RadWall S300

Area Radiation Monitor

Operator Manual

Version 1.7
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X-Z LAB, Inc.
Subsidiary of Raycan Technology Co., Ltd.

2440 Camino Ramon
Suite #264
San Ramon, CA 94583

Phone: (925) 359-6908
Email: contact@x-zlab.com

www.x-zlab.com

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1 Introduction

1.1 Product Description

RadWall S | Area Radiation Monitor is an all-digital area radiation monitor covering a wide range of gamma and X-ray radiation.

RadWall S combines three functions:

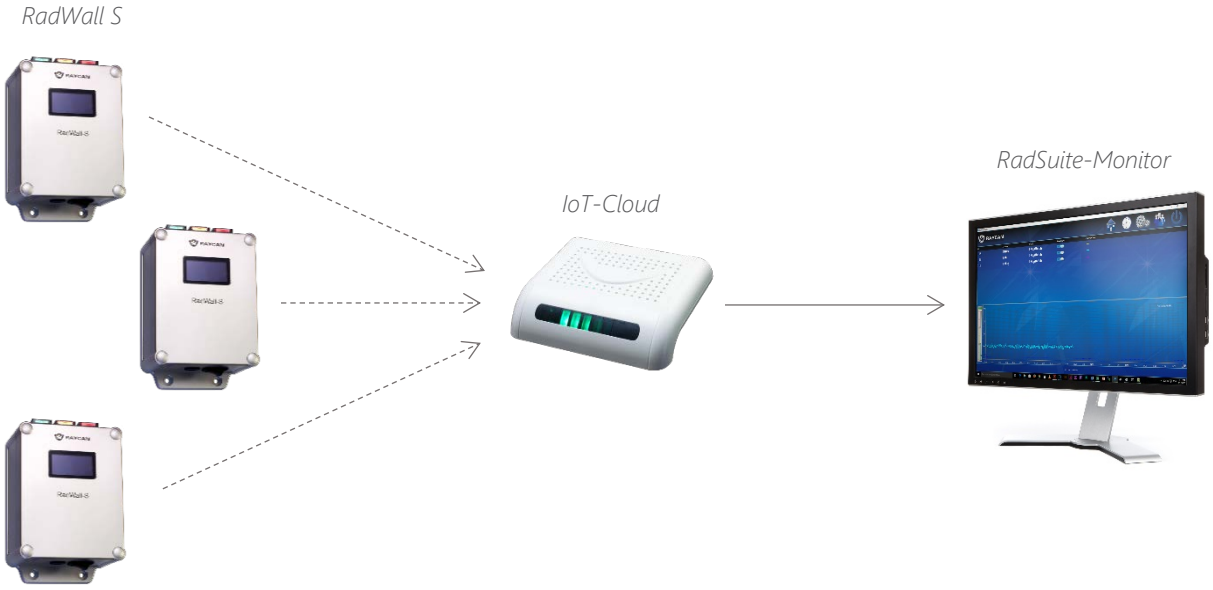
- Alarm and display unit
- Built-in scintillation detector
- Self-healing and self-forming mesh network capable monitor

RadWall S uses a high-performance YSO scintillation crystal combined with a state-of-the-art silicon photomultiplier (SiPM) and multi-voltage threshold (MVT) algorithm to detect a wide range of radiation doses.

RadWall S has high detection accuracy and sensitivity, as well as other significant advantages.

Proportional, real-time detection and measurement provide meaningful readouts that focus on real-world applications. The fast response and wide dose rate range maximize the safety of your team. The high-contrast OLED display provides a clear indication of dose rate.

RadWall S communicates with a wireless radiation monitoring network for data management. It can be used as a standalone area radiation monitor, or multiple units can be combined to form a protected mesh network communicating via the ZigBee IEEE standard.



1.1.1 Models

RadWall S100

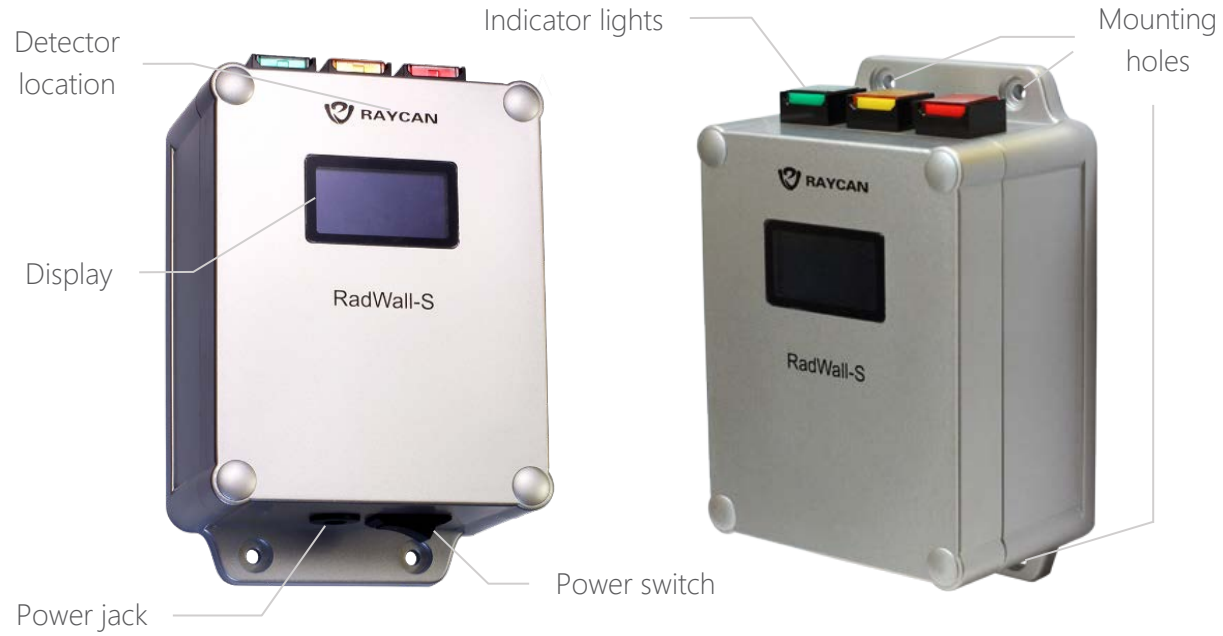
Wide range model

RadWall S300

High sensitivity model

1.2 Product Diagram

1.2.1 RadWall S



1.2.2 IoT-Cloud 2.0

1.3 Product Specifications

1.3.1 RadWall S300

Feature	Parameter
Radiological	
Detector	YSO(Ce) scintillator + SiPM
Type of Radiation Detected	Gamma; X-ray
Energy Range	20 keV–3 MeV
Dose Rate Range	1 µrad/h–100 mrad/h (0.01 µGy/h–1 mGy/h)
Sensitivity	410 cps/mrad/h (41 cps/µGy/h) (∝ Cs-137)
Energy Response	≤ ±15% (∝ Cs-137)
Dose Rate Linearity Error	≤ 10% up to 100 mrad/h (1 mGy/h)
Accuracy	±5% (∝ Cs-137)
Alarm Threshold	User-set values for dose rate: 100 µrad/h–100 mrad/h (1 µGy/h–1 mGy/h)
Alert Options	Audible (80 dB at 12 in / 30 cm) Visual (LED and display)
Alarm Response Time	≤ 2 s
Overload Display	Activation when > 100 mrad/h (1 mGy/h) Overload indication up to 10 rad/h (100 mGy/h)
Electrical and Mechanical	
Communications	Self-forming and self-healing mesh network via ZigBee and RadSuite-Monitor (PC software)
Power Supply	AC 100–240 V, 50–60 Hz (UL certified) Rechargeable lithium-ion battery
Battery Life	Typically 10 h in background field
Display	OLED
Dimensions	5.9 x 3.5 x 2.4 in (150 x 90 x 60 mm)
Weight	12.0 oz (340 g)
Accessories	5 V AC adapter (UL certified) IoT-Cloud 2.0 (FCC ID: 2AC7P-113)
Initialization Time	< 10 s
Environmental	
Operating Temperature	32–122 °F (0–50 °C)
Storage/Transport Temperature	-4–158 °F (-20–70 °C)
Relative Humidity	≤ 90% (non-condensing)
EMI/EMC Compliance	Exceeds IEC 61526 requirements
FCC Compliance	FCC Part 15

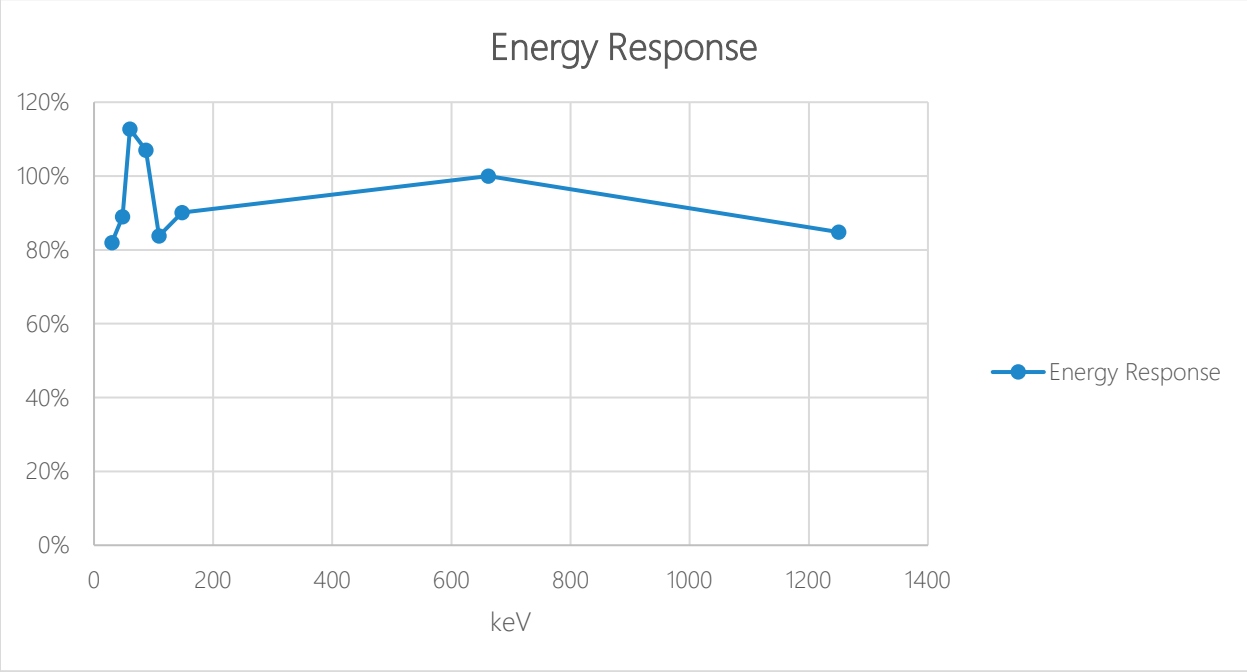
1.3.2 IoT-Cloud 2.0

Feature	Parameter
Electrical and Mechanical	
Communications	MicroUSB, RJ45 (Ethernet), and ZigBee
ZigBee Frequency	2.4 GHz
Power Supply	100 mA @ 5 V DC
Dimensions	5.1 x 5.9 x 1.4 in (130 x 50 x 35 mm)
Weight	8.1 oz (230 g)
Environmental	
Operating Temperature	-4–122 °F (-20–50 °C)
Storage/Transport Temperature	-4–158 °F (-20–70 °C)
Relative Humidity	≤ 90% (non-condensing)
EMI/EMC Compliance	Exceeds IEC 61526 requirements
FCC ID	2AC7P-113

1.4 Performance Data

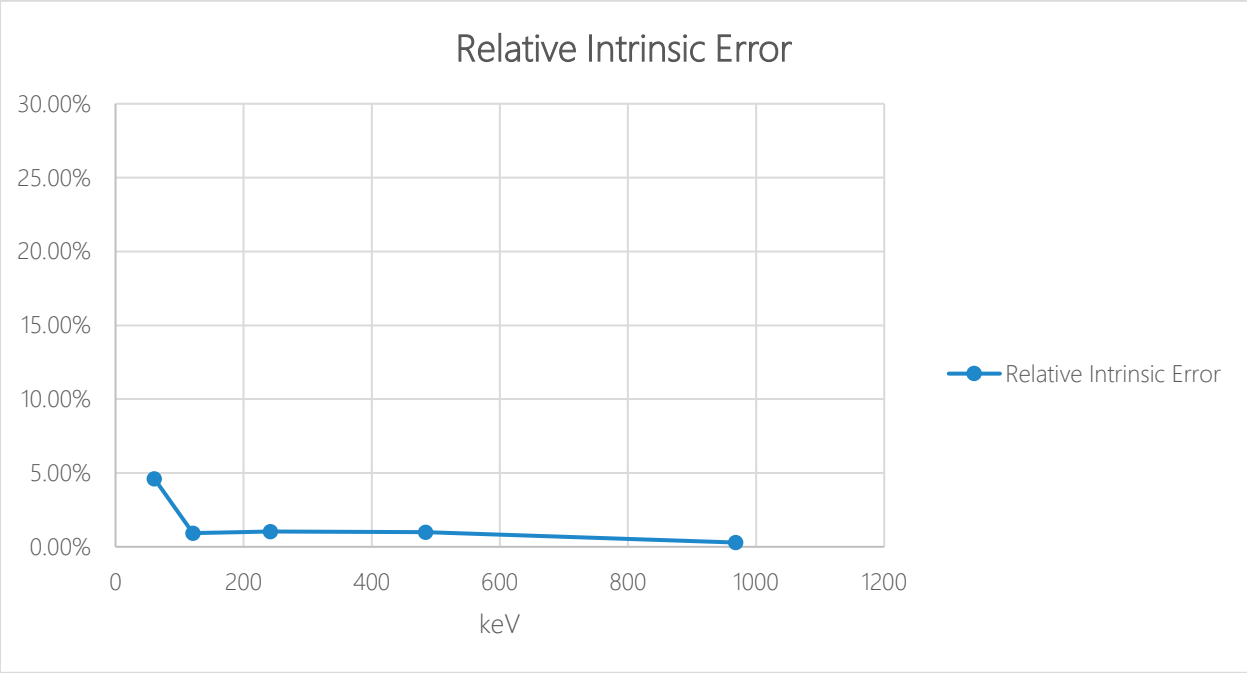
1.4.1 Energy Response

ISO Beam Tech Code	Energy (keV)	Energy Response
LK35	30	82.00%
LK55	48	89.01%
LK70	60	112.74%
LK100	87	107.03%
LK125	109	83.78%
LK170	148	90.12%
^{137}Cs	662	100.00%
^{60}Co	1250	84.82%

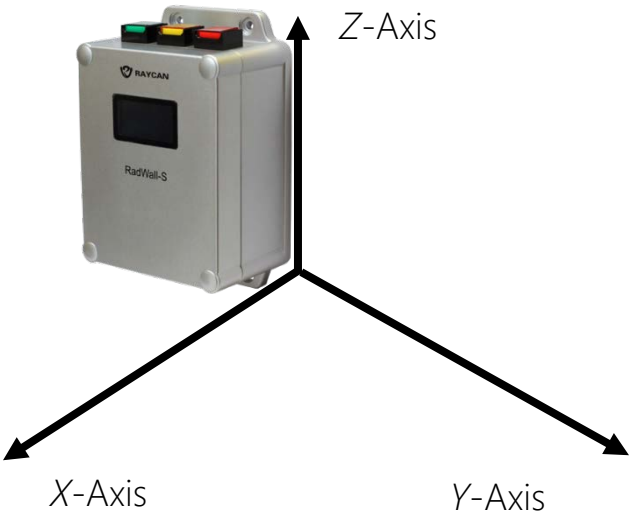


1.4.2 Accuracy

Photon Beam	Dose Equivalent Rate (μGy/h)	Relative Intrinsic Error
^{137}Cs-662 keV	60.5	4.62%
	121.0	0.93%
	242.0	1.03%
	484.0	1.00%
	968.0	0.29%

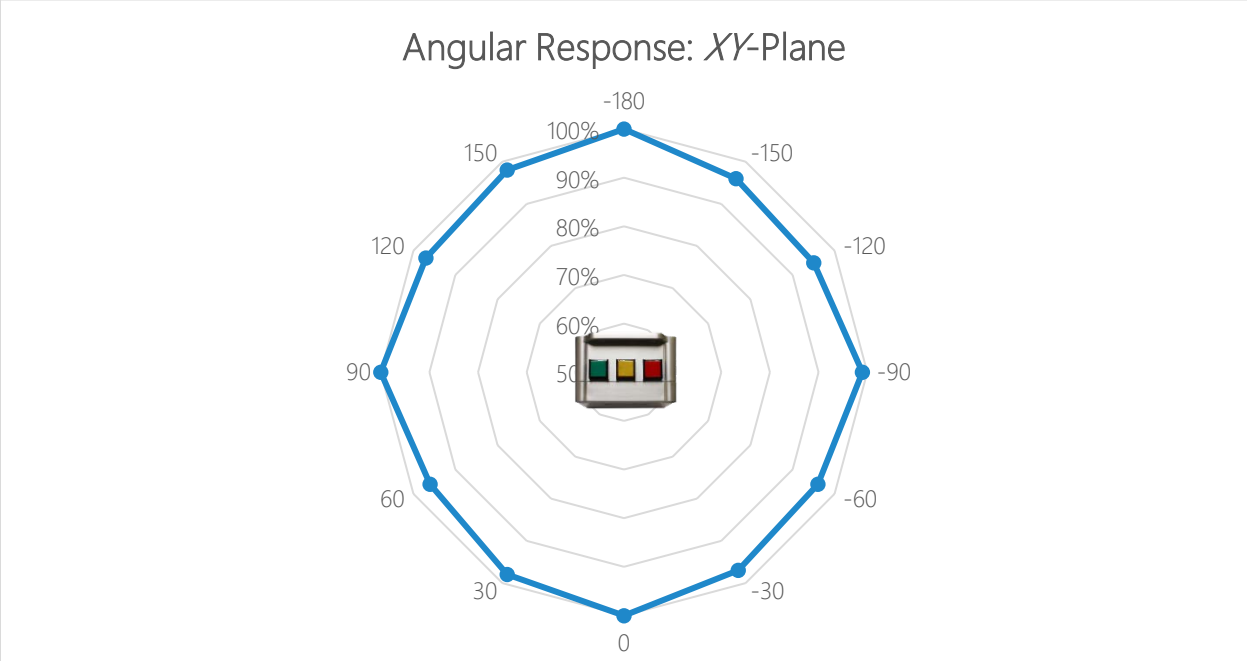


1.4.3 Angular Response



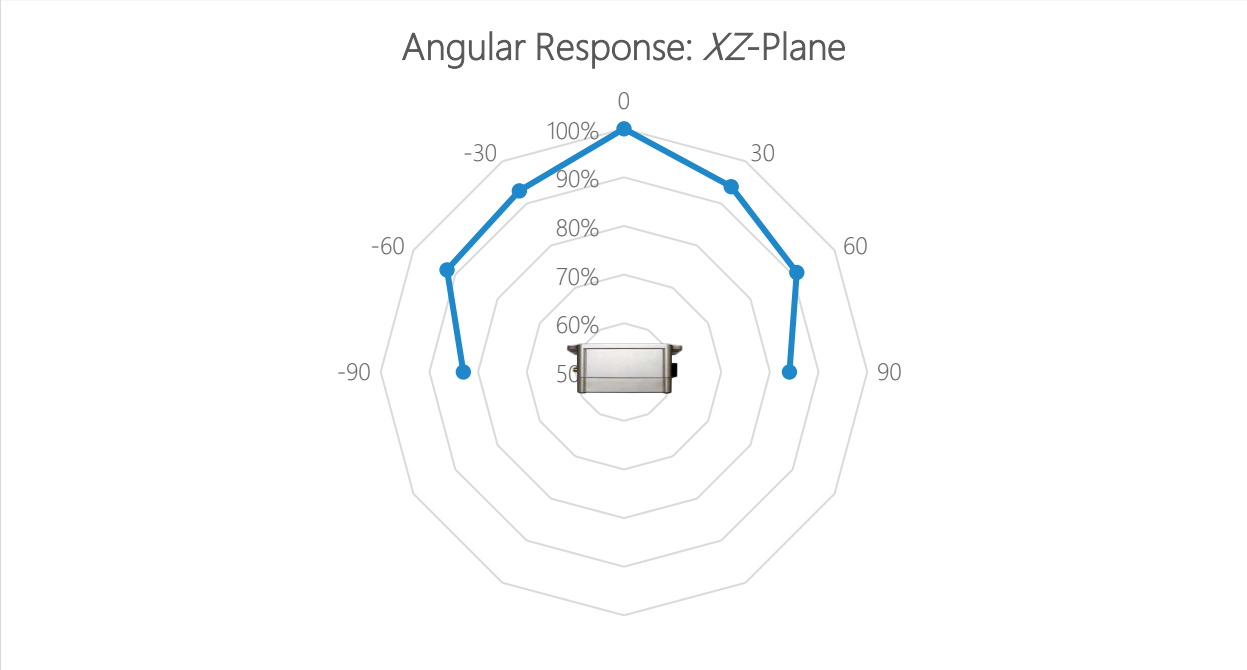
XY-Plane (^{137}Cs)

Direction (°)	Response
-180	100%
-150	96%
-120	95%
-90	99%
-60	96%
-30	97%
0	100%



XZ-Plane (^{137}Cs)

Direction (°)	Response
0	100%
30	94%
60	91%
90	84%
-90	83%
-60	92%
-30	93%



1.5 Package Contents

Item	Quantity
RadWall S300	1
M4 x 14 mm Flat Head Screw	4
Power Supply	2
User Guide	1
IoT-Cloud 2.0	1

2 Installation

2.1 Inspection

Inspect the contents for damage. Ensure all items have been received and are in good condition. The protective film on the indicator lights and OLED display may be removed if desired.

If any items are missing or damaged, please contact X-Z LAB.

2.2 Mounting

RadWall S can be mounted onto a vertical surface as needed. Before mounting RadWall S, ensure the device is within reach of a power outlet. To mount, place RadWall S onto an area where it is clearly visible and fix four M4 x 14 mm flat head screws into the mounting holes.

2.3 Power

Plug the power adapter into a power outlet and the power jack at the bottom of the device. Flip the power switch to the ON position. During startup, the yellow light remains on until self-diagnostics are completed. Green light is followed by "RAYCAN" on the display, indicating active monitoring state.

RadWall S includes a rechargeable internal lithium-ion battery. In case of power outage, the backup battery will keep RadWall S running for up to 10 hours. As an extra precaution, it is recommended that the power adapter is connected to an uninterruptable power supply (UPS).

3 Operation

3.1 Display

3.2 Indicator Lights

Lights at the top of RadWall S indicate its working status.

Color	Status
Green	Perfect working condition
Yellow	During startup: Self-diagnostics During operation: Problem with device
Red	Radiation intensity over threshold

3.3 Audible Alarm

The air absorbed dose rate alert level is indicated by an audible alarm that adjusts in frequency and volume. The alarm will increase its intensity as the level of danger increases.

3.4 Alarm Threshold

The manufacturer default alarm threshold value is 1 mrad/h (10 µGy/h). RadWall S has an alarm threshold range of 100 µrad/h–100 mrad/h (1 µGy/h–1 mGy/h). The alarm threshold can be set remotely at 100 µrad/h (1 µGy/h) intervals via RadSuite-Monitor. Please refer to the Alarm Threshold Setting section for more details.

3.5 Software

RadWall S is used in conjunction with the RadSuite-Monitor software to enable features such as multi-unit monitoring, data export, and alarm threshold setting.

The IoT-Cloud configuration software establishes a connection between IoT-Cloud 2.0 and the computer, allowing RadWall S readings to be collected and displayed on RadSuite-Monitor. The software also allows users to manually set IoT-Cloud's IP address, gateway, port, and MAC address if needed for network compatibility.

3.5.1 Procedure Overview

To manage RadWall S from a PC, follow the procedure outlined below:

1. IoT-Cloud Configuration
   Configure IoT-Cloud 2.0 to connect to your network using the IoT-Cloud configuration software.
   Video demonstration: https://www.youtube.com/watch?v=SFBdW7RExOI
2. IoT-Cloud Setup
   Connect IoT-Cloud 2.0 to RadSuite-Monitor.
3. Device Management
   Add one or more (up to 100) RadWall S to RadSuite Monitor.
   Video demonstration: https://www.youtube.com/watch?v=Z_v-bxstHXI&t=5m33s

Continue reading for step-by-step instructions.

3.5.2 Download

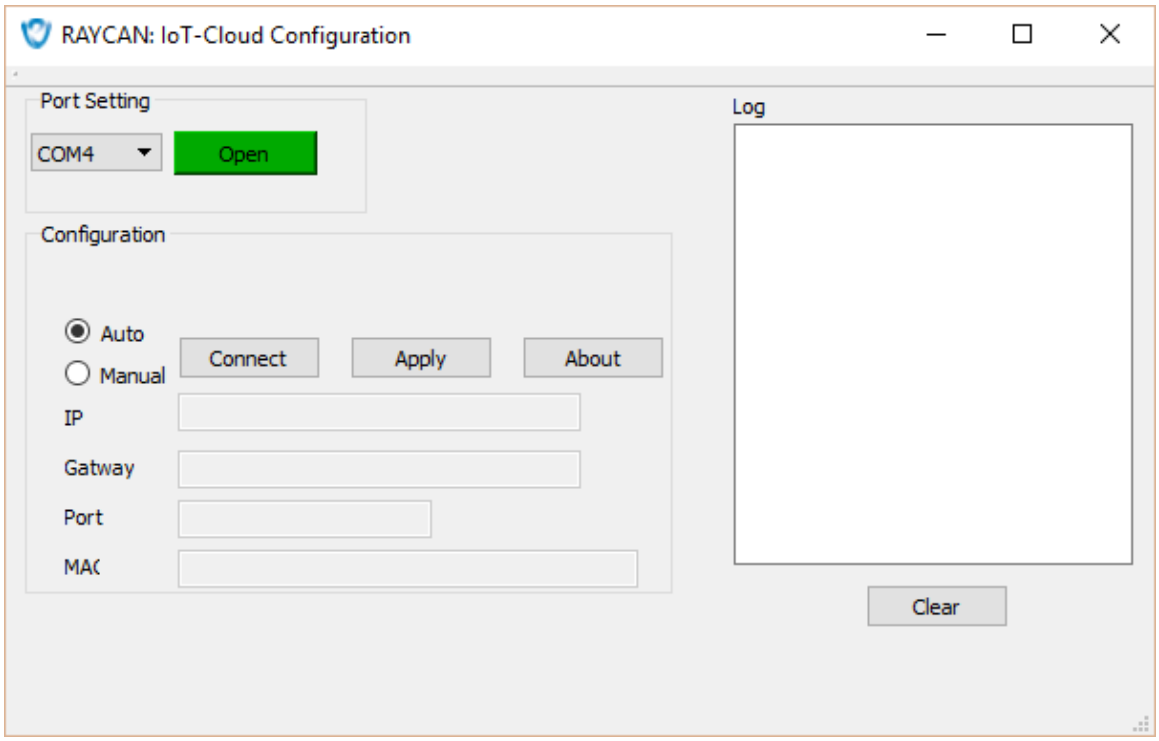
RadSuite-Monitor and the IoT-Cloud configuration software are available for Windows and can be downloaded online.

URL: https://www.x-zlab.com/radsuite-monitor/

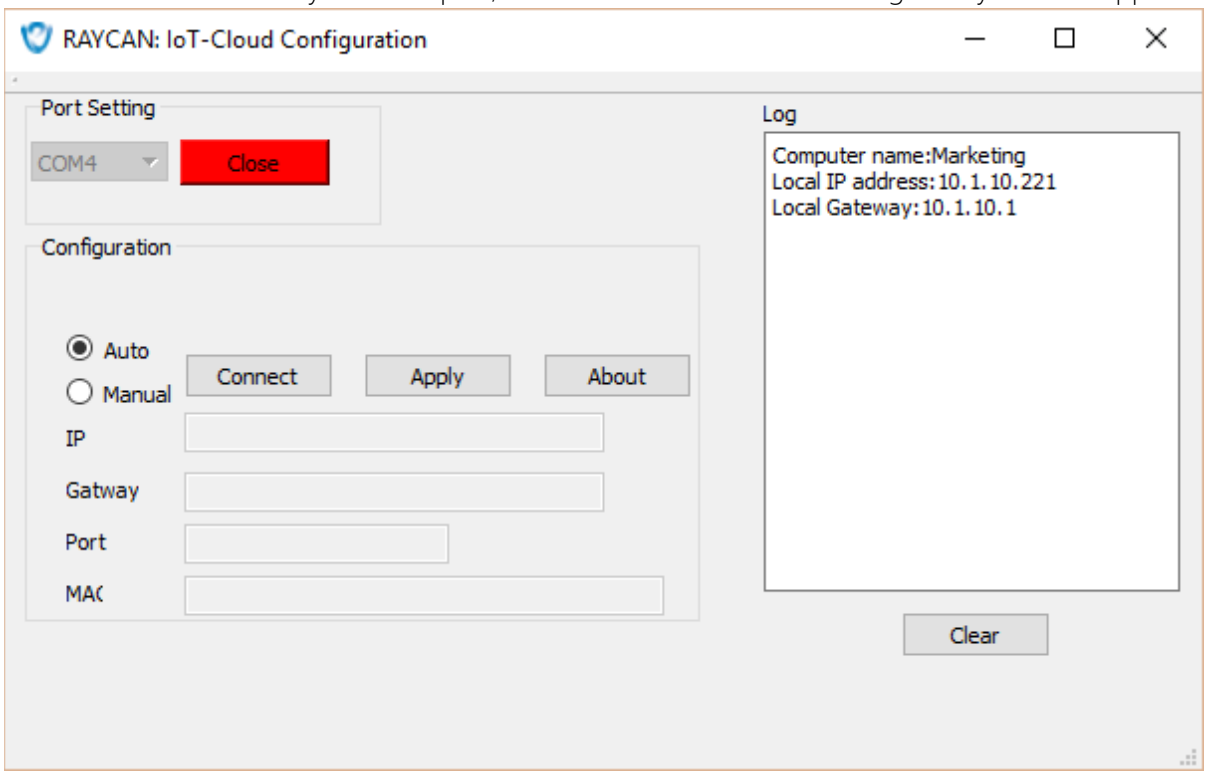
3.5.3 IoT-Cloud Configuration

Video demonstration: https://www.youtube.com/watch?v=SFBdW7RExOI

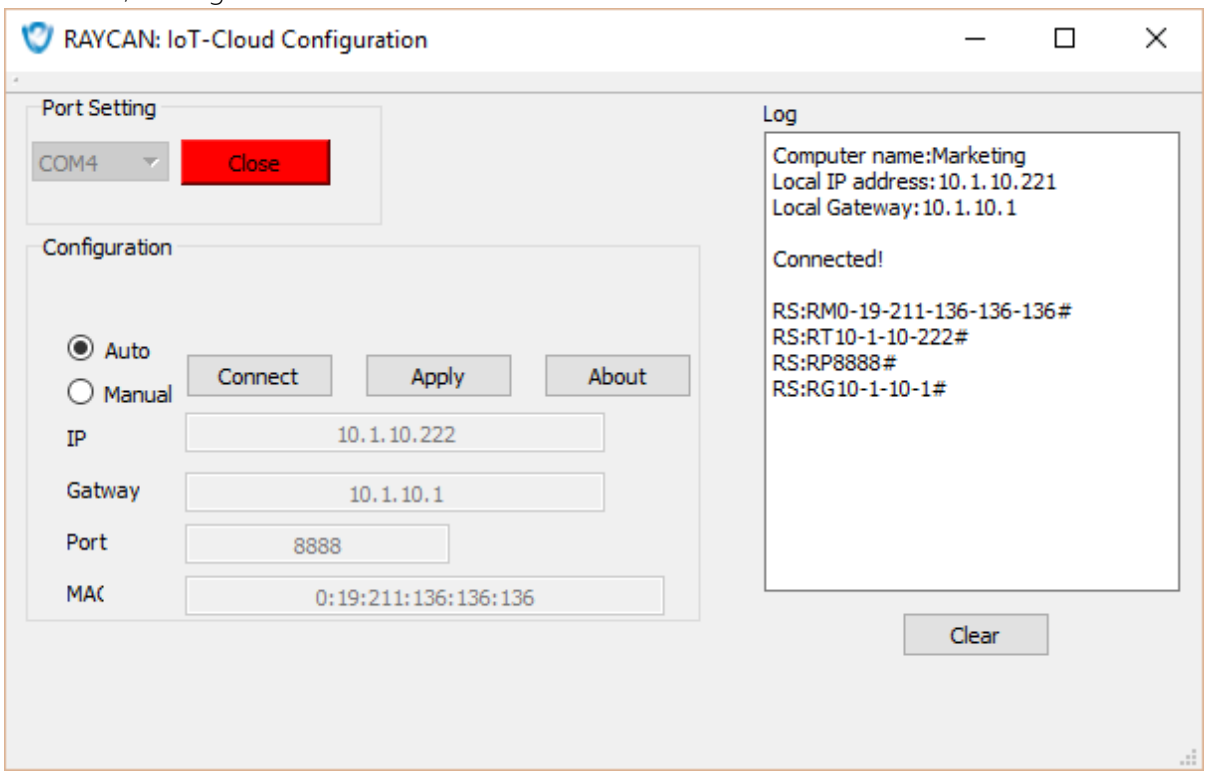
1. Connect IoT-Cloud to the PC using a MicroUSB cable.
2. Flip the power switch to the right. Blinking lights at the front of IoT-Cloud indicates device startup.
3. IoT-Cloud can be connected via the router or directly to the PC. If you plan to use IoT-Cloud while connected to a secondary Ethernet port on your computer, plug in an Ethernet cable to IoT-Cloud and the PC as well.
4. Download and extract the IoT-Cloud configuration software into a folder.
5. Open the IoT-Cloud configuration software (cloudConfigured.exe) and open the COM port associated with IoT-Cloud.



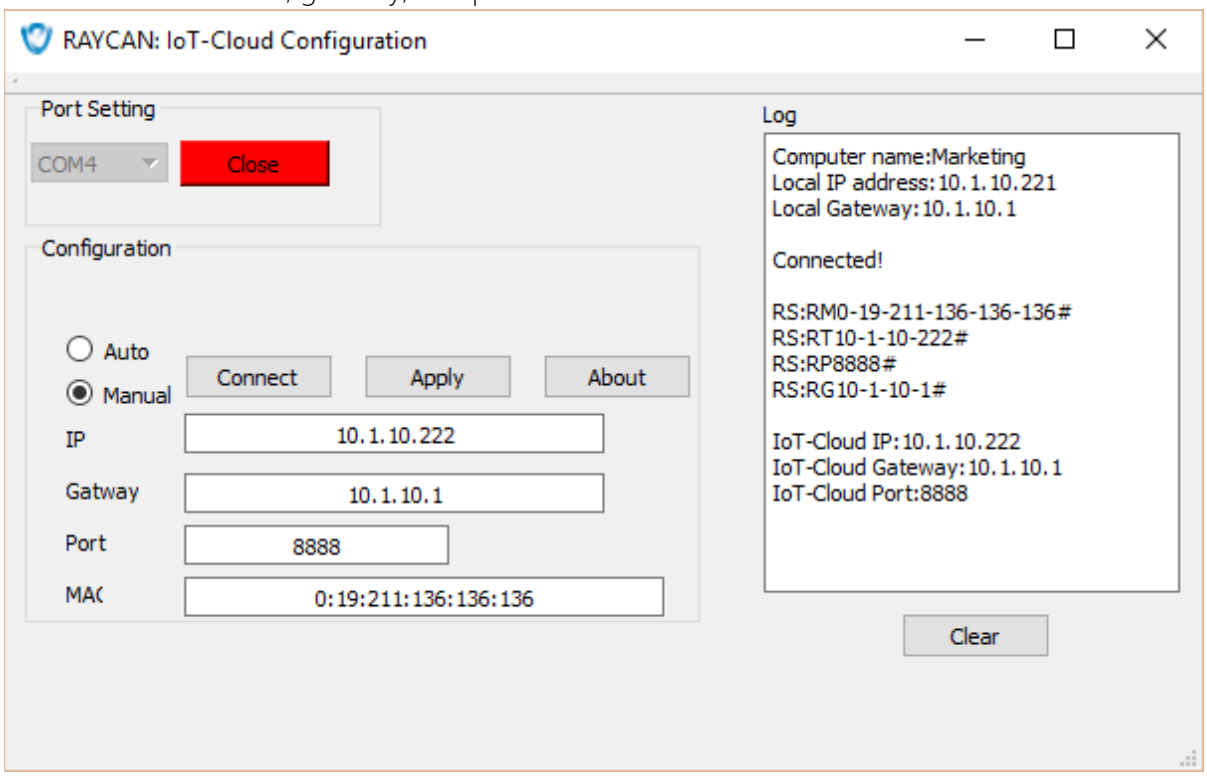
6. Once the port is opened, the log will display the PC name, local IP address, and local gateway. If connected to a secondary Ethernet port, a second set of IP address and gateway will also appear.



7. Click the Connect button to retrieve IoT-Cloud's MAC address, IP address, port, and gateway. If successful, the log will indicate the status "Connected!"



8. There are two configuration modes to choose from. Auto mode allows the software to configure IoT-Cloud based on the PC's information. Manual mode allows the user to configure IoT-Cloud manually. The IP address must be configured to the same segment as your PC or router, depending on which you are connecting to, so that IoT-Cloud and your computer/router can communicate. Select the desired mode and click Apply to save changes. The log will return IoT-Cloud's new IP address, gateway, and port.



9. Download and extract RadSuite-Monitor into a folder.
10. Open RadSuite-Monitor (RadSuite-Monitor.exe) and click on the Settings tab (gear icon). Click on System Settings and enter IoT-Cloud's IP address and port, which were configured in step 8. Click OK to save changes.

3.5.4 IoT-Cloud Setup

1. Remove the MicroUSB cable.
2. Attach the antenna to the antenna base.
3. Plug in an Ethernet cable to IoT-Cloud and the router or PC, depending on your configuration. This will determine the method used to connect IoT-Cloud and RadSuite-Monitor.
4. Connect the power supply to the power jack and power outlet.
5. Flip the power switch to the left. Lights at the front of IoT-Cloud indicate that it is powered on.
6. The status message at the bottom of RadSuite-Monitor will update once IoT-Cloud is connected.

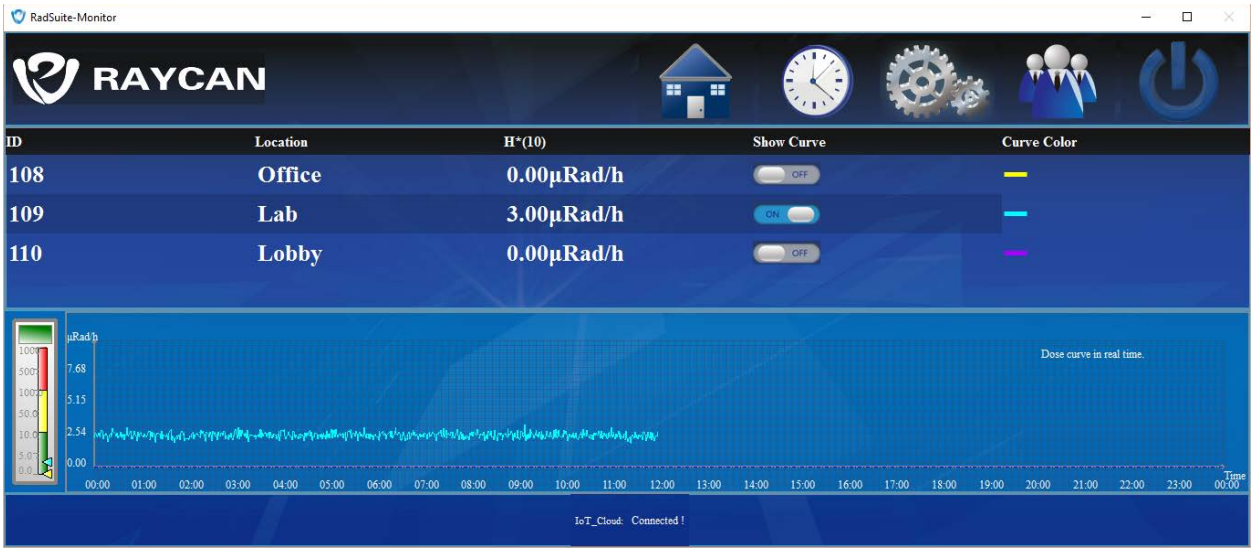
3.5.5 RadSuite-Monitor

Navigate the software using the five tabs on the top right of the window:

- Home
- Data Log
- Settings
- About
- Quit

Home

View real-time dose rates and dose curves for all connected devices on the Home page.



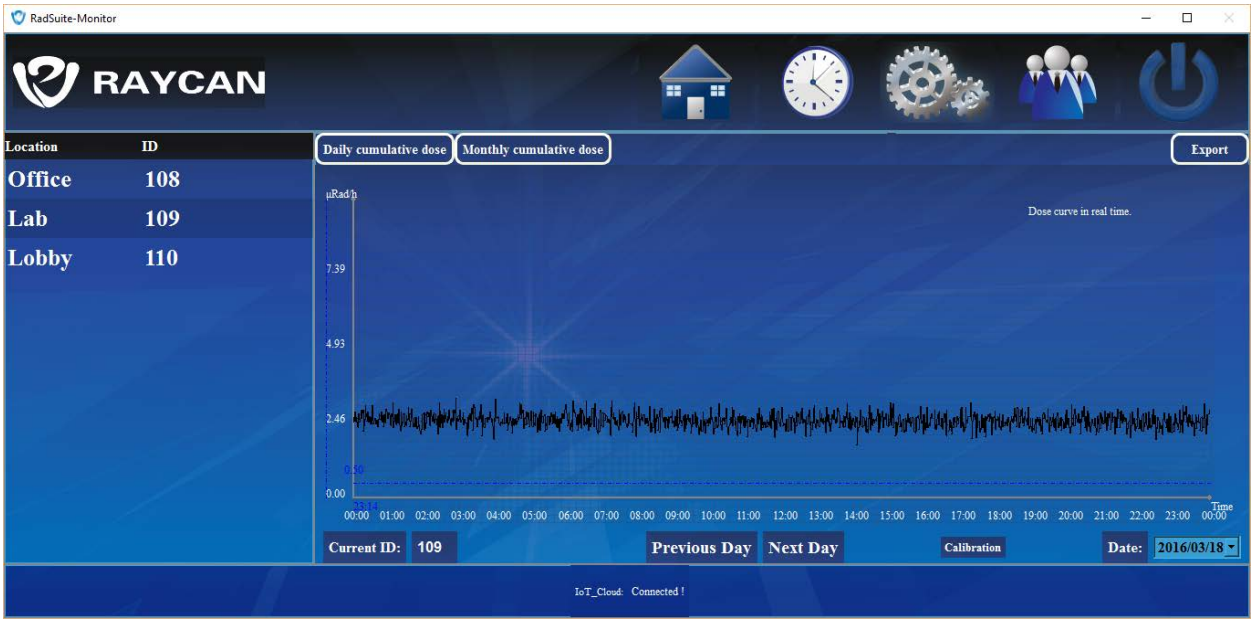
Name	Function
ID	ID/serial number of RadWall S
Location	Device location
H*(10)	Current air absorbed dose rate
Show Curve	Dose curve display toggle
Curve Color	Dose curve color change tool
Dose Curve in Real Time	Real-time dose curve(s) for current day

Data Log

Select from the list of devices on the left to browse or export data collected on each RadWall S.

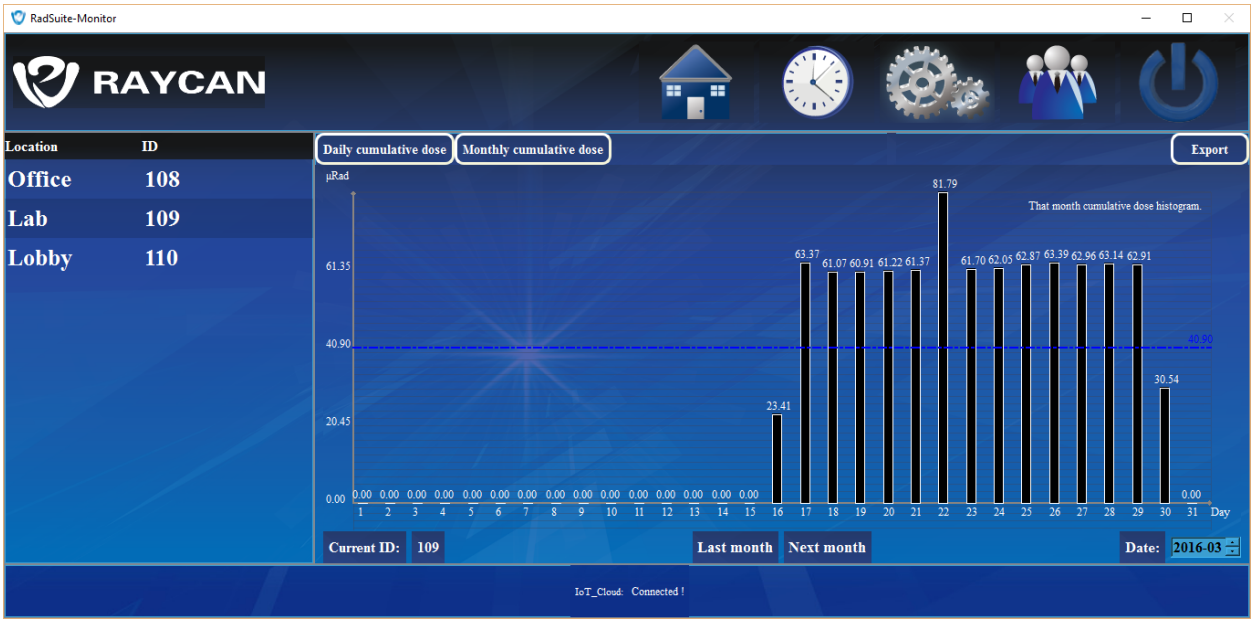
Daily Dose Rate

View the daily dose rate curve.



Monthly Cumulative Dose

View the monthly cumulative dose histogram.



Export

Click Export to choose file location to save and export the selected device's data for the month chosen.

Settings

Set up RadWall S and IoT-Cloud connections or change the alarm threshold on the Settings page.

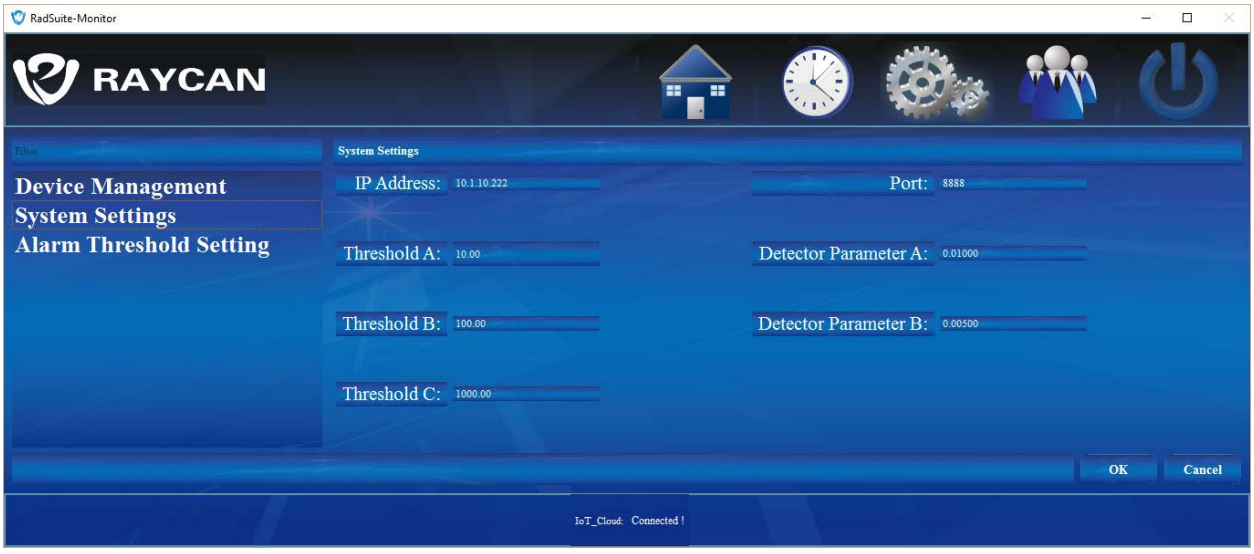
Device Management

Manage your list of connected devices.

1. Click Add to add a new device. IoT-Cloud 2.0 supports up to 100 RadWall S connections at once.
2. Double click to edit the ID, which corresponds to the serial number, excluding leading zeroes (last two digits only for serial numbers 111+), located on the back of RadWall S.
3. Double click to edit Location.
4. To remove a device, select the unit and click Delete.
5. Click OK and Save to apply changes.

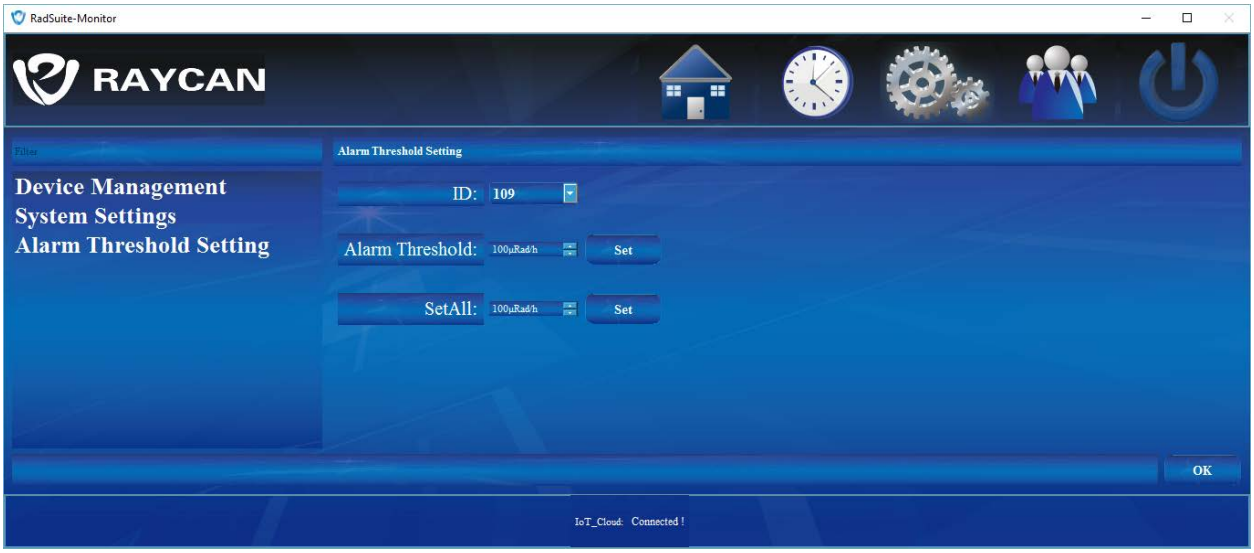
System Settings

This page is used during IoT-Cloud Configuration to connect IoT-Cloud 2.0 to RadSuite-Monitor.



Alarm Threshold Setting

Change the alarm threshold on a connected RadWall S.



1. Select the ID of the RadWall S unit you wish to alter. The device must be powered on for changes to take effect. To simultaneously change the alarm threshold on all connected units, use the Set All function.
2. Enter desired alarm threshold in increments of 100 μrad/h (1 μGy/h).
3. Click Set. A window will appear briefly to confirm changes.

4. Click OK and Save to apply changes.

About

Display information about the software.

Quit

Click the Quit tab and Close to exit the program.

4 Maintenance

4.1 Cleaning

RadWall S can be cleaned by wiping it with a damp cloth. Do not immerse RadWall S in liquid as the device is not completely waterproof.

4.2 Calibration

RadWall S does not require user calibration to work properly. However, depending on the rules and regulations of your industry, you may be required to regularly calibrate your equipment for quality assurance purposes. Calibration may only be performed by X-Z LAB or an accredited calibration laboratory.

4.3 Troubleshooting

Problem	Solutions
Unable to turn on	Check to see if the power switch is in the ON position Ensure the power supply is properly connected to RadWall S and the power outlet
Automatic shutdown	Make sure the power source is not tainted
Continuous alarm ringing	Confirm that a radiation source is nearby Check alarm threshold settings
Alarm is not ringing near radiation source	Check alarm threshold settings
IoT-Cloud not connected	Make sure IoT-Cloud's IP address is in the same segment as the PC or router
RadWall S not reading on RadSuite-Monitor	Ensure the ID matches the serial number, excluding leading zeroes (last two digits only for serial numbers 111+) Make sure IoT-Cloud is connected to software Restart both IoT-Cloud and RadWall S

If the problems listed above cannot be solved, please contact X-Z LAB.

4.4 Warranty

RadWall S comes with a one (1) year limited warranty for parts and labor. Cosmetic defects are not eligible for repair. The device is not eligible for warranty if it has been subjected to improper use or intentional damage.

While the device is still under warranty, users may purchase an additional year of coverage for 5% of the product's price. The warranty can be extended up to two (2) years, totaling to three (3) years of coverage past purchase date.

Devices past warranty may be sent in to X-Z LAB for repair. Rates for parts and labor will be determined at the time of repair.

Revision History

Revision	Date	Description
0.1	March 16, 2016	Document created
1.0	March 31, 2016	Document released
1.1	April 5, 2016	Table of contents/document outline formatted
1.2	April 12, 2016	RadWall S network diagram added
1.3	November 1, 2016	RadWall-S → RadWall S300, models added, daily cumulative dose → daily dose curve
1.4	November 3, 2016	Connect 100 RadWall S to IoT-Cloud, use last two digits of serial no. as ID
1.5	January 12, 2017	Operating temperature updated
1.6	March 27, 2017	Overload indication updated
1.7	June 20, 2017	Troubleshooting updated