

# **CT007R Radon Sniffer User's Manual**

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# 1 Introduction

The CT007R Radon Sniffer is ideal for locating radon entry points in real-time or for quickly verifying a successful remediation. It responds to the presence of radon in 15 seconds and quantifies the radon concentration more accurately in 5 minutes.

The CT007R can be used alone or in conjunction with the *Radon Sniffer* app, available on the Google Play Store.

## 2 Controls



Figure 2.1 CT007R front face plate

An overview of the front face plate controls is given in Figure 2.1. The CT007R Radon Sniffer controls include:

1. ON/OFF power switch.
2. Toggle Button: Switches views of radon concentration averages over different time periods during normal operation (short, long, total). Press for more than two seconds to enter or exit sleep mode.
3. OLED Screen: Displays user information.
4. Indicator Light: Illuminates when there is radon detected in the last 200ms.

### 3 Accessories



Figure 3.1 CT007R Radon Sniffer Kit Accessories

**CT007R:** Contains Lucas cell, SiPMs, air pump, controls, internal battery, USB charger connector, and air intake.

**Inlet Filter:** Cylindrical tubes contain the desiccant material and filter. The filter is used to remove radon progeny from the air. The desiccant is used to remove moisture from the air.

**Air Hoses:** Air hoses are used to connect the filter and desiccant to the air intake of the CT007R. The black curly hose must always be connected to the CT007R to prevent light from entering and causing spurious counts.

**CT007R Charger:** The charger is used to recharge the internal batteries.

## 4 Basic Operation

**⚠ Important: The black curly hose must always be connected to the CT007R to prevent light from entering and causing spurious counts.**

Basic operation of the CT007R is outlined in the following steps.

1. Power unit on by toggling ON/OFF switch to “ON” position.

In a few seconds, the indicator light will illuminate for one second and the display will show “CT007R Radon Sniffer” for two seconds.

2. The radon sniffer detector is now operating!

The unit will now automatically start radon activity concentration detection. The display will show the radon activity concentration as a calculated average over 15 second intervals, for each second, in Bq/m<sup>3</sup> or pCi/L units. This is referred to as the “SHORT” averages.



Press the “Toggle” button once to see a calculated average over 5 minutes intervals, for each consecutive 15 seconds, in Bq/m<sup>3</sup> or pCi/L units. This is referred to as the “LONG” average.

Note: The Sniffer must be running for more than 5 minutes for the 5-minute average to be accurate.

**!** Turn the CT007R on in a low radon area at the start of the day. Leave it running for the remainder of the day. (Turning it off and on confuses the “smart” algorithm, if you have sampled high radon concentrations.) Let the unit run in a low radon area for at least 5 minutes at the end of the day to flush out radon.



Suggestion: Use the “Short” reading in high radon concentration environments and “Long” reading in low radon concentrations.

Press the “Toggle” button again to see a calculated average since the start of unit operation, for each consecutive 15 seconds, in Bq/m<sup>3</sup> or pCi/L. This is referred to as the “TOTAL” average.



Press the “Toggle” button for a third time to turn off the display. Press “Toggle” once more after this to turn the display on once again and show the “Short” reading.

The display will cycle through “Short”, “Long”, “Total”, and finally display off screens, on continued button presses.

Note: CT007R units can show only one measurement unit, in either Bq/m<sup>3</sup> or pCi/L. The user can decide which unit they want to use when they place their order. CT007R measurement units can be changed from the Radon Sniffer App. Open the settings and select “Detector Unit”, then choose either Bq/m<sup>3</sup> or pCi/L. The selected unit is then written to the detector, and will become its default unit. The writing process may take a few minutes. Users can always see readings in both Bq/m<sup>3</sup> and pCi/L through the *Radon Sniffer* App. Changing the units by using the radio buttons on the main app UI will only affect the app, and will not change the units on the detectors.



# 5 App Usage

The CT007R *Radon Sniffer* app can be used to:

- Monitor real-time readings from smartphones
- Switch measurement modes between Smart mode and Standard mode, or between displays units
- Switch to Timer mode, which can collect detected radon counts in a user defined period
- Change settings, such as the conversion factor, enabling background running, or enabling data logging
- Email the logged data

Install the “Radon Sniffer” app from the Google Play Store.



Figure 5.1 App Icon



Figure 5.2 Detector Scan

Click the *Radon Sniffer* app icon, as seen in Figure 5.1. It will direct the user to the “Detector Scan” screen, seen in Figure 5.2. All nearby Bluetooth Low Energy devices will be listed. Choose the one called “C-R-##”, where ## is the unit number for the detector.

During connection, your unit’s firmware will be checked to see if an update is required. If so, this process will be done automatically, and will take several minutes. After a successful connection, a screen like Figure 5.3 will show up. This is the default screen. It displays the radon concentration averages in 15-second, 5-minute and overall time intervals. The “Raw Radon Counts” are the detected radon particles in each second. All readings from the app are independent of the readings from the detector. Readings from the app are calculated based on the raw radon counts sent from the unit after the connection is

establish. Therefore, readings on the app may not be the same as readings on the unit, but should be similar.

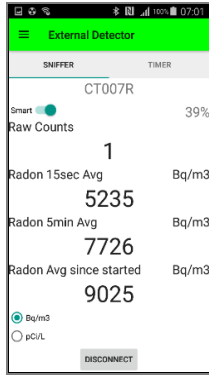


Figure 5.3 App Sniffer Default Screen “Smart” mode

There is a switch to enable or disable “Smart” Radon concentration calculations. “Smart” calculation is the default reading display, and it refers to the calculation accounting for current raw radon counts and radon progeny for the previous 15 seconds to generate the new radon activity concentration averages. Therefore, “Smart” readings relate to the previous radon levels.

**Note: The radon calculations on the unit are “Smart” calculations.**

If “Smart” calculation is disabled, the common radon level calculation will execute. The “Standard” mode calculation directly converts the received raw radon counts for each 15

seconds into radon activity concentration averages. So, each new reading is independent of the previous readings.

The “Standard” mode is what other scintillation cell based radon measuring instruments use. It tends to under-estimate the radon concentration at the beginning of the sampling sequence and over-estimate at the end, once radon progeny has accumulated in the cell.

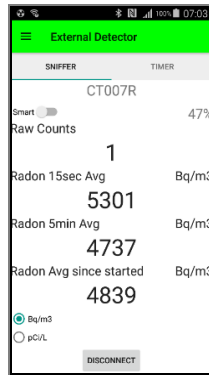


Figure 5.4 App Sniffer “Standard” mode in Bq/m3

By default, all radon activity concentration averages are displayed in Bq/m3. Users can switch to pCi/L display by clicking the radio button at the left down corner of the screen.

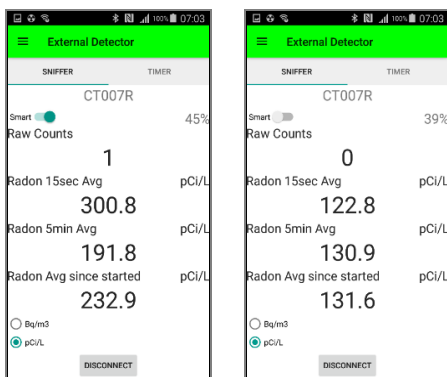


Figure 5.5 “Smart” (left) and “Standard” (right) modes in pCi/L

Swipe the screen to the left to get to the Timer mode screen. This can measure the total raw radon counts in a specified period. “Counts/sec” is the raw radon counts coming in from the connected CT007R unit for each second, and is always updating, even if the timer is not started. Before using the timer, enter the desired counting time by typing the time in “hh:mm:ss” format. If no time is entered, the timer will run for 5 minutes by default. Click the “START” button to begin the timer mode run. This will accumulate all raw radon counts received from the unit to the “Total Counts” for the specified period. When the time is up, “Total Counts” will continue to show the accumulated counts until the timer is started again.

Timer mode is independent of sniffer mode, and they can run simultaneously.

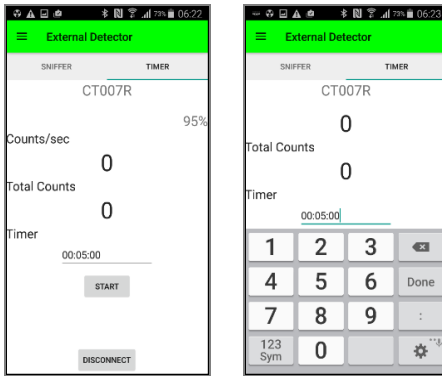


Figure 5.6 Timer default screen (left) and time entering (right)

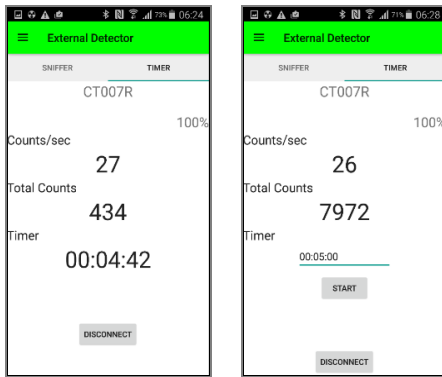


Figure 5.7 Timer running screen (left) and finished (right)

## 6 Battery Charging

The CT007R contains rechargeable batteries which are located inside the unit. These batteries should not need to be changed during normal operation. Fully charged batteries should provide around 19 hours of operating time. If the battery is low, the display will have an extra “!!” sign before the battery percentage. Once the battery gets too low, the unit will automatically shut down.

Once the battery is low or depleted, it will need to be charged for 16 hours in “Sleep” mode to restore full charge. To charge the battery, plug the supplied charger into the USB connector on the unit.



**Important: The power switch must in the ON position for charging!**

There is no charging indicator when the CT007 is running. However, in “Sleep” mode, the CT007R charges faster and indicates charging states on the LED light. Charging (Sleep) mode helps with fast charging. The unit may be operated while the batteries are charging, but the charging process will take longer.

Press the “Toggle” button for more than two seconds to enter “Sleep” mode. In sleep mode, the display will be blank, and there will be no radon counting. While charging in sleep mode,

the LED light will blink. Once the battery is fully charged, the LED light will remain on.



# 7 Other Useful Information

In the menu bar on the left top corner of the *Radon Sniffer* app, there are “External Detector”, “Settings”, “Email Logged Data”, and “Close App” options as in Figure 7.1.

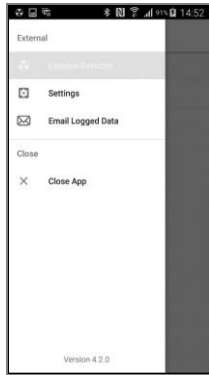


Figure 7.1 Menu bar

Clicking “External Detector” will lead you to the measurement display screen.

In the “Settings” menu, a window will pop up asking you to enter the password to access secure settings, such as the conversion factor and changing the password. The default password is “1234”.

Some settings options are introduced in detail below.

## 7.1 Data Logging

By checking “Data Logging” in settings, the next available measurement data will be written into a CSV file, “dataLog-CT007R.csv” in a folder called “Radon Sniffer” in local storage. The data will be logged each “Logging Interval”.

The data in the CSV file includes the date and time, conversion factor, SHORT, LONG, and TOTAL readings in both Smart and Standard modes.

## 7.2 Conversion Factor

The default conversion factor is  $340 \text{ Bq/m}^3 / \text{counts/15sec}$ . The conversion factor can be changed on the app, but this change will not be reflected on the detector.

## 7.3 Data Share by Email

Clicking “Email Logged Data” will direct you to an email composition window, where the current data log file has been attached. Once the recipient email address is entered, the email can be sent out.

Note: If you don’t have an email account logged in on your smartphone, it will require you to enter the email account and password.

## 7.4 Demonstration Video

For video demonstrations, please go to:  
[http://www.radonsniffer.com/CT007R\\_videos.htm](http://www.radonsniffer.com/CT007R_videos.htm) .