

About your Instrument / System

The RadEye sPRD-STC (Personal Radiation Detector) is a highly sensitive and rugged measuring device

to detect and localize gamma radiation sources. The RadEye sPRD-STC separates man-made (non-NORM) radiation from natural background fluctuations by using the NBR (Natural Background Rejection) technique.

The RadEye sPRD-STC contains a single CsI (cesium iodide) Scintillator which is equipped with a miniature silicon photomultiplier (SiPM) allowing the detection of very low radiation levels. The RadEye sPRD-STC shows the operator any alarms that are due to gamma or neutron radiation, by flashing alarm LEDs, generating an audible alarm tone and vibration. The alarm type is also clearly shown on the LCD. The RadEye sPRD-STC has different audible alarms discriminating between elevated background/NORM and any artificial isotope alarm. In addition, different types of gamma audible alarms are clearly differentiated. This gives the RadEye sPRD-STC audible and visual identification using NBR of the type of material detected.

The last 1600 alarms, errors, changes, mean and maximum values of gamma count rate and gamma dose rate data points are recorded internally and can be read out via serial interface. A real time clock is provided to add a time stamp to all buffer data. The RadEye sPRD-STC enables measurement of detector pulse rates and energy compensated dose and dose rates.

Rubber Boot

The rubber protection sleeve improves ruggedness to mechanical shocks and is required to maintain operability after 1.5m drops. The rubber boot shall always be kept on the PRD.

CAUTION: Removing the rubber bumper by the top end first can result in the inadvertent removal of the top rubber button cover, and loss of the actuator beneath it.

CAUTION: Take care not to dislodge the rubber earphone jack cover, which is located on the bottom of the unit.

CAUTION: Improper fitting of the rubber bumper can block the speaker and reduce audible noise.

1. Install the bumper by mounting the top first.
2. Place the round end of the bumper over the top of the RadEye sPRD-STC.
3. Fit the bottom of the bumper by pulling the tabs to the back of the unit.
4. Make sure that the bottom of the bumper lines up with the buttonhole.



Inserting the battery

The two AAA alkaline cells as delivered with the instrument allow est. 170 hours of normal operation.

AAA size NiMH rechargeable batteries can be used as well.

- Switch off the measuring instrument and wait about 5s for complete shutdown.
- Remove rubber boot.
- Open the cover of the battery compartment.
- Use of a coin is recommended to open the lid lock.

Have fresh batteries ready. Exchange the batteries according to the shown polarity. Changing the batteries within 20 seconds preserves the date and time without having to resynchronize it with a personal computer (PC).



Close the compartment cover hooks first, taking care that the rubber seal is in its groove. Switch on the unit again.

The instrument continues working in the operating mode set last (see Chapter 3). The measure values in the history memory remain stored. If Real Time Clock (RTC) is set, actual time and date is displayed for 3 seconds.

To keep the RTC running during battery exchange, batteries must be exchanged without delay. History data and measurement parameters are stored permanently, even if batteries are removed. If the battery voltage is below the configured threshold voltage, a "Low Batt" message will display on the basic display. In addition, the sounder generates a chirp sequence every 30 seconds. This acoustic warning can be suppressed by pressing the alarm acknowledge key. The chirp will begin again after 8 hours if the low battery level is still below threshold. Even under a low battery warning, the RadEye PRD can still be operated for several hours. Be sure that the PRD is set to match the type of battery installed in the unit (alkaline vs. NiMH). This option can be found in the settings menu of the PRD. Not matching the correct battery type may cause malfunction of the PRD and excessive loss of battery power.

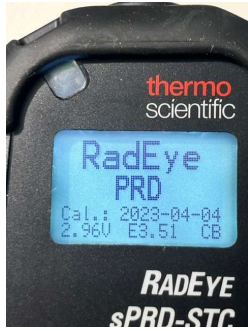


1. Alarm LED lights (orange = Gamma)
2. Top push button (same function as Mute/▶ button “7”)
3. LCD display with backlight
4. Speaker
5. Push button Menu/◀ to access the menu structure
6. Push button Info/▲ for additional information (+ switch mode short cut)
7. Push button Mute/▶ for sound control
8. Power button On/▼ / display screen selection
9. Earphone connector



- 1: Lower part
- 2: Label
- 3: Speaker
- 4: Battery cover
- 5: IR Interface

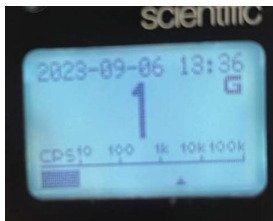
Rad Eye Configuration



To switch on the RadEye PRD button pressed for at least one second. The RadEye may need a longer time for startup if it is started immediately after the batteries are inserted. The sound generator (beeper) and the LED test routine will remain on as long as the key is pressed.

The RadEye PRD starts working with the parameters previously selected (operation mode, calibration factor, alarm threshold, measurement unit, etc.). The following figures show operation of the RadEye in cross mode, i.e. dose rate display and count rate alarm setting.

(Display of the welcome screen)



If the real time clock is set, actual time and date is displayed for 3 seconds. After startup, the message with "Learning" with a progress bar for the first 30 seconds. During this time the sigma-alarm levels of the gamma channel are adapted to the current radiation level. During period, the sigma alarms are active, but not yet with full sensitivity. The NBR-Alarm is immediately active.

The following display after the Learning phase indicates that the RadEye is ready for operation. The factory preset alarm thresholds for the count rate allows sensitive detection measurements without nuisance alarms. The alarm thresholds for the dose are set to the maximum possible values, thus being deactivated. These values are typically set by customers according to their Concept of Operation (CONOP). The standard default partition of memory allows an interval of 120 seconds, which is sufficient to retrieve the last 48 h of operation. The calibration parameters can only be changed in the factory using special software tools.



Rateometer



After switching on the RadEye PRD, the configured basic display is activated. By a short press on the arrow up key (Infor Button) for one or more times, four further display modes can be chosen which are shown for only some seconds. The following Chapters describe the different modes of the basic display.

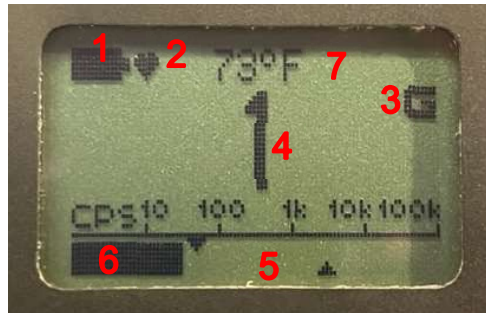
Basic display screens



Number on Display	Dose Rate in $\mu\text{R/hr}$ OR mR/h
0	0...12 $\mu\text{R/h}$
1	12...27 $\mu\text{R/h}$
2	27...62 $\mu\text{R/h}$
3	62...142 $\mu\text{R/h}$
4	142...329 $\mu\text{R/h}$
5	329...760 $\mu\text{R/h}$
6	761 $\mu\text{R/h}$...1.75 mR/h
7	1.75...4.05 mR/h
8	4.05...9.4 mR/h
9	9.4...25 mR/h

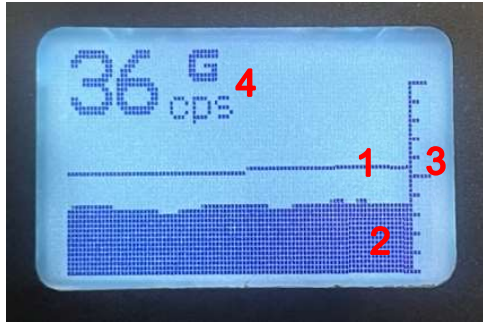
The basic display shows the gamma channel utilizing a scale of 1-9. Normally the **On** key toggles between the ratemeter display with gamma value (above left), and finder mode on a time axis measured in counts per second (above right).

Basic Display: Gamma Measurement Value



1. Battery Indication
2. Heart Beat
3. Gamma Channel
4. Measurement Unit
5. Measurement Thresholds
6. Bar Graph Overview
7. Info Line

Basic Display: Graphical “Finder Mode”



1. Threshold Alarm
2. Gamma Count Rate
3. Linear Scale (auto ranging)
4. Measurement Value

The different display modes can be toggled by pressing the arrow down key.

Please note: *If the backlight of the display is not on, the first pressed key will lead only to an activated display backlight without any other action.*

The battery indication symbol shows the state of the battery. A pulsing heartbeat and auto adjust symbol indicates that the RadEye PRD is working properly. The measurement unit can be chosen by the main menu and may differ from the pictures above.

Please note that the time response of the gamma count rate (measurement unit: cps) is much quicker than the time response of the energy compensated dose rate (measurement units: rem/h, R/h, Sv/h, Gy/h).

During operation of the measuring device at least four alarm thresholds are checked. Two of them are shown in the basic displays with two triangles (upper triangle: alarm 1, lower triangle: alarm 2. Two more refer to the dose and can only be seen in the EDIT ALARMS submenu. The bar graph graphically represents the intensity of the measurement value to simplify the meter-reading.

The info line at the top of the display is used to provide additional information, e.g. the ambient temperature, the NBR-Status, or any kind of malfunction.

Information mode display (in cross mode)

Note: *Some of the following display options may be disabled by the user specific configuration.*

Pressing the up-arrow key...



1st click: Dose Rate **G** (Gamma) screen. Radiation units measured in μR (micro-Roentgens), mR (mili-Roentgens), or R (Roentgens).



2nd click: The accumulated **G** gamma dose and additionally the remaining time until the dose alarm 1 is reached, assuming the current dose rate remains on the current level.



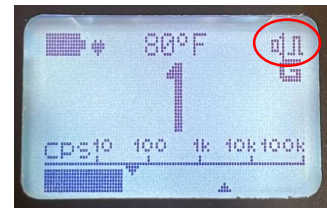
3rd click: The mean value and peak value of the measured gamma count rate (cps), together with the time indicated since the last reset.

Please Note: After 10 seconds in any of the above information mode displays, the device returns to the basic display.

RadEye Operation

Audible single pulse indication

With the single pulse indication active, every pulse of the detector generates a short audible signal emitted by the beeper, similar to a Geiger counter. An audible alarm signal caused by exceeding the alarm threshold 1 is not given while single pulse indication is active. The single pulse indicator is activated and deactivated by pressing the right button (Mute) or button on top of the RadEye twice.



Alarm indication

Each time the first alarm threshold is exceeded, all active alarm indicators (sounder, LED, vibrate, display) are activated. The sound and vibration alarm can be silenced by a short key depression of the right button (Mute) or the button on top of RadEye. However, the LED remains pulsing as long as the alarm threshold is exceeded. The alarm automatically clears once the radiation levels fall below the threshold.



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Detection of gamma sources

To detect hidden gamma sources, the use of the count rate mode or the cross-mode is recommended. In these modes the instrument reacts much more quickly to an increase in the radiation intensity. Next, the operator moves past the object while keeping the distance between the object and the RadEye as small as possible. With an alarm occurring, the operator should move the instrument while observing the display in order to localize the position of the source. Please note that the alarm can occur up to two seconds after passing the nearest distance to the source.

Gamma Background

During operation in count rate mode, the background radiation is always monitored and a smoothed, low pass filtered value is computed. This value, limited to 150 cps, is used for the calculation of Alarm 1 if the sigma alarm is activated. This Alarm 1 replaces any value set in Alarm 1. In addition, while the sigma alarm is triggered, the monitoring of background is suspended. On acknowledgement of an Alarm 1, provided that no artificial radioactivity has been detected (NBR-alarm), the background Ratemeter is readjusted automatically and set to the new count rate and background learning continues. This provides users with the most sensitive detection in all levels of natural background.

NBR (Natural Background Rejection)

NBR uses the ratio between the detected gamma energies to indicate artificial isotopes (shielded and unshielded). The alarm tone and vibration can be acknowledged by a short key depression. The PRD's have been calibrated to minimize alarms created by background radiation created by naturally occurring radioactive material (NORM).

In the case of a natural source or a change in background radiation level, "Natural" will be displayed after approximately 5 seconds. If the PRD alarms with the "Natural" message, no action or investigation is required.



Examples of Screen Displays while Monitoring

Finder Mode: Note that the numerical value reflects CPS (counts per second). Numerical value and graphic representation change in relation to radioactive source proximity. This mode provides instant feedback of the radiation source.



Basic Display – Gamma Value Mode: When the PRD alarms, the initial display will briefly display “ALARM 1”. Once the PRD has determined whether the source origin is either natural or artificial, the display will change to reflect the detected type of radiation source. Also note the numerical value of gamma radiation at the top of the screen based on the 0-9 scale. By pressing the INFO (UP ARROW) button on the PRD, you will see the Dose Rate Screen which displays the amount of radiation in roentgens including micro-roentgens and mili-roentgens (this example shows micro-roentgens). This display may take up to two seconds to reflect the radiation dose effectively. Remember, the only alarms that require action are artificial alarms as described in the operating guidelines.

