CRM-LPT Device Training

Device Training Course for

NRPP Certification

Course Objectives

- What does the CRM-LPT test for?

- Understand the operation of CRM-LPT

- Learn touch screen interface & Rad-Lab integration

- Understand multi-sensor features

What is Radon?

Radon is an invisible, odorless, tasteless, radioactive gas.

It is the product of decaying uranium found in the soil, rocks, and water all around the world.

As a gas, it seeps into your home or business through any cracks or holes present in the building's foundation, or even through your well water.

Radon can also enter your home or business through gaps in suspended floors, gaps around service pipes, cavities inside walls, & construction joints.

Once it makes it inside your building it becomes trapped, subjecting all residents to exposure.

Why Test for Radon?

Radon is the second leading cause of lung cancer in the United States.

Most people do not know that their home has high levels of radon or that they should test for it.

Many people do not realize how harmful radon is.

The longer your exposure, the higher the risk to you.

This means if exposed continually starting at a young age, children are at a higher risk of lung cancer as they grow into adulthood.

EPA & Industry Protocols

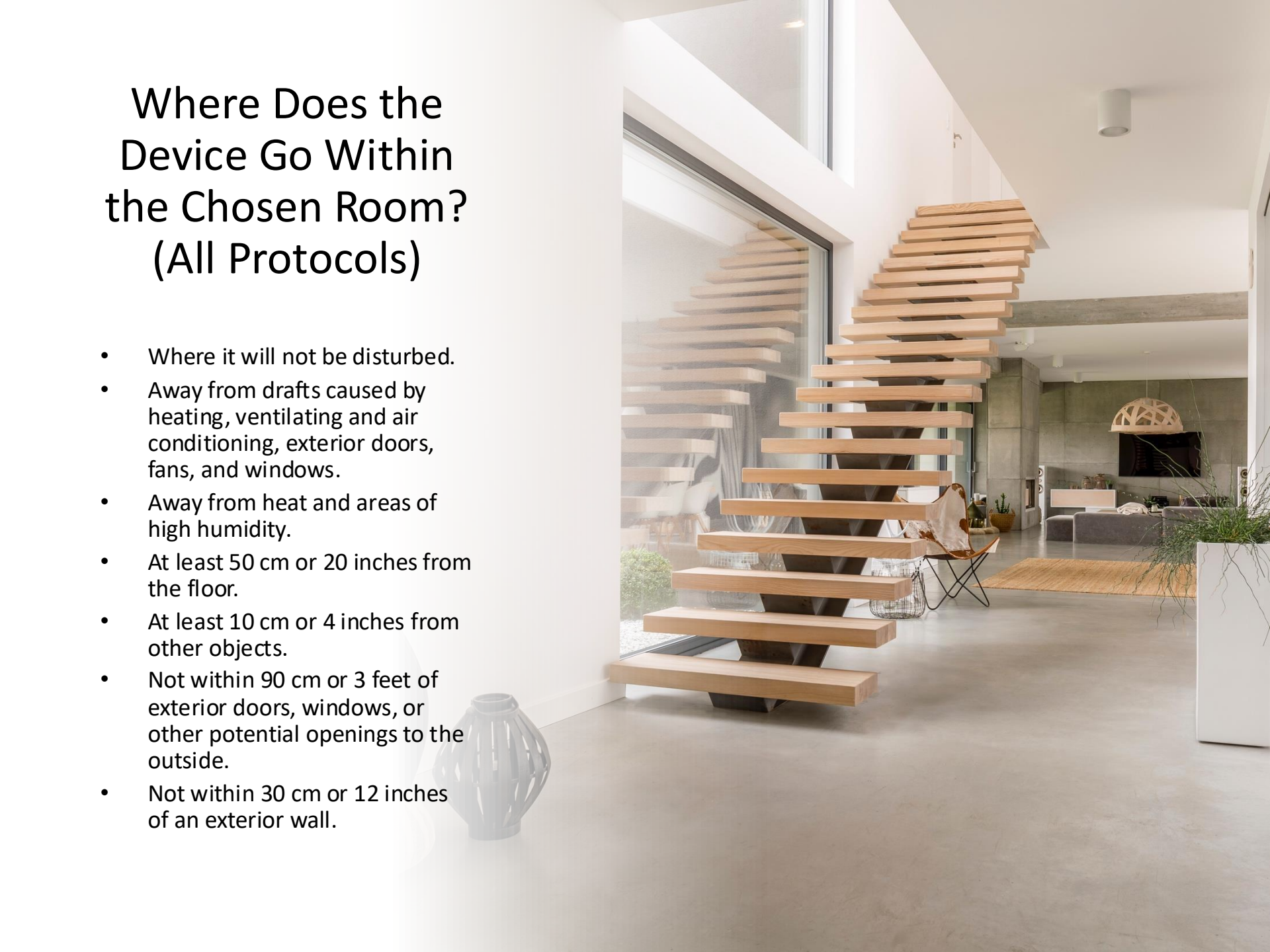
- **ANSI/AARST MAH-2023**
  - Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes
- **ANSI/AARST MA-MFLB-2023**
  - Soil Gas Mitigation Standards for existing Multifamily, School, Commercial and Mixed-Use Buildings
- **ANSI/AARST MS-QA-2023**
  - Radon Measurement Systems Quality Assurance
- **ANSI/AARST MS-PC-2022**
  - Performance Specifications for Instrumentation Systems Designed to Measure Radon Gas in Air

Closed House Conditions & Placement

- All exterior doors and windows closed, except for normal entry and exit.
- Internal-external air exchange systems off.
  - Total internal recycle is allowed.
  - Combustion or make-up air must not be closed.
  - Permanent radon mitigation systems remain on.

Where Does the Device Go Within the Chosen Room? (All Protocols)

- Where it will not be disturbed.
- Away from drafts caused by heating, ventilating and air conditioning, exterior doors, fans, and windows.
- Away from heat and areas of high humidity.
- At least 50 cm or 20 inches from the floor.
- At least 10 cm or 4 inches from other objects.
- Not within 90 cm or 3 feet of exterior doors, windows, or other potential openings to the outside.
- Not within 30 cm or 12 inches of an exterior wall.



Ways to Prevent or Detect Tampering

- A report generated from the continuous monitor data helps detect unusual measurement swings.
- A motion detector built into the monitor will help to determine if the device was moved.
- The monitor's environmental data can be paired with historical weather data using the RAD-LAB app.
- Record room temperatures to assess the opening of windows.
- Monitor is passcode protected

CRM-LPT Device Overview

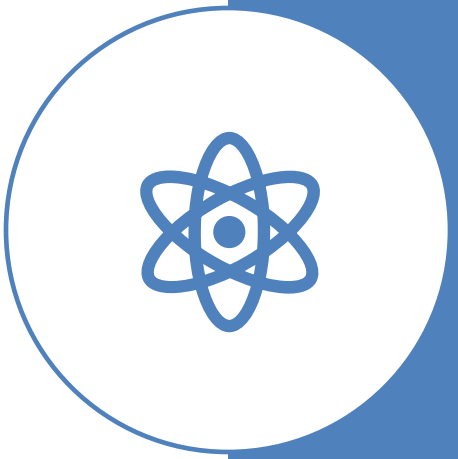
- Lightweight aluminum design
- 3.5” touchscreen interface
- Bluetooth & USB-C
- Long battery life (rechargeable)
- Passive diffusion ion chamber
- Virtually unlimited test storage
- Standard ¼-20 tripod mount
- 24+ CPH/pCi/l
- AARST-NRPP Approved CR-8445

CRM-LPT Environmental Sensors

Radon	CO	CO_2	PM2.5 / PM10
VOC/AQI	Temp	Humidity	Pressure

Radon Sensor

- Pulsed Ion Chamber fed via passive air diffusion
- Sensitivity: 24 cph/pCi/L | 96 cph @ 4 pCi/L
- Self Check
  - The CRM-LPT has a self test feature that is completed at the start of every test.
  - This feature physically pulses the Ion Chamber to verify that everything is working exactly as expected.

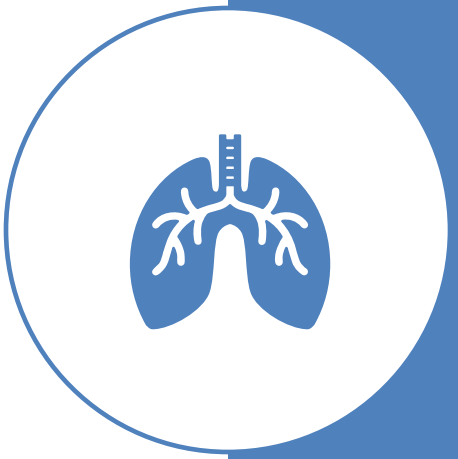


Carbon Monoxide Sensor

Carbon monoxide is an odorless, colorless and toxic gas. Because it is impossible to see, taste or smell, CO can kill you before you are aware it is in your home. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. Average levels in homes without gas stoves vary from 0.5 to 5 parts per million (ppm). **Levels near properly adjusted gas stoves are often 5 to 15 ppm and those near poorly adjusted stoves may be 30 ppm or higher. The U.S. Environmental Protection Agency (EPA) strongly recommends taking further action when the average carbon monoxide level exceeds 9 ppm.** Many questions you may have can be found in the EPA's publication "Carbon Monoxide's Impact on Indoor Air Quality".

Carbon Dioxide Sensor

Carbon dioxide is an odorless, colorless gas. It is denser than air and at high concentrations it can persist in open pits and other areas below grade. **The current OSHA, NIOSH, and ASHRAE standard is 5000 ppm as an 8- hour time-weighted average (TWA) concentration.** Gaseous carbon dioxide is an asphyxiant. Concentrations of 10% (100,000 ppm) or more can produce unconsciousness or death. Lower concentrations may cause headache, sweating, rapid breathing, increased heartbeat, shortness of breath, dizziness, mental depression, visual disturbances or shaking. **CO2 levels can serve as an indication of poor ventilation for the number of occupants in the building.**



Volatile Organic Compounds (VOCs)

Volatile organic compounds, or VOCs, are gases that are emitted into the air from man-made products or natural processes. Some can be very harmful to our health and in some cases they can cause cancer. Breathing in VOCs can irritate your eyes, nose and throat, cause difficulty breathing, nausea, and damage your central nervous system as well as other organs. **Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. Paints, varnishes and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing and hobby products, even fuel.** All of these products can release organic compounds while you are using them and to some degree when they are stored.

Particulate Matter 2.5/10

PM stands for Particulate matter (also called particle pollution): the term for a mixture of solid Particles and liquid droplets found in the air. Particles such as dust, dirt, soot, and Even smoke are large enough to be seen with the naked eye, but some particles are so small they can only be detected using specialized equipment. Some particles less than 10 micrometers in diameter can get deep into your lungs and some may even get into your bloodstream. Particles less than 2.5 micrometers in diameter, also known as fine particles or PM2.5, pose the greatest risk to health. **The EPA 24-hour standard for fine Particles (PM 2.5) is 35µg/m³, and for coarse particles (PM 10) is 150µg/m³.**

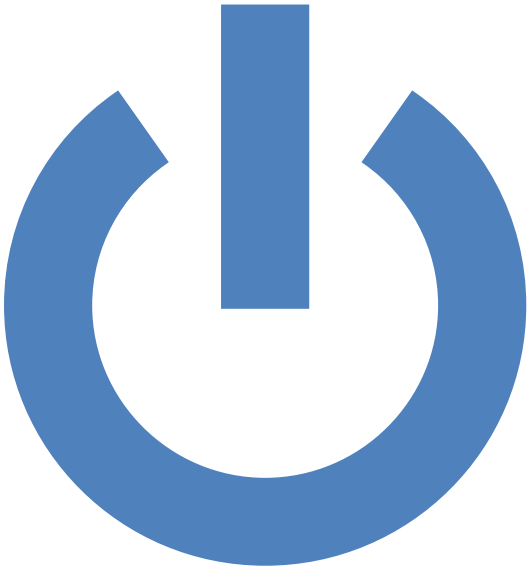
Things to Avoid in the Test Environment

- Condensing humidity (moisture in the air can cling to the surfaces of electronics)
- Frequent vibrations (do not place on a washer/dryer or near something that could move the device)
- Wireless devices (place at least 10ft away from any wireless broadcasting device such as router/modem/radio transmitter) – these devices can cause interference when placed improperly

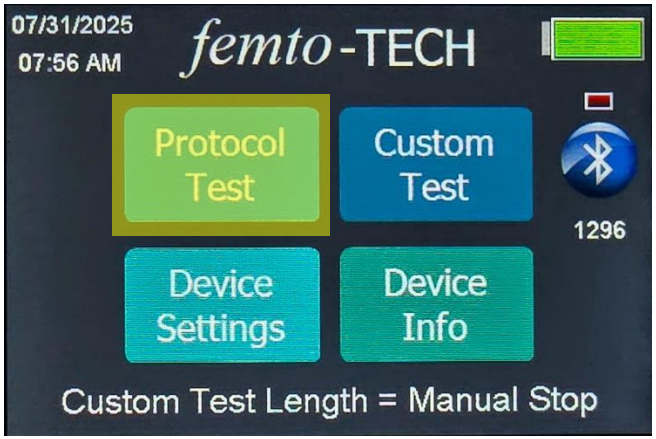
Self Test

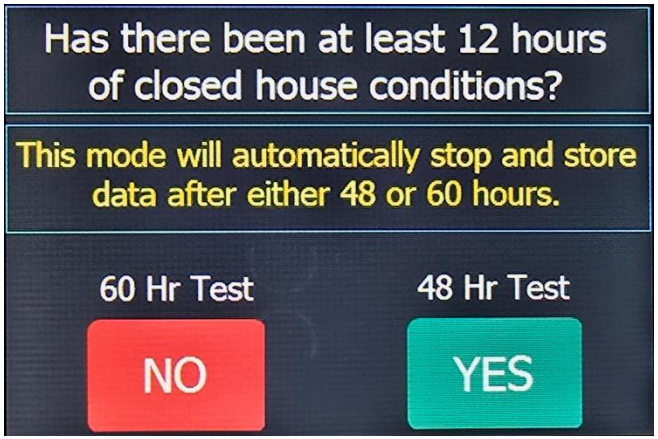
- Are preformed on the CRM-LPT each time a test is started.
- It tests the battery, electrometer, and storage to ensure a reliable test.
- The electrometer self check electronically injects pulses into the ionization chamber to verify that it is sensing and measuring radon correctly.
- Takes less than 10 seconds in perfect conditions.
- If the Self Test fails, you will be notified of the error and what to do next by the monitor.

Starting a Protocol Test



- Power on via front panel button
- Select Protocol Test
- Choose 48 or 60 hours
- The LPT will start an automatic self-test
- Device will power itself off after test is complete



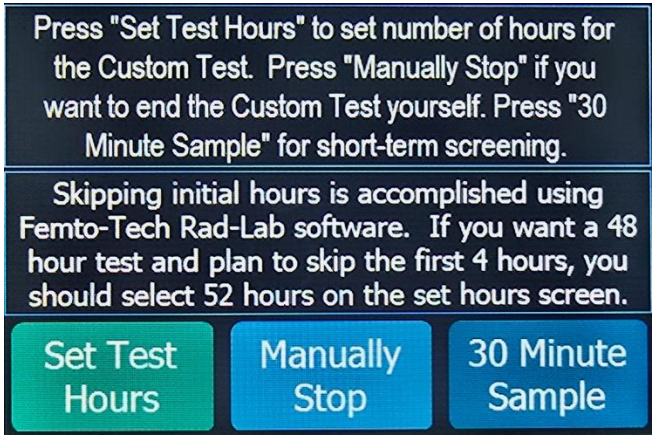


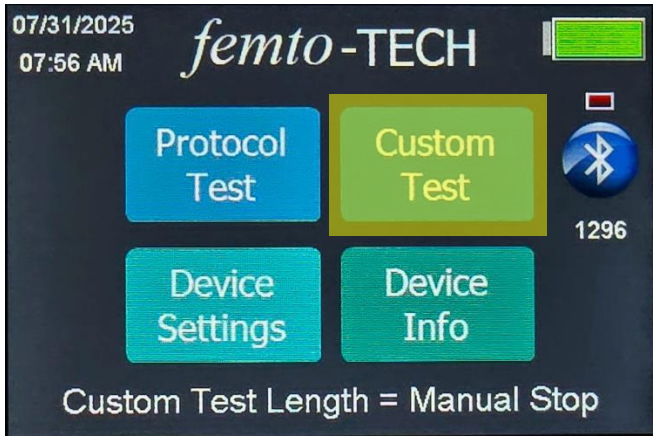
Ending a Test Early

Press	- Press button to wake device
Enter	- Enter passcode (default: 51)
Stop	- Stop Test -> data saved, device shuts off

Custom Tests & Sample Modes

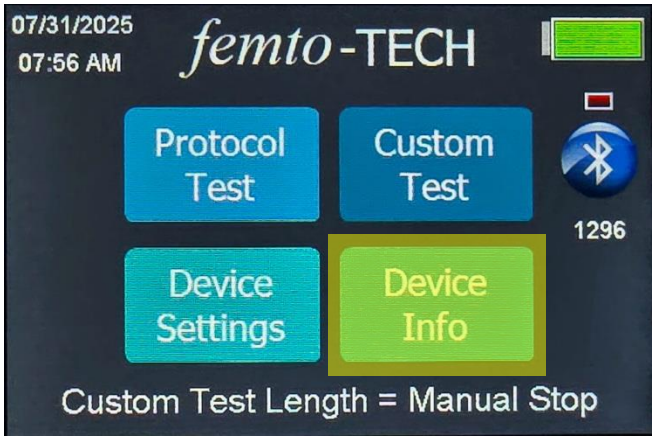
- Found in Device Settings > Change Custom Test Length
  - Set test hours (1–9999 – will shut off after final hour)
  - Manual stop (continuous testing until stopped)
  - 30-minute sample (snapshot of tested volume)

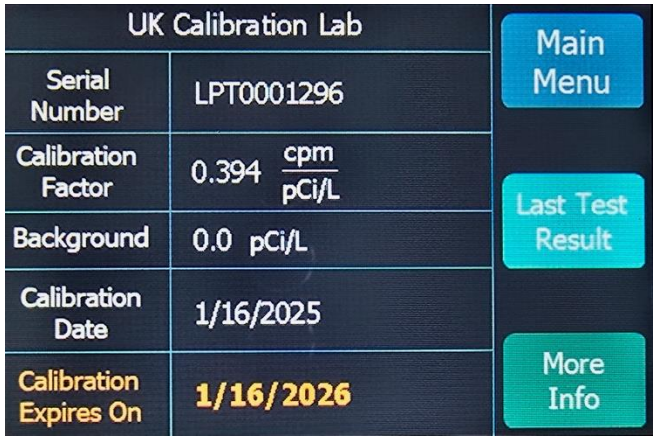




Calibration Information

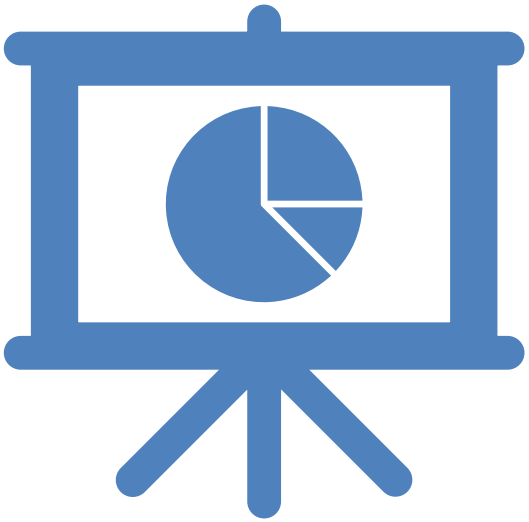
- Found by pressing ‘Device Info’
  - Includes all information normally found on a Calibration Sticker
  - The calibration information is only able to be changed by approved calibration labs.

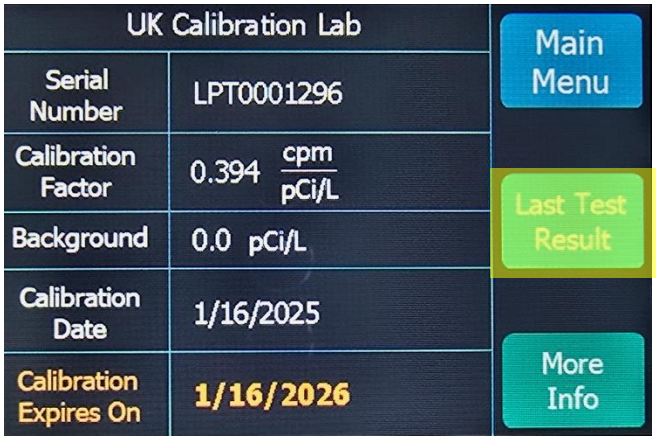


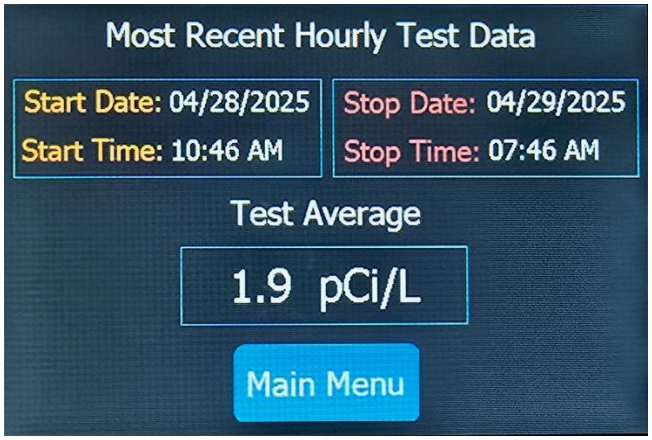


Last Test Result

- Found by pressing ‘Device Info’ > ‘Last Test Result’
  - Displays the final radon average for the previously saved test
  - Includes the precise Start and Stop times that the device has logged data

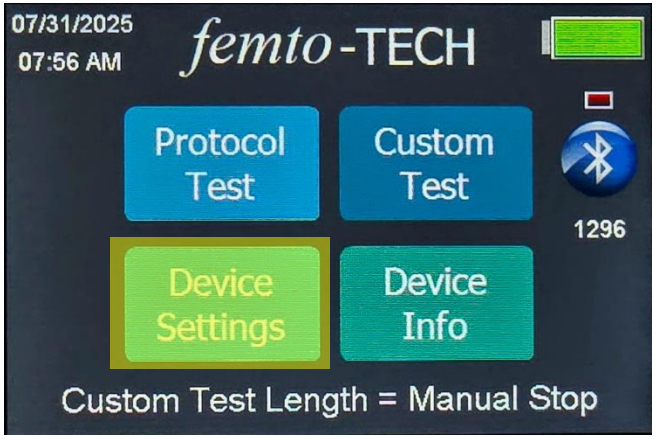






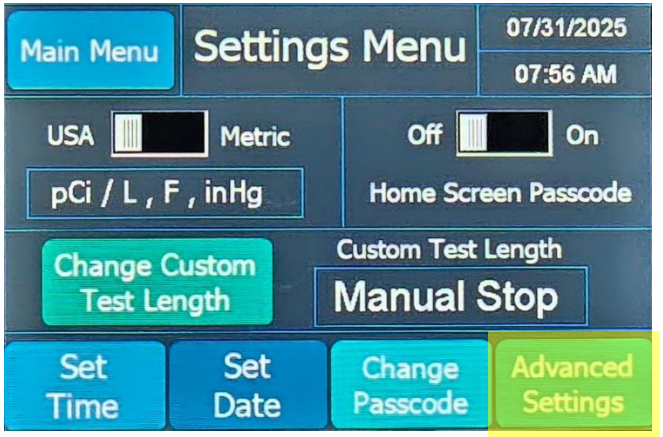
Device Settings

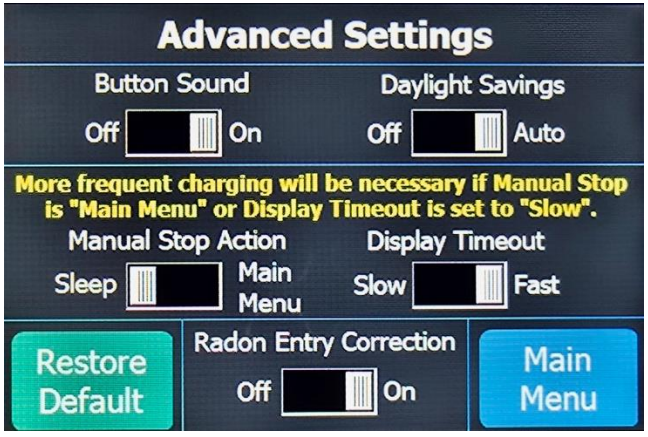
- Found by pressing ‘Device Settings’
  - SAE/Metric
    - Use slider to select between US and EU-extended units
  - Custom Test Length
  - Set Time
    - Press button and follow on-screen directions
  - Set Date
    - Press button and follow on-screen directions
  - Enable Home Screen Passcode
  - Change Passcode
    - Press button and follow on-screen directions

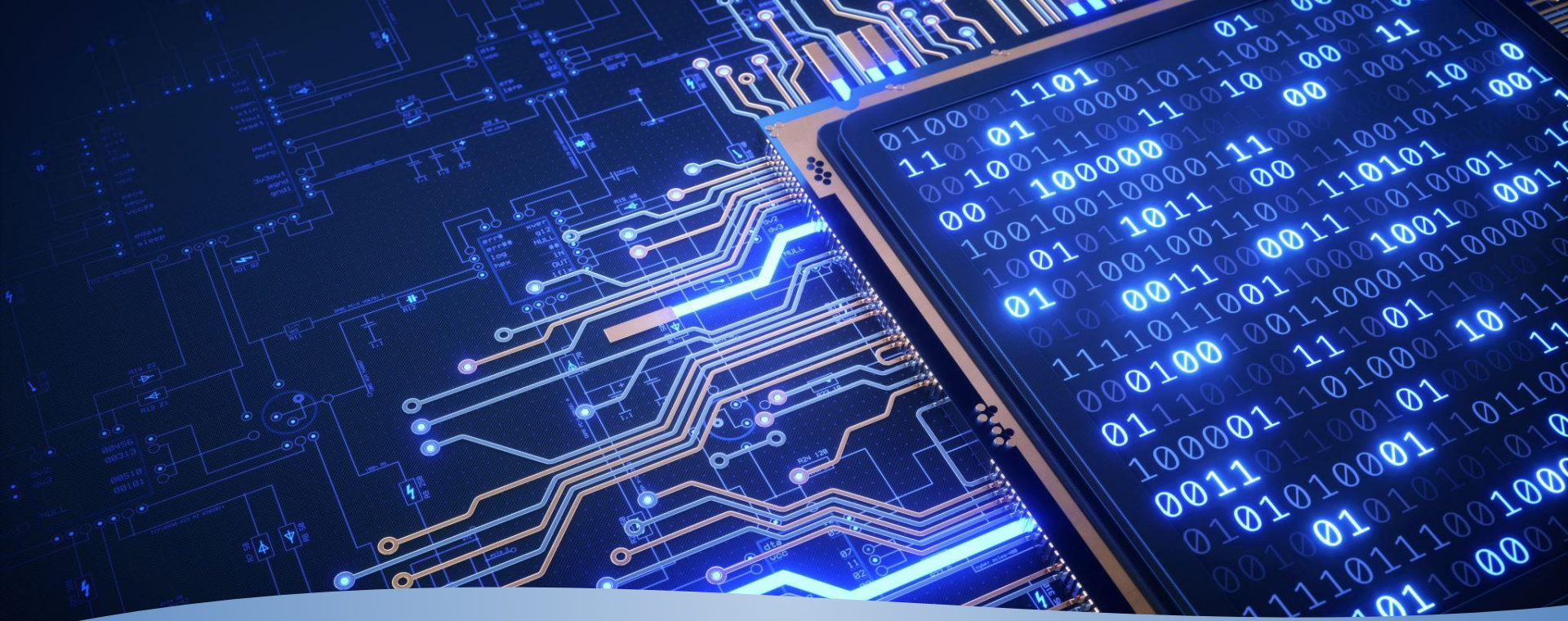


Advanced Settings

- Found by pressing ‘Device Settings’
  - Button Sounds
    - Use slider to enable/disable the tone when pressing the screen
  - Daylight Savings
    - Use slider to enable/disable DST adjustment
  - Manual Stop Test Action
    - Use slider to select between going to sleep or returning to main menu
  - Screen Timeout
    - Use slider to select between a slow and fast timeout (fast saves battery)
  - Radon Entry Correction
    - Utilizes the high sensitivity of the CRM-LPT to quickly estimate the true radon level at the very start of a test







RAD-LAB Software Explanation of Features & Operation

RAD-LAB allows you to connect your femto-TECH CRM to the computer or mobile device of your choice to download and manage report data. This version of the software is our most feature-packed version to date, giving you the tools you need to analyze your protocol tests and customize/manage your report data with ease.

Download Desktop App HERE

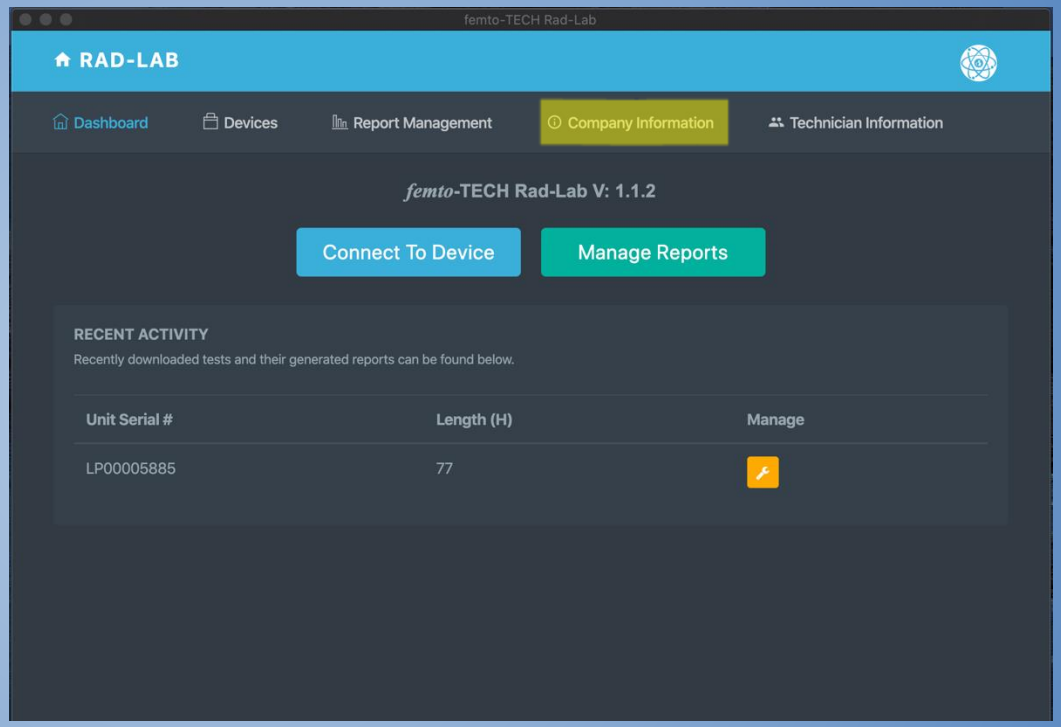
(Compatible with macOS and Windows)

Download Mobile App HERE

(Compatible with Android and iOS)

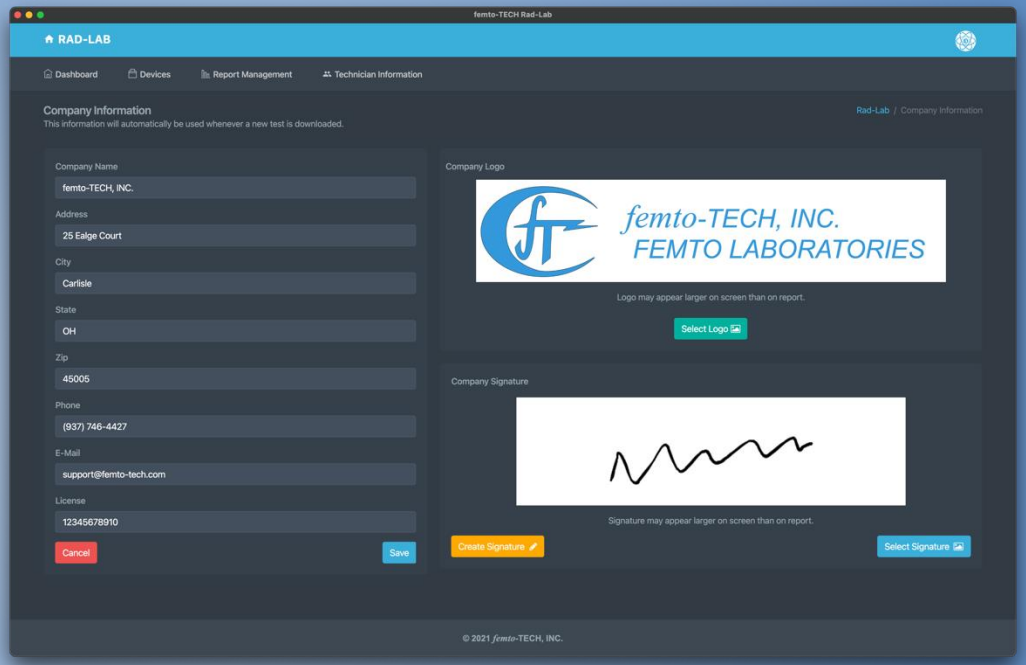
Getting Started

- First things first, click the ‘Company Information’ tab to edit/save your company’s information and logo.
- Once saved, this information will automatically be added to each of your generated reports.



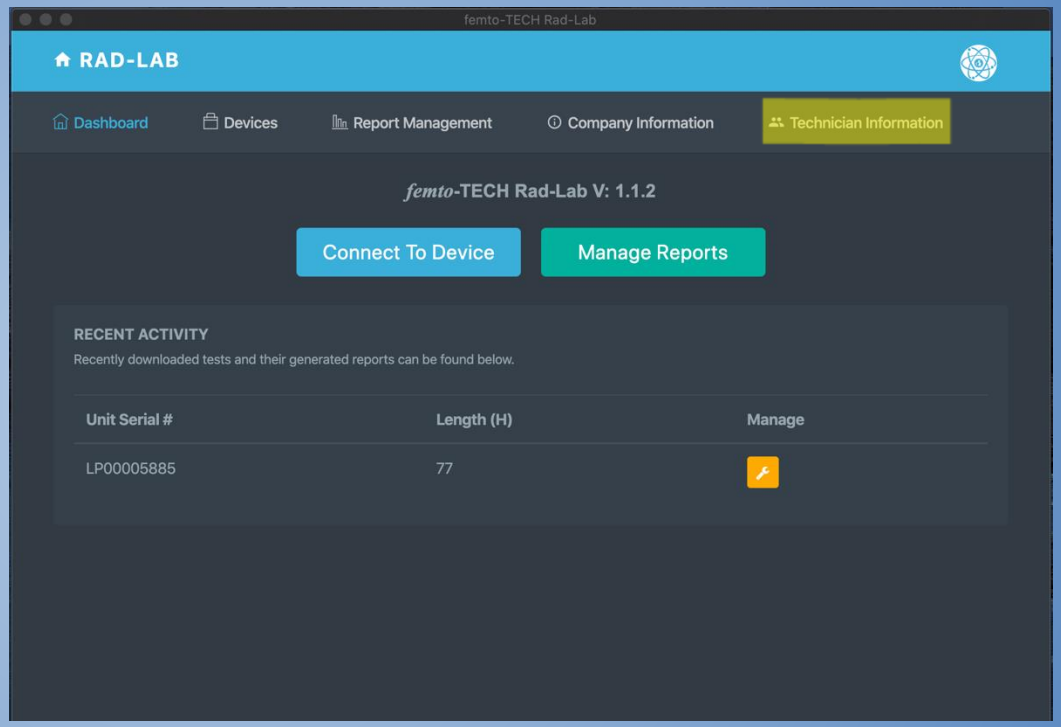
Company Information

- Enter your company's information to be automatically populated to each of your reports.
- Select your company's logo (optional) to be added to the top of each report.
- Create or add a signature to be added on each of your reports.



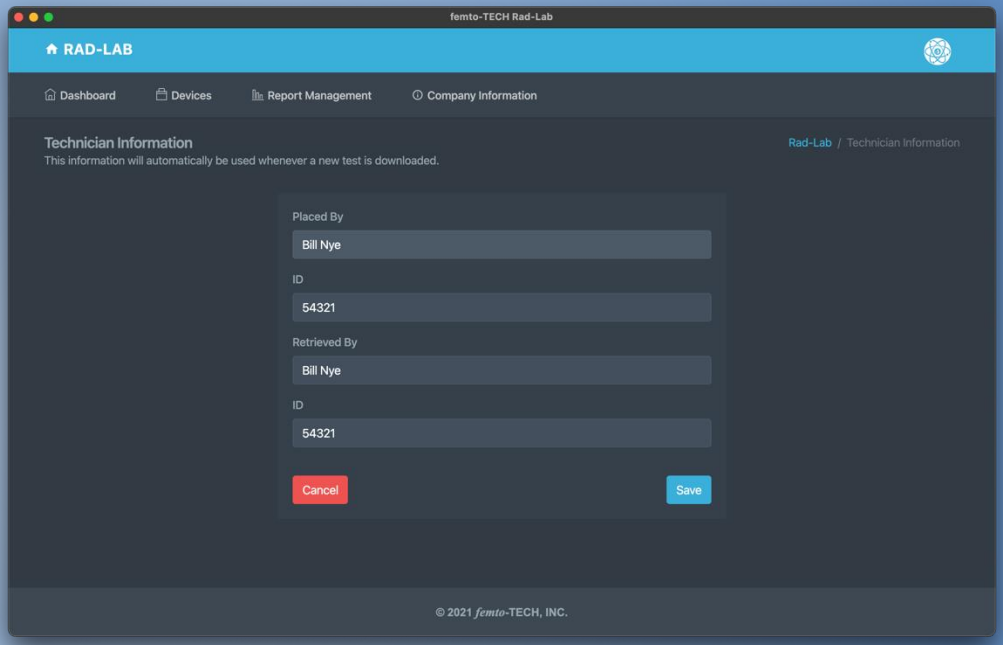
Getting Started (continued)

- Next, click the ‘Technician Information’ tab to edit/save technician information



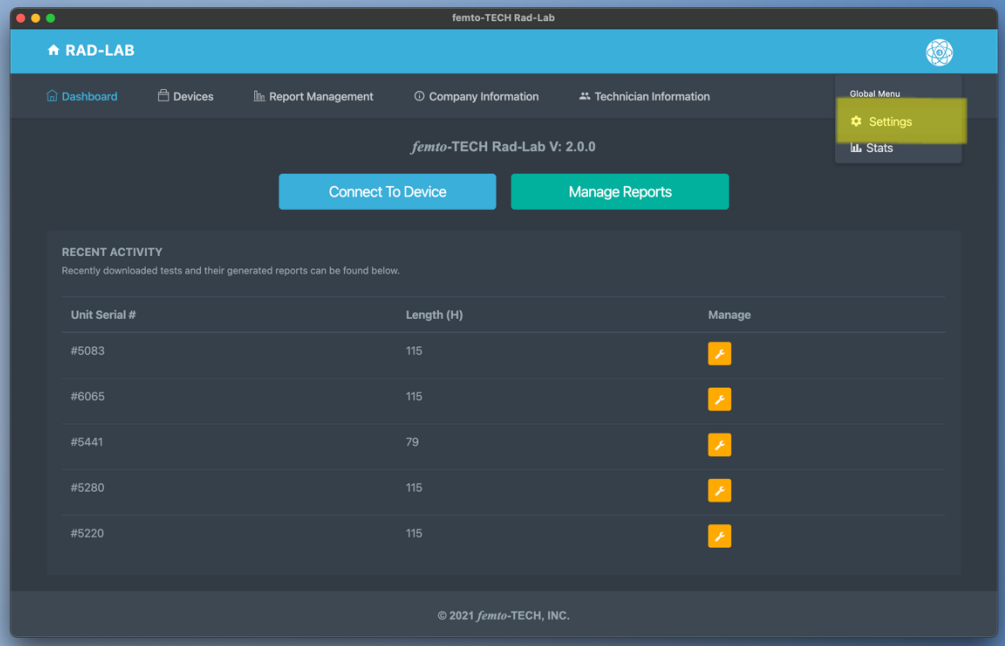
Technician Information

- Enter the name and ID of the technician(s) placing and retrieving the CRM that normally use the device.
- This information can also be changed on the report itself.



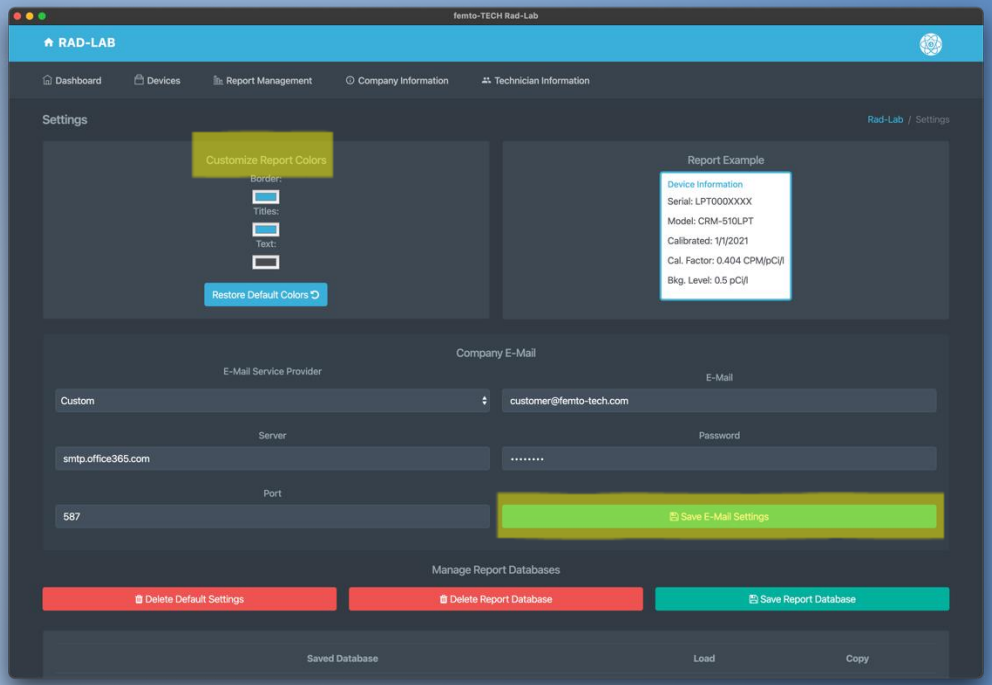
Getting Started (continued)

- Next, click the ‘Settings’ tab within the global menu in the top-right (circular icon) to further customize your generated reports.



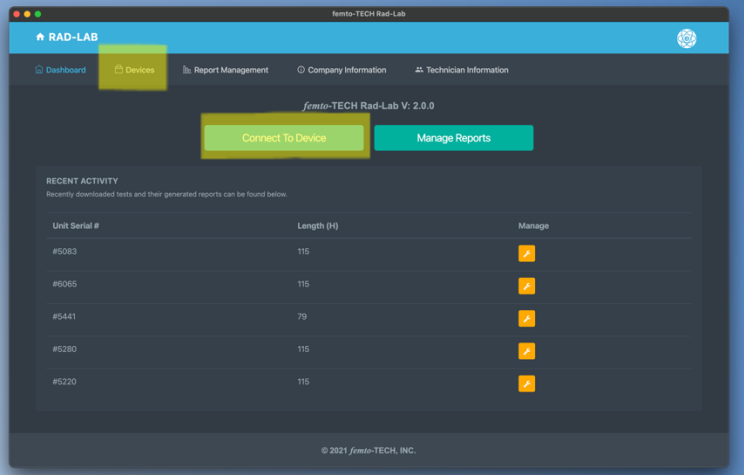
Customize Reports

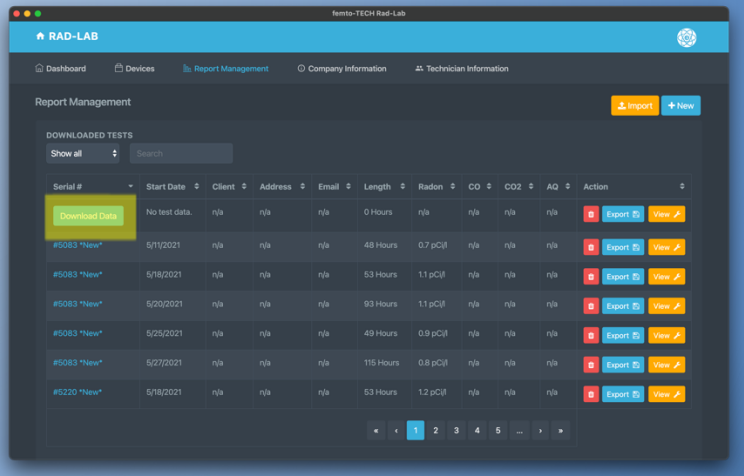
- Customize the colors on your reports by making color selections in the top-left.
- Configure a company e-mail to be used to send reports directly once generated. If your company has no e-mail available or is unable to get it to work, femto-TECH provides an alternative option under ‘E-Mail Service Provider’. Select ‘femto-TECH’, and you will be able to send reports via customer@femto-tech.com. The Reply To address will be marked as your company’s e-mail from the ‘Company Information’ section, that way your customer can reply directly to you.
- Company e-mail feature is optional. Most users prefer to save the report as a PDF and attach it to their own e-mail.



Download Data

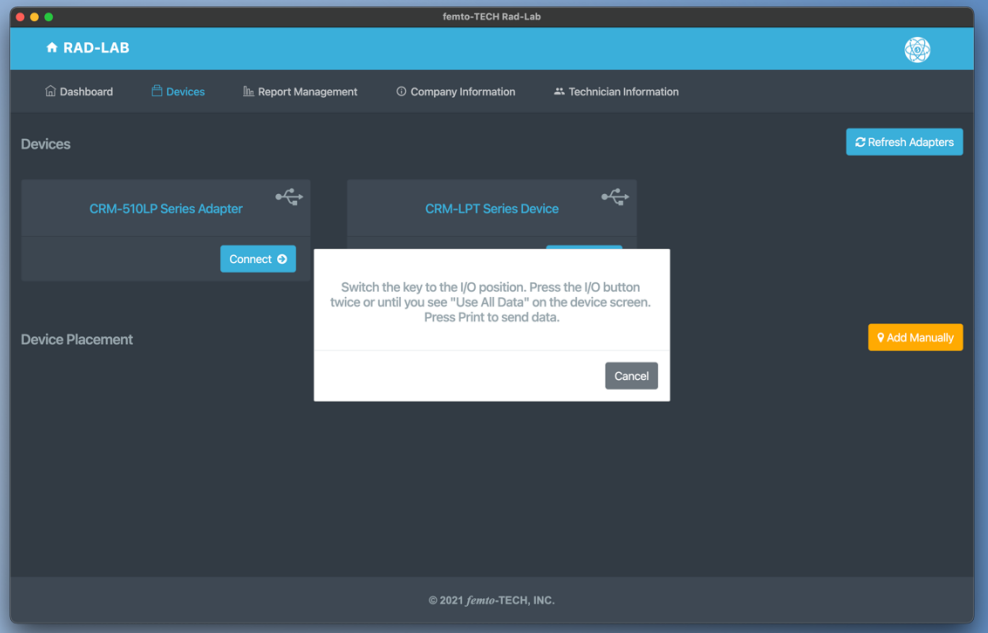
- Click either ‘Devices’ at the top left of the navigation bar or the ‘Connect To Device’ button on the Dashboard.
- Data can also be downloaded to a previously created test entry by clicking ‘Download Data’ on the entry within the Report Management table.





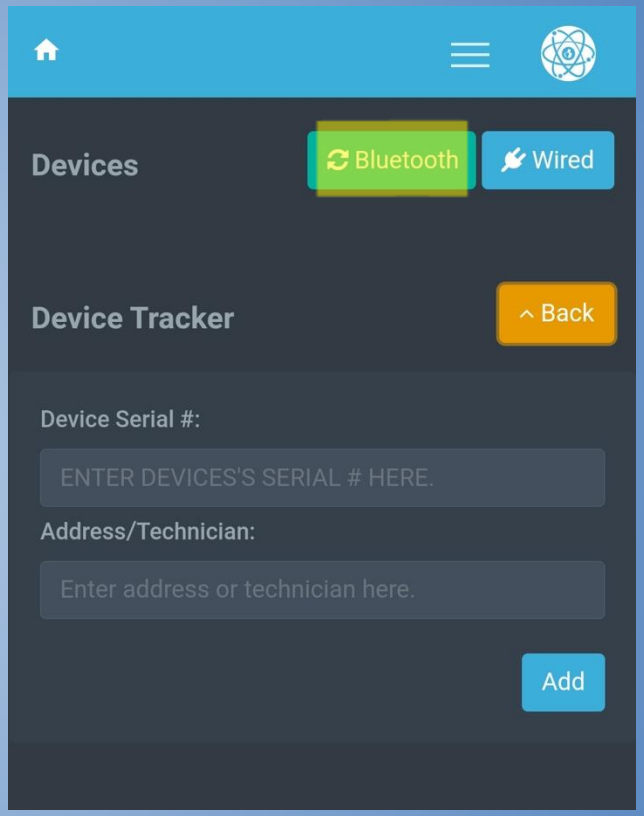
Download Data (Desktop)

- Plug the CRM-LPT into the computer using the provided download cable (USB-C cable), wake it up with the power button, and then click ‘Refresh Adapters’.
- Click ‘Connect ->’ on the adapter displayed on the screen and then follow the on-screen instructions and select a test to download the data. Once the data has downloaded, a ’Download Complete!’ message will appear and then take you to the ’Report Setup’ screen.



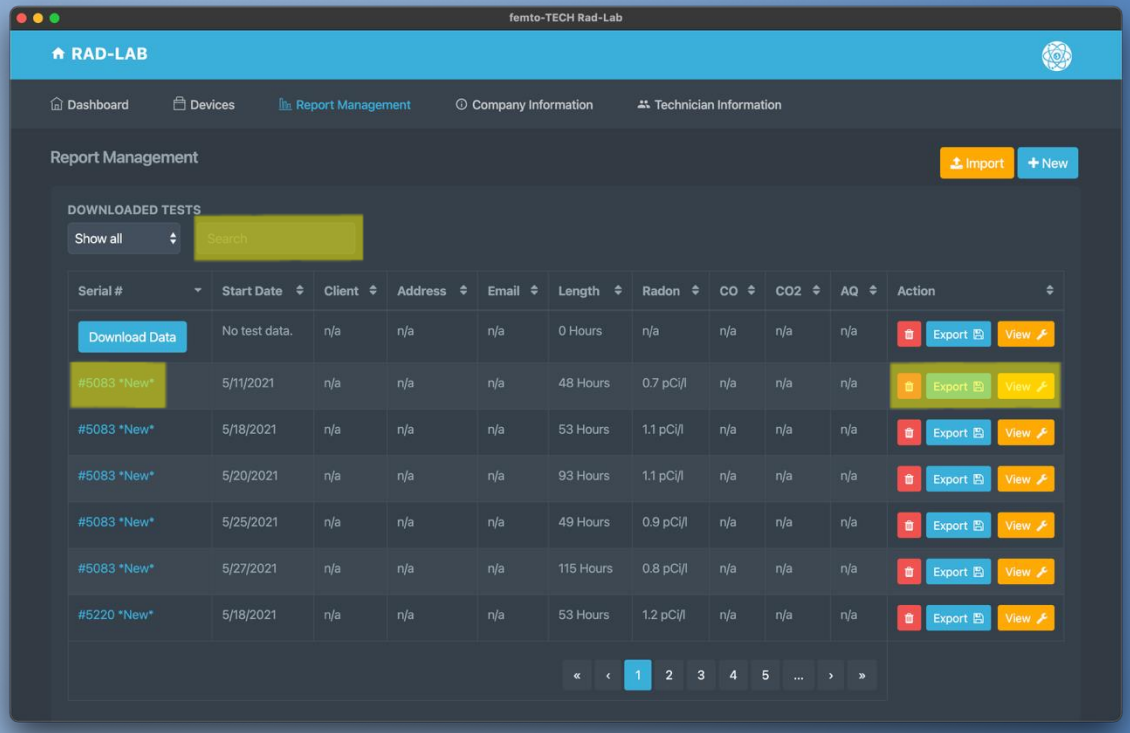
Download Data (Mobile)

- Wake the CRM-LPT up by pressing the button on the front panel. Make sure it is not currently running a test.
- Click the ‘Bluetooth’ button to search for your monitor and then click ’Download’ once it appears on the screen.
- Follow the on-screen instructions and select a test to download the data. Once the data has downloaded, a ’Download Complete!’ message will appear and then take you to the ’Report Setup’ screen.



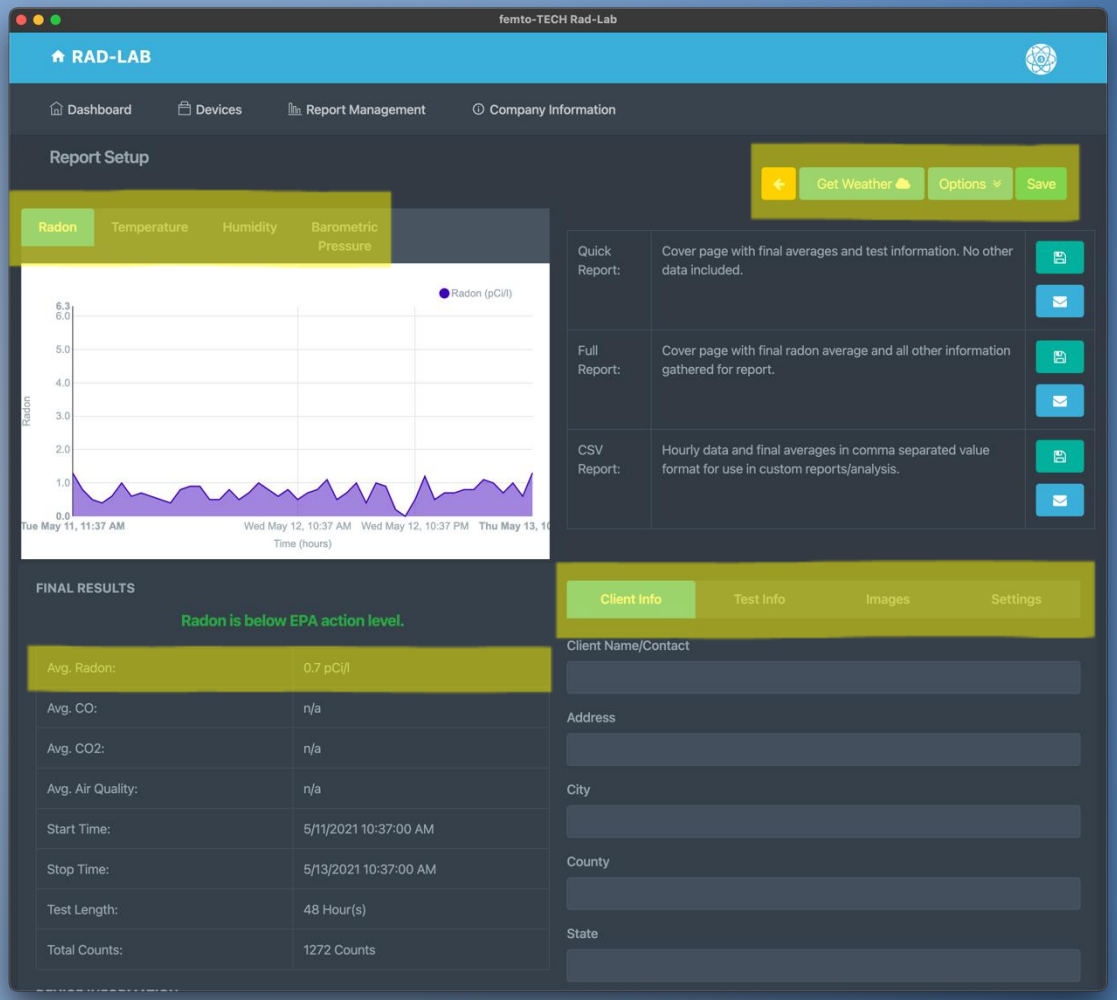
Report Management

- Use the search bar or table navigation menu to browse downloaded tests. Here you can edit, import/export, & delete existing tests.
- Click anywhere within the test entry on the table to expand it for more information.
- Click on the blue serial # of the entry or the ‘View’ button to load the test into the ‘Report Setup’ screen.



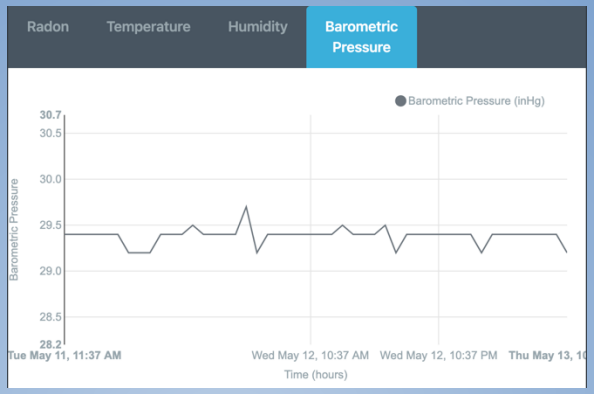
Report Management

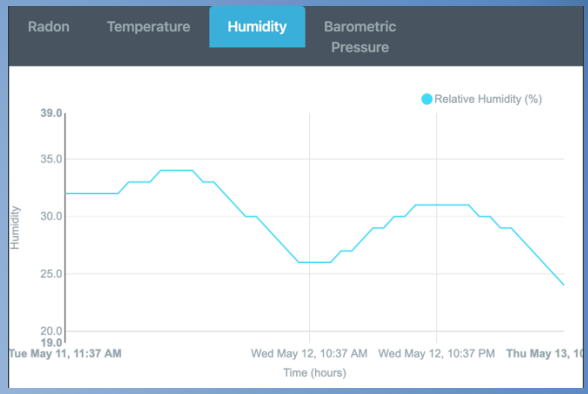
- Graphs plotted from the test data can be found in the top-left corner of the screen.
- Results of the test can be found in the table on the bottom-left of the screen.
- Hourly results can be read in table format via the button in the bottom-left corner below the ‘Final Results’ section.
- The test-specific options menu can be found at the top-right of the screen. From here, you can change the units of each measurement as well as specify a span of time in which you would like to report on within the test.
- The bottom-right section of the screen contains the report fields specific to the test being conducted. From here, you can add your customer’s information, test-specific information, images pertaining to the conducted test, and signatures.
- Each section outlined on this slide will have a dedicated slide explaining its usage.

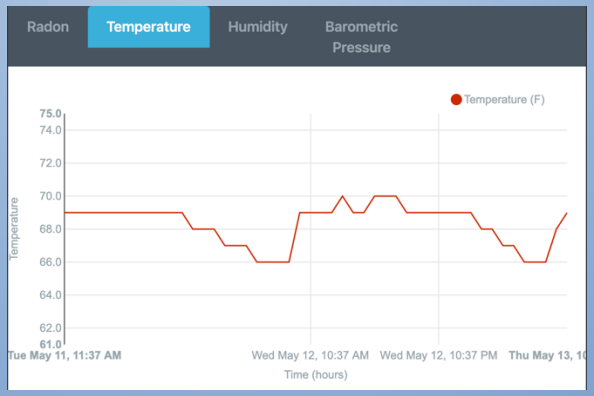


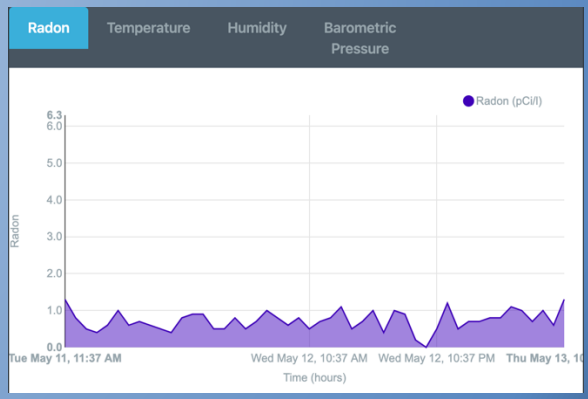
Report Setup (Graphing)

- Each graph can be viewed by clicking its respective tab.
- By hovering over the plots on each graph, you can view each hour's value and exact time of recording.
- Each graph is automatically adjusted/plotted whenever a specific range of hours is selected within the options menu (as seen on next slide).
- The graphs can be enlarged by either maximizing your app window or turning your mobile device horizontally.



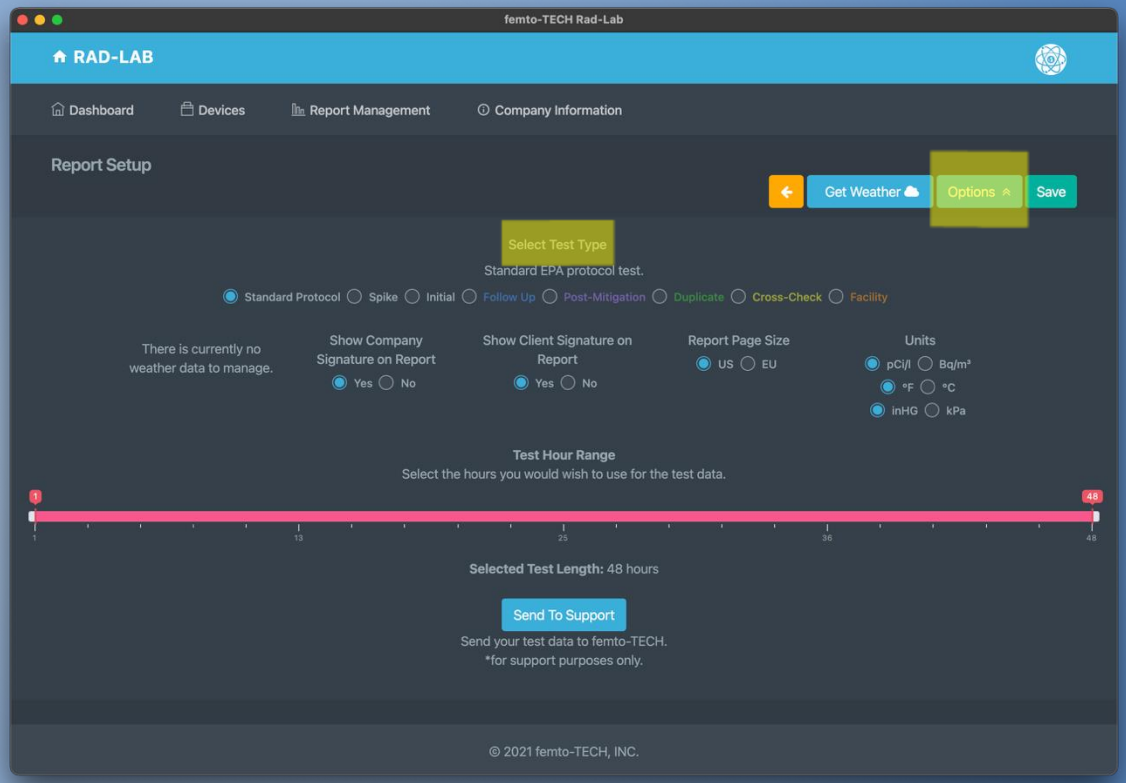






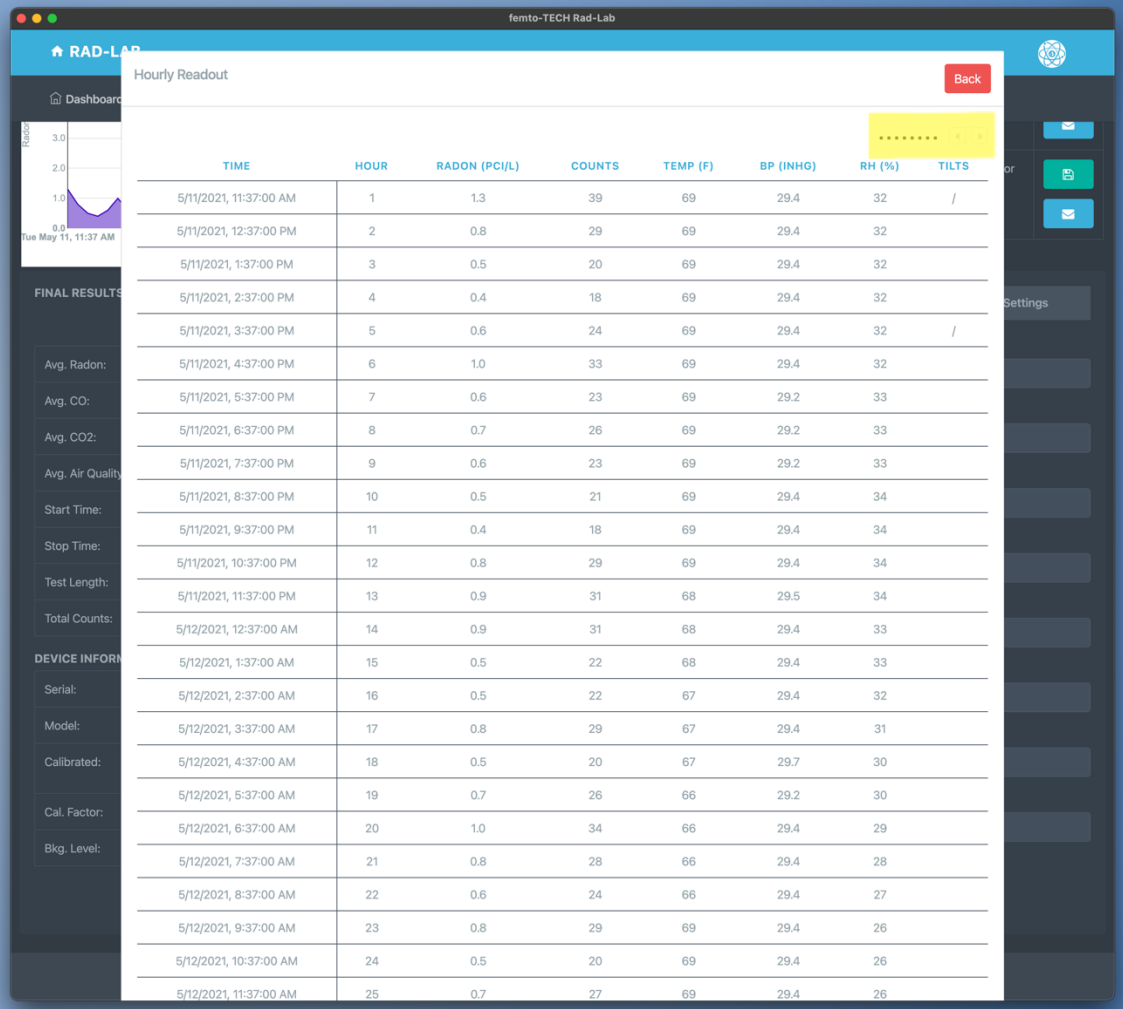
Report Setup (Options)

- Click the ‘Options’ button to drop-down the options menu for the test.
- From here, you can select the type of report you wish to generate. For most testing scenarios, the ‘Standard Protocol’ selection is adequate.
- Below ‘Select Test Type’, you have the option to show weather data acquired for the test, as well as the company and client signatures. (All default to ‘Yes’ when applicable).
- You can also change settings such as the report page size and the measurement units used for each field value and final average.
- Select a test hour range to customize the hours that are being measured/reported. This feature can be used to accommodate a lack of closed-house conditions by running a longer test and manually selecting the span of hours. *Notice* a minimum of 44 continuous hours are required per the EPA for protocol testing.
- Click the ‘Options’ button again to hide the menu and simultaneously save your changes.



Report Setup (Hourly Readout)

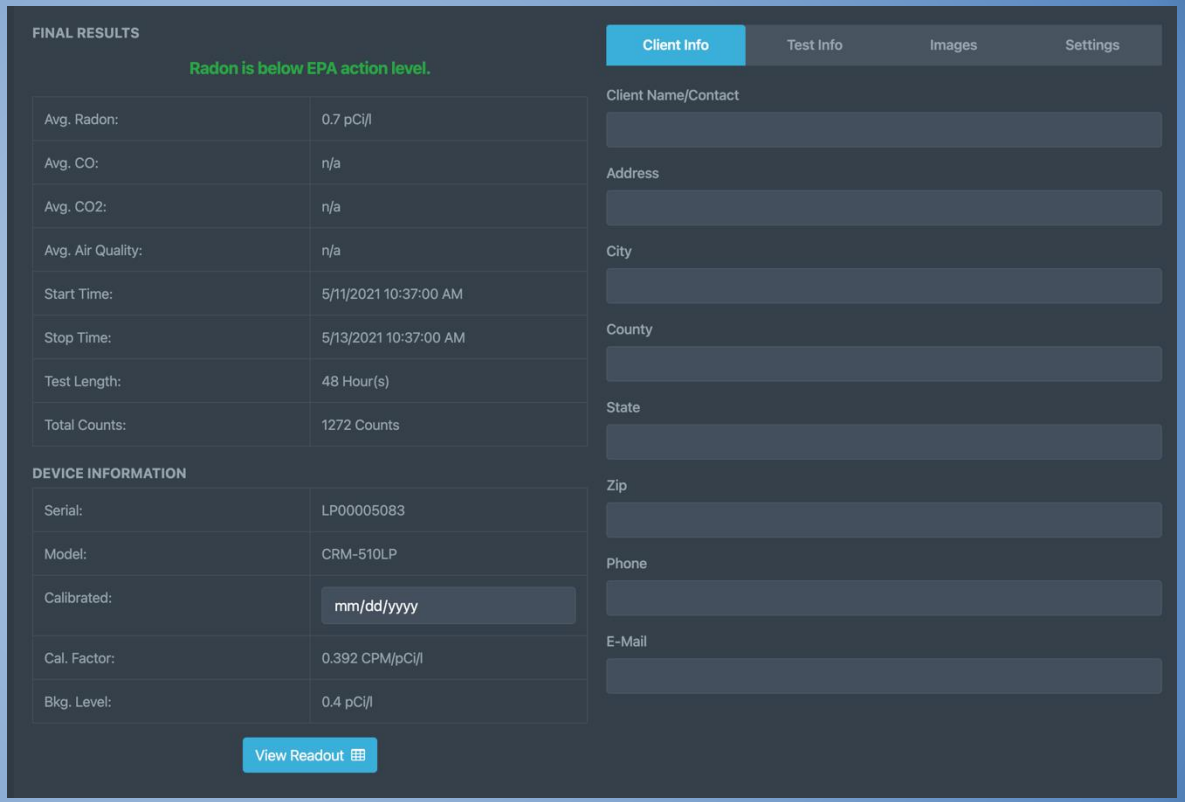
- Click the ‘View Readout’ button in the bottom-left side of the window to view the hourly table readout for each measured value.
- If all columns are not showing on your screen, you can use the legend in the top-right of the table to navigate through the overflow columns.
- Click the ‘Back’ button to close the hourly table readout and return to the previous screen.



TIME	HOUR	RADON (PCI/L)	COUNTS	TEMP (F)	BP (INHG)	RH (%)	TILTS
5/11/2021, 11:37:00 AM	1	1.3	39	69	29.4	32	/
5/11/2021, 12:37:00 PM	2	0.8	29	69	29.4	32	
5/11/2021, 1:37:00 PM	3	0.5	20	69	29.4	32	
5/11/2021, 2:37:00 PM	4	0.4	18	69	29.4	32	
5/11/2021, 3:37:00 PM	5	0.6	24	69	29.4	32	/
5/11/2021, 4:37:00 PM	6	1.0	33	69	29.4	32	
5/11/2021, 5:37:00 PM	7	0.6	23	69	29.2	33	
5/11/2021, 6:37:00 PM	8	0.7	26	69	29.2	33	
5/11/2021, 7:37:00 PM	9	0.6	23	69	29.2	33	
5/11/2021, 8:37:00 PM	10	0.5	21	69	29.4	34	
5/11/2021, 9:37:00 PM	11	0.4	18	69	29.4	34	
5/11/2021, 10:37:00 PM	12	0.8	29	69	29.4	34	
5/11/2021, 11:37:00 PM	13	0.9	31	68	29.5	34	
5/12/2021, 12:37:00 AM	14	0.9	31	68	29.4	33	
5/12/2021, 1:37:00 AM	15	0.5	22	68	29.4	33	
5/12/2021, 2:37:00 AM	16	0.5	22	67	29.4	32	
5/12/2021, 3:37:00 AM	17	0.8	29	67	29.4	31	
5/12/2021, 4:37:00 AM	18	0.5	20	67	29.7	30	
5/12/2021, 5:37:00 AM	19	0.7	26	66	29.2	30	
5/12/2021, 6:37:00 AM	20	1.0	34	66	29.4	29	
5/12/2021, 7:37:00 AM	21	0.8	28	66	29.4	28	
5/12/2021, 8:37:00 AM	22	0.6	24	66	29.4	27	
5/12/2021, 9:37:00 AM	23	0.8	29	69	29.4	26	
5/12/2021, 10:37:00 AM	24	0.5	20	69	29.4	26	
5/12/2021, 11:37:00 AM	25	0.7	27	69	29.4	26	

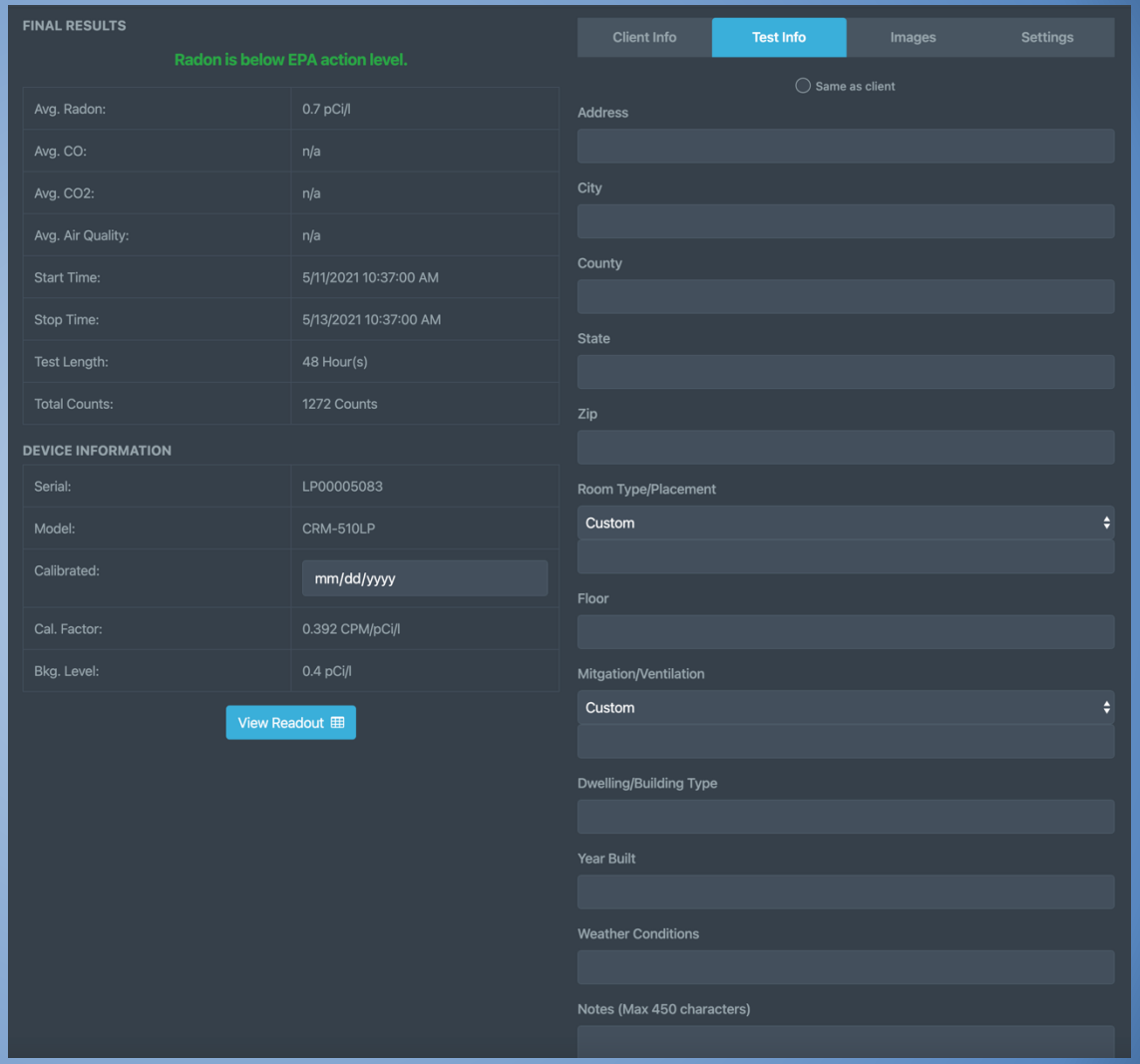
Report Setup (Client Information)

- Click the ‘Client Information’ tab to enter/edit the information of the customer having the test completed.
- These fields are used to populate the ‘Full Report’ as seen on the last slide of this show.



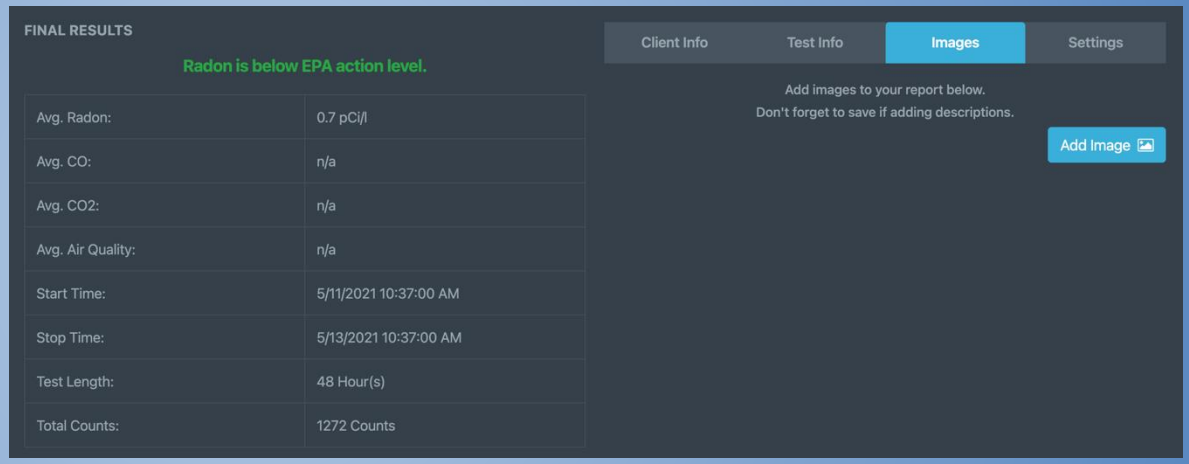
Report Setup (Test Information)

- Click the ‘Test Information’ tab to enter/edit any test-specific information.
- These fields are also used to populate the ‘Full Report’ as seen on the last slide of this show.
- Use the ‘Same as client’ button at the top to use the same address information as the client section.



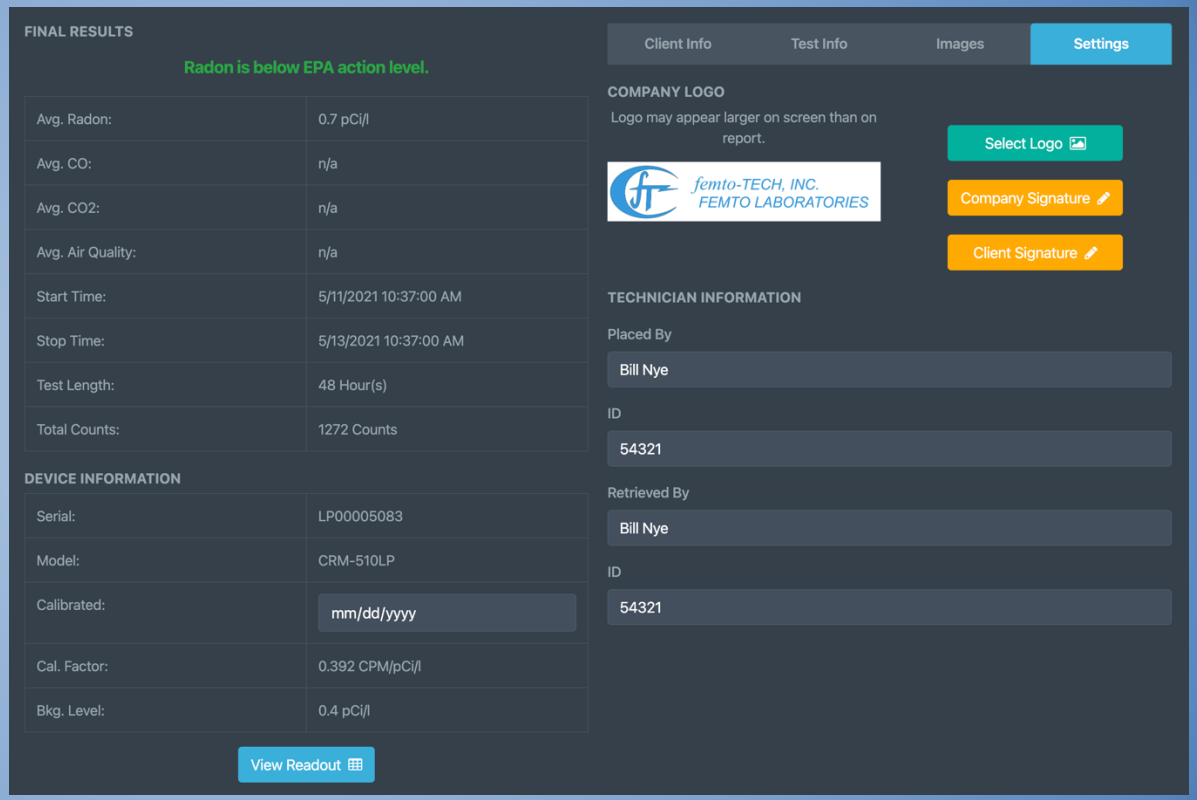
Report Setup (Report Images & Attachments)

- Click the 'Report Images' tab to add/take any images that are pertinent to the test being conducted.
- Once an image is added, you will have the option to add an image description.
- Each image and its accompanying description will automatically be added to your report once saved.
- Click Add Report Page to add a PDF or other report material to the Radon Report within its own dedicated page.



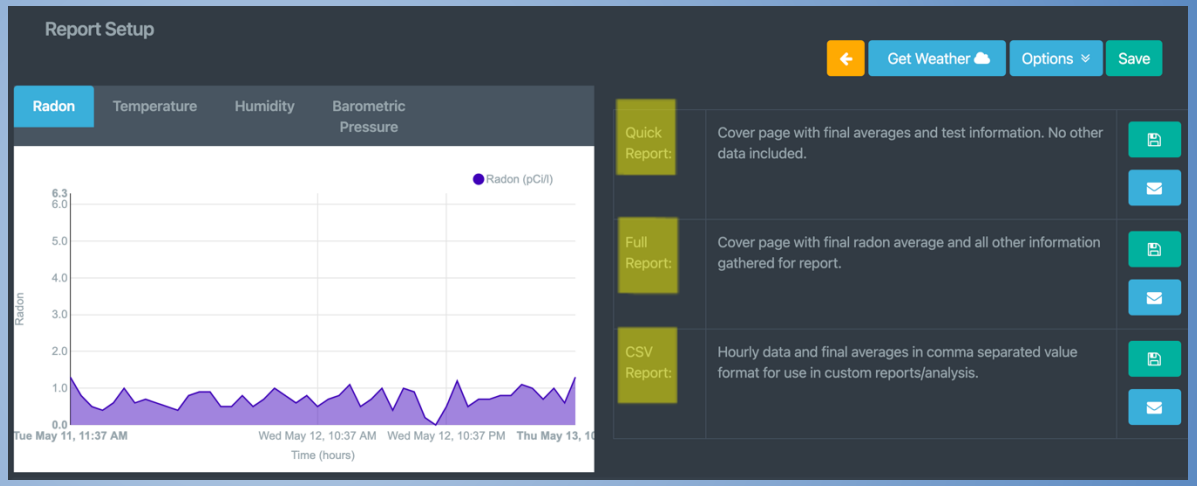
Report Setup (Report Settings)

- Click the ‘Report Settings’ tab to put the final touches on your generated report.
- Click the ‘Select Logo’ button to change the logo you would like to be added to the top of the report.
- Click ‘Company Signature’ to add/remove a signature for the person representing your company.
- Click ‘Client Signature’ to add/remove a signature for the customer acknowledging the completion of the test.
- The Technician Information can also be added/edited here in case that person were to change test-to-test.



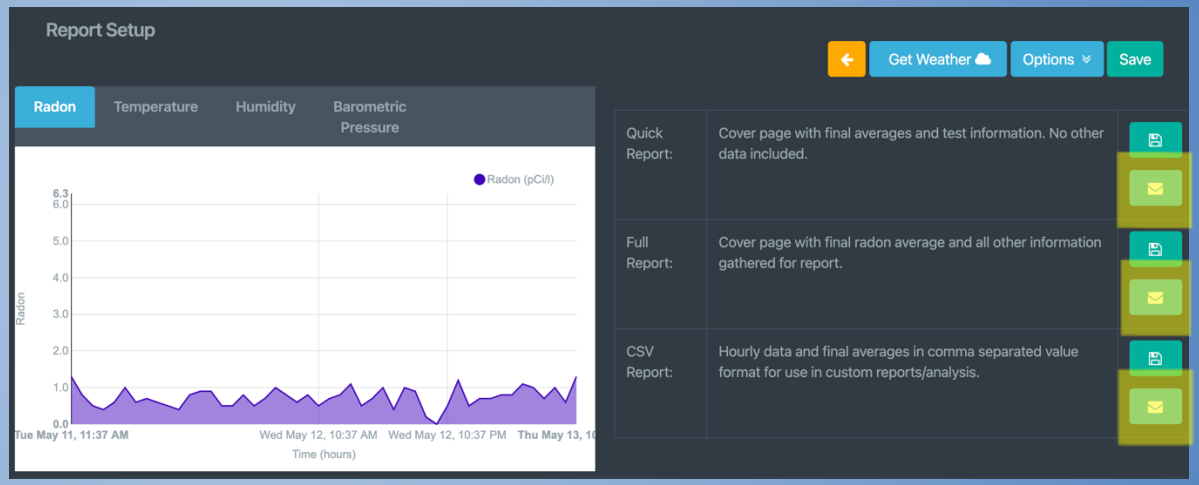
Report Setup (Generating Report)

- There are 3 types of reports that can be generated from your test data. (Quick, Full, & CSV Reports)
- Quick - Cover page with final averages only. No other data included.
- Full - Cover page with final test averages and all other information gathered for report.
- CSV - Hourly data and final averages in comma separated value format for use in custom reports/analysis.
- Mobile Only - Report can be shared/sent via your preferred method (email, message, other 3rd party apps) by clicking their respective 'Share' buttons.
- Mobile Only - Report can be printed directly to a networked printer if the printer has already been installed for use on your phone and you are connected to the same network.
- Mobile Only - Report can be printed directly to a supported BLE thermal printer from within the 'Settings tab' on your mobile device.



Report Setup (Sharing via E-mail)

- Click the button containing the mail icon for either of the 3 reports to generate and immediately share via e-mail. You can customize the e-mail that is sent and then save it as a template to be used for future e-mails. *Notice* - a valid e-mail account must be used for this feature to work properly. If you lack a valid e-mail or cannot get yours to work, femto-TECH provides a free option that can be found in the global settings menu. Select 'femto-TECH' as the email provider and be sure you have an e-mail configured in your company information for it to work properly.



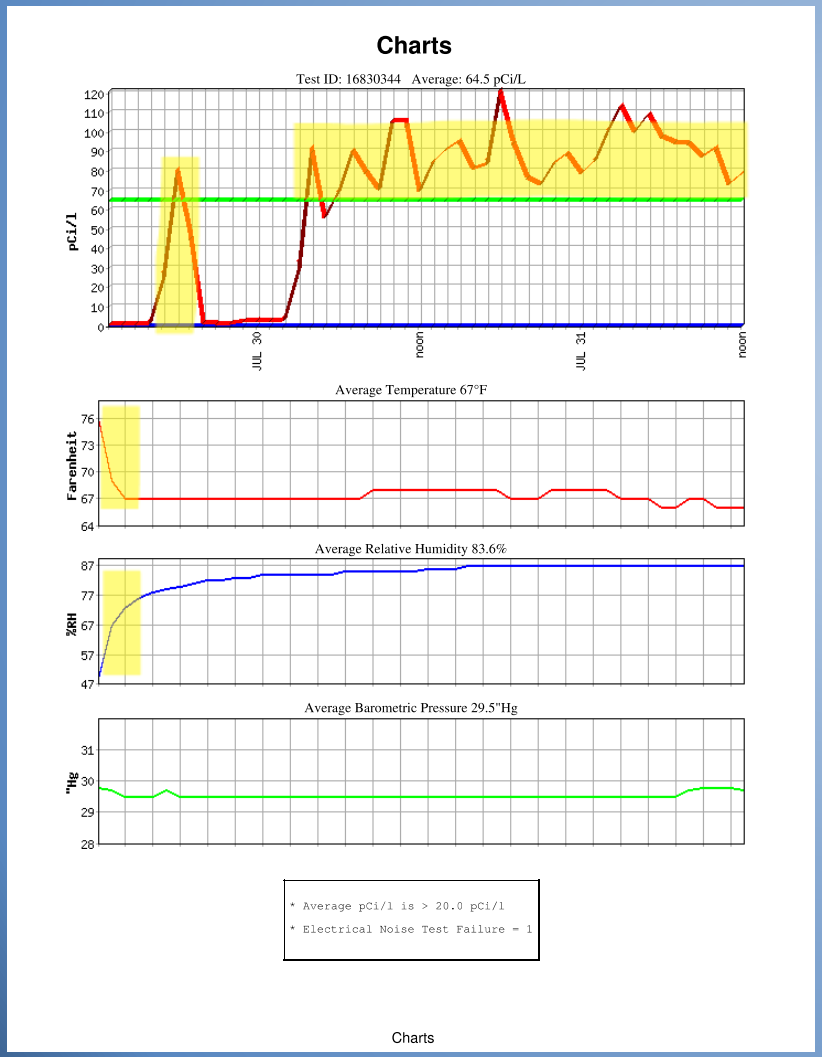
Tamper Detection

- Each CRM-LPT is equipped with an accelerometer that logs movement within the hour of detection (logs to graph and hourly readout).
- Along with the accelerometer, the LPT also measures temperature, humidity, and barometric pressure – all of which can be used for tamper detection.
- As you can see on the graphs to the right, there is clear indication of tampering occurring in this test due to the tilt indicators and sudden changes seen within those hours. Based on these indicators, it is also evident that this tampering has had a direct effect on the measured radon.

Data Interference

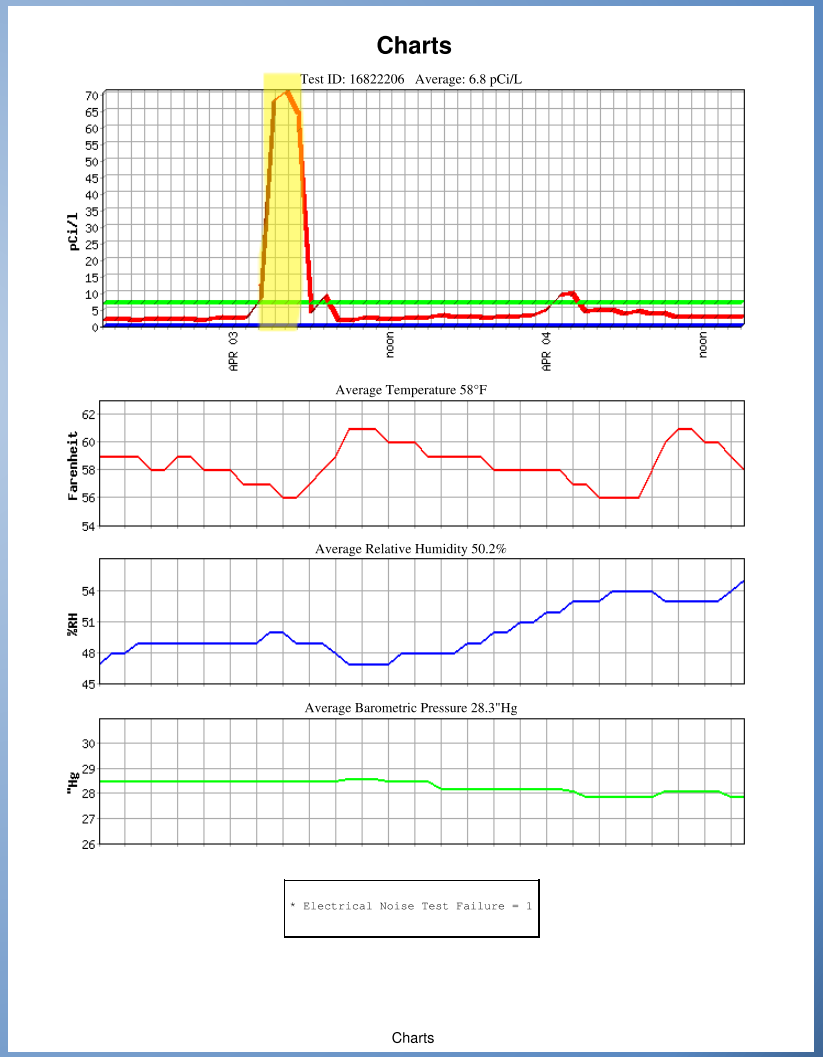
Condensing Humidity

Notice the sudden drop in temperature and rise in humidity at the start of the test. The average temperature and humidity are conducive to an environment in which condensing humidity can occur. With these conditions it is possible for the electrometer to 'run away'.



EMF

It is possible to overwhelm the electrometer on the CRM-LPT if it is placed near high-powered radio equipment such as modems/routers/cellular devices. Make sure to place your CRM at least 10 feet away from any wireless transmitting devices.



Declaration of Voluntary Compliance Example

DECLARATION OF VOLUNTARY COMPLIANCE

RADON INSPECTION DECLARATION OF VOLUNTARY COMPLIANCE

As the responsible party for the test location listed below, I hereby acknowledge receipt of the EPA's "Home Buyer's and Seller's Guide to Radon". I further understand that potential purchasers and/or lenders will be making important decisions pending the outcome of this test. Given this information I hereby certify that:

(1) I agree to keep this house closed (except for normal entry and exit) for approximately ____ hours prior to the start of the test. (NOTE: Minimum of 12 hours needed)

(2) I agree to keep all doors and windows shut during the entire test period except for normal entry and exit.

(3) I will not knowingly alter the test environment in any way including, but not limited to, raising or lowering the thermostat(s) or changing HVAC fan controls.

(4) I will not tamper with, remove or change the location of the test device(s).

(5) I will report any circumstances that occur during the test that may influence the final results.

(6) If I have any questions about the test I will contact the testing firm immediately.

TEST ADDRESS

Occupant _____ Occupant or Responsible Party _____

Address _____ Date _____

City _____ Technician _____

State _____ Zip _____ Date _____

femto-TECH, INC.
FEMTO LABORATORIES

Certified Indoor Air Quality Assessment
(Radon,CO,CO2,VOC,PM2.5/10)
License: 12345678190

femto-TECH, INC.
(937) 766-4427
support@femto-tech.com
25 Eagle Court
Carlisle OH 43006

Test Location Information
123 Radon St.
Radonville OH 12345 Isotope
Placement: Basement
Floor: Basement | Year Built: 1990
Building Type: Single Family

Device Information
Serial: LPT0001204 | Model: CRM--LPT
Rn Cal: 0.294 CPM/(pCi/L) | Bkg: 0.0 pCi/L
CO Cal: Calibration Gas @ 150 ppm
CO2 Cal: Factory Calibrated
Calibrated: 03/25/2024

Final Result(s)
Average VOC: 1/3 (Good)
Average PM 2.5: 41 µg/m³ | PM 10: 46 µg/m³
Average Carbon Monoxide: 0 ppm
Average Carbon Dioxide: 566 ppm
Average Radon: 2.2 pCi/l

PURPOSE OF THIS INSPECTION REPORT

To provide a professional opinion of a structure's radon level & indoor air quality at the time of the test period, limited to the conditions identified in this report.

EXPLANATION OF TEST RESULTS

Radon, carbon monoxide, carbon dioxide, VOC's, airborne particulates/mold have always been a concern for people spending time indoors.

- The U.S. Environmental Protection Agency (EPA) and the Surgeon General strongly recommend taking further action when the home's radon test results are 4.0 pCi/l or greater.
- The U.S. Environmental Protection Agency (EPA) recommends that carbon monoxide levels should not exceed 9 ppm in any given 8-hour period, 35 ppm for 1-hour.
- The National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE), recommend that carbon dioxide levels should not exceed 5,000 ppm in any given 8-hour period, or 30,000 ppm for a 15-min period.
- The U.S. Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC) recommend keeping indoor humidity levels between 30-50% to minimize the presence of airborne mold.

LIMITATIONS OF LIABILITY

femto-TECH, INC. cannot guarantee the necessary conditions were maintained during the test period. There can be uncertainty with any radon & indoor air quality measurement due to statistical variations and other factors such as changes in the weather and operation of the dwelling. We make NO WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, for the consequences of erroneous test results.

femto-TECH, INC. and its employees or agents shall not be liable under any claim, charge or demand, whether in contract, tort, or otherwise, for any and all loss, cost, charge, claim, demand, fee, or expense of any nature or kind arising out of, connected with, resulting from, or sustained as a result of any radon or indoor air quality test.

Technician Information
Placed by: Technician 1
ID: 1234567890
Retrieved by: Technician 2
ID: 0987654321

Client Information
billy@radon.com
(123) 456-7890
Billy Madison
123 Radon St.
Radonville OH 12345

Notes

RADON ANALYSIS

This test was conducted with a femto-TECH CRM--LPT, an EPA and industry approved radon testing device. This test was performed in accordance with the current Standards and Guidelines accepted for radon testing. **NOTICE: Motion was detected during the test. (0 total tilts in 2 hours).**

Weather Conditions: Normal
Mitigation/Ventilation Present: No active mitigation or ventilation system observed.

Rn
MODERATE
Average: 2.2 pCi/l

Radon Risk

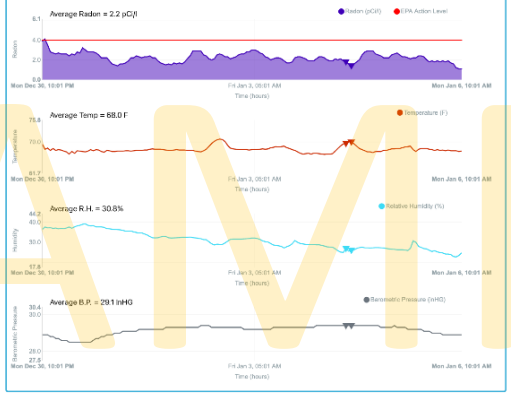
Radon is the second leading cause of lung cancer, after smoking. The U.S. Environmental Protection Agency (EPA) and the Surgeon General strongly recommend taking further action when the home's radon test results are 4.0 pCi/l (picocuries per liter of air) or greater. Radon levels less than 4.0 pCi/l still pose some risk and in many cases may be reduced. The national average indoor radon level is about 1.3 pCi/l while outdoor radon levels average 0.4 pCi/l. The higher a home's radon level, the greater the health risk to you and your family. Smokers and former smokers are at especially high risk. You can call your state radon office to obtain information, including a list of EPA or State approved radon contractors who can inspect or help you develop a plan for correcting the radon problem. Many questions you may have can be found in the EPA's publication "Home Buyer's and Seller's Guide to Radon".

Radon is near the EPA action level. Mitigation should be considered for long-term exposure.

Start Time	Stop Time	Test Length	Serial	Location
12/30/2024, 9:01:00 PM	1/6/2025, 10:01:00 AM	167 Hours	LPT0001204	Basement

Radon Graphing

V = tilt occurred ◊ = skipped hour



INDOOR AIR QUALITY (IAQ) ANALYSIS

VOC Avg: 1/3

VOC Risk

Volatile organic compounds, or VOCs, are gases that are emitted into the air from trace-made products or natural processes. Some can be very harmful to our health and in some cases they can cause cancer.
Breathing in VOCs can irritate your eyes, nose and throat, cause difficulty breathing, nausea, and damage your central nervous system as well as other organs. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.
Paints, varnishes and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing and hobby products, even fuel. All of these products can release organic compounds while you are using them and to some degree when they are stored.

VOC Rating: (Good) No action necessary.

CO Avg: 0 ppm

CO Risk

Carbon monoxide is an odorless, colorless and toxic gas. Because it is impossible to see, taste or smell, CO can kill you before you are aware it is in your home. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure.
Average levels in homes without gas stoves vary from 0.5 to 5 parts per million (ppm). Levels near properly adjusted gas stoves are often 5 to 15 ppm and those near poorly adjusted stoves may be 30 ppm or higher. The U.S. Environmental Protection Agency (EPA) strongly recommends taking further action when the average carbon monoxide level exceeds 9 ppm. Many questions you may have can be found in the EPA's publication "Carbon Monoxide's Impact on Indoor Air Quality."

Carbon monoxide is below the EPA action level.

CO2 Avg: 566 ppm

CO2 Risk

Carbon dioxide is a odorless, colorless gas. It is more dense than air and at high concentrations it can persist in open pits and other areas below grade. The current OSHA, NIOSH, and ASHRAE standard is 5000 ppm as an 8-hour time-weighted average (TWA) concentration.
Gaseous carbon dioxide is an asphyxiant. Concentrations of 10% (100,000 ppm) or more can produce unconsciousness or death. Lower concentrations may cause headache, sweating, rapid breathing, increased heartbeat, shortness of breath, dizziness, mental depression, visual disturbances or shaking. CO2 levels can serve as an indication of poor ventilation for the amount of occupants in the building.

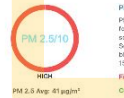
Carbon dioxide is below the EPA action level.

RH Avg: 30.8%

Mold Risk Assessment (not a direct measurement of mold)

Molds are part of the natural environment. Outdoors, molds play a part in nature by breaking down dead organic matter such as fallen leaves and dead trees, but indoors, mold growth should be avoided. Molds reproduce by means of tiny spores; the spores are invisible to the naked eye and float through outdoor and indoor air. Inhaling or touching mold or mold spores may cause allergic reactions in sensitive individuals.
Allergic responses include hay fever-type symptoms, such as sneezing, runny nose, red eyes, and skin rash (dermatitis). Normal relative humidity (%) for airborne mold protection is 50% and less. This is not a direct measurement of mold spores, but an assessment of temperature and humidity to determine the risk for mold within the measured volume. Many questions you may have can be found in the EPA's publication "A Brief Guide to Mold, Moisture and Your Home".

Mold risk is low due to average relative humidity being below 60%.



PM 2.5 Avg: 41 µg/m³
PM 10 Avg: 46 µg/m³

PM 2.5 / 10 Pollution

PM stands for particulate matter (also called particle pollution): the term for a mixture of solid particles and liquid droplets found in the air. Particles such as dust, dirt, soot, and even smoke are large enough to be seen with the naked eye, but some particles are so small they can only be detected using specialized equipment.
Some particles less than 10 micrometers in diameter can get deep into your lungs and some may even get into your bloodstream. The EPA 24-hour standard for fine particles (PM 2.5) is 35ug/m³, and for coarse particles (PM 10) is 150µg/m³.

Fine particle pollution risk is high, air is not healthy for short-term exposure.

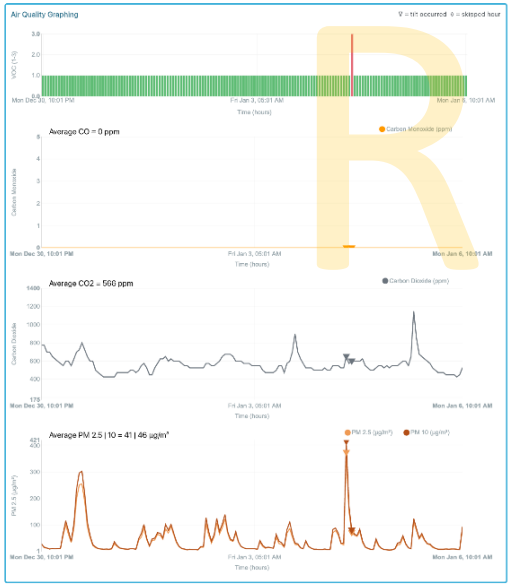
Coarse particle pollution risk is low.

*VOC risk is calculated using published research by the following:
American Lung Association | Agency for Toxic Substances and Disease | United States Environmental Protection Agency

Radon Level	CO Level	CO2 Level	VOC	PM 2.5 / 10	Serial
2.2 pCi/l (Near Action)	0 ppm (Below Action)	566 ppm (Below Action)	1/3 (Good)	41 µg/m³ 46 µg/m³	LPT0001204

Air Quality Graphing

V = tilt occurred ◊ = skipped hour



TIME	HOUR	RADON (PCI/L)	COUNTS	CO (PPM)	CO2 (PPM)	VOC	PM 2.5|10	TEMP (F)	BP (INHG)	RH (%)	TILTS
12/30/24, 10:01 PM	1	3.9	93	0	775	Good	29 | 29	69.4	28.9	38.4	0
12/30/24, 11:01 PM	2	4.1	96	0	775	Good	16 | 17	68.1	28.9	37.6	0
12/31/24, 12:01 AM	3	3.5	83	0	700	Good	13 | 14	68.4	28.9	37.2	0
12/31/24, 1:01 AM	4	2.8	66	0	700	Good	10 | 10	67.8	28.8	37.3	0
12/31/24, 2:01 AM	5	2.7	65	0	650	Good	12 | 12	68.3	28.9	36.8	0
12/31/24, 3:01 AM	6	2.6	62	0	625	Good	11 | 11	67.8	28.7	37.1	0
12/31/24, 4:01 AM	7	2.7	65	0	600	Good	12 | 12	68.0	28.7	36.7	0
12/31/24, 5:01 AM	8	2.8	67	0	575	Good	12 | 12	67.9	28.6	36.9	0
12/31/24, 6:01 AM	9	2.6	62	0	550	Good	62 | 70	67.6	28.5	36.8	0
12/31/24, 7:01 AM	10	2.8	62	0	600	Good	101 | 117	67.4	28.6	37.1	0
12/31/24, 8:01 AM	11	2.4	56	0	600	Good	66 | 79	66.8	28.5	37.6	0
12/31/24, 9:01 AM	12	2.6	61	0	650	Good	34 | 39	67.5	28.5	37.0	0
12/31/24, 10:01 AM	13	2.6	58	0	625	Good	90 | 107	67.6	28.5	37.7	0
12/31/24, 11:01 AM	14	2.8	66	0	700	Good	199 | 238	67.7	28.5	38.2	0
12/31/24, 12:01 PM	15	2.7	63	0	725	Good	252 | 297	67.6	28.6	38.3	0
12/31/24, 1:01 PM	16	3.2	75	0	800	Good	253 | 304	67.5	28.5	39.0	0
12/31/24, 2:01 PM	17	3.0	72	0	725	Good	168 | 212	67.4	28.5	39.2	0
12/31/24, 3:01 PM	18	2.8	67	0	650	Good	84 | 113	67.6	28.6	38.9	0
12/31/24, 4:01 PM	19	2.8	66	0	600	Good	54 | 62	68.0	28.5	38.2	0
12/31/24, 5:01 PM	20	2.8	67	0	600	Good	34 | 37	67.7	28.6	38.3	0
12/31/24, 6:01 PM	21	2.7	64	0	600	Good	16 | 18	68.0	28.7	37.7	0
12/31/24, 7:01 PM	22	2.5	58	0	475	Good	11 | 12	67.9	28.7	37.7	0
12/31/24, 8:01 PM	23	2.2	53	0	450	Good	10 | 10	67.5	28.8	37.7	0
12/31/24, 9:01 PM	24	2.2	53	0	425	Good	9 | 9	67.3	28.8	37.4	0
12/31/24, 10:01 PM	25	2.2	51	0	425	Good	8 | 10	67.8	28.9	36.8	0
12/31/24, 11:01 PM	26	1.9	46	0	425	Good	8 | 8	67.7	28.9	36.7	0
1/1/25, 12:01 AM	27	1.6	37	0	425	Good	10 | 11	67.5	28.9	36.5	0
1/1/25, 1:01 AM	28	1.5	36	0	425	Good	30 | 37	67.6	29.0	36.4	0
1/1/25, 2:01 AM	29	1.4	32	0	475	Good	20 | 23	67.6	29.0	36.3	0
1/1/25, 3:01 AM	30	1.6	38	0	475	Good	13 | 14	67.8	29.0	36.2	0
1/1/25, 4:01 AM	31	1.6	38	0	475	Good	11 | 12	67.6	29.1	36.3	0
1/1/25, 5:01 AM	32	1.7	40	0	475	Good	9 | 10	67.7	29.1	36.6	0
1/1/25, 6:01 AM	33	1.9	46	0	475	Good	9 | 9	67.7	29.1	36.6	0
1/1/25, 7:01 AM	34	2.2	53	0	500	Good	11 | 11	67.6	29.1	36.6	0
1/1/25, 8:01 AM	35	2.2	52	0	500	Good	11 | 11	67.7	29.1	36.2	0
1/1/25, 9:01 AM	36	2.4	57	0	475	Good	9 | 9	67.8	29.1	34.9	0

Post-Test Recommendations

Test result is 4.0 pCi/L or greater

- Fix the building if the test result indicates occupants may be exposed to radon concentrations that meet or exceed the EPA action level of 4.0 pCi/L.
- Efforts to reduce radon concentrations are not complete until a retest provides evidence of effectiveness.
  - Complete a short-term radon test between 24 hours and 30 days after the installation of a mitigation system.
  - Retest every 2 years to ensure the system remains effective.

Test result is between 2.0 and 4.0 pCi/L

- Consider fixing the building if the test result indicates radon levels greater than half the action level.
- Tests conducted when heating systems are active both day and night are more likely to provide a clear characterization of potential radon hazards.

When to Retest

- Retest every 5 years if NO mitigation system is installed.
- Retest in conjunction with the sale of any new or existing buildings.
- Be certain to test again if and when any of the following circumstances occur:
  - A new addition is constructed or alterations for building rehab or reconfiguration occur.
  - A ground contact area not previously tested is occupied, or a home is newly occupied.
  - Heating and cooling systems are significantly altered.
  - Ventilation is significantly altered by extensive weatherization, changes to mechanical systems or comparable procedures.
  - Significant openings to the soil occur due to:
    - Groundwater or slab surface water control systems that are altered or added (ex. sumps, perimeter drain tile, shower/tub retrofits).
    - Natural settlement causing major cracks to develop.
  - Earthquakes, construction blasting, or formation of sink holes nearby.
  - A mitigation system is altered, modified, or repaired.

State Radon Information

State	Phone	E-Mail
Ohio	(614) 644-8480	gene.phillips@odh.ohio.gov

Website
http://www.odh.ohio.gov/odhprograms/rpt/radprot/radprot1.aspx

Information
More information about radon is available by contacting the Ohio Department of Health.

Device QA Log Example

Report Issued By: _____ License/certification # _____ Date: _____

Radon Test Log

Serial Number_____ **Calibration / background date:_____**

(1)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(2)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(3)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(4)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(5)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(6)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(7)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(8)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

(9)
Date: _____ Address _____Zip: _____
Average Radon level _____ pCi/l

***** Instrument Measurement Check Data:**

Date: _____ Location _____

Average Radon level _____ pCi/l

Test Device used to compare: Serial# _____ Calibration date _____

Average Radon level _____ pCi/l **COV = _____**

Environmental Interference

- Avoid areas with condensing humidity
- Keep away from strong EM sources (Wi-Fi, routers, radio transmitters)
- The array of sensors included in the CRM-LPT help to isolate and display potential interference caused by the surrounding environment.
- The CRM-LPT is designed to work at any traversable elevation. (from mines to mountains)
- CRM-LPT Operating Humidity & Temperature:
  - 5-90% non-condensing & 35-105°F

Calibration & QA

- Calibration information visible on device screen (Device Info Button)
- Calibration factor is stored within the device and set by manufacturer (cannot be tampered with)
- Quality Assurance reduces the risk of error and ensures reliable results
- CRM-LPT is to be calibrated annually by an approved calibration lab.

Approved Calibration Facilities for the CRM-LPT:

femto-TECH

Bowser Morner

UKHSA

Click here for more information about our radon calibration services

Click here to download a Quality Assurance Plan (QAP) for your CRM

Battery & Charging

- USB-C charging
- Months of battery life per charge
- Full recharge may take 12–24 hours
- Can also run test while charging for continuous use

Handling & Storage

- Use protective case resistant to water
- Avoid car storage – let device acclimate to test volume before starting a test if it has been sitting in a hot/cold car to prevent condensation on surfaces of device
- Designed for long life and daily use

Radon Concentration Calculation

Although the built-in computer normally performs all the computations and provides the radon concentration data in pCi/l or Bq/m3, it is advisable for the operator to know how to carry out "hand" calculations. A back-up "hand" calculation should be carried out after entering a new calibration factor or background value to verify their correct entry.

To perform a "hand" calculation, record the number of counts accumulated and the elapsed time shown on the LCD display, convert to counts per minute, and apply the conversion factor (C.F.) and background (BKG) values supplied with the instrument to obtain the radon level in units of pCi/l. The following formula is used for this conversion:

Rewritten:

$$\text{pCi/l} = \frac{\text{(Ending Count – Beginning Count)}}{\text{[Elapsed Time (in minutes) x C.F.]}} - \text{BKG}$$

The background subtraction is generally only necessary for radon levels below 10 pCi/l. The backgrounds of femto-TECH calibrated devices are determined from aged air measurements. The background does not vary significantly with time nor from unit to unit, because the pulsed ion counter detector and open grid chamber discriminates against all ionizing radiation other than airborne alpha.

A a sample calculation:

$$\text{pCi/l} = \frac{(3150 - 0)}{\text{[2880 minutes x .357 cpm/pCi/l]}} - 0.5 \text{ pCi/l}$$

$$\text{pCi/l} = \frac{3150/2880}{.357} - 0.5 \text{ pCi/l}$$ (background in pCi/l, NOT cpm counts per min)

Or

2.5 pCi/l

(2880 minutes is 48 hours)

Training Complete!

Congratulations on completing CRM-LPT device training!