshot updates	All

Safety Precautions

Battery Warnings

Batteries are susceptible to fire and abuse. Some manufacturers provide batteries with a safety vent, which allows a controlled released of electrolyte if fire and abuse conditions occur. If the Rad Tag has been damaged in a manner that could affect the battery, care must be exercised during battery removal. The battery may have vented into the Rad Tag case and caused the Rad Tag to become pressurized.

Internal Access

The operator is not authorized to open the Rad Tag. Attempting to gain access to the internal components will cause permanent damage to the Rad Tag electronics.

Certifications

FCC Compliance Statement

IMPORTANT: Contains FCC ID: VW4A091732 and FCC ID: 2ADY2RSCSDWUWBM1. This equipment complies with Part 15 of the FCC Rules. 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 (FCC 15.19).

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Important

IMPORTANT: Modifications not expressly approved by this company could void the user's authority to operate this equipment (FCC section 15.21).

FCC ID: VW4A091732

FCC ID: 2ADY2RSCSDWUWBM1

Canada, Industry Canada (IC) Notices

This product complies with Industry Canada RSS-210.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, the radio transmitter(s) in this device may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Contains IC: 11019A-091732

Contains IC: 12574A-RSCSDWUWBM

Rad Tag

Canada, avis d'Industry Canada (IC)

Cet appareil est conforme aux norme RSS210 d'Industrie Canada.

Cet appareil est conforme aux normes d'exemption de licence RSS d'Industry Canada. Son fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

Conformément aux réglementations d'Industry Canada, les émetteurs radio de cet appareil ne peuvent fonctionner qu'à l'aide d'une antenne dont le type et le gain maximal (ou minimal) pour ces émetteurs - transmetteurs sont approuvés par Industry Canada. Pour réduire le risque d'interférence éventuelle pour les autres utilisateurs, le type et le gain de l'antenne doivent être choisis de manière à ce que la puissance isotrope rayonnée équivalente (p.i.r.e.) minimale nécessaire à une bonne communication soit fournie.

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1 SIM-Teq System Overview

The SIM-Teq™ System is a portable wireless training network of simulated dosimeters, survey meters, and gamma radiation sources. The system allows the instructor to combine simulated instrument auto-response with manual remote control capability. The SIM-Teq system enables trainers to create a training environment which includes high fidelity simulated instruments and “live” detectable sources to instill the experience, self-assurance, and real understanding they want trainees to achieve - safely. The instructor is free to teach, observe and assess the trainee, with the ability to remotely manage or control any SIM-Teq device at any time. The system is designed to meet the variety of training organization needs to provide frequent, realistic training to provide Responders with the skills necessary to successfully coordinate together in an actual incident.

SIM-Teq System

The basic building blocks of the SIM-Teq system include the following:

- Windows tablet running the Simulation Control Center (SCC) application
- USB Dongle: allows for wireless control of the devices
- TWRS: Two-Way Ranging Source to simulate actual radioactive gamma-emitting material
- Simulated Survey Meter: Realistic portable survey instrument with Two-Way Ranging feature
- Simulated Electronic Dosimeter: Realistic electronic dosimeter
- Rad Tag: Two-Way Ranging receiver that pairs with Simulated Electronic Dosimeter

1.1 Simulation Control Center (SCC) and USB Dongle Overview

The Simulation Control Center (SCC) software application is the SIM-Teq system command center to wirelessly monitor, manage and control all SIM-Teq training products. SCC is designed to run on a Windows 10® tablet/PC. The USB Dongle contains an IEEE 802.15.4 wireless module, allowing for configuration, manual control, and monitoring of one or more devices. SCC enables the instructor to swap between auto-response and manual control of all features and functions supported by each connected training device. Individual devices or groups of devices can be managed effectively for classroom and field training scenarios. SCC supports up to thirty-two (32) connected training devices at one time. The SIM-Teq system allows multiple tablets to run SCC in proximity. In addition, SCC allows the user to update SIM-Teq product firmware. Instructors should fully familiarize themselves with the operations of their Windows 10® device before reading this manual.

Simulation Control Center is routinely updated to include new SIM-Teq system features, training instruments, and system devices. These updates ensure all SIM-Teq users of having a common training platform with the ability to interface with any inventory of SIM-Teq products. It also ensures that new training products are seamlessly incorporated. SCC is available for download from the online Windows Store®.

1.2 TWR Sources Overview

The Two Way Ranging Source (TWRS) simulates a "live" point isotropic source of gamma radiation. SIM-Teq training instruments fitted with TWR circuitry continually measure the distance from one or more sources and adjust the reported dose rate in accordance with the 1/R² principle. Each source is physically identical, small and easy to conceal, and suited for indoor and outdoor use. Powered by an

Rad Tag

internal rechargeable battery with LED charge indication, the TWR source requires no user intervention other than switching on to operate. The source strength is pre-configurable for specific training application and is adjustable via the SCC application. Each source activity level is configurable from 1 mR/hr to 99,000 R/hr, measured at one foot from the source. Sources can be deployed individually or as hot spots. Sources are detectable up to approximately 100 feet line of sight.

1.3 Simulated Instruments

SIM-Teq training instruments simulate Original Equipment Manufacturer (OEM) portable survey meters and electronic dosimeters. Each training product uses OEM factory parts in their construction to provide the same form factor, display, switches, fault and alarm features, response variability and operating functionality as the real instrument. In most cases, all features are replicated. No calibration is required. Each simulated instrument is designed for manual or automatic dose rate input. The training instrument is manually controlled wirelessly using SCC through the dongle. Automatic dose rate input is provided to SIM-Teq training instruments fitted with TWR circuitry responding to one or more TWR sources. Supported training device features include most real device configuration options, alarms, and faults. In some cases, training instruments include operability with associated real device accessories for expanded training capability.

Personnel can be trained to operate instrument controls and functions (display, view alarm set points, toggle dose and dose rate), observe any dose and dose rate (up to saturation), and recognize and distinguish dose and rate alarms (audible and visual). Depending upon the instrument they can also be trained to identify fault and alarm conditions, and in some cases, respond to instrument conditions associated with OEM remote monitoring accessories and software applications.

1.4 Rad Tag Overview

The Rad Tag is a device fitted with TWR circuitry to continuously measure the distance from one or more TWR sources and input the reported dose rate, via a wireless communication link, to a SIM-Teq electronic dosimeter or small survey meter which is not fitted with TWR circuitry. The Rad Tag is small, light and easy to wear by the user in proximity to the training instrument. Each Rad Tag is physically identical, powered by an internal rechargeable battery with LED charge indication, and requires no trainee intervention other than switching on to operate. Wireless pairing of a Rad Tag with a SIM-Teq instrument without TWR circuitry is done using SCC. Once paired, no further instructor control is required. Paired devices operate within the SIM-Teq system the same as any other training instrument fitted with TWR circuitry. The instructor can monitor and manage each pairing within SCC, including swapping between instrument auto-response and manual remote control. One or more Rad Tag/instrument pairings operate within a training exercise.

1.5 Using SIM-Teq

The SIM-Teq system includes many options to train responders using radiation detection instruments. The system is a portable, comprehensive tool to enable any training organization to quickly and easily create a safe and realistic radiological environment. In the simplest training scenario, a powered TWR source can be deployed, and a trainee handed a training instrument to locate a boundary line, complete a survey or locate the source. The trainee can practice their skills and build their confidence while experiencing life-like response of an OEM radiation detection instrument - in a safe environment. From learning the basic principles of radiation and operation of instruments in a classroom to working in complex radiological scenarios in the field, SIM-Teq provides the flexibility to suit the needs of radiation training programs and achieve the desired results. Trainees can independently practice honing their

skills using a single simulated source and instrument. A classroom of trainees can each experience the features and functions of their instrument, all controlled by a single instructor. Response Teams participating in a multi-organizational drill can all safely experience an interactive large-scale radiological event, where one or more Exercise Controllers can easily observe and manage the hazardous environment.

2 Rad Tag Description

2.1 Introduction

This manual provides operation and operator's maintenance information for the Radiation Safety & Control Services Inc. (RSCS) Rad Tag. The Rad Tag is a SIM-Teq™ system device fitted with TWR (two-way ranging) circuitry to continuously measure the distance from one or more TWR sources and input the reported dose rate, via the paired wireless communication link, to any SIM-Teq electronic dosimeter or small survey meter which is not fitted with internal TWR circuitry. The Rad Tag is small, light and easy to wear by the user near the training instrument. Each Rad Tag is physically identical, powered by an internal rechargeable battery with LED charge indication, and requires no trainee intervention other than switching on to operate. Wireless pairing of a Rad Tag with a SIM-Teq instrument without TWR circuitry is done using the SCC application. Once paired, no further instructor control is required. Paired devices operate within the SIM-Teq system the same as any other training instrument fitted with TWR circuitry. The instructor can monitor and manage each pairing within the SCC application, including swapping between instrument auto-response and manual remote control. One or more Rad Tag/instrument pairings will operate within a training exercise.

Note: It is recommended that the user fully familiarize themselves with the SCC, TWR Source, and specific training instrument User Manuals, before reading this manual.

2.2 Specifications

The Rad Tag has been designed to work in the same environmental conditions as the SIM-Teq Instruments it pairs with. The Rad Tag includes an integrated belt clip for ease of wearing on a belt or clipped to clothing in proximity to the training instrument. It is also small enough to be carried in a pocket. The Rad Tag is not waterproof. However, it is well suited for use in:

- Classroom, office, and Laboratory environments
- Industrial environments (including dockyards and shipping)
- Hospitals
- Military Training Environments

The Rad Tag has the following major features:

- Wireless communication via integrated transmitters with a range of approximately 75 ft.
 - IEEE 802.15.4, 2.4 GHz, 0.44 mW
 - UWB (ultra-wide band) 6.4 GHz (6.2-6.7 GHz), <0.001 mW

Rad Tag

TABLE 1 RAD TAG SPECIFICATIONS

Model Number	Rad Tag
Physical Dimensions	PMMA Plastic Case: approximately 4" x 0.75" x 2.5"
Color	Black
Power Requirements	Internal Battery: 3.7V rechargeable Li-ion battery with micro-USB recharging port Supplied Charger: USB Wall Charger 5V / 2A
Battery Life	At least 8 hours of continuous use, includes LED Power Indicator and LED Battery Life Indicator
Environmental	Drop resistant, IEC 61526
Wireless Communication	IEEE 802.15.4, 2.4 GHz, 0.44 mW UWB (ultra-wide band) 6.4 GHz (6.2-6.7 GHz), <0.001 mW
EMI	Pending
Supported Features	<ul style="list-style-type: none"> • Can be wirelessly paired with any SIM-Teq training dosimeter • Operates independently with any SIM-Teq TWR Source providing automatic input of dose rate measurements to paired dosimeter • Automatic detection of TWR Sources • No calibration required
SCC Application	Available from Windows Store® runs on Windows 10® tablet or pc with USB Dongle
Max Devices in SCC Configured Kit	8 Devices (DMC 2000TD with Rad Tag, ICTD 9-4...etc.) and 8 TWR Sources
Range of Operation	Approximately 100 ft. line of sight. Depending upon material composition, obstructions may reduce operational distance.
Control Options	<ul style="list-style-type: none"> • Automatically responds to any SIM-Teq TWR Source (in the same Kit) • Pairs with SIM-Teq dosimeter via Simulation Control Center (SCC)



FIGURE 1 RAD TAG CONTROLS AND INDICATORS

2.3 Features

The Rad Tag wirelessly pairs with any SIM-Teq dosimeter to provide automatic response to TWR Sources. After pairing with a SIM-Teq dosimeter, the Rad Tag continually inputs dose rate measurements to the dosimeter based on measured distance from TWR Sources and source strength. The Rad Tag features;

- Wireless pairing with any SIM-Teq training dosimeter
- Unique identification ID for Remote Selection
- Automatic detection of TWR Sources (in the same Kit)
- Power Button
- Integrated Belt Clip
- LED power indication
- LED battery life indication

2.3.1 Wireless pairing with any SIM-Teq training dosimeter

The Rad Tag wirelessly pairs with any SIM-Teq training dosimeter to provide automatic response to TWR Sources. Up to eight (8), Rad Tags can be programmed in a Kit with up to eight (8) TWR Sources. Once a Rad Tag has been programmed in a Kit with at least one (1) TWR Source, the Rad Tag is ready for pairing with a SIM-Teq dosimeter.

Simulation Control Center (SCC) is used to pair a Rad Tag with a training dosimeter wirelessly. Once paired, the training dosimeter gains the ability to auto-respond to TWR Sources for automatic dose rate

Rad Tag

indication on the dosimeter. The measurement display indicated is the measurement result of the distance(s) of the Rad Tag to the detected TWR Source or sources.

Note: Refer to any SIM-Teq training dosimeter User Manual for more information on how the dosimeter works in Automatic Control.

2.3.2 Unique Identification ID for Remote Selection

Each Rad Tag has a unique 12-digit serial number used to identify it. The last four (4) digits are used in SCC to identify the Rad Tag.

2.3.3 Automatic Detection of TWR Sources

Once powered On, the Rad Tag automatically responds to TWR Sources in the same Kit. The Rad Tag provides no indication of response to the TWR Sources as it is designed to only transmit the reported dose rate to a paired SIM-Teq training dosimeter. Once the paired dosimeter is Controlled in SCC, the dosimeter will indicate the automatic dose rate from the Rad Tag.

2.3.4 Power Button

The Rad Tag utilizes a momentary power on/off pushbutton. Press it once to turn the Rad Tag on and press it again to turn the Rad Tag off.

2.3.5 Integrated Belt Clip

The Rad Tag includes an integrated belt clip for ease of wearing on a belt or clipped to clothing in proximity to the training instrument.

2.3.6 LED Power Indicator

The Rad Tag indicates power status through the LED Power Indicator located directly above the power button. When power is On, the LED Power Indicator (see Figure 1) is lit up green. When the Rad Tag is powered Off, the LED is not lit up.

2.3.7 LED Battery Life Indicator

The Rad Tag indicates battery level through the LED Battery Life Indicator located at the top left corner of the Rad Tag (see Figure 1). Two (2) indications are possible in use and one (1) indication while charging.

2.3.7.1 Battery Indication During Use

While in use, the Rad Tag has two (2) battery life indications;

1. The Red LED flashes for fifteen (15) seconds indicating 25% of battery power is remaining
2. The Red LED stays on indicating <5% of battery power is remaining

2.3.7.2 Full Battery Indication During Charging

While charging, the Rad Tag has one (1) indication for a fully charged battery. The LED Battery Life Indicator lights up green when the battery has reached a full charge.

Note: Revision 01 Rad Tags (serial numbers beginning with 80101501 and 80101601), Battery Life Indicators will not automatically light up when fully charged. To verify the battery is full during charging; power on the Rad Tag and the Battery Life Indicator lights up green for 4-6 seconds and then goes out.

2.4 Firmware

The Rad Tag firmware can be wirelessly updated through the SCC application. All users will be notified of any firmware updates through customer notifications and supplied new firmware files through download link (see Firmware Update).

Note: The Rad Tag firmware version is displayed in SCC only.

3 Configuration

The Rad Tag needs to be programmed in a Device Kit to work with any TWR Sources. Only Devices and TWR Sources programmed in a Kit will work together. Refer to the Simulation Control Center (SCC) User Manual for more information on creating a Device Kit.

4 Operation

The Rad Tag requires a SIM-Teq™ training dosimeter for TWR operation. Once paired with a dosimeter (in Automatic Control), the Rad Tag will continually update the dose rate (and resulting accumulated dose) of the dosimeter based on distance to a TWR Source(s) and source strength.

Note: The following is an example of pairing a DMC 2000TD with a Rad Tag. Refer to the Simulation Control Center (SCC) User Manual for more information on navigating SCC screens and options available.

4.1 Initial Start-up and Recharging

4.1.1 Power Button

The only Rad Tag physical control feature is the power button. The power button is a momentary pushbutton that simply turns the Rad Tag on and off. Press it once to turn the Rad Tag on and press it again to turn the Rad Tag off.

Note: Turning off the Rad Tag during an active training session will cause the Rad Tag, and SIM-Teq dosimeter to become unpaired.

4.1.2 Recharging

The Rad Tag has an internal Lithium Ion (Li-ion) rechargeable battery that provides over eight (8) hours of continuous use. The battery is not interchangeable. The user should ensure the Rad Tag is fully charged before each day's use. To recharge the Rad Tag;

1. Power off the Rad Tag
2. Plug in the supplied USB Wall Charger
3. Connect the supplied USB to Micro-USB cable between the wall charger and the Rad Tag
4. Allow the Rad Tag to charge for 4 hours or more to ensure a full charge
5. After at least 4 hours, verify the battery is fully charged
6. Unplug the Micro-USB cable from the Rad Tag
7. The Rad Tag is now ready for use

Note: Recharging the Rad Tag with any USB Charger other than the one supplied is not recommended.

4.2 Pairing a DMC 2000TD with a Rad Tag

In order for a DMC 2000TD to work in Automatic Control, the DMC 2000TD must be paired with a Rad Tag. To pair a DMC 2000TD with Rad Tag;

Note: Ensure the Rad Tags and TWR Sources to be used are part of the same Device Kit.

1. Connect a DMC 2000TD in SCC
2. Power on the Rad Tag
3. Select the DMC 2000TD Tile (if more than one is selected, the pairing option is not available)
4. Click on Pair with Rad Tag on the Action Bar
5. A pop-up box appears displaying all available Rad Tags not already connected to a DMC 2000TD (see Figure 2)
6. Select the desired Rad Tag by clicking on the Rad Tag Tile
7. Click Pair RadTag

Rad Tag

8. A pop-up box appears with the words “Pairing Device with RadTag...” (see Figure 3)
9. The pop-up box disappears
10. The DMC 2000TD Tile shows chain links briefly (see Figure 4)
11. The DMC 2000TD Tile chain links change to double arrows (see Figure 5)
12. The Rad Tag is successfully paired with the DMC 2000TD

Note: To unpair, a Rad Tag, select the DMC 2000TD Tile and click the unpair Rad Tag option on the Action Bar. Alternatively, powering off the Rad Tag will unpair the DMC 2000TD and Rad Tag.

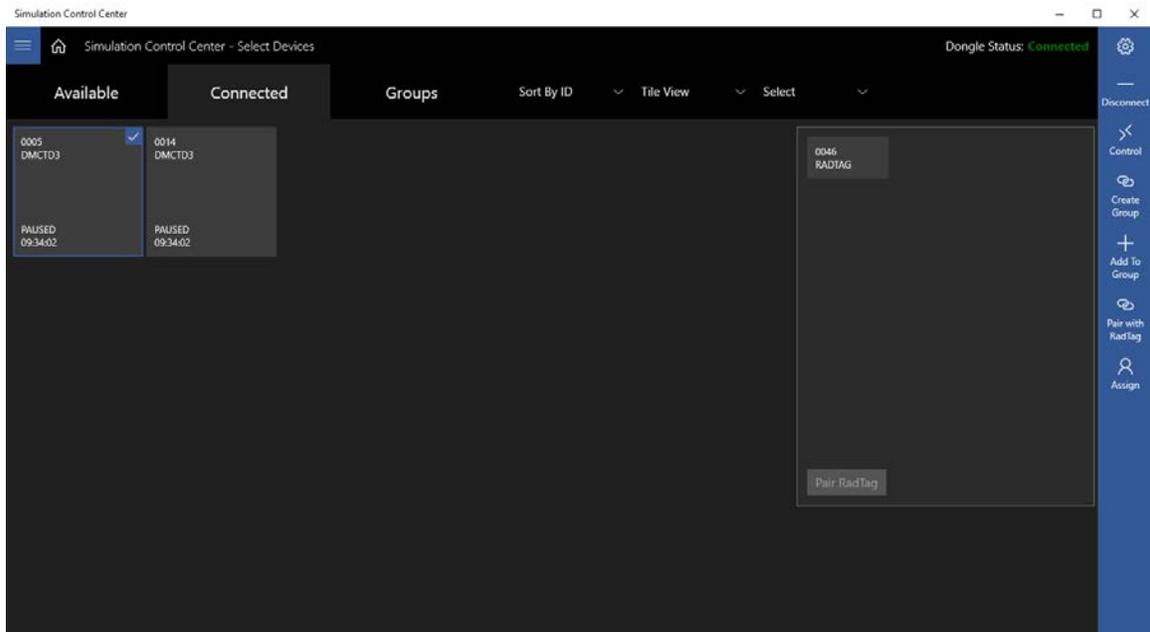


FIGURE 2 RAD TAG POP-UP BOX

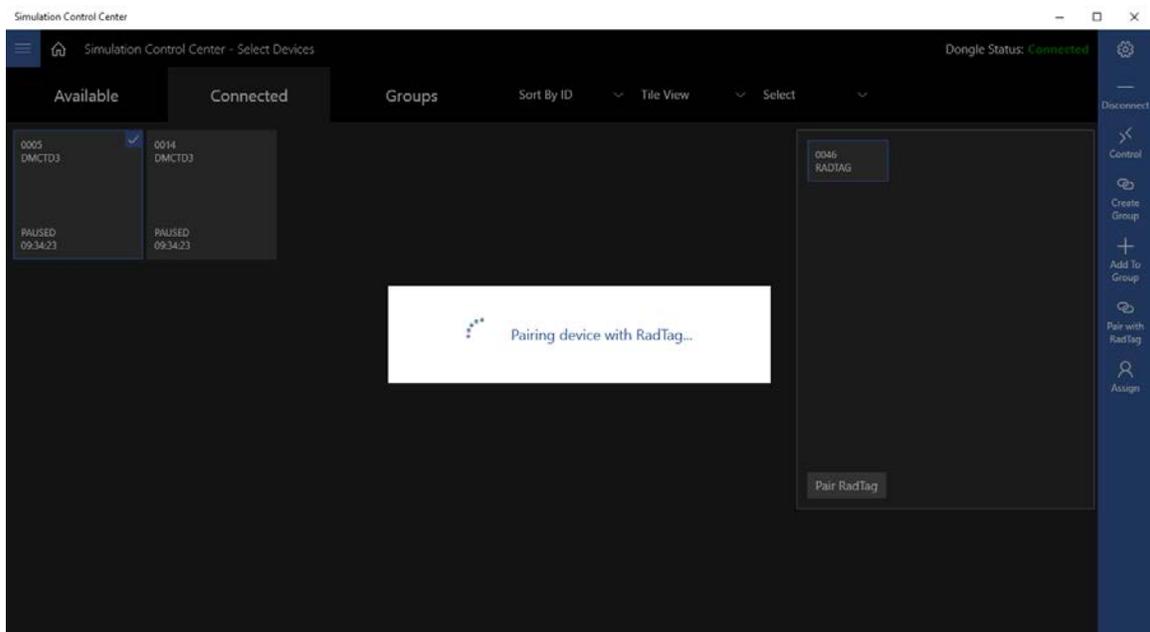


FIGURE 3 PAIRING WITH RAD TAG

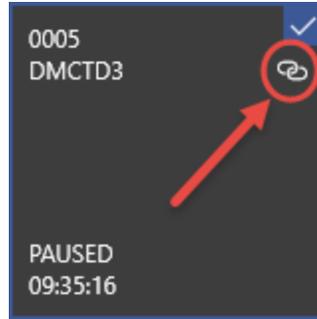


FIGURE 4 CHAIN LINK ON DMC TILE

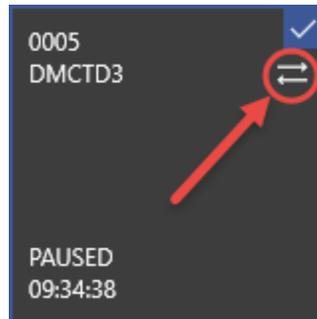


FIGURE 5 SUCCESSFUL RAD TAG PAIRING

4.3 Rad Tag Placement

The Rad Tag should always be placed with the Front Face Side (power button side) positioned outward. Placing the Rad Tag Front Face Side down (or against the body), will limit the Two-Way ranging useable distance.

Note: It is recommended that prior to beginning any exercise, the environment be tested using the Rad Tag and a TWR Source to determine its specific impact on range.

4.4 Positional Accuracy

Due to the complex nature of distance measurement using wireless signals, the calculated distance between a Rad Tag and a TWR Source varies plus or minus six inches ($\pm 6''$) with very occasional measurements outside of this range. Depending on the distance between the Rad Tag and a TWR Source, the variation in accuracy can result in large differences in the displayed dose rate on a SIM-Teq dosimeter. This variation is due to the inverse square calculation being applied to the distance measurement (i.e., the dose rate at 6" is greater than the dose rate at 12").

5 Troubleshooting

Condition	Resolution
Rad Tag does not power on	Verify the Rad Tag is fully charged
Rad Tag paired with DMC 2000TD is not showing automatic dose rate updates	<ul style="list-style-type: none">• Verify the dosimeter is not in manual control mode• Verify the Rad Tag is properly programmed in a Device Kit with the TWR Source(s) in use
Battery does not hold a charge	Battery beyond life cycle. Contact SIM-Teq Service Rep for battery replacement options

6 Firmware Update

The Rad Tag firmware is wirelessly updated through the SCC application. All users will be notified of any firmware updates through customer notifications and supplied new firmware files through download link (see Firmware Update).

To update the Rad Tag Firmware, the new firmware file should be transferred to the Tablet/PC and saved in a location easily accessed (i.e., desktop). To update the firmware on a DMC 2000TD;

WARNING: Only one device can be updated at a time. Ensure all other devices are fully powered OFF or at least 500 feet away. Not following this will result in a Corrupted Device and require additional steps to recover and update the firmware.

6.1 Updating Rad Tag Firmware

1. Navigate to the Device Firmware Update screen
2. From the Device Type drop-down list, select RADTAG (see Figure 6)
3. From the Firmware file selector, click the ... box and select the firmware file previously saved to the Tablet/PC (see Figure 7) and click open
4. Select the Rad Tag Tile by clicking on it (see Figure 8)
5. Click the Update Firmware button to begin loading the firmware on the Device (see Figure 9)
6. Once complete, it shows Completed under the Update Firmware button

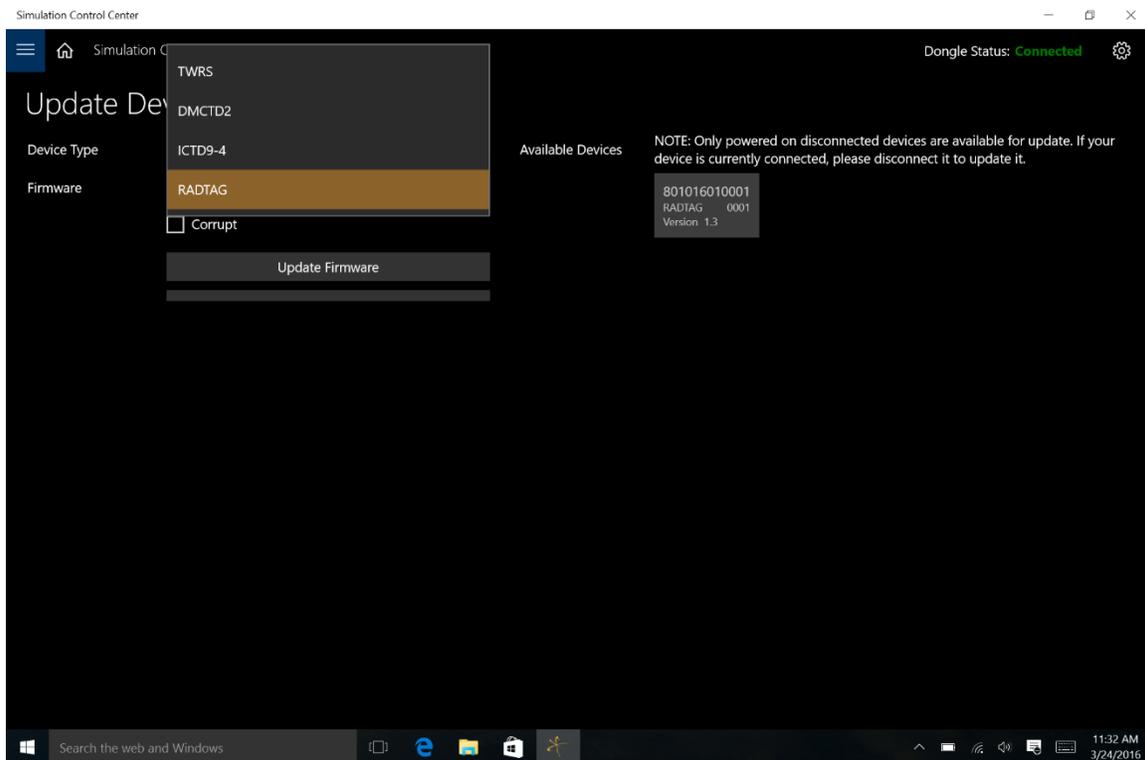


FIGURE 6 SELECT DEVICE TYPE

Rad Tag

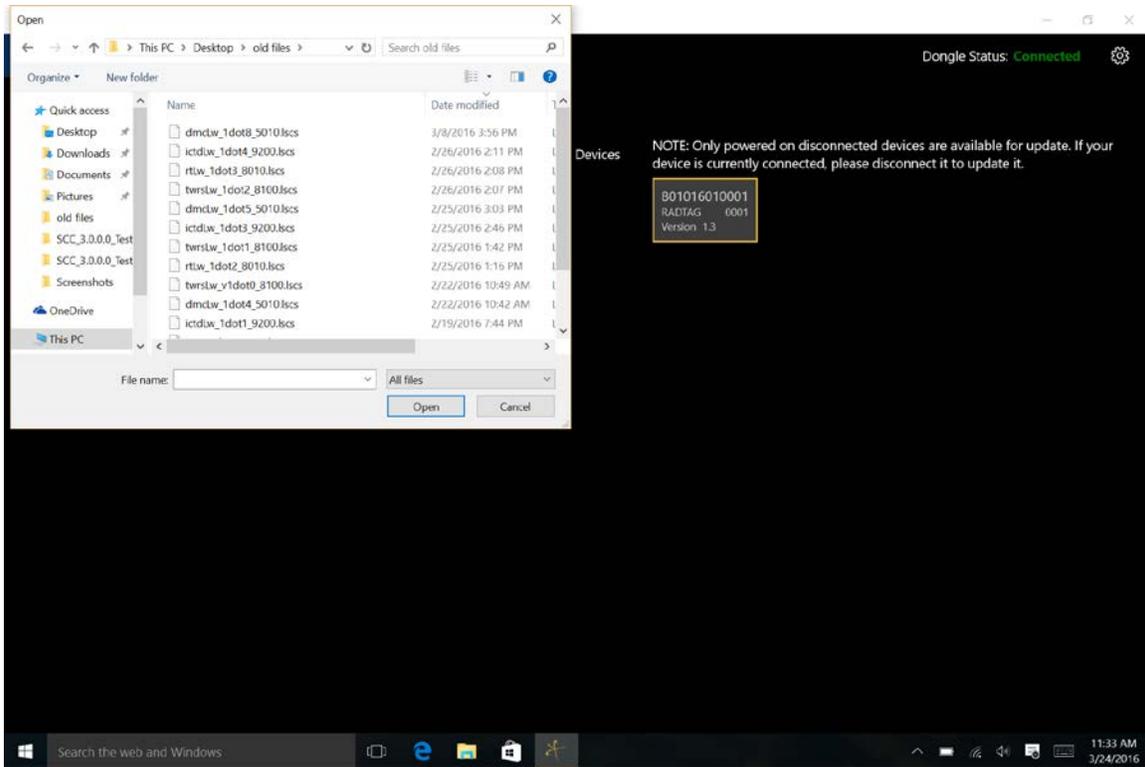


FIGURE 7 SELECT DEVICE FIRMWARE

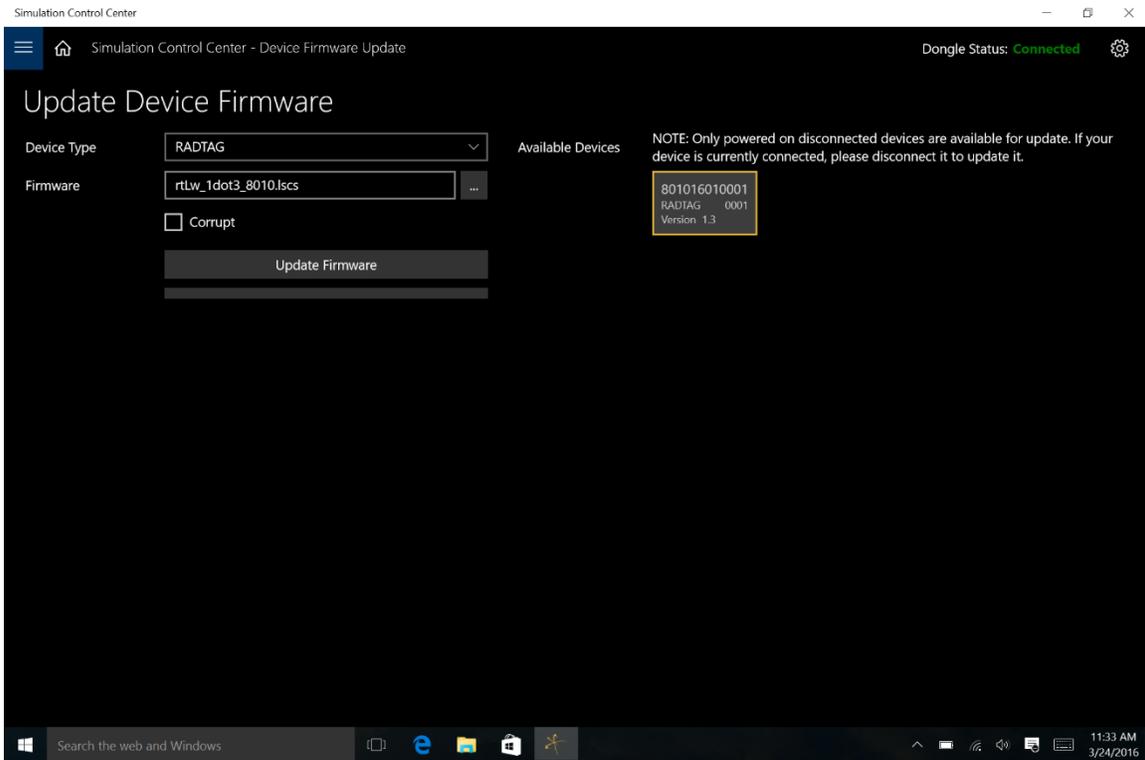


FIGURE 8 SELECT DEVICE FOR FIRMWARE UPDATE

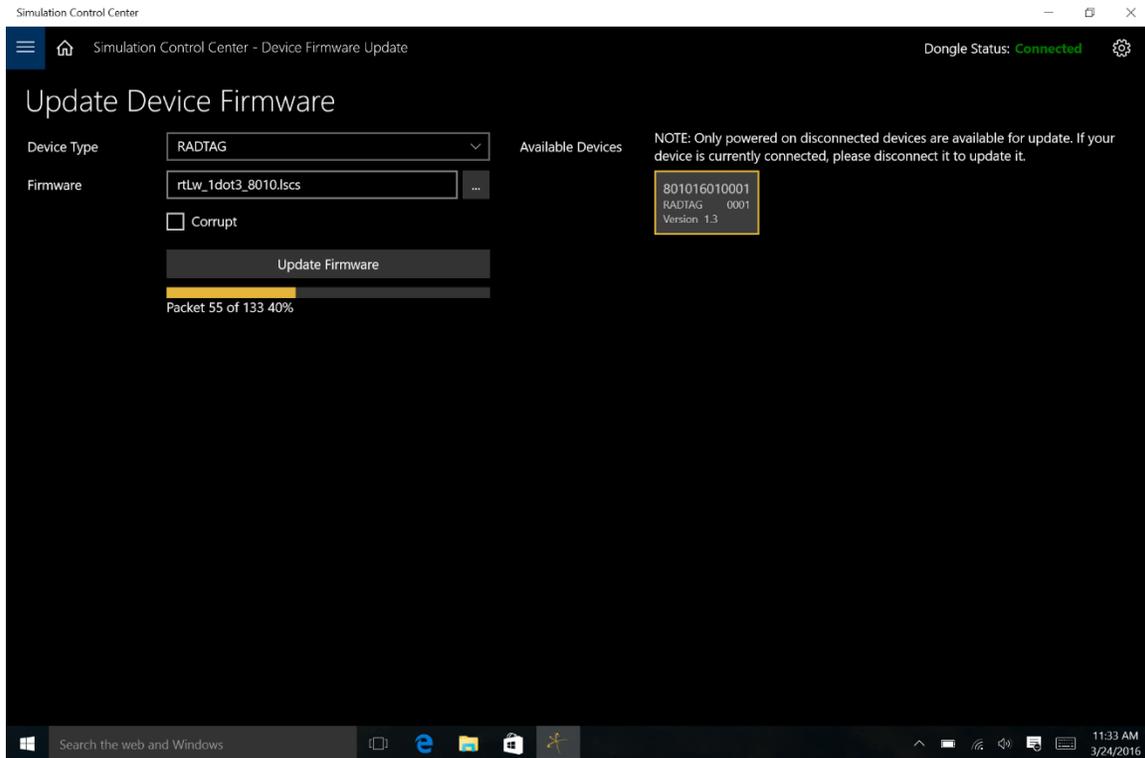


FIGURE 9 FIRMWARE UPDATE

6.2 Updating a Corrupted Rad Tag Firmware

A Rad Tag firmware file may become corrupted, and the Rad Tag no longer functions properly. A corrupted Rad Tag is most easily identified when it no longer pairs with a dosimeter. To update the firmware of a corrupted Rad Tag;

1. Navigate to the Device Firmware Update Screen
2. Select RADTAG from the Device Type drop-down list
3. Select the correct Rad Tag Firmware file saved on the Tablet/PC
4. Click the Corrupt checkbox
5. A new drop-down box appears next to the Corrupt checkbox labeled Serial
6. Select the corrupted Rad Tag Serial number from the drop-down box (see Figure 10)
7. Click Update Firmware
8. The Rad Tag power should cycle after a successful update
9. The Rad Tag should now work properly

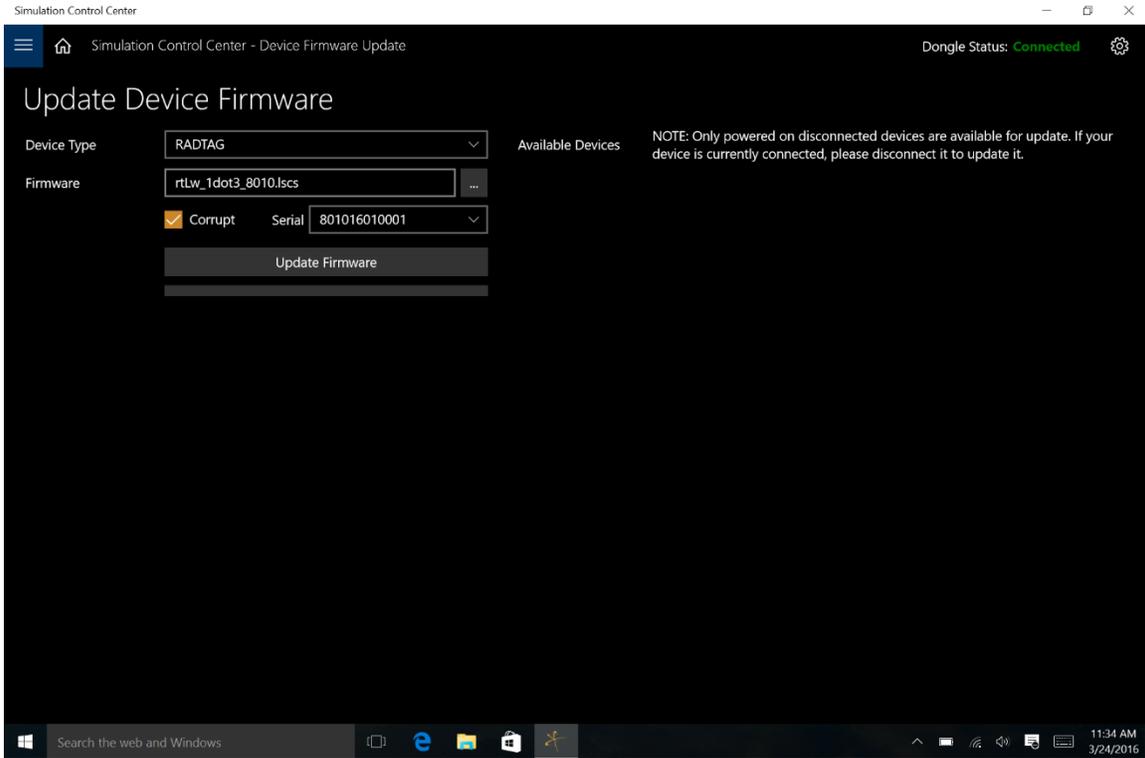


FIGURE 10 CORRUPTED FIRMWARE UPDATE SCREEN