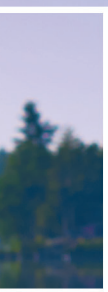
DURRIDGE

Radon Capture & Analytics











Product Guide

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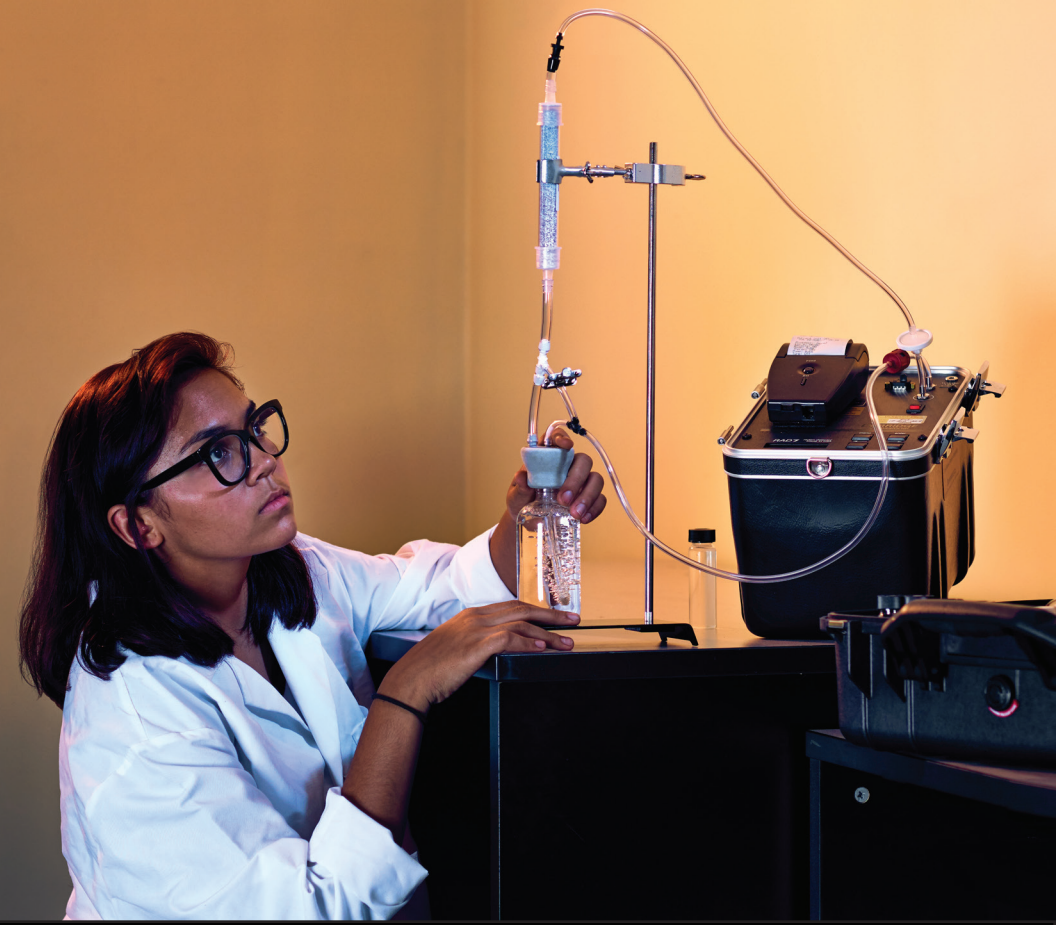

[Customer Testimonials]

Praise for the RAD7 and other DURRIDGE products from industry and academic professionals.

From a University Professor:
"We have been measuring Rn for about 20 years - mostly in water but in air as well. The RAD7 is the best commercially available instrument for measuring Rn that I have ever seen. We originally bought one - we now own 12 and may purchase more. The RAD7 is a very nice little device with features that one would only expect in much more expensive instruments."

From an Environmental Laboratory:
"We find the RAD7 user-friendly. When side-by-side studies were run against our liquid scintillation unit we found the RAD H_2O to be within ±5% of our Packard unit. We find the instrument to be more hassle-free than the Packard unit because we no longer have to fool around with the Optifluor liquid. Your unit's portability allows us to bring the "lab" to the customer. We are very pleased with the RAD H_2O. It performs better than I expected and I will recommend your product to my colleagues."

From a Radon Mitigator:
"I have been using the RAD7 now for a few years, and I am very pleased with it. When searching for radon entry points I discovered that Thoron often shows in the spectrum printout, where radon enters the house. Measuring one half meter away from that point Thoron doesn't show. This is a very good help to find the entry points."

From a University Graduate Student:
"The RAD7 has been an excellent purchase. It significantly helped a research project I was working on and I see many new research opportunities in the future using the RAD7. The machine and add-ons (RAD AQUA and RAD H_2O) are all well documented and work very well and easily in the field. The greatest help and what really separates DURRIDGE from other companies is the unparalleled service I have been given. Answers and advice have always been quick, helpful and thorough."

Read more customer testimonials at www.durridge.com.

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[Radon]

When the Earth was formed several billion years ago, it contained a huge amount of radioactive material. Since then almost all of this matter has decayed into stable elements. All, that is, except for uranium and thorium, whose half-lives are 4.5 and 14 billion years, respectively. Much of the Earth's original radioactive uranium and thorium remains to this day.

Where Does Radon Come From?

The uranium and thorium decay chains include a variety of radioactive elements. Most of these are metals, so they remain underground where they do little harm. But one of them is a gas, radon. Because radon has a half life of a few days, it often has enough time to seep up through the ground, through cracks in building foundations, and into homes and offices.

Radon and its daughters in the air can be inhaled. As they decay some emit high-energy alpha particles, as shown in Figure 1. These alpha particles are hazardous to living cells. Over time, continued exposure can result in lung cancer. Modern, well insulated homes are especially effective at trapping high concentrations of radon.

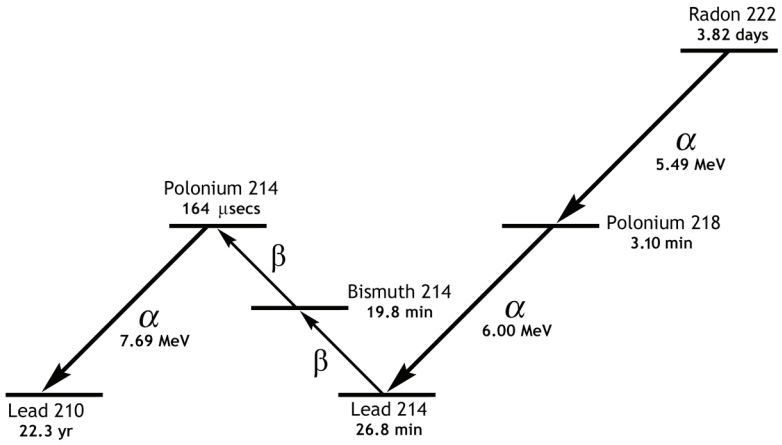

Figure 1: Radon decay chain from Radon 222 to Lead 210.

How Dangerous is Radon?

Radon is widely known to be the second leading cause of lung cancer, after cigarette smoking. While short term exposure to a high concentration of radon may not create an immediate health risk, continuous exposure over a period of time poses a significant danger. Smokers are more susceptible to the effects of radon exposure, because their lungs are already damaged.

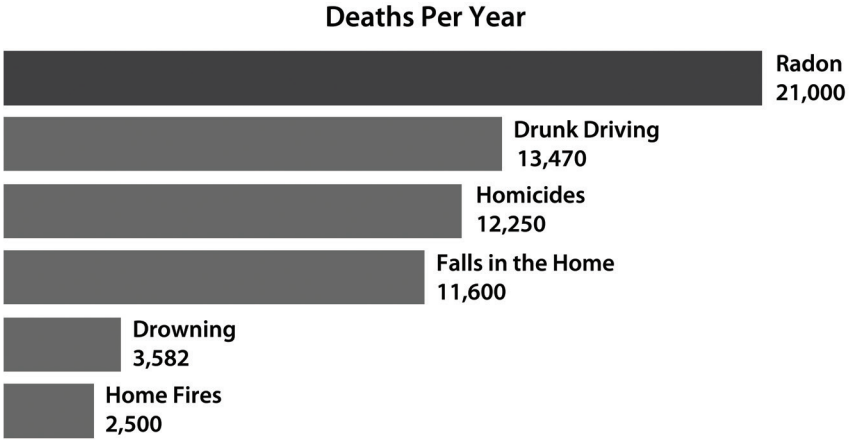

Figure 2: Comparison of deaths from various causes in the U.S. Sources: U.S. EPA, U.N. Office on Drugs and Crime.

Radon Mitigation

When radon is allowed to collect in an enclosed space it poses a significant health risk. If dangerous levels of radon are detected in a building, it is necessary to install a mitigation system. Sub-slab depressurization is an effective mitigation method. Air beneath the basement slab is sucked out, causing a reduction in pressure, so that any air leakage goes out from the basement instead of in from the soil.

[Detecting Radon with the RAD7]

The DURRIDGE RAD7 is a versatile radon detector. It is widely used not only in home radon testing, but also in laboratories and field sites around the globe. It is easy to set up and use: common measurement tasks can be completed using pre-programmed settings. CAPTURE software provides automatic remote download and sophisticated graphing and analysis.

The RAD7 comes complete with a built-in pump, rechargeable batteries, and a wireless infrared printer. It is built to withstand demanding use in the field, with a rugged, protective case.

Figure 3: The DURRIDGE RAD7 Electronic Radon Detector

RAD7 Specifications

Operating Modes:	• Continuous radon and thoron monitoring • Long-term/Short-term screener • SNIFF mode, to search for radon entry points • GRAB mode, for batch sample analysis
Radon Sensitivity:	• Monitor: 0.5 cpm/(pCi/L) • Sniffer: 0.25 cpm/(pCi/L)
Operating Range:	0.1 to 20,000 pCi/L (4.0 to 750,000 Bq/m^3)
Data Storage:	1000 radon concentration records w/ associated data
Principle of Operation:	Electrostatic collection with real-time high-resolution spectral analysis. Passivated Ion-implanted Planar Silicon detector.
Built-In Air Pump:	Nominal 1L/minute flow rate
Power Supply:	External 11-15 VDC, or battery powered with 5 AH 6V batteries. Battery life is 24 to 72 hours.
Connectivity:	RS-232 port with supplied USB adaptor cable
Operating Range:	32°-113° F (0°- 45° C). 0% - 100% humidity
Weight:	9.6 pounds (4.35 kg)
Dimensions:	11.5” x 8.5” x 11” (29.5 cm x 21.5 cm x 27.9 cm)

Additional specifications are available at www.durridge.com.

Key RAD7 advantages include:

- Fast response: detects EPA action level of 4 pCi/L in just one hour.
- Vanishingly small intrinsic background for life of instrument.
- Independently and simultaneously measures radon and thoron.
- Complete, compact, and portable unit with rugged carrying case.
- Includes wireless infrared printer for on-the-spot feedback.
- USB and Serial connections for use with any computer.
- Bluetooth wireless remote communication option.

Where Are RAD7s Used?

Over 5,000 RAD7 radon monitors are in regular use around the world. RAD7 customers range from radon testers to university research departments, municipalities to national governments, and from underground uranium mines to oceanographic research institutes. RAD7s have been successfully deployed in deserts and volcanoes, at extreme temperatures and humidities. One university professor wrote:

"I have four RAD7s and am about to purchase a fifth for some Greenland work. I have never had any major troubles with the instruments and found them to be EXTREMELY robust. I have repelled into craters with them on my back and hauled them out. Probably a better testament of their robustness is that I have masters students take them into the field and they still work!"

Technical Note: How the RAD7 Gathers Data

The RAD7 has a measurement chamber containing an electrostatic field. When radon atoms enter the RAD7 and decay, polonium 218 (^{218}Po) atoms are deposited onto the surface of the RAD7's silicon alpha detector. Alpha particles from subsequent steps along the decay chain are counted and their energy recorded. By identifying individual isotopes, the RAD7 achieves unsurpassed capability and functionality.

^{218}Po, the first daughter of radon, has a half-life of just 3.05 minutes. When the RAD7 is set to count ^{218}Po decays, it responds quickly and can be used to take multiple spot measurements within a short time. After about 4.3 half lives or 13 minutes, the RAD7 count rate reaches 95% of its equilibrium value. This makes the RAD7 uniquely suited for radon testing when time is at a premium, or for following rapid changes in radon concentration.

The RAD7 also detects the decays of ^{214}Po, a later daughter of radon which takes about three hours to reach equilibrium with radon in the measurement chamber. Using the default settings the RAD7 will begin recording measurements with increased precision after three hours, by counting both ^{218}Po and ^{214}Po decays.

Thoron: A Short-Term Tracer

In addition to measuring radon concentrations, the RAD7 provides an independent assessment of thoron (^{220}Rn). This isotope of radon occurs in the thorium decay chain, and has a half-life of just 55.6 seconds. When a thoron atom decays inside the RAD7 the resulting ^{216}Po atom is precipitated onto the surface of the alpha detector. Here it immediately decays to ^{212}Pb, emitting an alpha particle which is identified and counted by the RAD7.

If there is little air movement in a building, thoron will not diffuse far from its point of entry before it decays. The thoron concentration will be highest near the source. So the RAD7 may be used to "sniff" for thoron in order to locate radon entry points.

Since the ^{216}Po daughter of thoron has such a short half life (150 ms) the RAD7's response to thoron is practically instantaneous. Sniffing for thoron is therefore a fast and effective way to find out where soil gas is entering a building.

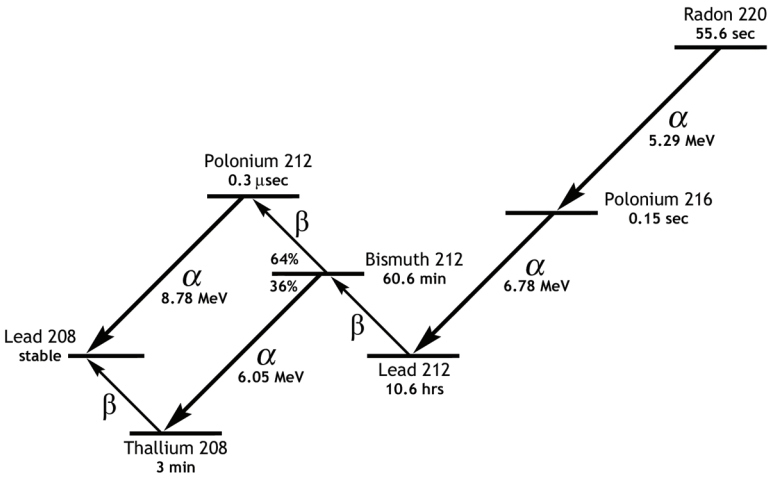

Figure 4: Thoron decay chain from Radon 220 to Lead 208.

[Radon Data Acquisition and Analysis]

Stored RAD7 data may be printed on the included portable infrared printer, or downloaded to a computer using a USB or serial connection. DURRIDGE offers a dedicated RAD7 communications software package called CAPTURE for Windows and macOS. CAPTURE is used to transfer RAD7 data to a computer, view radon graphs and spectrum histograms, monitor a RAD7 statuses in real time, organize and share RAD7 data with colleagues, and more.

CAPTURE: RAD7 Data Retrieval and More

CAPTURE's ability to communicate with the RAD7 extends beyond downloading and graphing data: it is also possible to control testing runs, obtain data summaries, configure the RAD7's numerous settings, and obtain the RAD7's serial number and calibration date. In fact, any command available on the RAD7's physical keypad may be issued from within CAPTURE, whether the machine is located across the room or across the world.

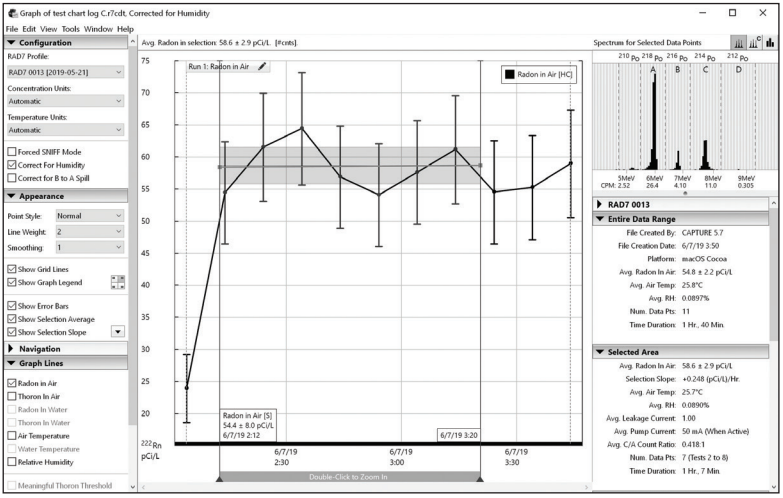

Figure 5: The Graph Window is used to view and analyze radon data in DURRIDGE's CAPTURE software.

The CAPTURE Graph Window displays radon, thoron, air temperature, and humidity data across a scrollable, zoomable time line. Under certain conditions it is also possible to graph radon in water, thoron in water, and water temperature. Uncertainty is represented visually.

Auxiliary panels provide data navigation controls and a wealth of statistical data. In addition, a Spectrum panel displays a alpha energy spectrum of the selected data points.

CAPTURE's graph data may be cropped, combined, printed, and exported. Several data formats are supported, permitting further analysis with spreadsheets and other software.

CAPTURE Software Key Features

Through continuous and ongoing development, DURRIDGE's CAPTURE software has come to include many features that improve the RAD7 workflow:

- Automatic detection of all connected RAD7s and DRYSTIKs.
- Remote downloading of RAD7 data.
- Automatic correction for humidity and other variables.
- Chart Recorder for real time radon data visualization.
- CAPTURE CLOUD service for storing and sharing RAD7 data online.
- Communication with RAD7s over Bluetooth and the Internet.
- Event-Driven Actions for configuring customized program behaviors.
- Calculation of radon in water concentrations, with full support for the RAD AQUA, the RAD H_2O, and the Big Bottle System.
- Support for damaged and incomplete RAD7 data files.
- Acquisition of full spectrum and other supplementary RAD7 data.
- Exporting of Radon Inspection Reports and Run Summary reports.
- All major CAPTURE software features are available in both the Windows and macOS versions.

Praise for the RAD7 from a radon professional:

"I want to let you know how much I have liked working with the RAD7 radon detector. I enjoy the ease of operation, and my customers appreciate the ability to see the print-out of results within 48 hours."

The CAPTURE Chart Recorder

CAPTURE's Chart Recorder displays a live graph of RAD7 data as it is recorded. As a radon test progresses, the radon concentration, temperature, and humidity data are plotted in real time, and logged to disk with the full data spectrum for each cycle. The Chart Recorder is accompanied by a set of controls for starting and stopping tests and for configuring RAD7 settings. Below these controls is a Status Display panel containing a detailed readout of the RAD7's current status.

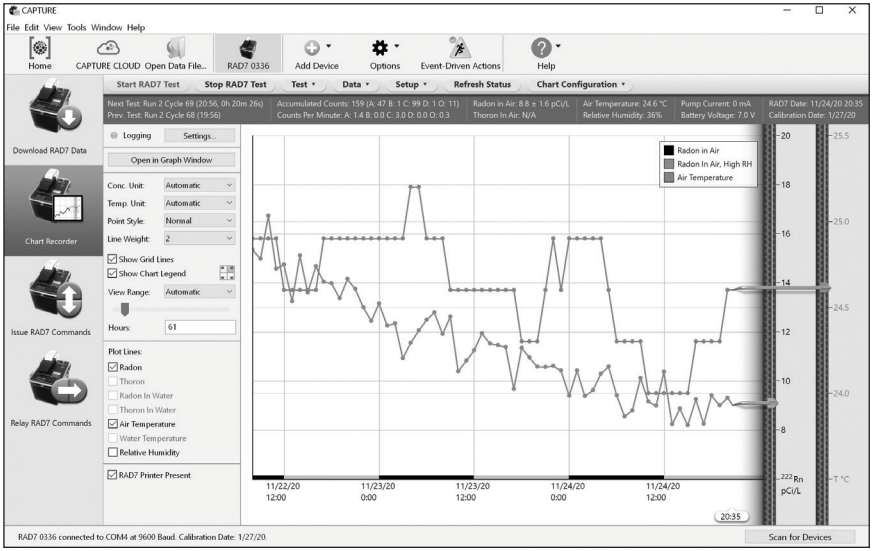

Figure 6: The CAPTURE Chart Recorder

Exporting RAD7 Data from CAPTURE

CAPTURE can export data summary reports, radon inspection reports, as well as tab- and comma-delimited data tables for use in spreadsheets and other data analysis software. In addition to exporting radon concentrations and diagnostic data obtained from the RAD7, CAPTURE can export calculated information such as humidity-corrected radon and thoron concentrations and radon-in-water readings that have been determined based on user-specified parameters. It is also possible to export radon data that has been calculated based on customized RAD7 device profiles.

CAPTURE CLOUD
Store, Organize, & Share RAD7 Data Online

CAPTURE CLOUD is a subscription-based service that makes it easy to store, organize, and share RAD7 data. CAPTURE CLOUD users can browse their RAD7 data files and issue queries to search for record sets by several criteria including name, description, date range, organization, RAD7 device, and more. RAD7 data can be assigned custom searchable tags to associate it with a particular project, job site, technician or other attribute.

When a RAD7 data file is selected from the list of results, a preview appears immediately. The data can then be analyzed and edited using the CAPTURE Graph Window. Any modifications can be saved to disk or back to the CAPTURE CLOUD server. Data files can also be made accessible to authorized colleagues and collaborators.

CAPTURE CLOUD is a powerful, low-cost, flexible solution that offers unlimited storage capacity for DURRIDGE customers worldwide. Learn more at **https://durridge.com/capturecloud**, and sign up for a free 60-day trial.

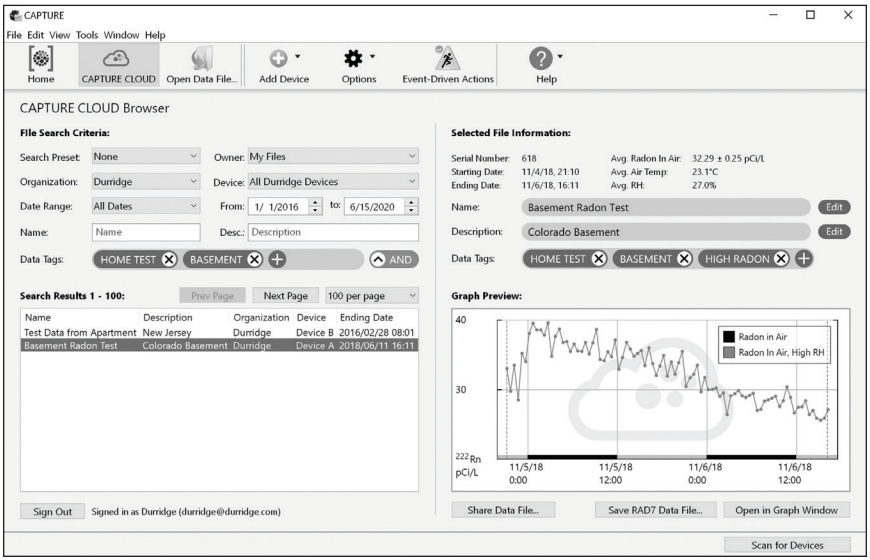

Figure 7: The CAPTURE CLOUD Browser

RAD7 Bluetooth Connectivity

Normally communicating with the RAD7 is as easy as plugging it into your computer and launching CAPTURE. But for situations where the RAD7 is out of reach, DURRIDGE offers the Parani SD1000 Serial to Bluetooth Adaptor. This adaptor offers a 100 meter wireless range, and it comes pre-configured for plug and play compatibility with the RAD7 and CAPTURE. An optional 16 hour battery allows the adaptor to be used even in the absence of a reliable power source.

Figure 8: The Parani SD-1000 Serial to Bluetooth Adaptor, with battery.

CAPTURE Graph Controls

CAPTURE's Graph Controls panel is used to navigate the graph and change its behavior and appearance. This scrollable panel consists of a series of sub-panels, labeled Configuration, Appearance, Navigation, Graph Lines, and Windows and Panels. Each may be expanded or collapsed by clicking on its heading.

Each graph window contains its own set of controls, so graphs may be configured independently. Settings are saved in CAPTURE's preferences, so reopening a graph restores it to its previous configuration. The CAPTURE User's Manual provides extensive documentation.

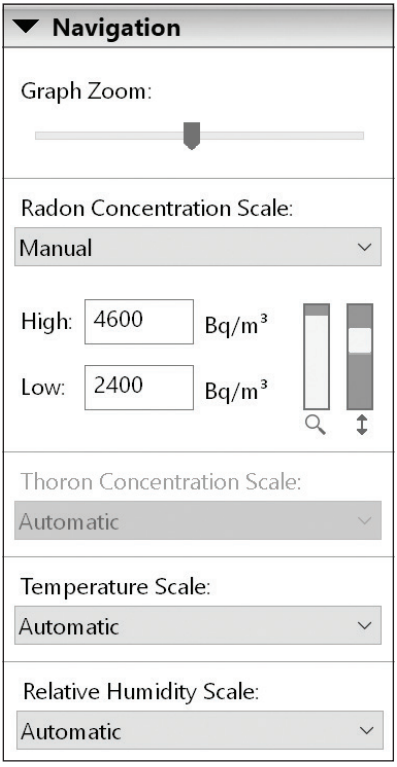

Figure 9 (Right): The Graph Controls Navigation sub-panel

[DURRIDGE RAD7 Accessories]

DURRIDGE offers a broad selection of accessories for the measurement of radon in air, water, soil gas, surface and bulk emissions. In addition, accessories are provided for measuring unusually high concentrations of radon and for pre-drying the sample air as required by the needs of the user.

Accessories Overview

RAD H_2O: Measure radon concentrations in small samples of water collected from any source.

RAD AQUA: This accessory supports fast-response continuous monitoring of radon and thoron concentrations in water.

Soil Gas Probe: Measure radon in soil gas with a RAD7 and this selection of steel probes.

DRYSTIK: Remove moisture from the air entering the RAD7, reducing or eliminating the need for desiccant.

Big Bottle System: This accessory measures radon in larger samples of water, up to 2.5L.

Emission Chambers: Measure the radon emitted from soil samples, hard flat surfaces and soft ground surfaces.

Natural Rock Sample: Monitor RAD7 performance once per month.

Range Extender: The Range Extender lets a RAD7 measure radon in concentrations of up to ten times the normal limit.

Water Probe: The Water Probe uses a permeable membrane tube for slow-response continuous monitoring of radon in water.

Water Switch: Prevent liquid water from entering the DRYSTIK.

Cool Trap: Remove excess moisture from air in the DRYSTIK and RAD7.

Read on for detailed descriptions of each DURRIDGE accessory.

RAD H_2O

Radon In Water Accessory for the RAD7

For over fifteen years radon testers and laboratories worldwide have relied on the RAD H_2O to test radon in water samples.

The RAD H_2O is an accessory designed for use with Durridge's RAD7 radon detector (not included). It enables users to aerate and analyze water samples collected in 40ml an 250ml vials. The radon in water concentration may range from less than 10 pCi/L to greater than 400,000 pCi/L. By diluting a water sample, or by waiting for the sample to partially decay before performing an analysis, the upper range of detection can be extended to virtually any concentration.

The RAD H_2O and the RAD7 radon detector are easily transported and no external power sources are required. The data analysis process is handled by the RAD7's software. Measurements can be completed within an hour, with a level of accuracy matching that of liquid scintillation methods, and no harmful chemicals are involved. Once the measurement procedure becomes familiar and well understood, it will produce accurate results with minimal effort.

Figure 10: The RAD H_2O kit (left), and the assembled RAD H_2O connected to a RAD7 (right). The RAD7 is not included.

RAD AQUA

Fast Response Monitoring of Radon at the Water Source

The RAD AQUA is a RAD7 accessory used for monitoring radon and thoron at the water source, such as running tap water, a borehole, a flowing stream, or even sea water. The RAD AQUA is used to bring the radon concentration in a closed air loop into equilibrium with the radon concentration in a flow-through water supply. In this manner the reported radon concentration in the air entering the RAD7 can be used to determine the level of radon in the water passing through the RAD AQUA.

The RAD AQUA's spray chamber is responsible for bringing the air and water into equilibrium. The radon in the air is monitored continuously by the RAD7, with a temperature probe measuring the water temperature. DURRIDGE's CAPTURE software can be used to process the RAD7 data and the corresponding temperature probe data, to generate graphs displaying radon and thoron concentrations in water.

Figure 11: The RAD AQUA with the included air and water nozzles, tubing, and temperature logger.

It takes time for the water passing through the RAD AQUA to deliver radon to the air loop, and for the RAD7 to respond to the changed radon concentration. With optimum configuration, the response time of the system may be reduced to less than half an hour.

Soil Gas Probe

In-Ground Radon Detection

When measuring radon in soil gas, it is essential to collect the sample without exposing it to the outside air. DURRIDGE offers two heavy-duty soil probes for this purpose: one for sampling gas from soft soil, and one for sampling gas from firm or rocky soil.

Designed to be simple and effective, DURRIDGE's Soil Gas Probes consist of a hollow steel tube and a Water Stop at the top. An included drive rod slides down inside the tube and penetrates the ground. Also supplied with the probe is a pilot solid steel rod to make a pilot hole for the probe.

The pilot rod is hammered down to the depth required, then removed and replaced with the drive rod inside the probe. Once that has been hammered down to the required depth, the drive rod is removed, creating a channel through which the gas may flow upward.

Figures 12 and 13: DURRIDGE Soil Gas Probe with handle (left) and with Water Stop (right)

Praise for the RAD7 from a university professor:

"The RAD7 is the best commercially available instrument for measuring Rn that I have ever seen. We originally bought one - we now own 12 and may purchase more."

DRYSTIK

Active Moisture Exchanger to reduce the humidity of the air entering the RAD7

The RAD7 radon monitor works most effectively when the incoming air sample has a low relative humidity. The DURRIDGE DRYSTIK achieves this by channeling pressurized air through a Nafion humidity exchanger to transfer water molecules from the incoming air sample to the air being exhausted from the RAD7. When a DRYSTIK is used together with a laboratory drying unit, the air from the DRYSTIK will have already lost most of its moisture, greatly extending the life of the desiccant in the drying unit. In some cases the need for desiccant is eliminated totally.

The DRYSTIK features a brushless pump, fixed and variable flow rate limiters, and a built-in programmable Duty Cycle Controller. The DRYSTIK's pump compresses the sample air inside the Nafion tubing, initiating the transfer of moisture to the outer purge flow, and drying the incoming air as it moves through the device.

Figure 14: The ruggedized DRYSTIK ADS-3R with built-in pump and programmable Duty Cycle Controller.

Figure 15: The DRYSTIK model ADS-3 contains the same pump and programmable Duty Cycle Controller as the ruggedized model ADS-3R.

The DRYSTIK is available in two models, one with a standard enclosure suitable for laboratory use, and one with a ruggedized enclosure that will withstand prolonged outdoor use. Both models are capable of bringing the relative humidity of air flowing at 0.15 L/min down below 10% in less than four hours, and maintaining an RH below 6% indefinitely without any desiccant. This allows a RAD7 to operate under optimum conditions with the highest sensitivity and lowest operating cost. At a higher flow rate of 1.2 L/min, the DRYSTIK can bring the RH down below 12%, which is sufficient for continuous enhanced-sensitivity thoron measurement.

When measuring radon in soil gas, the DRYSTIK's built-in Duty Cycle Controller can be used to reduce the effective airflow rate to extremely low values, allowing continuous soil gas readings to made indefinitely, without the risk of creating a low-pressure area underground that would allow fresh air to dilute the soil gas sample by diffusing down to the extraction point.

Big Bottle System

High Sensitivity Radon In Water Accessory for the RAD7

The Big Bottle System is a RAD7 accessory enabling users to measure radon in 2.5L water samples with high sensitivity. Radon concentrations of as low as 1 pCi/L (37 Bq/m^3) can be detected in the water. The upper operating limit is 10,000 pCi/L (400,000 Bq/m^3). Ranges higher than that are possible with the standard RAD H_2O accessory, which uses smaller glass sampling bottles.

Once the RAD7 has recorded the radon concentration of the aerated sample, the collected data can be copied to the computer, along with the temperature data obtained by the temperature logger.

Figure 16: The Big Bottle System

The Big Bottle System consists of several components, including a 2.5L glass jug, tubing set for connecting to the RAD7 and drying apparatus, aerator system, support stand, USB temperature logger with hermetically sealed thermocouple, and elastic clinching strap.

The complete Big Bottle System is portable and requires no power source besides that used by the RAD7 itself. The measurement process is moderately fast. Even for the lowest radon concentrations, it is possible to obtain an accurate reading within two hours of collecting the water sample.

The operation is simple and straightforward, and there are no harmful chemicals involved. Once the measurement procedure becomes familiar and well understood it produces accurate results with minimal effort.

DURRIDGE's CAPTURE software makes it easy to collect and interpret results from the Big Bottle System. CAPTURE calculates the concentration of radon in water based on the data downloaded from the RAD7, along with water temperature records recorded by the included temperature logger during the aeration process.

CAPTURE also accounts for the particular configuration of the laboratory apparatus, with consideration given to the volume of the bottle and the laboratory drying unit, the tubing structure, and the DRYSTIK, assuming one is present. The calculated data can then be viewed as a graph and exported to a spreadsheet or other software for additional analysis.

Figure 17: Soda Bottle Aerator Kit for the Big Bottle System

For added convenience and versatility, the Big Bottle System can be used with standard soda bottles of any size from 500ml to 2L. This configuration requires the Soda Bottle Aerator Kit accessory, which supports an aerator system similar to that used in the standard 2.5L jug.

Larger bottles allow for greater precision and lower limits of detection. With a 500 ml bottle, it is possible to measure comfortably down to below 5 pCi/L (200 Bq/m^3). With a 2L bottle it becomes possible to measure down to 1 pCi/L (37 Bq/m^3). While soda bottles lack the size benefits of the larger 2.5L jug, they have the advantage of being inexpensive and shatter-proof.

Emission Chambers

Bulk, soil and hard surface emission detection

DURRIDGE offers a line of Emission Chambers for measuring radon being emitted from objects as well as from hard and soft surfaces.

Bulk Emission Chambers are perfect for storing samples of rock, soil, and more. Two quick-release ports make it easy to connect a Bulk Emission Chamber to the RAD7 in a closed loop for continuous measurement.

The Hard Surface Emission chamber has a flat base which creates a firm seal against surfaces such as concrete. The Soil Surface Emission Chamber has a stainless steel skirt around its circumference which may be pressed down into soft ground.

Figures 18 and 19: The 2.85L Bulk Emission Chamber (top) and the Hard Surface Emission Chamber (bottom)

Natural Rock Sample

Monitor RAD7 performance as often as once per month

DURRIDGE offers a sealed granite rock sample suitable for checking the performance of a RAD7 and monitoring long-term changes in both radon and thoron sensitivity.

With the optional Thoron Calibration Check Kit, the Natural Rock Sample can be used for low-precision checking and verification of the RAD7's thoron sensitivity.

Figure 20: The Natural Rock Sample

Range Extender

Increase the range of the RAD7 by a factor of 10

The Range Extender mixes fresh air with sampled air containing high concentrations of radon, to reduce the concentration of radon fed to the RAD7 radon detector by an order of magnitude. This permits the RAD7 to monitor radon concentrations exceeding its normal operating range.

Fresh air is fed into one input of the Range Extender while the incident radon sample is fed to the other. A differential pressure sensor across the two capillary tube inputs is used to ensure that both tubes have the same pressure drop across them.

The Range Extender can be used for the measurement of very high radon concentrations in air, in soil gas, and in water. It can also be used with any other instrument that has its own pump, for any gas. It may also be used to extend the range of thoron measurement, once corrections are made for the additional decay of the thoron due to sample acquisition delay.

Figure 21: The DURRIDGE Range Extender reduces the radon concentration delivered to the RAD7 by a factor of 10. The RAD7 pump can cycle on and off without affecting the reduction factor.

Water Probe

Slow Response Monitoring of Radon in Water

The DURRIDGE Water Probe consists of a semi-permeable membrane tube mounted on an open wire frame. The tube is placed in a closed loop with the RAD7.

When the probe is lowered into water, radon passes through the membrane until the radon concentration in the air loop is in equilibrium with the water. As with the RAD AQUA, the equilibrium ratio of radon in the air to radon in the water is determined by the temperature of the water.

Figure 22: The Water Probe, for continuous slow response radon monitoring.

Water Switch

Prevent water from entering the DRYSTIK and RAD7

The DRYSTIK (which is shown on pages 21 and 22) is very effective at removing moisture from air samples, but it is important to prevent liquid water from entering the device. The Water Switch accessory aids with this. It contains a reed switch with a magnet embedded in a float. The device is packaged in a small, airtight container with hose connections. It is placed upstream of the DRYSTIK, in line with the power supply to the DRYSTIK, so that if it fills up with water it cuts the power to the DRYSTIK, preventing the DRYSTIK's built-in pump from pulling in liquid water.

Figure 23: The DURRIDGE Water Switch accessory

Cool Trap

Remove moisture from air entering the DRYSTIK and RAD7

The Cool Trap directs air through a coil of tubing operating under pressure at a low temperature. This process creates condensation and removes excess moisture from the air. The Cool Trap is placed upstream of the DRYSTIK membrane tube.

Two versions of the Cool Trap are available: the Bucket-Sized Cool Trap and the Mug-Sized Cool Trap. The Mug-Sized Cool Trap is more portable, while the Bucket-Sized Cool Trap offers greater moisture removal due to its longer tubing. Both versions of the Cool Trap have one air inlet tube and two outlet tubes, one for outputting the dried air, and the other for draining the condensed water.

Figure 24 (Left): *The Mug-Sized Cool Trap, pictured, operates using the same principle as the Bucket-Sized Cool Trap.*

Figure 25 (Below): *The Cool Trap is placed in a vessel containing icy water.*

[DURRIDGE Services]

RAD7 Calibration

DURRIDGE's RAD7 Calibration Service includes a comprehensive range of tests, routine maintenance, and adjustment of any parameters necessary to bring your RAD7 up to full specifications, as well as replacement, if needed, of consumable components such as the battery and NVRAM chip, and up to a half hour of labor for any additional minor repairs.

DURRIDGE's radon calibration facilities in the USA and the UK have their own controlled, standard source of radon gas. All RAD7 testing, calibration, and quality assurance is performed at DURRIDGE by NRSB-certified, DURRIDGE-qualified staff.

The U.S. EPA recommends that continuous radon monitors, such as the RAD7, be calibrated at least once per year, and DURRIDGE agrees.

Thoron Calibration

The RAD7 is able to measure both radon (222-Rn) and thoron (220-Rn) concentrations simultaneously and independently. DURRIDGE can provide, as an option, a specific thoron calibration for the setup preferred by the user. The detailed conditions of the calibration, including the air flow rate, may be chosen by the user and are clearly specified in the thoron calibration certificate issued by DURRIDGE.

For any other setup, with a different flow rate or a different volume in the sample air path, that thoron calibration is no longer valid. For some projects DURRIDGE has provided multiple thoron calibrations, each for a different RAD7 setup and air sample acquisition path.

RAD7 Repair

If you discover that your RAD7 is malfunctioning, we recommend that you first call DURRIDGE and talk to a technician. A surprising number of minor "disasters" can be avoided by long-distance consultation. The next step, if consultation fails, is usually to send your instrument in for evaluation and repair. Please send any documentation of the problem

that you might have (notes, printouts, etc.) and a short description of the problem. This information may be emailed to us at service@durridge.com. Be sure that you put your name and contact information on the note. Within 48 hours of our receipt of the instrument, we will call you to give a diagnosis.

Shipping Information

You can send us your RAD7 at any time to either one of our Calibration facilities (USA and UK). We need the RAD7 in house for 10 days, so the total time a RAD7 will be away from your facility will be 10 days plus the time the RAD7 spends in transit. If additional service or repair is required, this may delay the return of the instrument.

When sending your RAD7, please send the instrument only, without the cables and accessories. Pack the instrument upright in a box with one-inch (2.2cm) padding all around. A 14x14x14 in (or 36x36x36 cm) box is suitable. Pack the box well, and seal it carefully. Please include your contact info with the package. For more details please see the DURRIDGE website, which contains specific instructions for sending RAD7s to our USA and UK facilities.

Warranty

All new products sold by DURRIDGE Company Inc. are covered by the DURRIDGE 2-YEAR LIMITED WARRANTY, starting from the day the equipment is delivered to the end-user.

This limited warranty covers parts and labor to repair or replace faulty components and/or manufacturing faults in the product. Liability is limited in value to the cost of replacing the product. Repair of damage that may be caused by acts of God, other external causes, accident or misuse, are not covered under this warranty, nor does it cover direct, incidental or consequential damages for any reason, including damage resulting from a breach of a warranty or condition such as lost data. Replacement parts purchased to repair such damage are covered by a 1-year limited warranty beginning from the date of installation and, similar to the 2-Year Limited Warranty, shall not cover direct, incidental or consequential damages for any reason, including damage resulting from a breach of a warranty or condition such as lost data.

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