Rad Elec Recon™

Continuous Radon Monitor

Operator's Manual

Version 0.8.6
27 December 2022

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Introduction

The Recon™ serves as a precise and durable entry point into the world of continuous radon monitors. It steadily measures radon on an hourly basis; in addition, it monitors temperature, relative humidity, barometric pressure, and registers if the instrument has been disturbed during the exposure period. It operates on rechargeable batteries that are capable of conducting a 96-hour exposure. When plugged into an outlet (or operating from another external power source), it is capable of recording more than eight months worth of data in a single session. The Recon™ is a solid-state instrument that measures alpha decays from radon by utilizing two discrete photodiodes. Each of these photodiodes is enclosed in its own independent electrically-conductive chamber.

This instrument has a micro USB port that can be connected to your computer via the included cable (although nearly any micro USB cable can be used). The Recon™ ships with a free software package that will allow the radon professional to generate reports and graphs (in a PDF format); it is compatible with Microsoft Windows®, Apple macOS, and Linux. It is also fully compatible with Rad Elec's Radon Report Manager software.

> The Recon™ is a durable solid-state detector with two discrete photodiodes, each enclosed in an independent chamber. Each chamber has a sensitivity of 6 – 7 counts per hour per pCi/L, for a nominal combined sensitivity of approximately 13 counts per hour per pCi/L. A full technical specification sheet can be found near the end of this manual.

The Recon™ has been constructed with durability in mind, in order to make it one of the most solid and robust continuous radon monitors on the market. Nevertheless, it is a complex instrument and should be handled with care. Environments with condensing humidity and/or temperatures over 100 °F (38 °C) or below 32 °F (0 °C) should be avoided. Devices that emit electromagnetic radiation or radio frequencies should not be placed within 4" (10 cm) of the Recon™ whenever it is acquiring data.

This manual will detail the different components of your new continuous radon monitor, explain how to operate it properly in the field, and how to install the included software in order to download data and generate a report. We have tried to be as comprehensive as possible, but there may be certain questions or concerns that are not addressed – if this is the case, please don't hesitate to give us a call at the office (**800.526.5482**) or to send us an email at **info@radelec.com**.

Features & Components

Each Recon™ has the following features:

- **Shock-Absorbent Bumpers** (choice of colors when ordering)

- **Universal Tripod Mount**

- **Micro USB Port** (for data transfer and external battery bank)

- **LCD Display Screen** (with Backlight)

- **Rechargeable Batteries**

- **Simple Key Operation**

- **Button Interface**

- **Charging Port** (for external power supply and recharging)

Every Recon™ comes packaged with the following components:

- **Recon™ Continuous Radon Monitor**

- **Set of two (2) keys**

- **AC Adapter / Charger**

- **Software on Flash Drive**

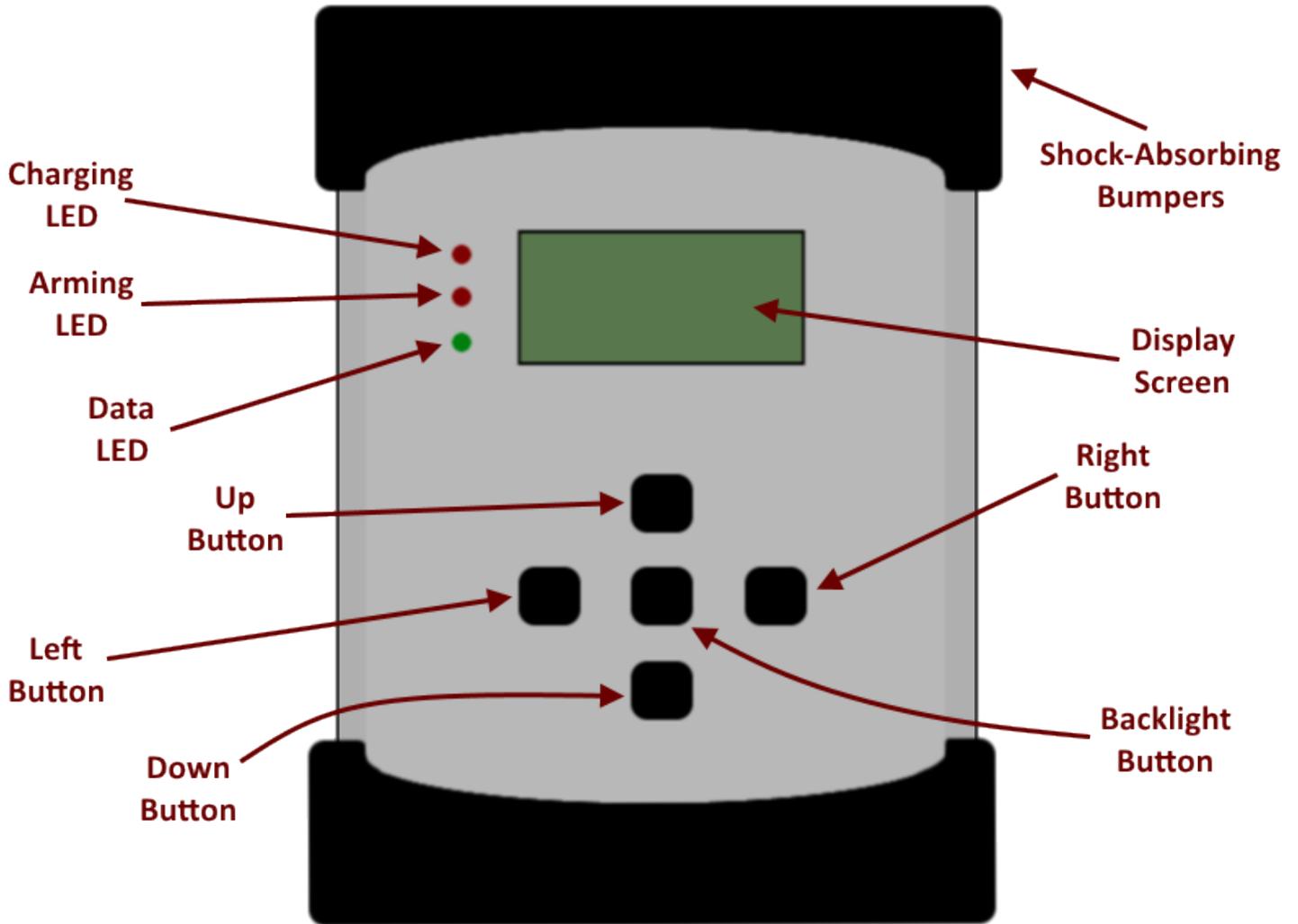- **User's Manual on Flash Drive**

- **Micro USB Cable**

Optional components include:

- **Traveling Case**

> If you lose or otherwise misplace any of these components, don't worry! You can buy replacements directly from Rad Elec.

Instrument Diagram

Shock-Absorbing Bumpers

Charging LED

Arming LED

Data LED

Display Screen

Up Button

Right Button

Left Button

Down Button

Backlight Button

Overview

This section in the manual will provide guidance on how to operate the Recon™, including basic procedures such as turning the instrument on, accessing its setup menu, powering it off, and acquiring field data. The monitor's interface is controlled by two mechanisms: a key switch and a set of buttons.
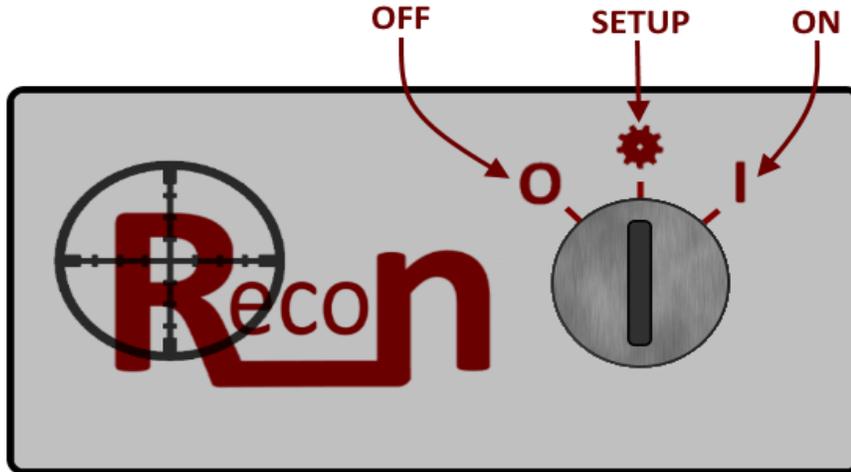
Key Switch (Modes)

The three instrument **modes** are determined by the key switch, which turns the monitor **on**, **off**, and allows access to a **setup menu**. A key is required to change modes; without it, you will be unable to operate the instrument. As such, the Recon™ ships with two keys – keep at least one in a safe place where you'll be able to find it (just in case you lose the other one). If you misplace both keys, Rad Elec will be happy to provide replacements for your instrument at a very reasonable price.

O

Turning Instrument OFF
To turn the instrument off, insert the key and turn it left towards the "**O**" (OFF) position. This will terminate power to the Recon™, and immediately conclude any ongoing data collection.

Accessing Setup Menu
To access the setup menu, insert the key and turn it towards the middle position (that looks like a gear). This will allow you to customize parameters for an upcoming deployment, such as setting a delay time, a pre-determined sampling period, and whether or not you'd like the screen to display the average radon concentration throughout the testing period.

Run Mode
In order to begin sampling, the key must be inserted and turned right towards the "**I**" (ON) position. The Recon™ will begin to measure radon using the parameters that were defined in the setup menu.

Button Interface

The Recon™ has five buttons on its face that can be used to activate a backlight and to navigate throughout the setup menu. The middle button can be pressed to activate a backlight, so that information on the display screen can be read more easily. This backlight button acts as a toggle when in the setup menu (so that it only needs to be pressed once in order to activate the light on the display screen), but must be held down when the instrument is acquiring data if you wish to illuminate the display. The other four directional buttons are used to navigate throughout the setup menu.
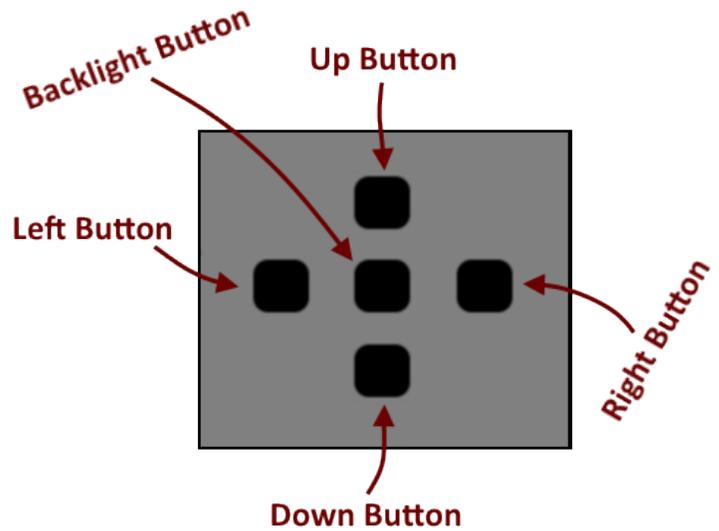
Display Screen
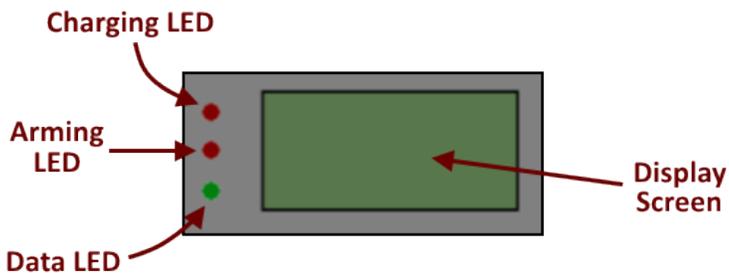
The LCD display screen lets you know exactly what's going on with your instrument, and provides visual feedback for a pretty large number of parameters and situations. The three lights to the left of the display also let you know whether the instrument is charging, arming/waiting, or collecting data.

The top red LED light will illuminate when the instrument is charging (by plugging the Recon™ into an outlet). After the instrument is fully charged, this top LED light will turn off so that you know the instrument is ready for a battery-powered deployment. The middle red LED light will blink when the instrument is either arming itself or is waiting to acquire data; this occurs when the key is first turned to the **I** (ON) position, and indicates that the Recon™

> The display screen and LED lights will assist you in understanding exactly what is going on with your instrument.

will begin collecting data. After the instrument has finished arming itself (and preparing for the data collection), the middle light will extinguish and the bottom green LED light will begin to flash. The LED flashes every 10 seconds, indicating that data collection is in-progress, and that the instrument is measuring radon. Note that both the arming and data LEDs will only illuminate when the key is turned to the **I** (ON) position. Even if the instrument has been configured to begin acquiring data immediately, it may take several minutes for the Recon™ to conclude its self-diagnostics and initiate data collection.

Micro USB Port

There is a micro USB port located on the side of the instrument. This is primarily used to transfer collected data sessions from the instrument to your computer by connecting it with the included USB cable that comes packaged with the Recon™. If you misplace the original USB cable, don't fret – nearly any micro USB cable can be used to interface with your Recon™.

AC Adapter Port

The AC Adapter port allows you to charge your continuous radon monitor by plugging it into an external power source (such as an outlet or battery bank), and to continuously power your instrument

for long-term data collection. When charging, the top red LED light (to the left of the display screen) will illuminate in order to let you know that your instrument's battery is recharging. After charging is complete, the red light will extinguish. For long-term data collection, the instrument will automatically switch over to its internal battery if a power outage occurs. As the battery can operate for 96 hours without external power, this provides security that your instrument will be able to continue its data collection if sporadic power outages occur. Note that if external power is not restored before the internal battery dies, the data session will terminate – but any collected data will be saved.

⚙ Setup Menu

The setup menu can be accessed by inserting the key into the Recon™ and turning from the **O** (OFF) position to the middle position (that looks like ⚙). This setup menu ***should be accessed each and every time before data collection occurs***, even if it's only for a few moments. It's an intuitive menu, and only requires a few moments in order to fine-tune the upcoming radon test to your desired options.

You must choose your setup options each time you run the instrument. The default parameters are as follows:

```
Run Parameters
Wait Time: 0
Run Time: Man
Display: OFF
```

When first accessing the setup menu, the instrument will progressively display two screens of data. The first screen includes the instrument's serial number and its current firmware version. The second screen displays values such the status of the battery, temperature, relative humidity, barometric pressure, date/time, plus some instrument diagnostics. Press any button in order to scroll past this data and load the setup menu.

There are three customizable parameters in the setup menu: **Wait Time** (the number of hours to delay the data collection), **Run Time** (the desired duration of the sampling period), and **Display** (whether or not to show real-time radon concentration on the display screen). Press the up and down buttons to navigate through the setup menu; as you cycle through the options, each row will highlight to let you know which parameter is currently selected. Use the left and right buttons to change the settings for the upcoming sampling period. The currently selected values will be applied when the key switch is turned to the **I** (ON) position and the data collection begins.

| Wait Time	Run Time	Display
0 / 12 / 24 / 48	**Man / 48 / 72 / 96 / Long Term**	**ON / OFF**
This is the number of hours to delay the start of the data collection. This is especially useful when closed building conditions have not been met prior to a short-term radon test, or after a structure has been mitigated. Selecting "0" will initiate the sampling immediately (with no delay).	This is the number of hours to sample and collect data. Selecting "Man" (Manual) will allow the instrument to collect data for an indefinite time-period (i.e. until you manually end the sampling or the battery runs out). The "Long Term" option will only appear when the instrument is plugged into the AC Adapter.	Select whether or not you wish the instrument to actively update the display screen with the ongoing radon concentration. Updates will be displayed if "ON" is selected. If "OFF" is selected, the display screen will not broadcast the radon (but will still continue to display temperature, humidity, and barometric pressure).

Self-Diagnostic Check

When the instrument first boots up (by turning the key from the **O** to the ✹ position), it will conduct a quick self-diagnostic check. This self-diagnostic will sequentially progress through two screens, each of which displays useful information and will help to ensure that the instrument is functioning within its specified parameters. To progress past the second self-diagnostic screen and enter the setup menu, you must push any button (except for the backlight).
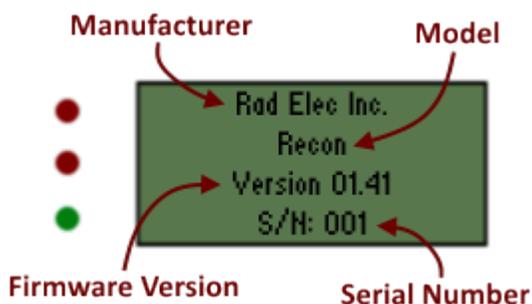
Manufacturer
The Recon's manufacturer, Rad Elec.

Model
This will always display "Recon".

Version
The current firmware version.

S/N
Your instrument's unique serial number.

Time
Current time (HH:MM:ss)

Date
Current date (MM/DD/YY)

Temperature
Current temperature (F or C)

Relative Humidity
Relative humidity (%)

Barometric Pressure
Current pressure (inHg or mBar)
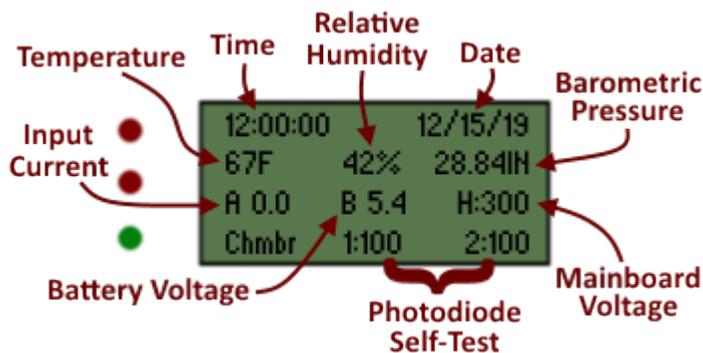
Input Current
0.0 when operating off battery, but expect higher value when powered by an external source.

Battery Voltage
Optimal value should be above 5.0V when fully charged.

Mainboard Voltage
Should be approximately 300V.

Photodiode Self-Test
A simulated test of 100 counts to each photodiode chamber (labeled as "1" and "2"). Ideally these values should be close to 100.

How to Acquire Data

In order to start measuring radon simply insert the key and turn it to the **I** (ON) position. As stated earlier, you should navigate to the setup menu before acquiring data. This serves to ensure that you have checked the battery status, checked the diagnostic functions, and selected the desired optional test parameters. This process is described in greater detail in the previous section of this manual.

If a desired **run time** is selected (48 hours, 72 hours, or 96 hours), the Recon™ will automatically terminate the data collection after the specified time has elapsed. When selecting a **run time**, *the display screen will flash when you attempt to arm the instrument if the battery voltage is not sufficient to complete the intended exposure.* Otherwise, if the instrument is operating with a manual run time, you must end the data collection yourself by inserting the key and simply turning it to the **O** (OFF) position. If you turn the key to the ✺ (SETUP) position when concluding a test (and before turning it to the **O** (OFF) position) the screen will display the average radon concentration measured during the measurement period. Note that the average radon concentration will be displayed briefly at the end of a measurement regardless of whether the **Display** setting is turned **ON** or **OFF**.

> After the arming period has concluded, the bottom green LED light will begin to flash intermittently. Before removing the key, check to make sure that the green LED is flashing in order to ensure that the Recon™ is acquiring data.

By default, the Recon™ will exclude the first four hours of any radon test (if no wait time is selected).

After a radon test has concluded, the acquired data is saved to the instrument as a specific **data session**. The Recon™ can store up to 15 discrete data sessions in memory, with a maximum storage capacity of 255 days of hourly data. If more than 15 data sessions are stored within the instrument, the oldest sessions will be deleted in order to make room for the new ones.

Instructions on how to download data from the Recon™ will be addressed later in the manual.

> If a desired **run time** is selected, the display screen will flash if there is insufficient battery voltage to complete the test. This lets you know to either plug the instrument into an external power source, or recharge the battery.

Display Screen During Data Acquisition

If you elected to turn the **Display** setting **OFF** in the setup menu, the Recon™ will only show the current temperature, relative humidity, and barometric pressure (in addition to the elapsed run-time). If the **Display** setting is **ON**, however, the instrument will also show the hourly and average (total) radon concentrations throughout the measurement period. By default, the **Display** setting is **OFF**. Note that this setting can only be changed when beginning a new test.
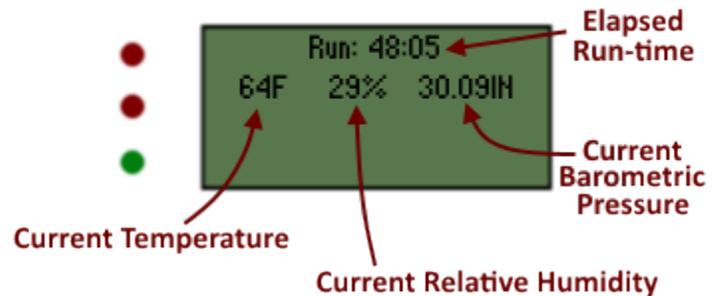
Elapsed Run-time
This represents the total elapsed run-time in hours and minutes (HH:mm).

Current Environment
These three values represent the recent (within 10 minutes) temperature, relative humidity, and barometric pressure readings. These units (US or SI) can be configured from within the Recon Download Tool software.

Display (OFF)

Run: 48:05

64F   29%   30.09IN

Elapsed Run-time

Current Barometric Pressure

Current Temperature

Current Relative Humidity

Display (ON)

Run: 48:05
64F   29%   30.09IN
A v g: 3.1 pCi/L
T o t: 2.9 pCi/L

Total Average Radon Concentration

Hourly (Recent) Radon Concentration
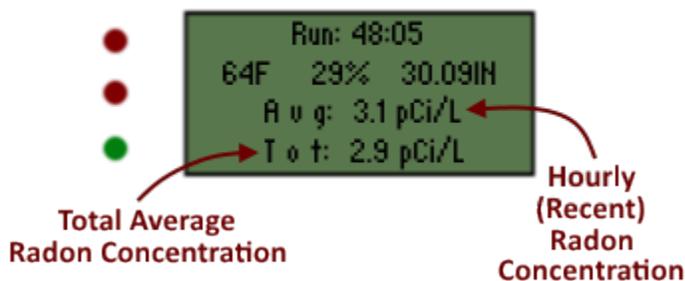
Hourly Radon
The third line represents a recent "snapshot" of the current hourly radon concentration. Only shown if the **Display** setting is **ON**.

Total/Average Radon
The fourth line represents the cumulative, integrated average radon concentration of the current exposure. Only shown if the **Display** setting is **ON**.

How to Download Data

After a data session has been stored internally in the Recon™, you'll want to download the data in order to analyze it and to generate a PDF report for your clients. The Recon™ ships with its own software (the Recon Download Tool), which is easily installed and compatible with a wide range of operating systems.

1 Connect the Recon™ to your computer using a micro USB cable while the key is in the **O** (OFF) position.

2 Turn the key to the ⚙ (SETUP) position after it is connected.

Before Connecting

3 Launch the software.

4 Click on the **Connect** button (after the main menu appears) in order to allow the software to search for the Recon™. Once it is detected, additional buttons will populate the menu.

5 Type in the customer and test site information in the text boxes located in the lower left corner of the main menu. This information will be saved to the data session file when it's being downloaded, and will appear on the PDF report.

After Connecting

6 Click on the **Download Session** button. It may take several seconds for the entire record to be downloaded to your computer, so please be patient and wait.

7 (OPTIONAL) Click on the **Generate PDF** button to create a customer-friendly PDF report.
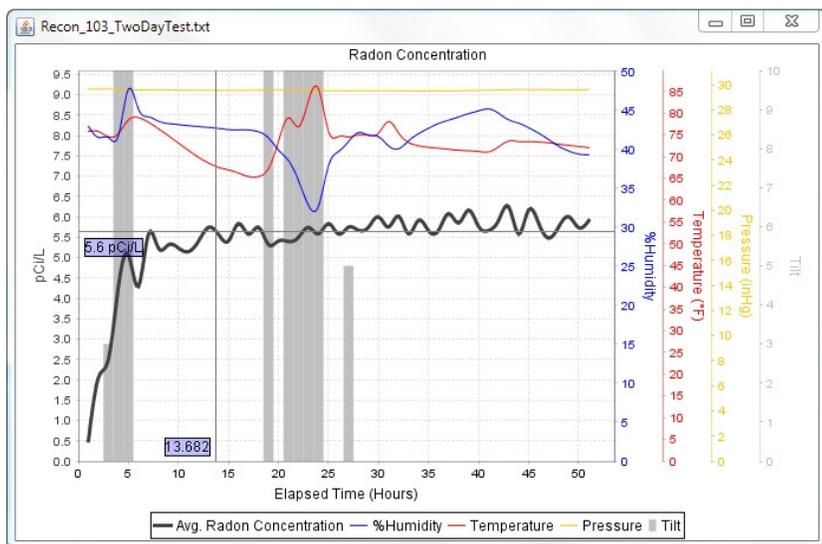
Note that you may have multiple data sessions stored on your instrument; if this is the case, you will download the oldest session first. Each data session will be independently saved (and given its own unique file name), so you won't need to worry about overwriting data sessions as they are downloaded. Although it will be explained in greater detail later in this manual, you may also load (and view) any previously saved data session by clicking on the **Open Saved File** button.

After the data session has downloaded, an interactive graph of the data will appear. This graph will show you the humidity, temperature, pressure, number of tilts, and – most importantly of all – the actual radon concentration itself. If you move your mouse over the graph, crosshairs will appear to let you know the exact radon concentration at a specific time.

Creating a PDF Report

If you wish to create a PDF report to give to your clients, click on the **Generate PDF** button located in the main menu. This button will not appear until a data session has been loaded. After clicking on the **Generate PDF** button, a folder will appear containing your PDF file. Feel free to open it up and check it out! If a component of the report needs to be changed in the PDF (such as tampering, abnormal weather, or generalized comments) click on the **Config** button to customize your report even further, and then generate the PDF again. By default, the PDFs will be stored in your ReconDownloadTool directory (in a subdirectory named "reports"), which can be found in your Documents folder.

> Large bands of grey in the graph indicate that the instrument was moved repeatedly throughout the test, which may be indicative of tampering!

> PDFs can be found in the "ReconDownloadTool" directory located in your Documents folder.

Sample Reports

The software included with the Recon™ can be used to generate full-featured PDF reports, displaying a customizable report with graphs and hourly data. Similar reports can be generated with Rad Elec's Radon Report Manager, which is also compatible with the Recon™.

ABC Radon Testing Company
123 Main Street
Frederick, MD 21703
ph: (301) 555-5555

Radon Test Report

20-Oct-2017

Customer Information:	Test Site:
Random Customer	Radium Manor
555 Bismuth Blvd.	123 Main Street
Frederick, MD 21703	Leesburg, VA 20176

A Rad Elec Recon® CRM (NRPP Device Code #8304) was used for radon screening measurements that were conducted at the above referenced test site by: ABC Radon Testing Company

The results are as follows:

Serial#	Instrument	Location	Start Date/Time	End Date/Time	Results (pCi/L)
103	Recon CRM	Basement	09-26-2017 14:35	09-28-2017 17:46	5.4

Average Radon Concentration in: Basement   5.4 pCi/L

Analyzed By: Joe Tech (#123456789)   Cal. Date: 9/11/2017   Cal. Due: 09/11/2018
Deployed By: Jane Tech (#555555555)
Retrieved By: Joe Tech (#123456789)

Protocol: Closed Building Conditions Met
Tampering: No Tampering Detected
Weather: No Abnormal Weather Conditions
Mitigation: No Mitigation System Installed
Comment: Thanks for the business!

Radon Health Risk Information

Radon is the second leading cause of lung cancer after smoking. The U.S. Environmental Protection Agency (US EPA) and the Surgeon General strongly recommend that further action be taken when a home's radon test results are 4.0 pCi/L or greater. The national average indoor radon level is about 1.3 pCi/L. The higher the home's radon level, the greater the health risk to you and your family. Reducing your radon levels can be done easily, effectively and fairly inexpensively. Even homes with very high radon levels can be reduced below 4.0 pCi/L. Please refer to the EPA website at www.epa.gov/radon for further information to assist you in evaluating your test results or deciding if further action is needed.

Signature: *Joe Tech, Esq.*   Date: *28 September 2017*

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ABC Radon Testing Company
123 Main Street
Frederick, MD 21703
ph: (301) 555-5555

Graphical Radon Report

20-Oct-2017

Customer Information:	Test Site:
Random Customer	Radium Manor
555 Bismuth Blvd.	123 Main Street
Frederick, MD 21703	Leesburg, VA 20176

A Rad Elec Recon® CRM (NRPP Device Code #8304) was used for radon screening measurements that were conducted at the above referenced test site by: ABC Radon Testing Company

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Average Radon Concentration in: Basement   5.4 pCi/L

ABC Radon Testing Company
123 Main Street
Frederick, MD 21703
ph: (301) 555-5555

Hourly Radon Report

20-Oct-2017

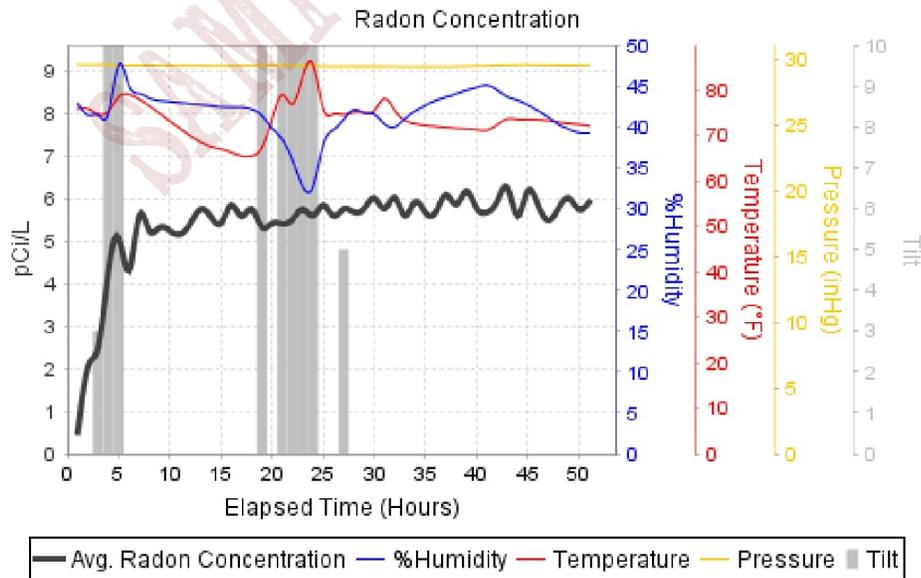| Customer Information:	Test Site:
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The results are as follows:

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103	Recon CRM	Basement	09-26-2017 14:35	09-28-2017 17:46	5.4

Average Radon Concentration in: Basement   5.4 pCi/L

Record#	Date/Time	Radon (pCi/L)	Temperature (°F)	Pressure (inHg)	Humidity (%)	Tilts
1	2017-09-26T15:35	0.5	76	29.7	43	0
2	2017-09-26T16:35	2.1	76	29.6	42	0
3	2017-09-26T17:35	2.5	75	29.6	42	3
4	2017-09-26T18:35	4.3	75	29.6	42	434
5	2017-09-26T19:35	5.1	78	29.6	48	240
6	2017-09-26T20:35	4.3	79	29.6	45	0
7	2017-09-26T21:35	5.6	78	29.6	44	0
8	2017-09-26T22:35	5.2	76	29.6	44	0
9	2017-09-26T23:35	5.3	75	29.6	43	0
10	2017-09-27T00:35	5.2	73	29.6	43	0
11	2017-09-27T01:35	5.1	71	29.6	43	0
12	2017-09-27T02:35	5.4	70	29.6	43	0
13	2017-09-27T03:35	5.7	69	29.6	43	0
14	2017-09-27T04:35	5.6	68	29.6	43	0
15	2017-09-27T05:35	5.4	67	29.5	43	0
16	2017-09-27T06:35	5.8	66	29.5	42	0
17	2017-09-27T07:35	5.6	65	29.6	42	0
18	2017-09-27T08:35	5.7	65	29.6	42	0
19	2017-09-27T09:35	5.3	67	29.6	41	482
20	2017-09-27T10:35	5.4	74	29.6	40	0
21	2017-09-27T11:35	5.4	79	29.6	39	480
22	2017-09-27T12:35	5.5	77	29.6	36	641
23	2017-09-27T13:35	5.7	83	29.6	33	304
24	2017-09-27T14:35	5.6	86	29.5	33	150
25	2017-09-27T15:35	5.8	76	29.5	38	0
26	2017-09-27T16:35	5.6	75	29.5	40	0
27	2017-09-27T17:35	5.7	75	29.5	41	5
28	2017-09-27T18:35	5.7	75	29.5	42	0
29	2017-09-27T19:35	5.7	75	29.5	42	0
30	2017-09-27T20:35	6.0	75	29.5	42	0
31	2017-09-27T21:35	5.7	78	29.5	40	0
32	2017-09-27T22:35	6.0	75	29.5	40	0

Hourly Radon Report

20-Oct-2017

Customer Information:	Test Site:
Random Customer	Radium Manor
555 Bismuth Blvd.	123 Main Street
Frederick, MD 21703	Leesburg, VA 20176

A Rad Elec Recon® CRM (NRPP Device Code #8304) was used for radon screening measurements that were conducted at the above referenced test site by: ABC Radon Testing Company

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Serial#	Instrument	Location	Start Date/Time	End Date/Time	Results (pCi/L)
103	Recon CRM	Basement	09-26-2017 14:35	09-28-2017 17:46	5.4

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Record#	Date/Time	Radon (pCi/L)	Temperature (°F)	Pressure (inHg)	Humidity (%)	Tilts
33	2017-09-27T23:35	5.6	73	29.5	41	0
34	2017-09-28T00:35	5.9	73	29.5	42	0
35	2017-09-28T01:35	5.7	72	29.5	43	0
36	2017-09-28T02:35	5.7	72	29.5	43	0
37	2017-09-28T03:35	6.1	72	29.5	44	0
38	2017-09-28T04:35	5.8	71	29.5	44	0
39	2017-09-28T05:35	6.2	71	29.5	45	0
40	2017-09-28T06:35	5.8	71	29.5	45	0
41	2017-09-28T07:35	5.7	71	29.6	45	0
42	2017-09-28T08:35	5.9	72	29.6	45	0
43	2017-09-28T09:35	6.3	74	29.6	44	0
44	2017-09-28T10:35	5.6	73	29.6	43	0
45	2017-09-28T11:35	6.2	73	29.6	43	0
46	2017-09-28T12:35	5.8	73	29.6	42	0
47	2017-09-28T13:35	5.5	73	29.6	41	0
48	2017-09-28T14:35	5.8	73	29.6	40	0
49	2017-09-28T15:35	6.0	73	29.6	40	0
50	2017-09-28T16:35	5.7	72	29.6	39	0
51	2017-09-28T17:35	5.9	72	29.6	39	0

Recon Download Tool Software

The Recon Download Tool software can be found on your flash-drive, and is freely available to all Recon™ owners. It is a lightweight application that is both intuitive and powerful, able to generate full-fledged reports with a few clicks of a button. This section focuses on the installation and proper use of the software, just in case you'd like to use it for more than simply downloading your data.

Installation and First-Time Use

After locating your flash-drive and inserting it into a USB port on your computer, you're ready to install the Recon Download Tool. Please follow the detailed instructions below depending on the operating system that you're using.

| Windows	macOS	Linux
Navigate to the **Windows** folder on the flash drive, and locate the following file: **Setup_ReconDT.exe** Double-click on the file, provide permission to run it (if necessary), and follow the on-screen instructions. The Recon Download Tool will be installed to the **Program Files (x86)** directory, although you can choose a different installation path if you prefer. After the installation is complete, a new shortcut will appear on your desktop entitled **Recon DT**. You can launch the application from this shortcut.	Navigate to the **macOS** folder on the flash drive, and locate the following file: **Setup_ReconDT.dmg** Double-click on the package file (it should look similar to an open box), and follow the on-screen instructions.	If you're using Linux, then you probably know what you're doing. Unpack the tarball to a location of your choice, making sure to preserve the directory structure (such as the **config**, **data**, and **lib** folders. The Java Runtime Environment 8 (JRE 8) is a dependency of this application, so you'll need it. The executable is the jar file: **RadElecRecon_DT.jar** If launching the application from a command line, type: **java -jar RadElecRecon_DT.jar**

Main Menu

When launching the Recon Download Tool, the main menu will appear on your screen. Until you connect a Recon™ to your computer (via a micro USB cable) and/or load a previously saved data session, there will only be a few buttons available to you. Additional buttons will appear after you connect the instrument and interface the software with it, or after loading a previously created data file.

If you're having trouble detecting the attached Recon™, make sure the instrument is off when connecting it into your computer with the micro USB cable. After it is connected, turn the key to the ⚙ (SETUP) position.
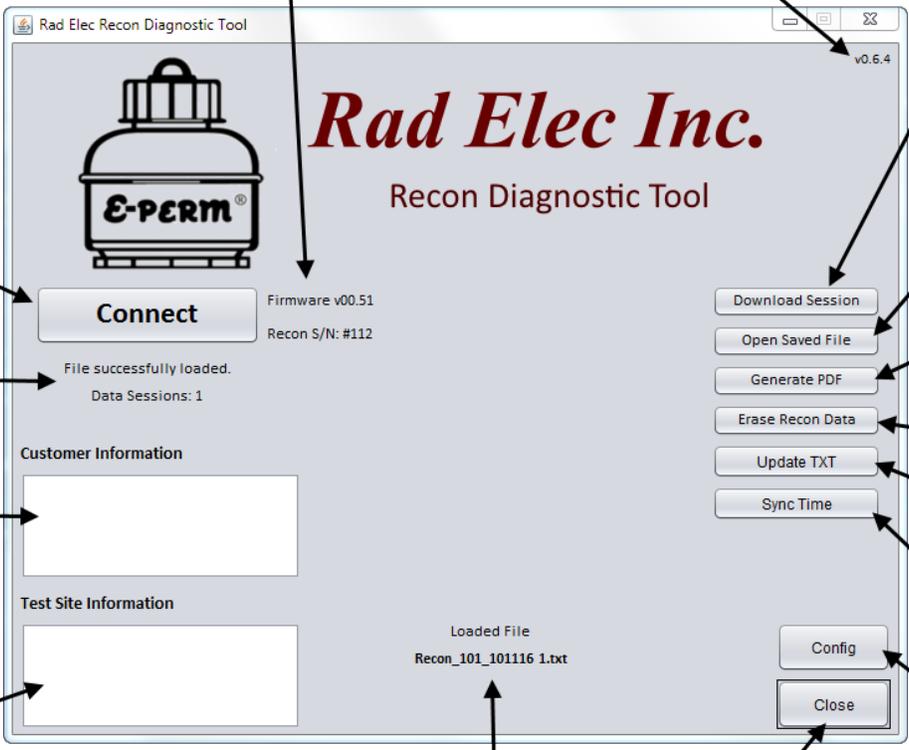
Firmware version and instrument serial number.

Current version of the software.

Download a data session from the instrument so that it can be saved to your computer.

Access a previously saved data session, which will also display a graph and allow a PDF to be generated.

Connect Button can be pressed to connect the instrument with the software. The Recon must be in the I/O position.

System Console will provide you with important messages when downloading data or loading files.

Generates a PDF report of the currently loaded data session or file.

Erases current data session, which is required to download newer data sessions on the instrument.

Type in the customer name, address, and any other pertinent information here. Do this before downloading a session.

Updates the loaded file with current test site and customer information.

Type in the test site information, such as the name of the resident, address, and any other relevant information. Do this before downloading a session.

Sets the current date and time of the instrument to your computer's date/time.

This button will open the configuration window, which will allow certain options and defaults to be defined.

If applicable, the currently loaded file name will appear here.

This button will close the application.

Rad Elec Inc.
Recon Diagnostic Tool

v0.6.4

Connect

Firmware v00.51
Recon S/N: #112

File successfully loaded.
Data Sessions: 1

Customer Information

Test Site Information

Loaded File
Recon_101_101116 1.txt

Download Session
Open Saved File
Generate PDF
Erase Recon Data
Update TXT
Sync Time

Config

Close

Config Menu

The configuration menu, which is opened by clicking on the **Config** button in the lower right corner of the main menu, allows you to save important default information that will appear on all of your reports (such as your company name and address). In addition to this, the configuration menu allows you to define the technicians responsible for deployment, retrieval, and analysis. It also presents you with options to customize text on the PDF report, and to define deployment protocols (such as whether or not closed-building conditions were met, whether or not tampering was observed, etc.). Lastly, the configuration menu allows you to write certain parameters to both the instrument and the application (such as US or SI measurement units, whether or not to automatically clear data sessions from the Recon™, and if you'd like the PDF folder to automatically open after a report has been created). All of these options will be explained in greater detail below.

Various tabs to navigate through the configuration menu.

Your company name, which will appear on the header of any created report.

Additional company address and details while will appear on the header of any created report.

Closes the configuration menu.
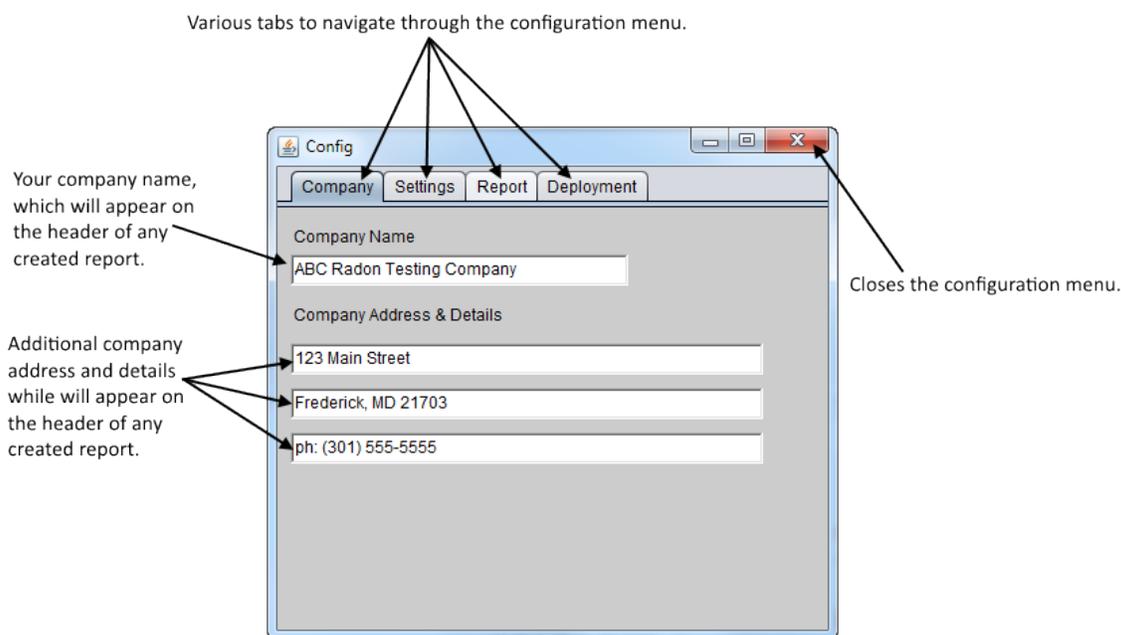
Company Tab

Type in and save your company information (such as your company name, address, and phone number) on this tab. In addition to the company name, you are given three text-boxes to enter in your company details. This information will appear in the header section of your PDF reports, and will be saved when the software shuts down.

Settings Tab

This is where you can customize the Recon Download Tool to better suit your own needs. These various options are described below:
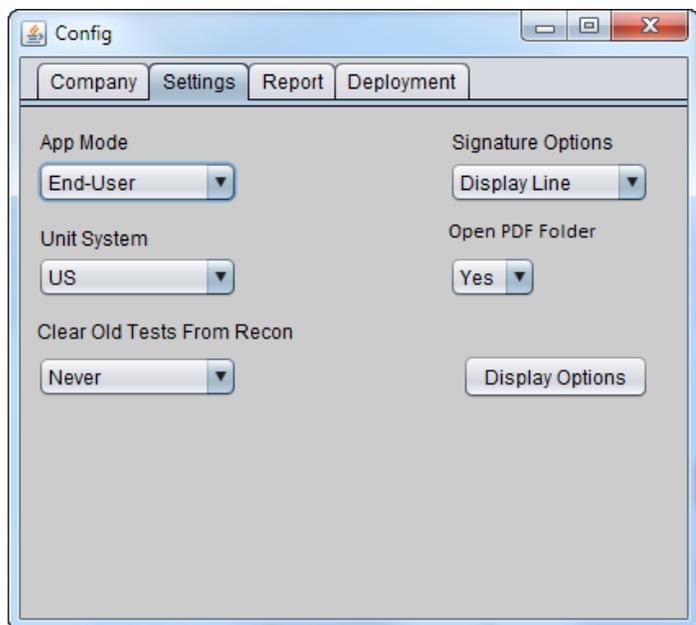
App Mode
There are two options – End-User and Diagnostic. The End-User mode should be optimal for most users, as this will combine the radon concentrations of each photodiode chamber in order to create a unified average. In Diagnostic mode each photodiode chamber will be treated independently, which creates a duplicate-equivalent measurement on the PDF report (with two radon concentrations).

Signature Options
Current options are "Display Line" and "No Signature". If you would like a signature and date line to appear at the bottom of the PDF report, select "Display Line"; otherwise, select "No Signature".

Open PDF Folder
Select whether or not you'd like the PDF folder to automatically open after each PDF report is generated.

Unit System
Select whether or not you'd prefer your PDF report to display US units (such as pCi/L, mbar, °F) or SI units (such as Bq/m³, mmHg, °C).

Display Options
Individually select the measurement system for various units to be displayed on the Recon™. You can also select whether or not you'd like each photodiode chamber to operate independently.
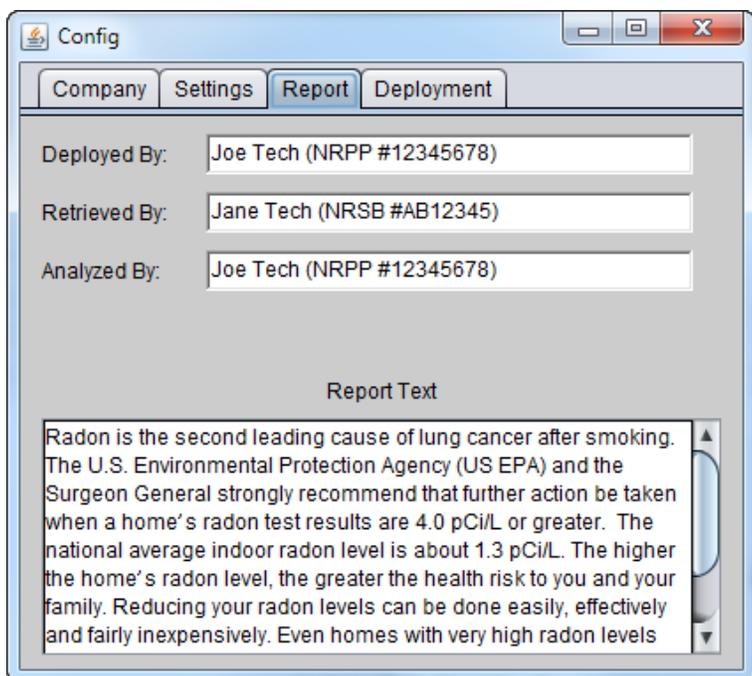
Clear Old Tests from Recon
The Recon is able to store up to 15 separate data sessions. When a data session is downloaded, you have the option to clear it from the instrument in order to free up extra space. By selecting "Never", downloaded data sessions will not be automatically deleted (although you can still manually delete them). Selecting "Prompt" will ask you whether or not you want to delete the downloaded session, and selecting "Always" will automatically erase each data session as it is downloaded.

Report Tab

The Report tab is primarily where you can define the technicians who deploy, retrieve, and analyze your results. You can also modify the text block that appears on your PDF report. This data is saved to the application whenever you make a change, so you won't need to type it in for each test.

Deployed By
The technician responsible for deploying the Recon™ and beginning the radon test. You should also include any technician credentials and certifying organizations here.

Retrieved By
The technician responsible for retrieving the Recon™ and concluding the radon test. You should also include any technician credentials and certifying organizations here.

Report Text
This report text will appear on the first page of the PDF report. Although the default text block is suitable for most situations and states, you are able to customize it to better suit your individual needs.

Analyzed By
The technician responsible for analyzing the radon test (downloading the data and generating the PDF report). You should also include any technician credentials and certifying organizations here.

Deployment Tab

The Deployment tab allows you to define important details and conditions on each PDF report, such as whether or not closed-building conditions have been met. Even though these data fields are saved to the application, we recommend that you review them before downloading a new data session and generating a PDF report.

Config

Company | Settings | Report | Deployment

Protocol: Closed Building Conditions Met

Tampering: No Tampering Detected

Weather: No Abnormal Weather Conditions

Mitigation: No Mitigation System Installed

Comment: Thanks for the business!

Room: Basement

Protocol
Intended to define whether or not closed-building conditions have been met, and can also be used to define if the test period is short-term or long-term.

Tampering
Intended to state whether any tampering was detected, and optionally to describe any anti-tampering methods that were utilized.

Weather
Intended to describe the overall weather conditions throughout the exposure period.

Mitigation
This data field lets you describe whether or not a mitigation system is installed in the testing location.

Comment
This can serve as a miscellaneous data field to customize a specific message to your customer regarding the radon test.

Location
This will describe the deployment location of the Recon™ throughout the radon test.

Display Options

This window can be accessed by clicking on the **Display Options** button located within the Settings tab. From within this window you can program the various units that are displayed on the Recon screen. Note that this will only affect the values shown on the display screen! If you wish to change the unit system displayed in the report, you must select the appropriate unit system (either US or SI) from within the Settings tab. After selecting the desired dropdown values, you must click on the **Apply** button to send these values to your Recon™ (which means that it must be connected to your computer beforehand).

Pres. Unit
Barometric pressure units. Select either inHg (for US units) or mBar (for SI units). This value will be displayed during the instrument's self-diagnostic, before accessing the Setup menu.

Radon Unit
Radon concentration units. Select pCi/L (for US units), Bq/m³ (for SI units), or CPH for raw counts per hour. This value will be shown on the display screen when a test is concluded, and (optionally) while the instrument is sampling.

Displayed Reading Interval
Select Hourly for the display screen to update the average and total radon concentrations on an hourly basis, or "10 Mins." to have the display screen updated every ten minutes.

Dual Chamber
Whether or not to display each photodiode chamber's radon concentration individually. When set to "No" it will average both photodiode chambers to produce a unified radon concentration.

Apply
When satisfied with your selections, click "Apply" to send these values to your instrument. Note that it must be connected to your computer.

Temp. Unit
Temperature units. Select F for Fahrenheit (US units) or C for Celsius (SI units). This value will be displayed during the instrument's self-diagnostic, before accessing the Setup menu.

Technical Specifications

Methodology:	Uses two independent photodiodes (each enclosed in an electrically conductive chamber). Alpha particles from radon decay are detected by these photodiodes.
LLD:	Lower limit of detection experimentally determined to be 0.6 pCi/L.
Sensitivity:	Combined sensitivity of approximately 13 counts per hour per pCi/L.
% Error:	0.75% (typical).
Dimensions:	Height 3" (8 cm), Length 7" (18 cm), Width 5" (13 cm), Weight 2.0 lbs (0.9 kg), Tripod Mount Thread Size 1/4"-20.
Procedures:	Keyed switch to initiate (and terminate) data collection, with optional delay up to 48 hours. Average results displayed on instrument LCD, but further analysis can be conducted via included software or with the Radon Report Manager software. Self-diagnostic on instrument boot.
Battery Life:	96 hour battery life (when fully charged), in addition to optional 12- to 48-hour delay before initiation of data collection.
Background:	Experimentally determined to be between 0.2 and 0.3 pCi/L.
Durability:	0% to 85% relative humidity; safe operating temperature range from 32°F to 100°F (0°C to 38°C). Unaffected by normal atmospheric pressure ranges. Able to withstand normal shocks during shipping.
Data Storage:	EEPROM data storage, which is written and erased via electrical pulses. Minimum data retention of approximately 40 years and 1,000,000 erase/write cycles. Up to 255 days of hourly data collection.
Thoron:	Thoron signature less than 5%. Radon and thoron must diffuse through two discrete Tyvek barriers and two tiny filter holes before reaching the sensitive volume.

Afterword

If you've made it this far, thanks for reading (or opening, just in case you skipped straight to the end) our manual! We at Rad Elec are dedicated to listening to our customers' suggestions, so please contact us if you have any feedback to improve our instruments or this document. We hope that you find the Recon™ to be an accurate, durable, and cost-effective addition to the catalog of Rad Elec radon measurement equipment.

Rad Elec warrants the Recon™ continuous radon monitor to be free from all defects in material and craftsmanship for a period of one (1) year from the purchase date. This warranty extends only to the original buyer. While covered under this warranty, Rad Elec will repair or replace any component determined to be defective due to flaws in material and craftsmanship; this warranty does not cover abuse or mishandling.

This limited warranty does not apply to any costs, repairs, or services that result from abuse, alterations, accidents, acts of God, or sheer lunacy (such as cooking the Recon™ in a microwave or tossing it out of a moving vehicle). Warranty is immediately voided if the instrument case is opened.

Opening the case immediately voids the warranty, and will trigger a tamper warning that necessitates an immediate re-calibration of the instrument. This means that you will need to mail the Recon™ back to Rad Elec in order to have it calibrated and re-evaluated; the user will be subject to a fee for both the calibration and re-evaluation process.

Please contact us (using the information below) if you have any questions, concerns, or bright ideas!

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