

femto-TECH, INC.

CRM-510LP CRM-510LPB & CRM-510LP/CO Device Training Course
for NRPP Certification

What is Radon (Rn)?

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.



Course Objectives:

- ❖ Understanding the operation of CRM-510LP
- ❖ Answer questions for operator
- ❖ Industry updates
- ❖ Hands-on training
- ❖ Certificate of proficiency
- ❖ Continuing education credits

“Four Rules of Radon Testing”

1

Always use an EPA approved testing device.

2

Always follow testing protocols.

3

Always document rules one and two.

4

Always comply with state regulations.

Important Radon Phone Contacts

femto-TECH, INC.

25 Eagle Ct.

Carlisle, OH 45005

(937) 746-4427 Office

(937) 746-9134 Fax

AARST Radon Assoc.

(866) 772-2778

EPA Radon Program

(800) 767-7236

American Lung Assoc.

(202) 785-3355

Eastern Training Center

(732) 932-9271 X606

Midwest Training Center (833) 723-6222

Kansas State University

(785) 532-6026

University of Chicago

(773) 702-1234

NRPP

(800) 269-4174

NRSB

(866) 329-3474

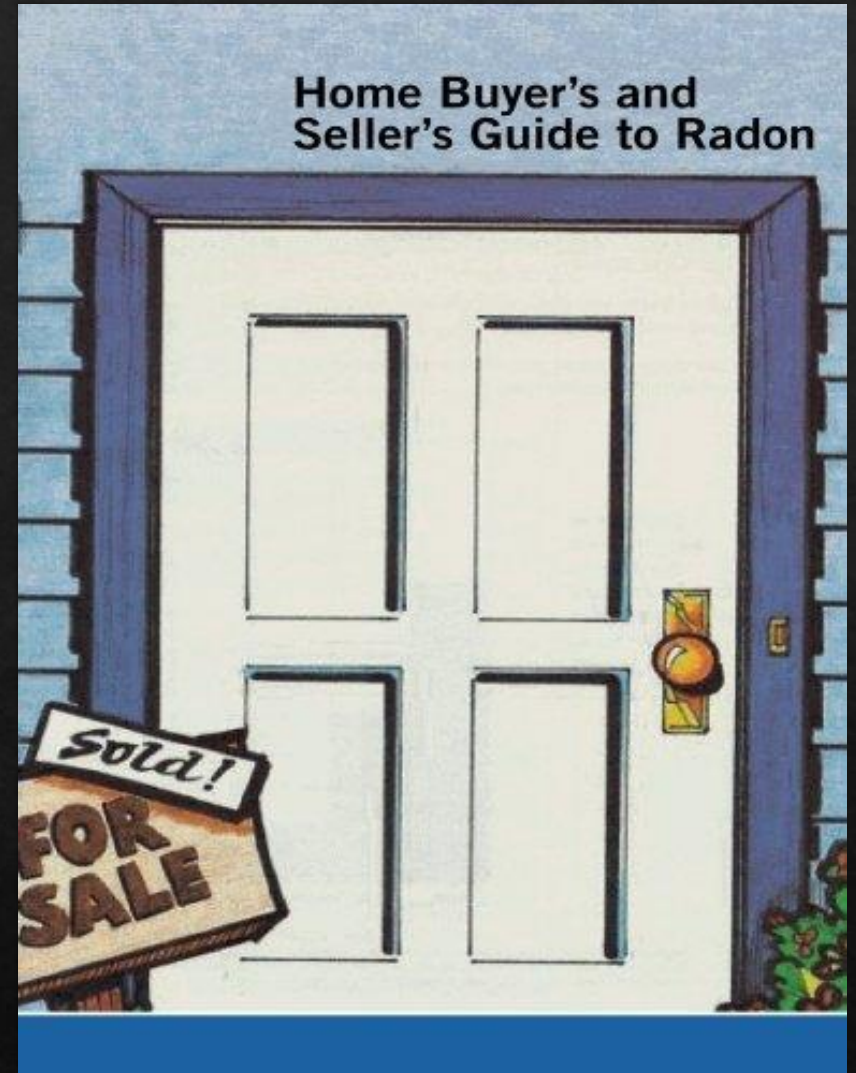
Testing at Time of Real Estate Transactions

- ◆ EPA recognized the need for quick testing results.
- ◆ Safeguards are put in place to reduce errors.
- ◆ Represents a large portion of the market.



EPA's Home Buyer's and Seller's Guide

- ◆ How to test a home that is being sold.
- ◆ How to hire a testing contractor.
- ◆ How to interpret test results.
- ◆ Not copyrighted
 - ◆ Reproduce in entirety without alterations.
 - ◆ Great marketing tool!



Closed House Conditions for All Short-Term Tests

- ◇ 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.



Preparing for Short-Term Test i.e., Closing House Prior to Test

- ◆ Tests lasting 2 or 3 days require closed house conditions 12 hours prior to testing.
 - ◆ Allows house to come to dynamic equilibrium.



Test Placement for Real Estate Transactions

- ◆ In home purchase and sale, place test in lowest area “suitable for occupancy” ... “without major renovations.”
 - ◆ May require interpretation in some cases.
 - ◆ Ultimately based on how the buyer will use the home.
 - ◆ Relocation companies may decide to test lowest level that could be used by a buyer.

Providing a Professional Analysis

Since you cannot see or smell radon, special equipment is needed to detect it. You can buy radon devices in retail stores when you want to test your own home, send away for radon devices from laboratories that offer mail order services, or you can hire an EPA listed or state certified radon tester who will test using professional radon devices that are appropriate for the situation.

Preventing or Detecting Test Interference

There is a potential for test interference in real estate transactions. There are a number of ways to prevent or detect test interference such as:

- ❖ Print-out report which frequently records radon or decay product levels to detect unusual swings.
- ❖ Motion detectors to determine whether the test device has been moved or testing conditions have changed.
- ❖ Proximity detectors to reveal the presence of people in the room which may correlate to possible changes in radon levels during the test.
- ❖ Record of barometric pressure to identify weather conditions which may have affected the test.
- ❖ Temperature record to help assess whether doors and windows have been opened.
- ❖ Taping windows shut to ensure closed house conditions.

If You Conduct a Short-Term Test...

- ❖ If you are testing in a real estate transaction and you need results quickly, any of the following three ways to conduct short-term tests are acceptable for determining whether the home should be fixed. Any real estate test for radon should include steps to prevent or detect device interference.

Short-Term Testing Options

- ❖ **Passive:** Take an initial short-term test for at least 48 hours. After the first test has been completed, take a follow-up short-term test for at least 48 hours. Or take two short-term tests at the same time in the same location for at least 48 hours.
 - ❖ Fix the home if the average of two tests is 4 pCi/l or more.
- ❖ **Active:** Test the home with a continuous monitor for at least 48 hours.
 - ❖ Fix the home if the average radon level is 4 pCi/l or more.

Device Information: Requirements for Use of Single Continuous Monitor for Real Estate



Single, CRM, or CW must integrate and record hourly or more frequently.



Monitors that do not record at least hourly must be used with another passive or active device using either the sequential or simultaneous method.



First four hours of test may be disregarded, but 44 contiguous hours required for average.

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.

Where Does the Device Go Within a Room? (continued...)

- ◆ For suspended detectors (e.g., hung from ceiling) an optimal height is 2.5 meters or 6 to 8 feet from the floor.
- ◆ 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 print-out of continuous monitor helps detect unusual measurement swings.
- ◆ Motion detectors can determine if the device was moved.
- ◆ Proximity detectors reveal presence of people.
- ◆ Record barometric and weather conditions.
- ◆ Record room temperatures to assess the opening of windows.

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 _____

RAD-LAB Radon Report Example



Radon Measurement Report
License: 12345678910

femto-TECH, INC.
(937) 765-4427
support@femto-tech.com
25 Eagle Court
Carlisle OH 45005

Test Location Information

Building Type: Office
Floor: B1 | Year Built: 2000
Location: Basement
25 Eagle Court
Carlisle OH 45005 Montgomery

Device Information

Serial: LP00005220
Model: CRM-510LP
Calibrated: 01/15/2021
Cal. Factor: 0.370 CPM/pCi/l
Bkg. Level: 0.4 pCi/l

Final Result(s)

Test Length: 48 Hours

Average Radon: 1.2 pCi/l
Radon is below EPA action level.

PURPOSE OF THIS INSPECTION REPORT

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

EPA EXPLANATION OF TEST RESULTS

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 correct 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".

LIMITATIONS OF LIABILITY

femto-TECH, INC. cannot guarantee the necessary conditions were maintained during the test period. There can be uncertainty with any radon 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 test.

RADON TEST DATA

This test was conducted with a femto-TECH CRM-510LP, an EPA and Industry approved testing device. This test was performed in accordance with the current Standards and Guidelines accepted for radon testing.

Weather Conditions: Clear
Mitigation/Ventilation Present: Mitigation system present and functioning.

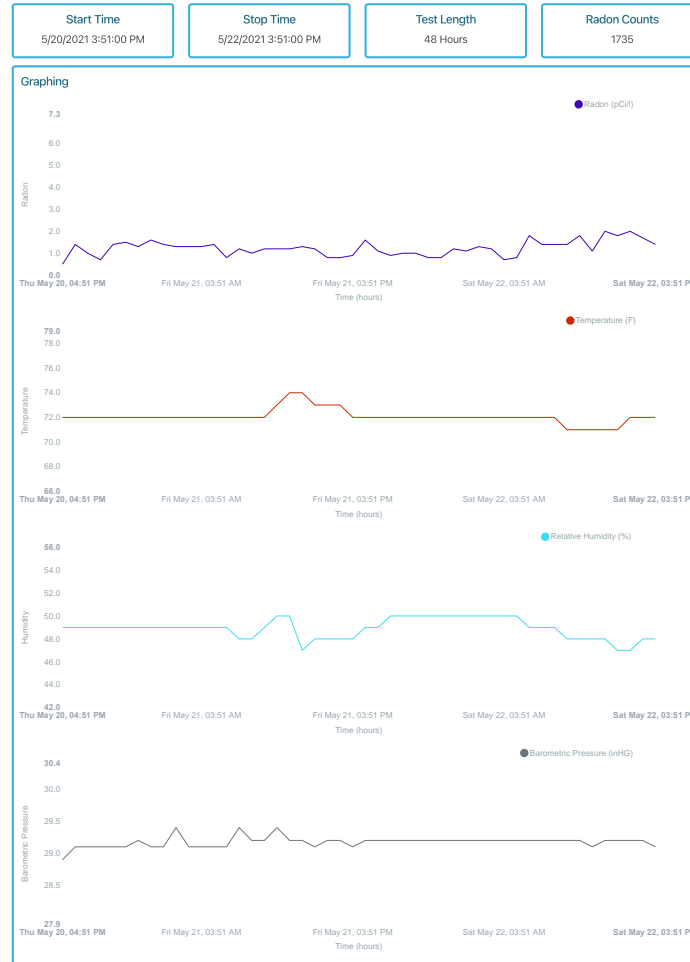
Technician Information

Placed by: Bill Nye Retrieved by: Bill Nye
ID: 54321 ID: 54321
Signature: _____

Client Information

John Doe 123 Radon Street
(937) 555-5555 Dayton OH 45005
Signature: _____ Date: 5/26/21

Notes



TIME	HOUR	RADON (pCi/L)	COUNTS	TEMP (F)	BP (INHG)	RH (%)	TILTS
5/20/2021, 4:51:00 PM	1	0.5	20	72	28.9	49	
5/20/2021, 5:51:00 PM	2	1.4	40	72	29.1	49	
5/20/2021, 6:51:00 PM	3	1.0	30	72	29.1	49	
5/20/2021, 7:51:00 PM	4	0.7	24	72	29.1	49	
5/20/2021, 8:51:00 PM	5	1.4	39	72	29.1	49	
5/20/2021, 9:51:00 PM	6	1.5	42	72	29.1	49	
5/20/2021, 10:51:00 PM	7	1.3	38	72	29.2	49	
5/20/2021, 11:51:00 PM	8	1.6	45	72	29.1	49	
5/21/2021, 12:51:00 AM	9	1.4	40	72	29.1	49	
5/21/2021, 1:51:00 AM	10	1.3	38	72	29.4	49	
5/21/2021, 2:51:00 AM	11	1.3	37	72	29.1	49	
5/21/2021, 3:51:00 AM	12	1.3	37	72	29.1	49	
5/21/2021, 4:51:00 AM	13	1.4	40	72	29.1	49	
5/21/2021, 5:51:00 AM	14	0.8	27	72	29.1	49	
5/21/2021, 6:51:00 AM	15	1.2	35	72	29.4	48	
5/21/2021, 7:51:00 AM	16	1.0	31	72	29.2	48	
5/21/2021, 8:51:00 AM	17	1.2	35	72	29.2	49	
5/21/2021, 9:51:00 AM	18	1.2	36	73	29.4	50	
5/21/2021, 10:51:00 AM	19	1.2	35	74	29.2	50	
5/21/2021, 11:51:00 AM	20	1.3	38	74	29.2	47	
5/21/2021, 12:51:00 PM	21	1.2	36	73	29.1	48	
5/21/2021, 1:51:00 PM	22	0.8	27	73	29.2	48	
5/21/2021, 2:51:00 PM	23	0.8	27	73	29.2	48	
5/21/2021, 3:51:00 PM	24	0.9	28	72	29.1	48	
5/21/2021, 4:51:00 PM	25	1.6	45	72	29.2	49	
5/21/2021, 5:51:00 PM	26	1.1	34	72	29.2	49	
5/21/2021, 6:51:00 PM	27	0.9	28	72	29.2	50	
5/21/2021, 7:51:00 PM	28	1.0	30	72	29.2	50	
5/21/2021, 8:51:00 PM	29	1.0	32	72	29.2	50	
5/21/2021, 9:51:00 PM	30	0.8	26	72	29.2	50	
5/21/2021, 10:51:00 PM	31	0.8	27	72	29.2	50	
5/21/2021, 11:51:00 PM	32	1.2	36	72	29.2	50	
5/22/2021, 12:51:00 AM	33	1.1	33	72	29.2	50	
5/22/2021, 1:51:00 AM	34	1.3	38	72	29.2	50	

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 = _____

List of Continuous Radon Monitor Types (CRM)

- ◇ Scintillation Cell and Photomultiplier Tube (PMT)
- ◇ Pulsed Ion Chamber
- ◇ Solid State Silicon Chip

Theory of Operation of Continuous Radon Monitors (CRM)

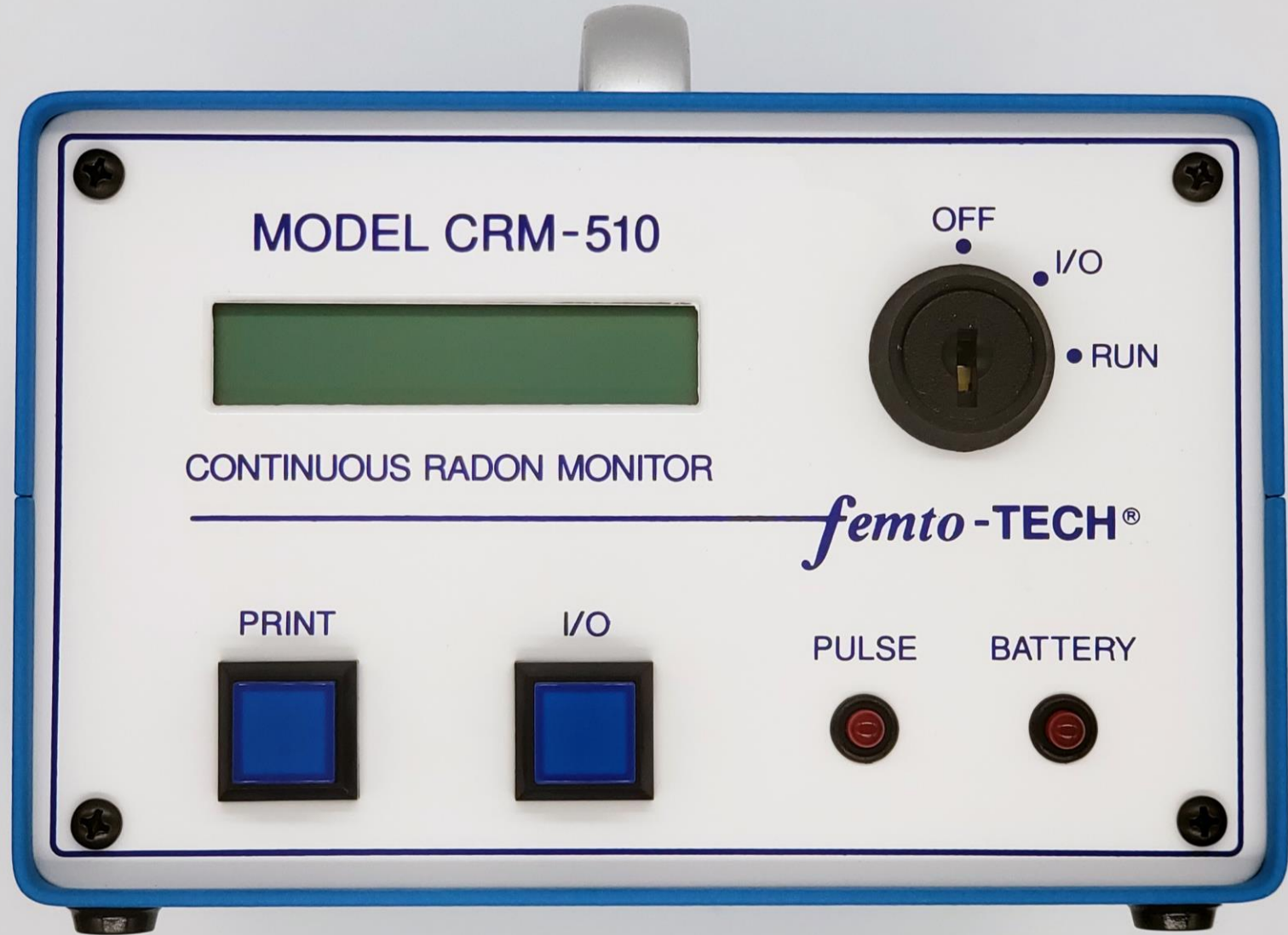
- ◇ Radon is collected from room by either a pump (active mode) or by diffusion (passive mode).
- ◇ RDPs are filtered out.
- ◇ Alpha particles from radon (active mode, also called sniffing) or radon and its RDPs (passive mode) are counted.
- ◇ Measure radon, results in pCi/l.

What is Used to Measure the Alphas?

- ◇ Scintillation cell with PMT
- ◇ Pulsed ion chamber
- ◇ Solid state silicon chip

Pulsed Ion Chamber

- ◇ Ions created from alpha radiation
- ◇ Ions detected by electrometer
- ◇ Results are short-term averages
- ◇ Passive or active mode



Time Characteristics of Sampling Methods

- ◇ Time integrating
 - ◇ Average over time
- ◇ Grab (sniffing)
- ◇ Continuous
 - ◇ Trends and averages



Protocol Test Rules: Single Test Option



The machine needs to record hourly.



The minimum measurement period is 48 hours.



There must be at least 44 continuous hours of usable data.



If the monitor cannot integrate over a period of one hour or less, then an additional (secondary) passive or active measurement device must be used. The two devices can be set up for simultaneously or sequentially.

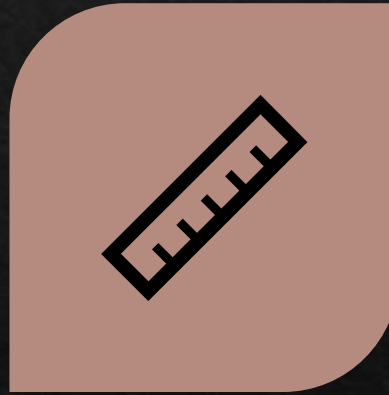


Adding an extra feature to detect tampering could deter people from tampering with the equipment and keep the closed building conditions.

Protocol Test Rules: Measurement Location



USE THE LOWEST LEVEL OF YOUR HOME THAT CAN BE USED FOR OCCUPANCY TO MEASURE FOR RADON.



MEASUREMENT SHOULD BE DONE IN A ROOM THAT IS USED QUITE OFTEN.



IF THERE IS A BASEMENT THAT COULD BE USED FOR RECREATION OR A BEDROOM WITHOUT RENOVATIONS, MEASURE FOR RADON THERE. THE POTENTIAL BUYER WILL HAVE THE OPTION OF USING THE BASEMENT KNOWING IT WAS MEASURED FOR RADON.

Protocol Test Rules: Measurement Checklist

This checklist shows that the radon measurement was done properly. Seller or tester should be able to confirm all items were followed. If they cannot confirm then another test should be made.

- ❑ Let occupants know how important proper testing conditions are.
- ❑ Give them instructions on radon testing.
- ❑ The service and device should be listed by EPA's National Radon Measurement Proficiency Program or your State. Follow instructions that came with the device.
- ❑ If using a professional use only EPA-listed or State-listed individuals. Ask to see photo I.D. Their contractor's identification number should be on the test report.
- ❑ Methods should be included to detect or prevent interference with testing conditions or the device.

Protocol Test Rules: Measurement Checklist (Continued)

- ❑ Minimum 48 hours for radon test. Some devices require longer.
- ❑ Any exhaust fan that runs for a short amount of time may be used during the radon test.
- ❑ For short-term tests less than four days, make sure an active radon reduction system fan has been running for at least 24 hours. Air exhaust equipment may stay running during testing. (Examples: Radon reduction system fans or small exhaust fans)
- ❑ A radon test that lasts less than one week, should be done under closed-building conditions.

Radon Measurement Method Abbreviations

Method Category

Abbreviations (Common)

Continuous Radon Monitors

CRM

Alpha Track Detectors

ATD

Electret Ion Chambers (Short Term / Long Term)

EIC/EC

Activated Charcoal Adsorption Devices

CC

Charcoal Liquid Scintillation

CLS

Unfiltered Track Detectors

UTD

Continuous Working Level Monitors

CWLM

Radon Progeny Integrating Sampling Units

RPISU

General Guidance: Measurement Conditions (All building types)

- ◆ Short-term measurements of 90 days or less the building should be in closed conditions. Windows, outside vents, and external doors should be closed except for normal entrance and exit for 12 hours prior to and during entire radon test period. External doors should not be left open. You can use them to exit and enter but do not leave the doors open for more than a few minutes.
- ◆ The closed building conditions are a requirement for measurements lasting four days or less and are recommended for measurements lasting up to a week.
- ◆ Turn off window fans, high-volume attic fans at least 12 hours prior to testing. A furnace or air conditioner can stay on.

General Guidance: Measurement Conditions (All building types) Continued

- ◆ Internal-external air exchange systems or air-to-air heat exchangers may be left on.
- ◆ Any radon mitigation system should be left on during testing.
- ◆ If there is going to be severe storms with high winds or rapidly changing barometric pressure do not conduct a short-term test lasting two or three days.
- ◆ In southern climates, or a warm season the closed building conditions does satisfy the criteria listed above.
- ◆ When normal living conditions does happen the closed building conditions must be verified and maintained more rigorously.

General Guidance: Measurement Device Location Selection

Place the detector where it will not be disturbed and where there is plenty of room for it.

Do not place the detector near drafts caused by heating, ventilating and air conditioning vents, doors, fans, and windows.


Avoid areas with high humidity, excessive heat, like fireplaces or direct sunlight.

If there is a window or other opening place the detector at least 90 centimeters (3 feet) away.


Place the detector away from openings (e.g., windows) place the detector 30 centimeters (1 foot) from the walls.

General Guidance: Measurement Device Location Selection (Continued)


Place the detector at least 50 centimeters (20 inches) off the floor.



The detector should be at least 10 centimeters (4 inches) from all other objects.



A detector that is suspended, should be 2 to 2.5 meters (about 6 to 8 feet) from the floor.



Radon tests should not be conducted in the kitchen, laundry rooms, closets, or bathrooms.

General Guidance: Documentation

- ◆ The operator must use a permanent log to record information about the measurement for data interpretation and comparison.
- ◆ Radon decay product measurements need to be recorded in Working Levels (WL). The WL value is converted to a radon concentration which is reported to the homeowner, it should be stated that this approximate conversion is based on a 50 percent equilibrium ratio. The report should indicate that the ratio is typical of home environments. Indoor environments such as schools or workplaces could have a different and carrying relationship with the radon and decay products.



General Guidance: Documentation (Continued)

The following lists may be used to satisfy accepted measurement methods:

- ❖ Dates, start, and stop times of testing.
- ❖ Standardized measurement conditions are satisfied.
- ❖ Exact location of the device, on a diagram of the room and building.
- ❖ Type of building, heating system, crawl space, or basement, if occupants smoke, humidifiers, air filters, electrostatic precipitators, or clothes dryers should be listed.
- ❖ Serial number and manufacturer of detector.
- ❖ Code number or description which identifies customer, building, room, and sampling position.
- ❖ Crawl space vents condition if open or closed.

Requirements Specific to Measurement: Service Providers

- ◆ Individuals and organizations providing analytical services must meet NRPP requirements for analytical measurement service providers. Analytical measurement services are defined as radon measurement services or activities, at a specific business location, that include the capability to extract, read, analyze, or manipulate radon/WL data from the measurement device(s) and calculate the final concentration for the client test report. These capabilities include, but are not limited to, reading and recording initial and final electret voltages, printing CM data tapes, recording radon or WL concentrations from a data window, or downloading the radon/WL data to a PC for test report generation.



Requirements Specific to Measurement: Service Providers (Continued)

- ◆ Individuals that are involved in any other part of a residential measurement, including consultation, placement, retrieval, etc., are listed for residential measurements services. Individuals that provide both analytical and residential services must apply to each category separately, unless his/her employer possesses an organizational listing for analytical measurement services for the specific device being used. Although EPA determines proficiency only for residential radon services, this does not preclude participants from offering non-residential radon measurement services which utilize knowledge or capabilities as demonstrated in the NRPP.

Requirements Specific to Measurement Service Providers: Analytical Measurement Services

- ◆ Those offering radon measurement services that include the capability to analyze or read radon measurement devices provide analytical measurement services. These listings are for the organization or individuals and are device specific. Device performance tests are required for such a participant to become listed. This test is scheduled once an Application has been accepted and the appropriate user fees paid. The test allows participants to demonstrate their ability to analyze accurately the level of radon to which their device(s) was exposed and to report the correct results. Successful participants are listed for a particular radon measurement device. Participants must have their listed devices calibrated at least annually to maintain their listing. They must also operate using an acceptable quality assurance plan (QAP), and meet other requirements described below. Successful participants are EPA listed and are issued Listing Letters to that effect. Participants may be listed for more than one brand/model/type of device if they meet the requirements and pay the appropriate user fees for each brand/model/type of device.

Requirements Specific to Measurement Service Providers: Residential Measurement Services

- ◆ The residential measurement service component of the NRPP evaluates the ability of individuals who enter the home to provide reliable radon measurement services in the home. This service may include consulting with the homeowner or realtor, placing and retrieving measurement devices, and/or providing the consumer with measurement results. To qualify for listing, individuals must pass a Measurement Exam and complete continuing education requirements every two years. Successful participants are EPA listed and are issued photo ID cards.

Program Requirements for Measurement Service Providers

- ❖ Adherence to all the following requirements constitutes an EPA-conforming measurement.
- ❖ Participants involved with real estate transactions must follow all described procedures in this section. As well as all requirements in the EPA's Protocols for Radon and Radon Decay Product Measurements in Homes.

Program Requirements for Measurement Service Providers: Develop and Implement a Quality Assurance Plan (QAP)

During participation in the program all analytical measurement and residential measurement service participants are all required to develop, operate by, and maintain QAPs. This is an entrance and continuing requirement. Participants with analytical capabilities for each device that is listed with the company must have a QAP. When a participant applies to add a device to the listing, they must update the QAP. The participant must provide a QAP with details, practices, and procedures unique to the devices that provide radon measurement services. Residential measurement service providers that provide consumers with radon measurement services must have a QAP that is appropriate to any device. The QAP can be either the residential or analysis service providers.



Program Requirements for Measurement Service Providers: Develop and Implement a Quality Assurance Plan (QAP) (Continued)

At a minimum, QAPs developed by analytical measurement service providers must address all four of the elements discussed in the following slides. QAPs developed by residential measurement service providers that do not partake in any analytical services do not need to have a calibration section, however, the QAP must address the three remaining topics mentioned on the next slides. The EPA will emphasize these elements when reviewing and approving a participant's QAP.

Program Requirements for Measurement Service Providers: Chain of Custody

- ◆ The QAP must demonstrate custody procedures for tracking specific measurement devices. All measurements performed in accordance with EPA procedures should have supporting documentation which provides complete chain-of-custody information including NRPP identification number of the analytical and residential measurement service providers. Residential measurement service providers must keep a record of all analytical measurement service providers that they use. This record should document the device(s) used and the NRPP ID number of the EPA listed analysis provider. EPA listed devices must each carry a unique identifier, such as a serial number. Analytical measurement service providers must keep a record of the EPA listed residential measurement service providers whose devices they analyze, and specific to the devices analyzed.

Program Requirements for Measurement Service Providers: Calibration

- ◆ The calibration procedure and schedule needs to be described. This shows when corrective action needs to be implemented or that the results of analyses are at acceptable limits. The calibration information must be attached to the continuous radon and continuous working level measurement devices. The calibration label should have on it; calibration facility, calibration date, and calibration expiration date. Calibration certificate or logs must be maintained for all devices covered by EPA listings. The calibration certificate is separate from the QAP. At anytime the EPA can request proof of calibration.

Program Requirements for Measurement Service Providers: Checks for Background

- ◆ The QAP should include instructions on how to assess the effect of background radiation on measurement results.

Program Requirements for Measurement Service Providers: Spiked, Blank, and Duplicate Samples

- ◆ Depending on the measurement device or method, a QAP must include regular use of one or more of these checks for bias and precision. Spikes are samples that are exposed to a known radon concentration. Blanks are unexposed samples. Duplicates are two or more measurements with identical equipment exposed over the same time interval at the same location.

Program Requirements for Measurement Service Providers: Provide Information to Consumers and Clients

- ◆ All participants listed for measurement services must provide consumer information as specified. This is a continuing requirement of the program. The EPA may evaluate compliance with this requirement through blind tests for an analytical service provider's listed devices or special information requests from analytical or residential measurement service providers.

Program Requirements for Measurement Service Providers: Provide Information to Consumers and Clients (Continued)

- ◆ Participants may elect to provide information on obtaining mitigation services along with measurement results. EPA strongly recommends that you include a copy of facsimile of the Consumer's Guide to Radon Reduction with the information you provide. Use of state-required mitigation brochures fulfills this requirement.
- ◆ In states with a radon office, the participant must provide the client with the state radon program office phone number and inform them that a list of EPA approved mitigators is available from the state.

Program Requirements for Measurement Service Providers: Have and Use Standard Operating Procedures (SOPs)

- ◆ The use of acceptable standard operating procedures is both an entrance and continuing requirement of the Program. All analytical measurement service providers need to have a written, device-specific SOP in place for every radon measurement device that they have listed. Analytical and residential service providers can either create their own SOP or use the manufacturer SOP for their device. After applying, applicants and participants must provide a copy of their SOP(s) to the EPA upon request.
- ◆ The SOP needs to include operating or analyzing procedures for the specific device. The SOP should also be consistent with EPA radon measurement protocols. (Next Slide)
- ◆ The Agency can conduct an audit or make an information request to make sure the participant is adhering to device-specific SOPs on a day-to-day basis.

Program Requirements for Measurement Service Providers: Follow Guidelines in Reporting Measurement Results

- ◆ Radon measurement results must be provided to consumers with the following guidelines. The guidelines are an entrance and continuing requirement for participants. EPA can request a copy at anytime for the test report or notice given to consumers to verify they are meeting the requirement. EPA can also evaluate blind tests as part of their analytical measurement service providers.
- ◆ Numerical Values: Radon gas must be reported no more than one decimal place, e.g., 4.3 pCi/L (picocuries per liter). Radon decay products (working level [WL]) must be reported no more than three decimal places, e.g., 0.033 WL.

Program Requirements for Measurement Service Providers: Follow Guidelines in Reporting Measurement Results (Continued)

- ◆ Timeliness: The consumer must have their test results to them within 30 calendar days after completion. Regardless if results are reported directly to consumer, it applies to both analytical and residential measurement service providers.
- ◆ Minimum 48 Hour Measurement: Participants that offer analytical measurement services with devices designated as grab methods must provide consumers with written notification that grab sample results should not be used as the sole basis for deciding to mitigate. The results of grab sampling measurements and those of less than 48 hours are not appropriate for mitigation decision making.

Program Requirements for Measurement Service Providers: Follow Guidelines in Reporting Measurement Results (Continued)

- ◆ Consumer Measurement Result Disclaimer: If an analytical measurement service provider is delisted for a measurement device, he/she must notify their clients of the delisting. Test report must have the following disclaimer:
 - ◆ “This radon measurement result was analyzed by an organization that does not currently meet the requirements of the U.S. EPA Radon Proficiency Program.”
- ◆ If a residential measurement provider loses his/her listing, a similar caveat must be added to any reports provided by the individual to their clients.
- ◆ In cooperation with the Consumer Federation of America (CFA), EPA has drafted a user-friendly test results letter for consumers that participants are encouraged to use.

Program Requirements for Measurement Service Providers: Record Keeping

- ◆ Listed analytical service providers need to have a record of all residential measurement service providers that use their analytical services. Also, residential measurement service providers must keep records of all analytical measurement services used for analysis and residential test reports. The list can be reviewed and compared anytime by the EPA. This is a continuing requirement of the Program.

Program Requirements Specific to Analytical Measurement Services

- ◆ In addition to the requirements described previously, analytical measurement service providers must also adhere to the following Program specifications.
- ◆ Analytical Measurement Service Providers Must Pass a Device Performance Test: All participants providing analytical measurement services must pass a device performance test to obtain a listing for a specific device. This applies to all devices for which a participant wishes to obtain a Proficiency Listing. The test will be scheduled for the next test window after the device application is accepted and user fees for that device are received. Test windows are conducted regularly throughout the year. The device performance test is designed to assess the participant's ability to produce accurate results.

Program Requirements Specific to Analytical Measurement Services: Analytical Measurement Service Providers Must Pass a Device Performance Test (Continued)

- ◆ Analytical service providers are expected to provide measurement results that are within $\pm 25\%$ of EPA's target value. They are also required to submit results to EPA in a manner consistent with requirements outlined that discusses procedures for the test.

Program Requirements Specific to Analytical Measurement Services: Analytical Measurement Service Providers Must Pass a Device Performance Test (Continued)

- ◆ Device performance tests within the Program are either announced or blind. Announced tests are tests that the applicant knows about. Applicants submit their measurement devices, which are exposed to known radon concentrations in EPA laboratories. After exposure, the devices are returned for analyses. Blind tests are done without the applicant's/participant's knowledge. During blind testing, EPA acquires the device for exposure to a known concentration of radon, typically in an EPA radon chamber. The participant must then report the measured value, which is compared to the target value. In both announced and blind types of testing, analytical service providers are required to return accurate measurement results in accordance with all Program requirements. Participants who fail to do so are subject to delisting and applicants who fail will not obtain their listing.

Program Requirements Specific to Analytical Measurement Services: Analytical Measurement Service Providers Must Pass a Device Performance Test (Continued)

- ◆ Devices will either be mail-in or walk-in for NRPP purposes. Devices that are shipped to EPA for radon measurement test exposure are mail-in. Devices that are dropped off at an EPA laboratory are walk-ins. Some participants are given either option. The agency can ask for a specific machine or specific operator. EPA at anytime can request information on your inventory and measurement technicians about portable or self-contained measurement devices.

Program Requirements Specific to Analytical Measurement Services: Analytical Measurement Service Providers Must Pass a Device Performance Test (Continued)

- ◆ In announced tests, applicants must conduct all exposures and analyses in the same way that they are done for consumers. For example, device analyses must be done by the participating organization using equipment used in analyzing consumer measurements. Applicants must pass a test for each specific brand/model/type of radon measurement device for which they have applied. Most initial performance tests are announced and are conducted with the knowledge of the applicant. However, the Agency reserves the right to conduct blind tests at any time after receipt of a correct and complete Application. Blind test results may be used to determine whether an applicant receives initial listing, or a participant should be delisted.

Program Requirements Specific to Analytical Measurement Services: Annual Calibration Requirement

- ◆ Your device being calibrated annually is an important factor for accurate radon measurements to consumers. Analytical measurement service providers are required annually unless your manufacturer of your device recommends sooner for calibration. Calibration stickers must be placed on CR and CW devices: The stickers must have on them at minimum the calibration facility, calibration date, and calibration expiration date. All records and certificates for the devices that correspond to the Program listing must be kept at the analysis service. If records are not kept it will result in delisting. The participant is the one who pays for any cost that is associated with this requirement.

Program Requirements Specific to Residential Measurement Services: Residential Measurement Service Providers Must Use EPA-Listed Analytical Measurement Service Providers

- ◇ All NRPP participants providing residential measurement services must use a listed analysis provider to analyze the radon measurement device(s) they use. If it is the individual's own company, that company must have a separate analytical listing and complete the requirements described above for analytical measurement services. This is a continuing requirement of the Program.

References:

- ◇ EPA's Home Buyer's and Seller's Guide to Radon & Consumer's Guide to Radon Reduction
- ◇ ANSI/AARST MS-QA 2019
- ◇ ANSI/AARST MAH 2019

Operating Procedure for CRM-510LP

Start Test

Action	Screen Shows
(1) Turn-key to RUN position	Blank
(2) Push the PRINT button once	RUN, then goes to: pCi/l, "Hg, °F, or Bq/M ³ , kPa, °C
(3) Push the PRINT button again	DATE 01/01/20 (current date)
(4) Push and release both buttons at the same time	TIME 14:06 (current time)
(5) At this time, the device goes into Self-Test Mode This process takes about 20 seconds. When the test passes, the screen shows: At this time, the test is running If the screen says: Turn the key to OFF and push a button Start again from the beginning. If the device fails a second time, call femto-TECH for guidance	SELF TEST ACTIVE PASSED SELF TEST TEST STARTED! Count 0 SELF TEST FAILED

End Test

Action	Screen Shows
(1) Turn the key to the OFF position and push either of the buttons	TEST ENDED!

Note: Once you start a new test, the old data will be CLEARED!

Operating Procedure for CRM-510LP (Continued)

Print Test Using Seiko Thermal Printer

Action	Screen Shows
(1) Attach printer cable to device and printer	Blank
(2) Turn the key to I/O, turn printer on	Blank
(3) Press PRINT button once	TIME: xxxx min.
(4) Press PRINT button again	pCi/l "Hg, °F
(5) Press IO Button to select between TABLE or GRAPH printout. Press PRINT to select	TABLE GRAPH
(6) Press IO button to select between USE ALL or SKIP 12. Press PRINT to select	USE ALL DATE SKIP 1 st 12 HRS
(7) Press PRINT button and data will begin printing	
(8) Data may be printed again by repeating the above steps	

Note: If closed house conditions were not met and the test time was extended:

During step #6, press the I/O button and the screen will say (Skip 1st 12 hrs), then push PRINT. This will skip the first 12 hours of data, preventing it from being included in the final test average.

Changing the Time on the CRM-510LP

Instructions

First, there must be no test data in the unit. Test Data must be cleared before changing the time!

(Be sure to print or download the data per printing instructions if you need data that is in the unit.)

To clear data: start a new test, waiting for the "SELF TEST ACTIVE" to complete and display "TEST STARTED!" Then, end the test by turning the key to OFF and pressing a button. The unit will display "TEST ENDED!" This will clear data from the unit.

Next, turn the key to I/O and press the PRINT button. As soon as "No Data to Print" is displayed, turn the key to RUN position.

The Time will be displayed in Hours/Minutes format, example: 9:17.

Use the PRINT button to change hours and the I/O button to change minutes. Pressing each button will accomplish this (hours will roll over at 23 to 0) (minutes will roll over at 59 to 0).

When the correct time is set, turn the key to the OFF position right away. The new time is set!

To check correct time setting, start a test and verify correct time during start up.

Radon Concentration Calculation for the CRM-510LP

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:

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

The background subtraction is generally only necessary for radon levels below 10 pCi/l. Background of the Model CRM-510LP has been determined from aged air measurements to be in the range of 0.075 to 0.30 counts per minute. This corresponds to 0.25 to 1 pCi/l for a unit with a nominal 0.3 CPM/pCi/l calibration factor. The background does not vary significantly with time nor from unit to unit, because the pulsed ion counter detector and open grid chamber in the CRM-510LP discriminates against all ionizing radiation other than airborne alpha.

As a sample calculation:

$$\text{pCi/l} = \frac{(3150 - 0)}{[2880 \text{ minutes} \times .357 \text{ cpm/pCi/l}]} - 0.5 \text{ pCi/l}$$
$$\text{pCi/l} = \frac{3150/2880}{.357} - 0.5 \text{ pCi/l} \quad (\text{background in pCi/l, NOT cpm counts per min})$$

Or

$$2.5 \text{ pCi/l}$$

(2880 minutes is 48 hours)

Specifications – CRM-510LP

RADIATION DETECTED	Radon-222 Alpha
DETECTOR	Air Ionization Probe
DYNAMIC RANGE	1 to 200 pCi/l (37 to 7400 Bq/m ³)
UNIT	pCi/l or Bq/m ³
SENSITIVITY	0.350 CPM per pCi/l
.....	(0.01 CPM per Bq/m ³)
LINEARITY	1 - 200 pCi/l (<10% Deviation)
SAMPLING MODE	Passive Air Diffusion
DATA STORAGE:	
CRM-510LP/B	192 one-hour data points (8 days)
CRM-510LP/CO	79 one-hour data points (radon)
	316 fifteen-minute data points (carbon monoxide)
	ENVIRONMENTAL SENSORS:
TEMPERATURE	Range 50-104 °F, 10-40 °C
.....	Sensitivity ±1 °F, ± 0.5 °C

Specifications – CRM-510LP (Continued)

BAROMETRIC PRESSURE Range 0-38 "Hg, 0-127 kPa
.....Sensitivity ± 0.2 "Hg, ± 0.5 kPa

RELATIVE HUMIDITY Range 0-90%
..... Sensitivity $\pm 5\%$

CARBON MONOXIDE Range 0-200 ppm
..... Sensitivity $\pm 10\%$

DISPLAY:

ALPHANUMERIC CHARACTERS 16-Digit One Line LCD

LOW BATTERY INDICATOR LCD Message

PULSE INDICATOR Red LED

CONTROLS:

KEY SWITCH OFF, I/O & RUN Positions

TWO MOMENTARY PUSH BUTTONS Multifunction Select & Execute

Specifications – CRM-510LP (Continued)

EXTERNAL OUTPUTS (MALE DB-25P)

SERIAL RS-232C

PARALLEL 8 Bit Simplified Centronics®

POWER:

ELECTROMETER 9-volt battery (1-year nominal life)

ION CHAMBER 27-volt battery pack (2-year nominal life)

COMPUTER/DATA LOGGER 7.2-volt lithium battery pack (1-year nominal life)

CARBON MONOXIDE SENSOR 9-volt lithium battery (1-year nominal life)

SIZE:

HEIGHT (w/Handle) 5.4" (137 mm)

WIDTH 6.6" (160 mm)

DEPTH 7.4" (190 mm)

WEIGHT 4 Pounds (1.8 Kg)

ENVIRONMENTAL OPERATING RANGE 50-104 °F (10-40 °C)

..... 10 to 90% RH (noncondensing)

QUALITY ASSURANCE and QUALITY CONTROL PLAN for MEASUREMENT of INDOOR RADON CONCENTRATION with the *femto*-TECH

MODEL CRM-510, CRM-510LP or CRM-510LP/CO CONTINUOUS RADON MONITOR

By _____

Place your name, business name, business address, and contact info. **HERE in Bold**

REVISION DATE: _____

APPROVED by Signatures and Dates:

President _____ DATE _____
 Signature _____

Date: _____
 QA/QC Manager _____ DATE _____
 Signature _____

Date: _____

These signatures represent the awareness of, approval of, and responsibility for this plan of all persons who have significant responsibility for ensuring that the provisions of this plan are implemented.

CRM-510LP Operation Sheet	
<u>Start Test</u>	
Action	Screen Shows
(1) Turn key to RUN position	Blank
(2) Push the PRINT button once	RUN, then goes to: pCi/l, "Hg, °F or Bq/M ³ , kPa, °C
(3) Push the PRINT button again	DATE 01/01/20 (current date)
(4) Push and release both buttons at the same time	TIME 14:06 (current time)
(5) At this time, the device goes into Self-Test Mode	SELF TEST ACTIVE
This process takes about 20 seconds. When the test passes, the screen shows:	PASSED SELF TEST TEST STARTED!
At this time, the test is running	Count 0
If the screen says: Turn the key to OFF and push a button Start again from the beginning. If the device fails a second time, call <i>femto</i> -TECH for guidance	SELF TEST FAILED
<u>End Test</u>	
Action	Screen Shows
(1) Turn the key to the OFF position and push either of the buttons	TEST ENDED!
Note: Once you start a new test, the old data will be <u>CLEARED!</u>	

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:

- 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)
- I agree to keep all doors and windows shut during the entire test period except for normal entry and exit.
- 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.
- I will not tamper with, remove, or change the location of the test device(s).
- I will report any circumstances that occur during the test that may influence the results.
- If I have any questions about the test, I will contact the testing firm immediately.

TEST ADDRESS

Occupant _____ Occupant or Responsible Party _____

Address _____ Date _____

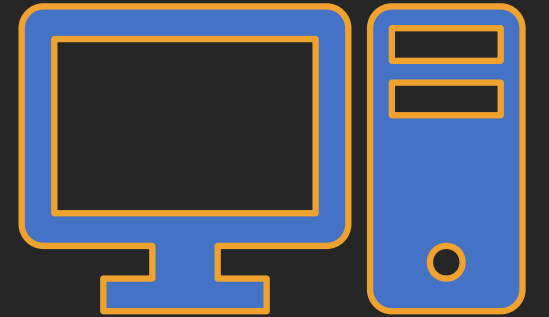
City _____ Technician _____

State _____ Zip _____ Date _____

Quality Assurance Plan, Standard Operating Procedure & Declaration Templates

Click the documents above for access.

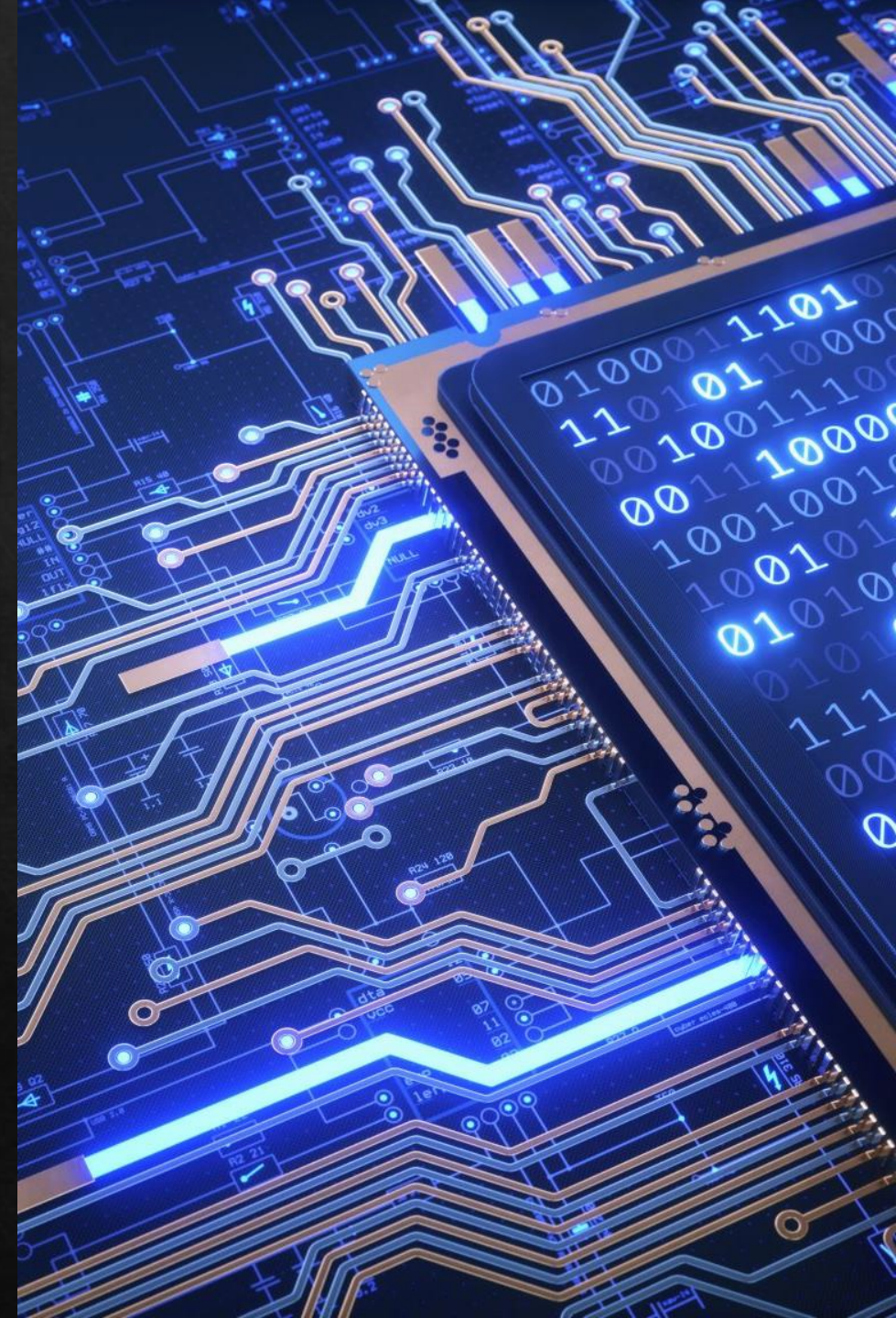
femto-TECH
RAD-LAB Software



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.



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.

femto-TECH Rad-Lab

RAD-LAB

Dashboard Devices Report Management **Company Information** Technician Information

femto-TECH Rad-Lab V: 1.1.2

Connect To Device Manage Reports

RECENT ACTIVITY
Recently downloaded tests and their generated reports can be found below.

Unit Serial #	Length (H)	Manage
LP00005885	77	

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.

The screenshot shows a web application interface for 'RAD-LAB' with the following elements:

- Header:** 'RAD-LAB' logo and navigation links for Dashboard, Devices, Report Management, and Technician Information.
- Page Title:** 'Company Information' with a breadcrumb 'Rad-Lab / Company Information'.
- Form Fields:**
 - Company Name: femto-TECH, INC.
 - Address: 25 Ealge Court
 - City: Carlisle
 - State: OH
 - Zip: 45005
 - Phone: (937) 746-4427
 - E-Mail: support@femto-tech.com
 - License: 12345678910
- Buttons:** 'Cancel' (red) and 'Save' (blue) at the bottom of the form.
- Company Logo Section:**
 - Image of the femto-TECH, INC. logo.
 - Text: 'Logo may appear larger on screen than on report.'
 - Button: 'Select Logo' (green).
- Company Signature Section:**
 - Image of a handwritten signature.
 - Text: 'Signature may appear larger on screen than on report.'
 - Buttons: 'Create Signature' (orange) and 'Select Signature' (blue).
- Footer:** © 2021 femto-TECH, INC.

Getting Started (continued)

- ◆ Next, click the 'Technician Information' tab to edit/save technician information

femto-TECH Rad-Lab

RAD-LAB

Dashboard Devices Report Management Company Information Technician Information

femto-TECH Rad-Lab V: 1.1.2

Connect To Device Manage Reports

RECENT ACTIVITY
Recently downloaded tests and their generated reports can be found below.

Unit Serial #	Length (H)	Manage
LP00005885	77	

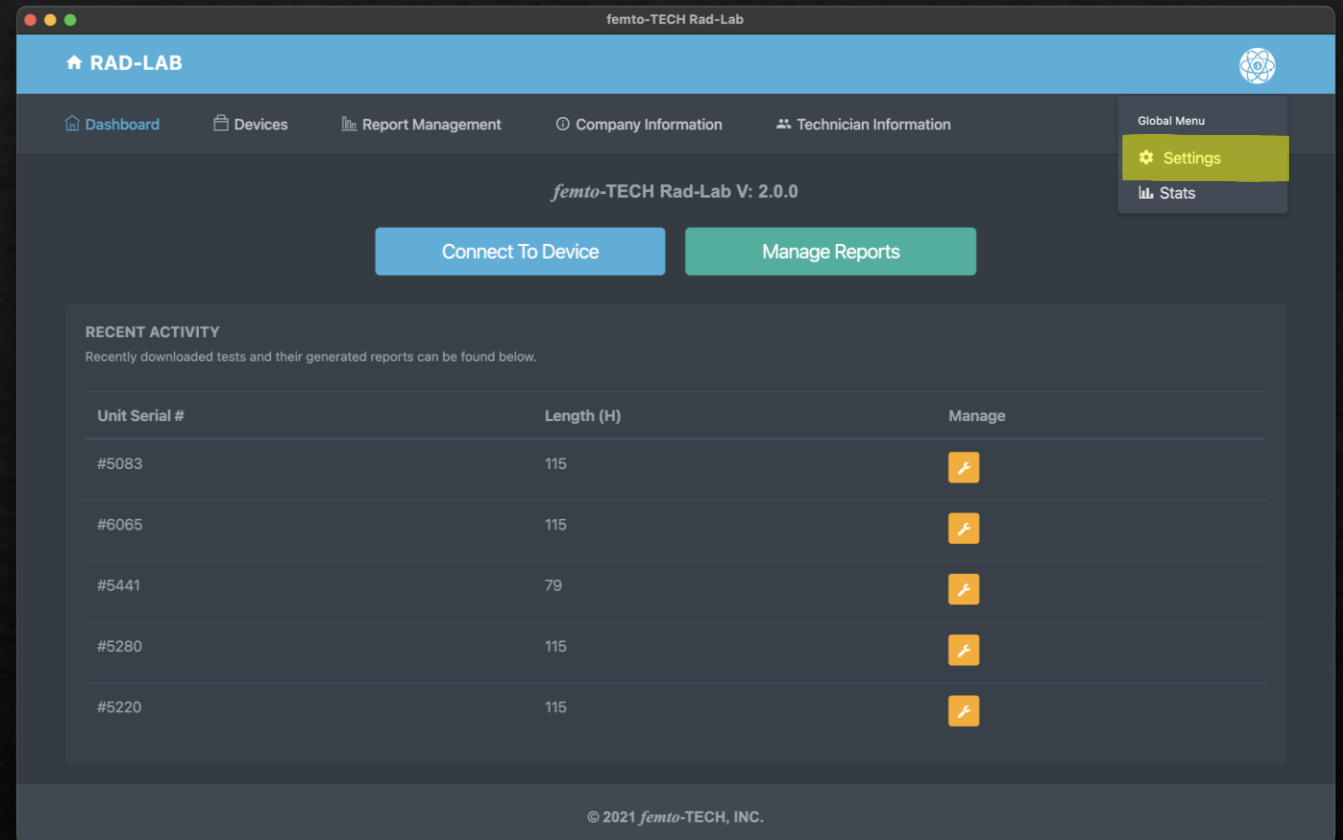
Technician Information

- ◆ 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.

The screenshot shows a web browser window titled "femto-TECH Rad-Lab". The browser's address bar shows "RAD-LAB". The page has a navigation menu with "Dashboard", "Devices", "Report Management", and "Company Information". The main content area is titled "Technician Information" and includes a sub-header "Rad-Lab / Technician Information". Below the sub-header is a note: "This information will automatically be used whenever a new test is downloaded." The form contains two sections: "Placed By" and "Retrieved By". Each section has a text input field for the name (both containing "Bill Nye") and a text input field for the ID (both containing "54321"). At the bottom of the form are two buttons: "Cancel" (red) and "Save" (blue). The footer of the page reads "© 2021 femto-TECH, INC."

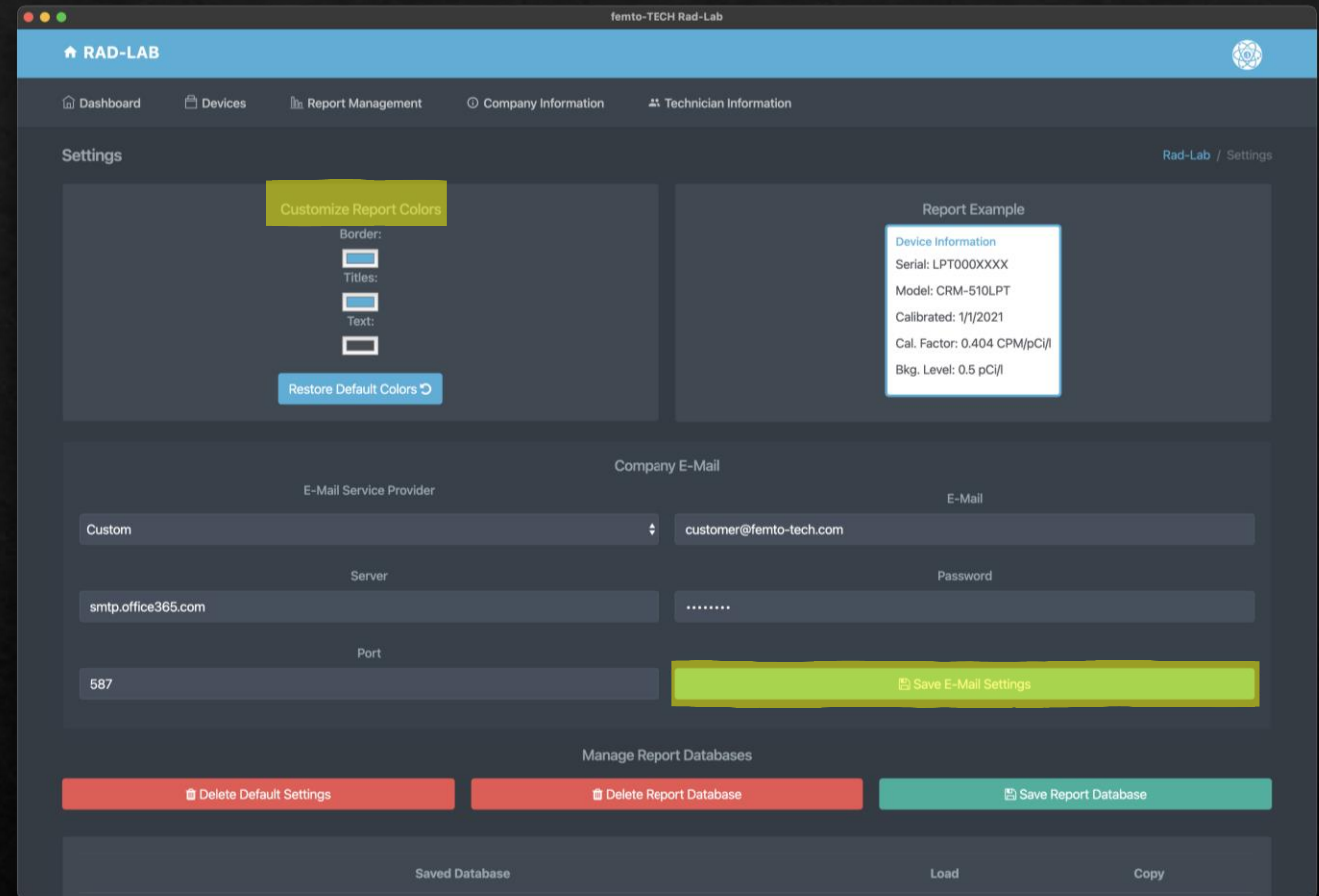
Getting Started (continued)

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



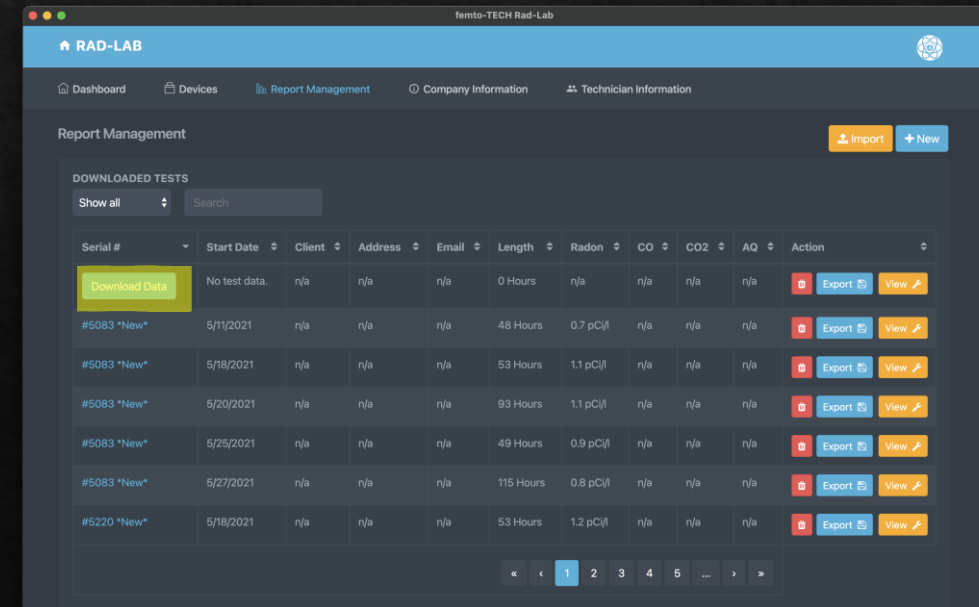
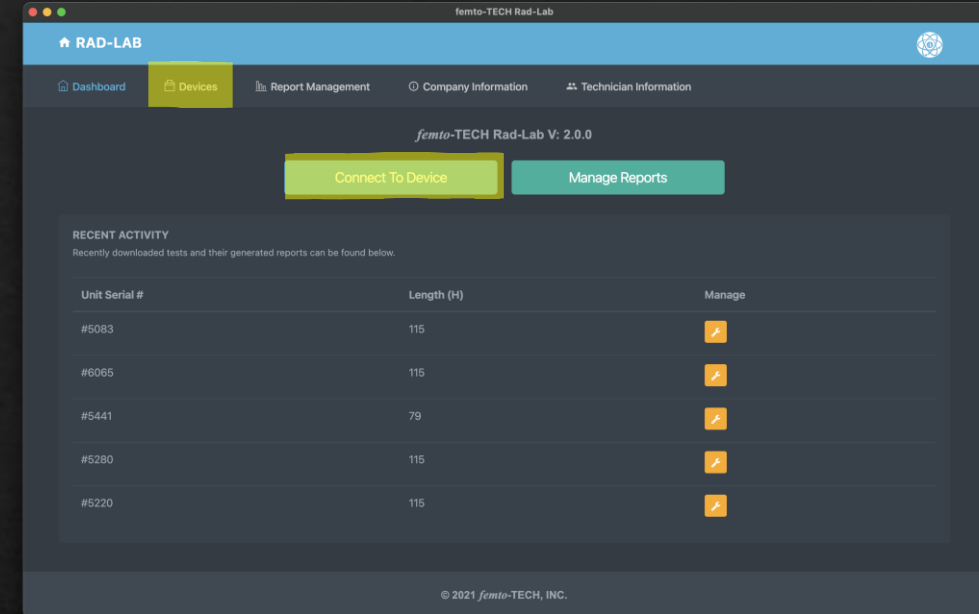
Customize Reports

- ◆ 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.



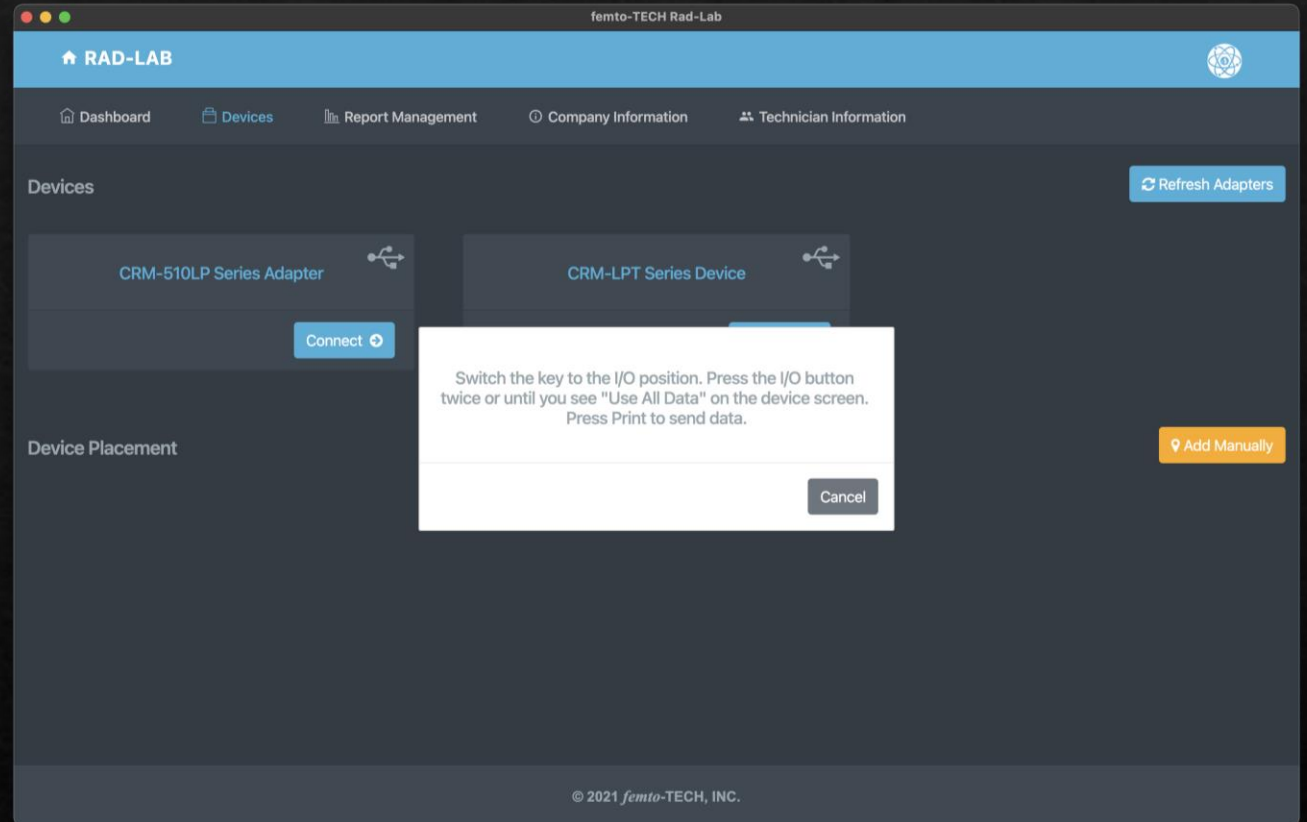
Download Data

- ❖ 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-510LP into the computer using the provided download cable and then click 'Refresh Adapters'.
- ◆ Click 'Connect ->' on the adapter displayed on the screen and then follow the on-screen instructions 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)

- ❖ Plug the CRM-510LP into the mobile device using the provided download cable & OTG adapter and then click the 'Wired' button.
- ❖ Follow the on-screen instructions to download the data. Once the data has downloaded, a 'Download Complete!' message will appear and then take you to the 'Report Setup' screen.

Home icon, Menu icon, Globe icon

Devices

Bluetooth Wired

Device Tracker

Back

Device Serial #:

ENTER DEVICES'S SERIAL # HERE.

Address/Technician:

Enter address or technician here.

Add

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.

The screenshot displays the 'Report Management' interface for 'femto-TECH Rad-Lab'. The page features a navigation menu with 'Dashboard', 'Devices', 'Report Management', 'Company Information', and 'Technician Information'. The 'Report Management' section includes an 'Import' button and a '+ New' button. Below this is a 'DOWNLOADED TESTS' section with a search bar and a 'Show all' dropdown. The main content is a table with the following data:

Serial #	Start Date	Client	Address	Email	Length	Radon	CO	CO2	AQ	Action
Download Data	No test data.	n/a	n/a	n/a	0 Hours	n/a	n/a	n/a	n/a	Delete Export View
#5083 *New*	5/11/2021	n/a	n/a	n/a	48 Hours	0.7 pCi/l	n/a	n/a	n/a	Delete Export View
#5083 *New*	5/18/2021	n/a	n/a	n/a	53 Hours	1.1 pCi/l	n/a	n/a	n/a	Delete Export View
#5083 *New*	5/20/2021	n/a	n/a	n/a	93 Hours	1.1 pCi/l	n/a	n/a	n/a	Delete Export View
#5083 *New*	5/25/2021	n/a	n/a	n/a	49 Hours	0.9 pCi/l	n/a	n/a	n/a	Delete Export View
#5083 *New*	5/27/2021	n/a	n/a	n/a	115 Hours	0.8 pCi/l	n/a	n/a	n/a	Delete Export View
#5220 *New*	5/18/2021	n/a	n/a	n/a	53 Hours	1.2 pCi/l	n/a	n/a	n/a	Delete Export View

At the bottom of the table, there is a pagination control showing page 1 of 5, with buttons for navigation and a search bar.

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.

The screenshot displays the 'femto-TECH Rad-Lab' interface. At the top, there is a navigation bar with 'RAD-LAB' and a home icon, and a secondary navigation bar with 'Dashboard', 'Devices', 'Report Management', and 'Company Information'. The main content area is titled 'Report Setup' and features a yellow bar with buttons for 'Get Weather', 'Options', and 'Save'. Below this is a tabbed interface with 'Radon', 'Temperature', 'Humidity', and 'Barometric Pressure' tabs. A line graph shows Radon (pCi/l) levels over time from Tuesday, May 11, 11:37 AM to Thursday, May 13, 10:37 AM. The y-axis ranges from 0.0 to 6.3. The graph shows fluctuations between approximately 0.5 and 1.5 pCi/l. Below the graph is a 'FINAL RESULTS' section with a green message: 'Radon is below EPA action level.' This is followed by a table of test results:

Avg. Radon:	0.7 pCi/l
Avg. CO:	n/a
Avg. CO2:	n/a
Avg. Air Quality:	n/a
Start Time:	5/11/2021 10:37:00 AM
Stop Time:	5/13/2021 10:37:00 AM
Test Length:	48 Hour(s)
Total Counts:	1272 Counts

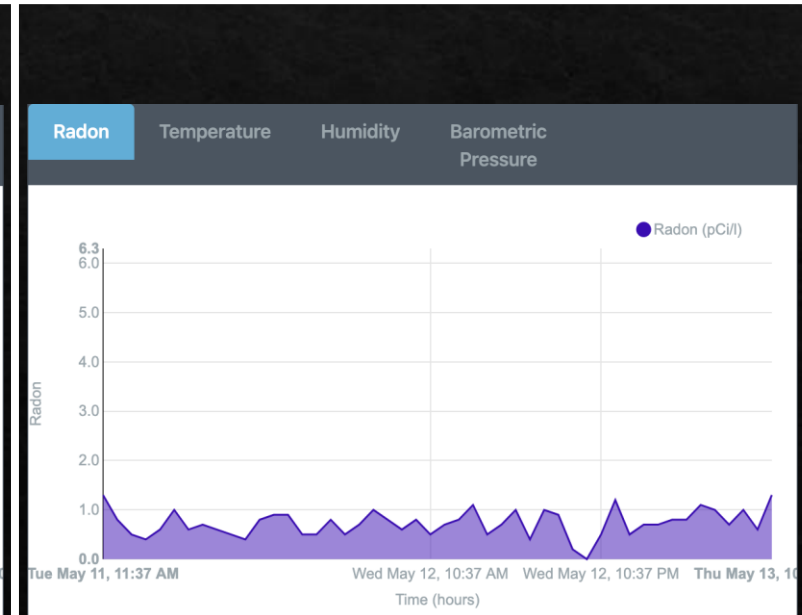
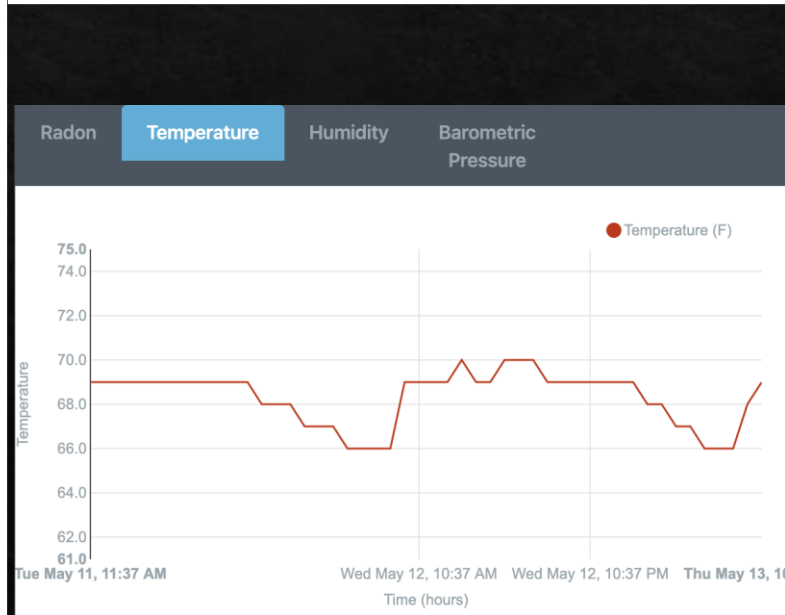
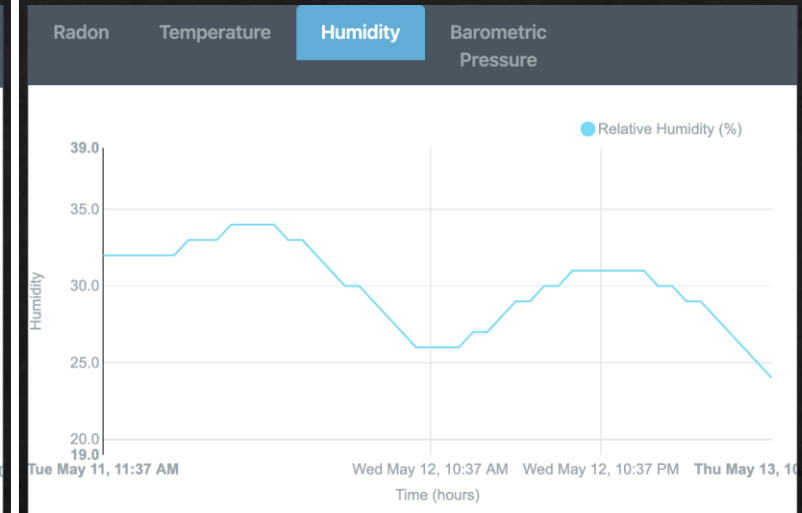
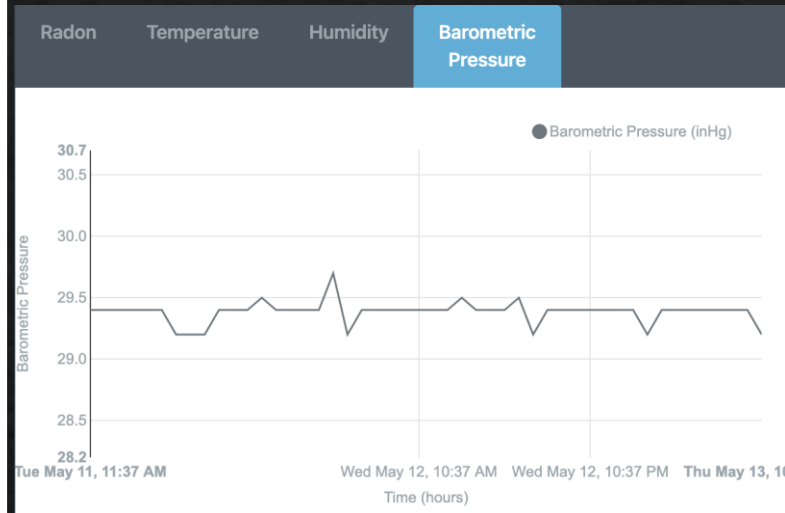
To the right of the graph is a table of report options:

Quick Report:	Cover page with final averages and test information. No other data included.	Print, Email
Full Report:	Cover page with final radon average and all other information gathered for report.	Print, Email
CSV Report:	Hourly data and final averages in comma separated value format for use in custom reports/analysis.	Print, Email

At the bottom right, there is a 'Client Info' section with tabs for 'Client Info', 'Test Info', 'Images', and 'Settings'. It contains form fields for 'Client Name/Contact', 'Address', 'City', 'County', and 'State'.

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 contiguous hours are required per the EPA for protocol testing.
- ◆ Click the 'Options' button again to hide the menu and simultaneously save your changes.

The screenshot shows the 'Report Setup' interface for 'femto-TECH Rad-Lab'. The top navigation bar includes 'RAD-LAB' and a home icon. Below it are menu items: 'Dashboard', 'Devices', 'Report Management', and 'Company Information'. The main content area is titled 'Report Setup' and features several interactive elements:

- A 'Get Weather' button with a cloud icon.
- An 'Options' button with a dropdown arrow, highlighted in yellow.
- A 'Save' button.
- A 'Select Test Type' section with a yellow highlight, containing radio buttons for: Standard Protocol (selected), Spike, Initial, Follow Up, Post-Mitigation, Duplicate, Cross-Check, and Facility.
- Four toggle sections: 'There is currently no weather data to manage.' (disabled), 'Show Company Signature on Report' (Yes selected), 'Show Client Signature on Report' (Yes selected), and 'Report Page Size' (US selected, EU unselected).
- A 'Units' section with radio buttons for: pCi/l (selected), Bq/m³, °F (selected), °C, inHG (selected), and kPa.
- A 'Test Hour Range' section with a slider from 1 to 48 hours, currently set to 48 hours. A red box highlights the '48' mark.
- A 'Send To Support' button with the text 'Send your test data to femto-TECH. *for support purposes only.' below it.

At the bottom, the footer reads '© 2021 femto-TECH, INC.'.

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.

The screenshot shows the RAD-LAB interface with the 'Hourly Readout' table. The table contains the following data:

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.
- ◆ You can also add the calibration date of your CRM-510LP to the report. Once the date is selected, the software will remember that calibration date for that serial # until you change it again.

FINAL RESULTS

Radon is below EPA action level.

Avg. Radon:	0.7 pCi/l
Avg. CO:	n/a
Avg. CO2:	n/a
Avg. Air Quality:	n/a
Start Time:	5/11/2021 10:37:00 AM
Stop Time:	5/13/2021 10:37:00 AM
Test Length:	48 Hour(s)
Total Counts:	1272 Counts

DEVICE INFORMATION

Serial:	LP00005083
Model:	CRM-510LP
Calibrated:	mm/dd/yyyy
Cal. Factor:	0.392 CPM/pCi/l
Bkg. Level:	0.4 pCi/l

[View Readout](#)

Client Info

Test Info Images Settings

Client Name/Contact

Address

City

County

State

Zip

Phone

E-Mail

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.

FINAL RESULTS

Radon is below EPA action level.

Avg. Radon:	0.7 pCi/l
Avg. CO:	n/a
Avg. CO2:	n/a
Avg. Air Quality:	n/a
Start Time:	5/11/2021 10:37:00 AM
Stop Time:	5/13/2021 10:37:00 AM
Test Length:	48 Hour(s)
Total Counts:	1272 Counts

DEVICE INFORMATION

Serial:	LP00005083
Model:	CRM-510LP
Calibrated:	<input type="text" value="mm/dd/yyyy"/>
Cal. Factor:	0.392 CPM/pCi/l
Bkg. Level:	0.4 pCi/l

[View Readout](#)

Client Info **Test Info** Images Settings

Same as client

Address

City

County

State

Zip

Room Type/Placement

Floor

Mitigation/Ventilation

Dwelling/Building Type

Year Built

Weather Conditions

Notes (Max 450 characters)

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.

FINAL RESULTS

Radon is below EPA action level.

Avg. Radon:	0.7 pCi/l
Avg. CO:	n/a
Avg. CO2:	n/a
Avg. Air Quality:	n/a
Start Time:	5/11/2021 10:37:00 AM
Stop Time:	5/13/2021 10:37:00 AM
Test Length:	48 Hour(s)
Total Counts:	1272 Counts

Client Info Test Info **Images** Settings

Add images to your report below.
Don't forget to save if adding descriptions.

[Add Image !\[\]\(43e165fd0a30e03a39afb86038cd3ee5_img.jpg\)](#)

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.

FINAL RESULTS

Radon is below EPA action level.

Avg. Radon:	0.7 pCi/l
Avg. CO:	n/a
Avg. CO2:	n/a
Avg. Air Quality:	n/a
Start Time:	5/11/2021 10:37:00 AM
Stop Time:	5/13/2021 10:37:00 AM
Test Length:	48 Hour(s)
Total Counts:	1272 Counts

DEVICE INFORMATION


Serial:	LP00005083
Model:	CRM-510LP
Calibrated:	<input type="text" value="mm/dd/yyyy"/>
Cal. Factor:	0.392 CPM/pCi/l
Bkg. Level:	0.4 pCi/l

[View Readout](#)

Client Info Test Info Images **Settings**

COMPANY LOGO

Logo may appear larger on screen than on report.



[Select Logo](#)

[Company Signature](#)

[Client Signature](#)

TECHNICIAN INFORMATION

Placed By

[Bill Nye](#)

ID

[54321](#)

Retrieved By

[Bill Nye](#)

ID

[54321](#)

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.

The screenshot shows the 'Report Setup' interface. At the top, there are navigation buttons: a back arrow, 'Get Weather' with a cloud icon, 'Options' with a dropdown arrow, and 'Save'. Below this is a tabbed menu with 'Radon' selected, and other tabs for 'Temperature', 'Humidity', and 'Barometric Pressure'. The main area features a line graph of Radon concentration (pCi/l) over time. The y-axis ranges from 0.0 to 6.3 pCi/l. The x-axis shows dates from Tuesday, May 11, 11:37 AM to Thursday, May 13, 10:37 AM. The graph shows a fluctuating purple line representing radon levels. To the right of the graph is a table of report options:

Report Type	Description	Share/Print Icons
Quick Report	Cover page with final averages and test information. No other data included.	Share, Print, Email
Full Report	Cover page with final radon average and all other information gathered for report.	Share, Print, Email
CSV Report	Hourly data and final averages in comma separated value format for use in custom reports/analysis.	Share, Print, Email

The screenshot shows the 'Refresh Thermal Printers' interface. At the top, there is a 'Refresh Thermal Printers' button with a circular arrow icon. Below this is a list of printers with their IDs and 'Print Test' buttons:

Printer ID	Action
STAR L200-00293	Print Test
TM-P20_018125	Print Test

At the bottom, there is a copyright notice: © 2020 femto-TECH, INC.

Print via Bluetooth Thermal Printer - First, make sure the thermal printer is turned on and already paired to your device. Once that step is complete, click 'Refresh Thermal Printers' to populate the list with connected printers. Once on the list, click 'Print Test' to send the test data to the printer.

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.

The screenshot displays the 'Report Setup' interface. At the top, there are navigation buttons: a back arrow, 'Get Weather' with a cloud icon, 'Options' with a dropdown arrow, and 'Save'. Below this is a tabbed menu with 'Radon' selected, and other tabs for 'Temperature', 'Humidity', and 'Barometric Pressure'. The main area features a line graph of Radon (pCi/l) over time. The y-axis ranges from 0.0 to 6.3 pCi/l. The x-axis shows time from Tuesday, May 11, 11:37 AM to Thursday, May 13, 10:37 AM. The graph shows a purple area representing radon levels, which fluctuate between approximately 0.5 and 1.5 pCi/l. To the right of the graph is a table with three report options, each with a print icon and a mail icon.

Report Type	Description	Actions
Quick Report:	Cover page with final averages and test information. No other data included.	Print, Email
Full Report:	Cover page with final radon average and all other information gathered for report.	Print, Email
CSV Report:	Hourly data and final averages in comma separated value format for use in custom reports/analysis.	Print, Email

Tamper Detection

- ◇ Each CRM-510LP is equipped with a tilt sensor that logs movement within the hour of detection (logs to graph and hourly readout).
- ◇ Along with the tilt sensor, the 510LP 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.



Influence of Environmental Factors

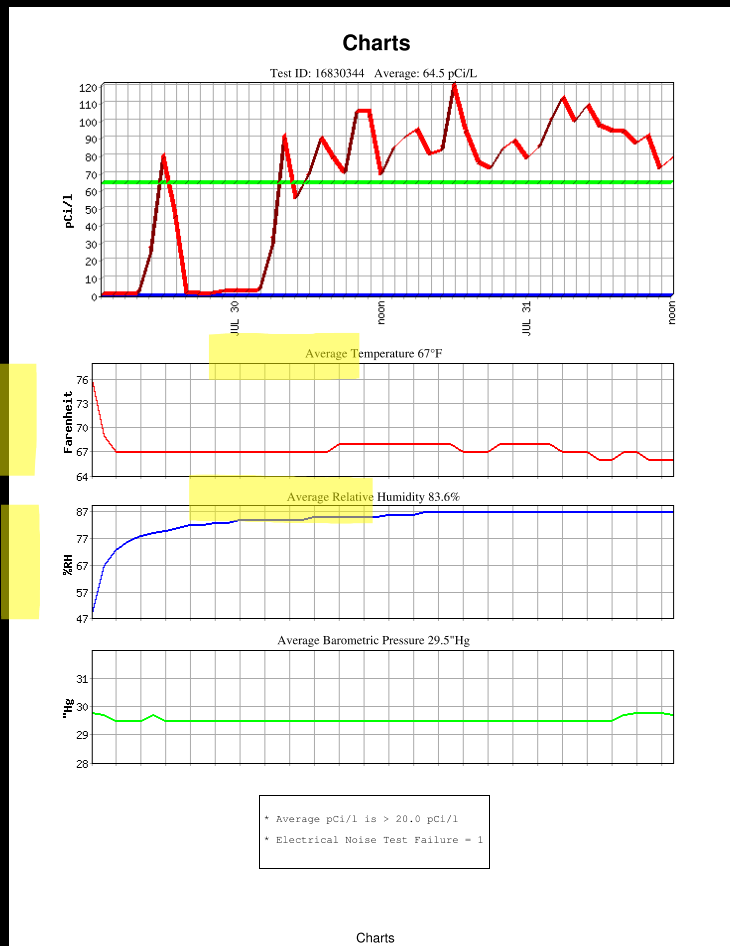
- ◆ The CRM-510LP by design is resilient to most environmental influences that might influence the measurement of radon.
- ◆ The most concerning environmental influencer is condensing humidity. Condensing humidity is when water collects on the surfaces of anything that has a certain temperature relative to the surrounding area temperature in a high humidity environment.
- ◆ This can occur in basements with temperatures lower and humidity higher than normal livable conditions, or if the CRM was brought into a high humidity/low temperature environment after directly being outside in the dry/hot weather.
- ◆ If water is to condense on the internal circuitry of the CRM, there is a chance that the electronics will be compromised, and the radon readings could suddenly show as 0.0 or spike to above-average levels.
- ◆ Avoid starting a test in a cold and wet basement directly after taking the CRM out of your hot vehicle.



Data Interference

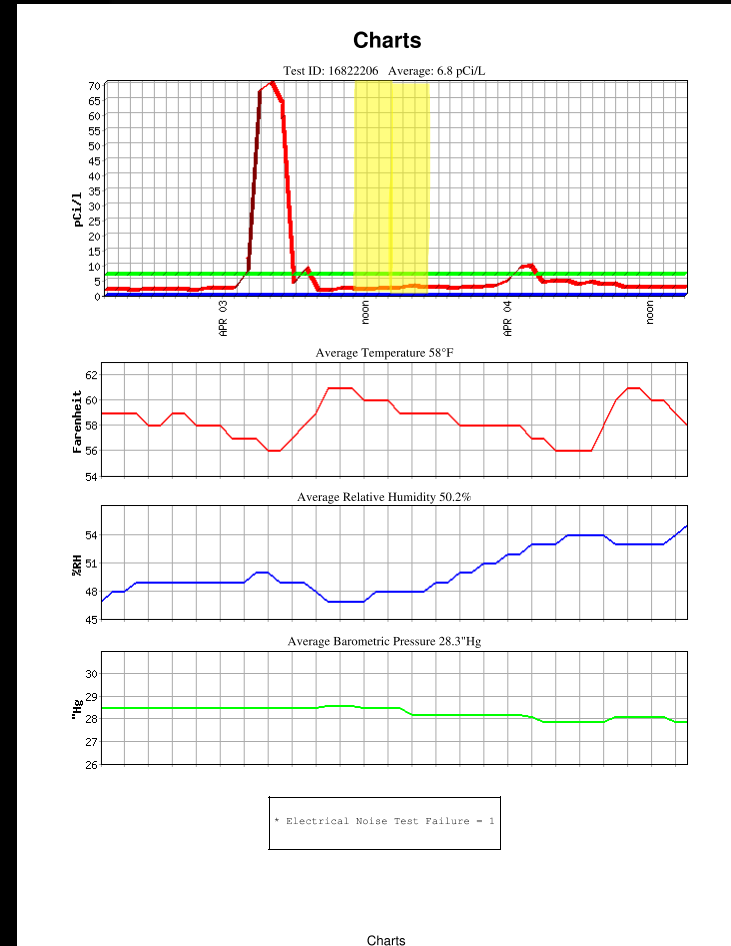
Condensing Humidity

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-510LP 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.



Device Handling & Storage

- ◆ Femto-TECH devices are commonly known as industry “work horses”. They are designed to be rugged and hold up to the rigors of day-to-day inspections.
- ◆ It is recommended to store your CRM-510LP in a drop and weather resistant case to prolong its lifespan and keep it safe while moving from location to location. To prevent theft, it is not recommended to leave your devices unattended in any vehicles.
- ◆ Our devices are known to last for decades due to the quality of materials used and the limited-lifetime warranty we apply to their electronics.





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FEMTO LABORATORIES

Congratulations on the purchase/rental of your femto-TECH CRM!