

RADIACODE

PORTABLE RADIATION DETECTOR

DOCUMENTATION

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Quick Guide

Radiacode-10X / Radiacode-1XX series — a portable detector and spectrometer of ionizing radiation for real-time assessment of the radiation environment. The device is highly sensitive to gamma and X-ray radiation: it estimates the dose rate, the accumulated dose and the energy spectrum of absorbed radiation, automatically keeps a log of measurement results and events, and warns of radiation hazards.



Applies to devices with firmware 4.11 and later. The developer is constantly improving the firmware — use the latest version of the manual.

Step 1: Unpacking and charging

Unpack the device, check it is intact and complete against the product passport, and check that the passport/warranty card is filled in. Connect the USB Type-C cable to a charger (5 V, 0.5 A or more) or a computer USB port and fully charge the battery — the blue indicator goes out when charging is complete.

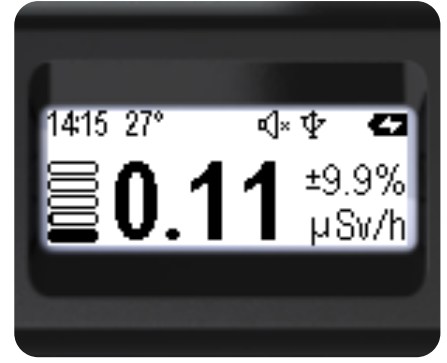
If you brought the package with the device from the cold into a warm room, leave it to warm up for two hours without opening it. Otherwise, moisture may condense inside the device and cause a malfunction.

Step 2: Turning on

Press the round button and hold it for three seconds. The device turns on in Monitor mode and starts estimating the dose rate.



- Press and hold the round button until the device turns on (at least 3 seconds).
- When turned on, the device is in Monitor mode.
- If enabled, the “turning on” sound plays, the device vibrates and the display backlight turns on.



Step 3: Reading the values

The screen shows the current dose rate estimate and, next to it, the estimation error in percent. At sufficient radiation intensity, the statistical error in Monitor mode is kept within 15% for the 2 σ confidence interval.



- At the bottom of the screen: the graphical indicator, the dose rate estimate, the error in % and the units.
- At the top — the status bar: time, radiation sensor temperature, alarms, sound, connection, button lock, battery.

Step 4: Connecting to a smartphone

Install the RadiaCode app: for Android — from Google Play or via the link downloads.radiacode.com/EN/RadiaCode.apk, for iOS — from the App Store via the link apps.apple.com/cy/app/radiacode. All downloads are also available at www.radiacode.com/downloads. Connect the device via Bluetooth for extended features: Google and OSM maps with GPS coordinates, data processing, an external database.

Pairing is done from the app: turn on Bluetooth on the device and select it in the list of devices. No codes are required.

Additionally recommended:

- Set the current time (Settings → Time)
- Select the menu language (Settings → Language)
- Set up the screen: backlight and orientation
- Set up the signals: sound, vibration, light

- Update the device firmware

Safety

Important warnings

Keep the device out of the reach of children and pets.

Do not disassemble the device. Repairs — only at certified service centres.

Operating a faulty device is unsafe. If the device malfunctions, contact a service centre.

Handling rules

Temperature. Protect the device from extreme temperatures (below -20°C or above $+45^{\circ}\text{C}$). Excessively high or low temperatures reduce battery capacity and shorten its life, and may degrade the radiation sensor parameters.

Moisture. Despite the IP64 protection, avoid getting the device wet. Moisture can cause serious damage to the device. Moisture penetration into the device voids the manufacturer's warranty. If water gets on the device, wipe it off with a dry cloth.

Condensation. If you brought the package with the device from the cold into a warm room, leave it to warm up for two hours without opening it. Otherwise, moisture condensation may cause the device to malfunction.

Handling. Do not grip the device tightly; press the buttons lightly. Handle the device with care — the display can be broken or scratched if handled carelessly.

Shocks. External shocks and rough handling can seriously damage the device electronics.

Electromagnetic interference. Avoid exposing the device to strong electromagnetic fields and electrostatic discharges. Electronic and household appliances, cordless phones and routers can interfere with the operation of the device.

Dust. Do not use or store the device in dirty or dusty areas.

Heat. Avoid contact with very hot objects and open flames. The device battery may ignite if overheated.

Charging. Use only USB chargers rated 5 V and at least 0.5 A, or a computer USB port. Do not use defective chargers. Connect the USB cable carefully. Damage caused by improper charging is not covered by the manufacturer's warranty.

Firmware update. Do not disconnect the device from the computer while the firmware is being updated. Interrupting the download may cause a device malfunction that can be fixed only at a service centre.

Radioactive contamination. Avoid contaminating the device with radioactive materials. In potentially contaminated areas, place the device in a sealed bag.

About the device

What Radiacode 100 Series can do

The device is highly sensitive to gamma and X-ray radiation and continuously assesses the radiation environment. All measurements and events are automatically recorded in a log and can be analysed in the standard apps on a smartphone or computer. The device is suitable for work on the ground, with samples of construction materials, and with specially selected and prepared samples of food or soil.

With Radiacode 100 Series you always have:

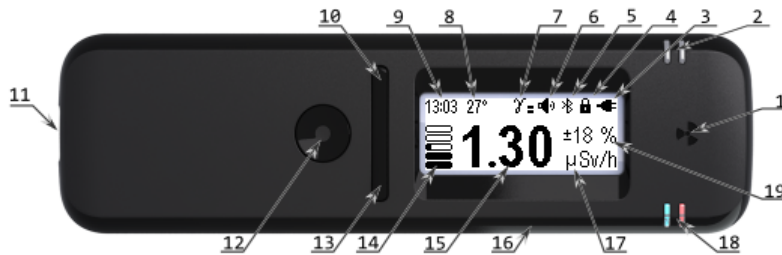
- Site reconnaissance, inspection of objects and materials
- Continuous monitoring of the radiation environment
- Automatic data storage in the device memory; a time-stamped database
- Accumulated dose monitoring
- Quick search for radiation sources
- Two-channel alarm signalling of radiation hazards and changes in the radiation environment
- Standalone operation or paired with a smartphone
- Wireless data transfer; processing in the Windows, Android and iOS apps

Device features:

- Fast response to changes in the radiation environment thanks to a CsI(Tl) scintillator radiation sensor working together with a silicon photomultiplier, and adaptive processing of incoming data
- Continuous assessment of the radiation environment as long as the device is on. Results can be presented at any moment as a dose rate estimate, count rate, accumulated dose, or energy spectrum of absorbed radiation. Assessment and accumulation of data do not depend on the display mode selected
- Splash- and dust-proof — IP64
- Long standalone operation from the built-in battery
- Independent alarm thresholds for count rate, dose rate and accumulated dose; 2 thresholds can be set for each quantity
- Built-in non-volatile memory for about 1000 hours of standalone observations; data transfer to a computer via USB and to a smartphone via Bluetooth; storage of results in an external database
- GPS-tagged results displayed on Google and OSM maps when paired with a smartphone
- Windows program, Android and iOS apps
- Regular firmware and app updates
- Power-efficient graphic display with automatic backlight in the dark; the screen image rotates when the device is rotated
- Sound, light and vibration alarms on the device, duplicated on a smartphone

Design elements

Design elements, controls and indicators of the device:



1. Location of the radiation sensor, digital thermometer and orientation sensor
2. Ambient light sensor for the screen backlight in the dark
3. Built-in battery status: charge level, charging, end of charging (powered from an external source)
4. Control button lock sign
5. External connection: USB, Bluetooth
6. Sound status
7. Presence, source and level of alarm
8. Radiation sensor temperature
9. Current time
10. Swing button "up"; "down" when the display image is flipped
11. USB Type-C connector for charging the device and data exchange
12. Power and confirmation button, round
13. Swing button "down"; "up" when the display image is flipped
14. Graphical representation of dose rate
15. Numerical representation of dose rate
16. Speaker
17. Dose rate units
18. Light indication: charging (blue); photon registration (green — normal, red — alarm threshold exceeded)
19. Dose rate estimation error

Technical specifications

The line-up includes two series of devices with a common design and different parameters:

Parameter	Radiacode-10X	Radiacode-1XX
AEDR estimation range (by Cs-137)	0.01–1000 $\mu\text{Sv/h}$	0.01–400 $\mu\text{Sv/h}$
AED estimation range	0–10 Sv	0–10 Sv
Energy range of registered photon radiation (gamma and X-ray)	0.15–3 MeV	0.15–3 MeV
Dose rate estimation error (in Monitor mode)	$\pm 15\%$	$\pm 15\%$
Display update period	0.5 s	0.5 s
Wired interface	USB Type-C	USB Type-C
Wireless interface	Bluetooth 4.0, BLE	Bluetooth 4.0, BLE
Built-in power source	Li-Pol 3.7 V, 1000 mAh	Li-Pol 3.7 V, 1500 mAh
Non-volatile memory	32 MB	32 MB
Data stored in standalone operation, at least	last 1000 h	last 1000 h
Continuous operation time from a fully charged battery	up to 200 h (RC-102/103/103g)	up to 300 h
Display	Monochrome graphic LCD, 128×48 pixels, 34×13 mm, FSTN, transflective, positive	Monochrome graphic LCD, 128×48 pixels, 34×13 mm, FSTN, transflective, positive

External power source voltage	5 V	5 V
Built-in battery charging current, max	500 mA	750 mA
Full charge time from a fully discharged battery, at least	3 h	3 h
Current consumption when connected to a computer, max	500 mA	800 mA
Ambient air temperature	-10...+45 °C	-10...+45 °C
Relative humidity, max	up to 85%	up to 85%
Splash and dust protection, code	IP64	IP64
Dimensions (W×H×D)	123×34×18 mm	127×34×21 mm
Weight	65 g	85 g

System requirements

The device works with computers and mobile devices that meet the following minimum system requirements:

Computer: Windows XP/7/8/10/11 operating system; at least 2 GB of RAM; graphics card with a resolution of at least 1024×768; at least 1 GB of free hard disk space; 1 USB port.

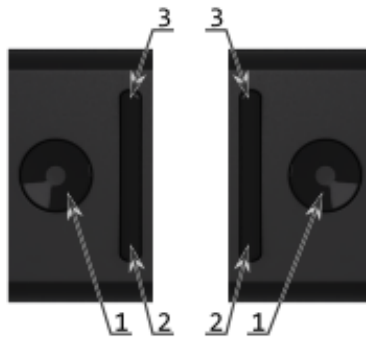
Android: tablets or smartphones running Android 6.0 or later.

iOS/macOS: iPhone and iPad devices running iOS 17.0 or later, or macOS 14.0 or later on a Mac with Apple silicon.

Controls and display

Buttons

The device has an intuitive menu system and is controlled by three buttons. Sound and vibration indication also help in operating the device. Which of the swing buttons is “up” and which is “down” depends on the screen orientation settings.



The device in the left and right hand:

1. Power and confirmation button, round.
2. Swing button “down”.
3. Swing button “up”.

Two types of button press are used: short and long (at least 3 seconds).

Long press on the round button [1]: turn on the device, unlock/lock the swing buttons, confirm viewing of the list of maximum alarm levels, some settings screens.

Short press on the round button: call up the menu, return from the main menu to the display mode, confirm the highlighted menu item, toggle options, turn off alarm signals.

The swing buttons are locked automatically after 5, 10, 15 or 30 seconds of inactivity. At the same time the screen backlight, if it was on, turns off. There are also two additional display backlight intervals — 2 and 5 minutes; in this case the swing buttons are locked after 30 seconds of inactivity. The time until auto-lock and backlight off depends on the settings.

Unlock the swing buttons — long press on the round button [1]. This also turns on the backlight, if enabled in the settings. In “Auto” mode the backlight does not turn on in sufficient light. Lock again — long press on the round button [1].

A short press on the “up/down” swing buttons [2, 3] is used to: move between menu items, set numerical values, and for additional options in different modes.

A long press on the “up/down” swing buttons [2, 3] performs different functions in different contexts. In menus, a long press scrolls quickly through the items. In the display modes, a long press on the “up” swing button turns the sound indication on and off.

The selected menu item at any level is highlighted in negative — light on dark.

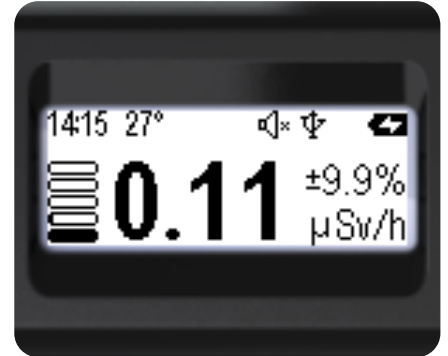
Pressing any button is accompanied by a short sound and vibration, depending on the settings. The sound and vibration accompanying button presses can be turned off.

Turning on and off

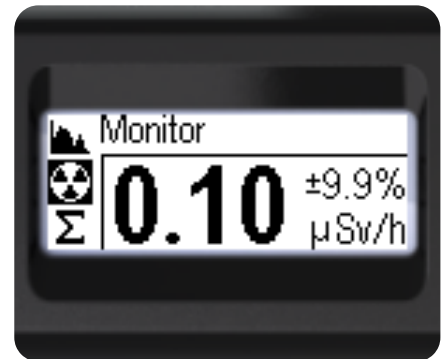
To turn on the device, press the round button and hold it for three seconds. The device can be turned off via the menu.



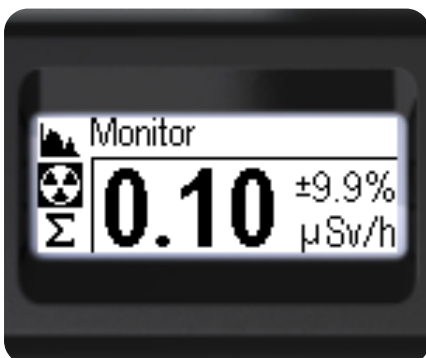
- To turn on, press and hold the round button until the device turns on (at least 3 seconds).
- When turned on, the device is in Monitor mode.
- If enabled, the “turning on” sound plays, the device vibrates and the display backlight turns on.



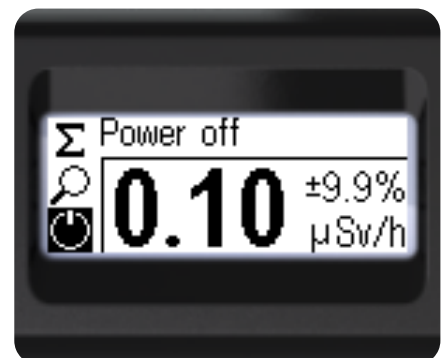
- To turn off, short-press the round button until the menu icons appear.
- The lock icon shows that the swing buttons are locked. To unlock them, press and hold the round button (at least 3 seconds).



Lock icon:  — the swing buttons are locked.



- Move the cursor to the power-off icon with the swing buttons.
- A short press on the round button turns the device off.
- If enabled, the “turning off” sound plays. The screen goes dark.



Power-off icon:  .

Indication: sound, vibration, light

The device has built-in sound and vibration sources to acknowledge button presses and to indicate events and alarms. Light indication is provided for remote monitoring.

Sound can accompany:

- Turning the device on and off
- Pressing a button
- Establishing a Bluetooth connection
- Photon registration
- Exceeding alarm thresholds
- Low battery warning
- Response to the "Find the device" request

Vibration can accompany:

- Turning the device on and off
- Pressing a button
- Exceeding alarm thresholds
- Response to the "Find the device" request

Light indication:

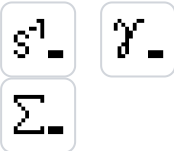
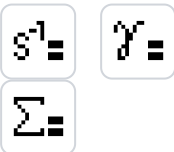
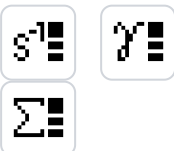
- Battery charging — blue, continuous glow
- Photon registration under normal conditions — green, flash
- Photon registration during an alarm — red, flash
- Exceeding an alarm threshold — screen backlight turns on

Signals can be turned on or off by groups:

- All sounds
- Button sound
- Photon registration sound
- All types of vibration
- Light indication

Summary table of events and signals:

Event / state	Screen	Sound	Vibration	Light
Turning on	–	+	+	–
Turning off	–	+	–	–

Establishing a connection	 	+	–	–
Loss of connection	–	+	–	–
Low battery charge		+	+	–
Charging		–	–	blue — continuous
Find the device	–	+	+	–
Button press	–	+	+	–
Photon registration	–	+	–	green, red — flashes
Alarm 1		+	+	screen backlight
Alarm 2		+	+	screen backlight
Over-range		+	+	screen backlight

Sound, light and vibration complement the information on the display and provide feedback when buttons are pressed.

Display



- Monochrome graphic LCD, 128×48 pixels, 34×13 mm, FSTN, transfective, positive

The screen has a backlight for operation in the dark. In “Auto” mode the device assesses the ambient light itself: the backlight turns on only when a button is pressed and does not turn on in bright light (for example, in the sun). The backlight brightness has ten levels. The screen image orientation can be set for left- or right-handed operation, or automatic rotation can be selected. The turn-on conditions, backlight duration, backlight brightness and image orientation are set via the menu, section “Settings”.

The display is used to show: the device status, the graphical dose rate level, the control menu, the settings menu, Spectrum mode (estimation of absorbed radiation energies), Monitor mode (dose rate estimation), Dose mode (accumulated dose estimation), and Search mode (visual estimation of count rate). The status bar is located at the top of the display; its content depends on the selected display mode. The icons used are described in more detail in the section “Icons and symbols”.

Handle the device with care: the display can be broken or scratched if handled carelessly.

Icons and symbols

Logarithmic indicator

In all display modes except settings, the display shows a logarithmic indicator. Each horizontal bar shows a value (dose rate, dose, count rate) on a logarithmic scale; the ranges of adjacent bars differ by a factor of 10. For example, for dose rate ($\mu\text{Sv/h}$) the ranges look as follows:



Status bar icons

Icons label the fields on the status bar. The battery level icons differ between the series.

Battery level — Radiacode-10X series:

Icon	Description
	At least 60% charge
	At least 30% charge
	At least 10% charge
	Less than 10% charge — charge the battery
	The battery is charging



Charge completed, powered from an external source

Battery level — Radiacode-1XX series:

Icon	Description
	100 to 90% charge, the device is operating standalone
	Less than 90% charge
	Less than 80% charge
	Less than 70% charge
	Less than 60% charge
	Less than 50% charge
	Less than 40% charge
	Less than 30% charge
	Less than 20% charge
	Less than 10% charge — charge the battery

	The battery is charging
	Charge completed, powered from an external source

Note: on Radiacode-1XX series devices, the battery charge percentage is displayed next to the graphical charge level icon.

Common status bar icons (both series):

Icon	Description
	Swing buttons are locked
	USB connection established
	Bluetooth connection established
	All sounds are off
	Sounds are on
	Count Rate Alarm 1
	Count Rate Alarm 2
	Count Rate over-range

	Dose Rate Alarm 1
	Dose Rate Alarm 2
	Dose Rate over-range
	Dose Alarm 1
	Dose Alarm 2
	Dose over-range
	Linear amplitude scale of the photon radiation energy spectrum
	Logarithmic amplitude scale of the photon radiation energy spectrum

Menu item icons

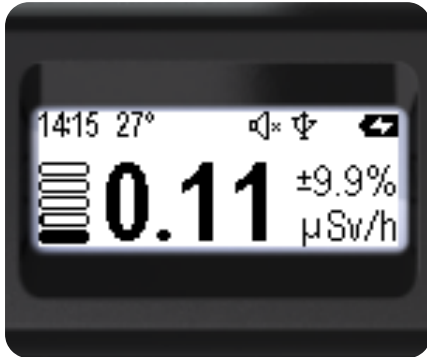
In the menu (short press on the round button) the sections are marked with icons and text.

Icon	Item	Description
	Settings	Device settings menu — go to the submenu
	Spectrum	Display of the photon radiation (gamma and X-ray) energy spectrum — display mode

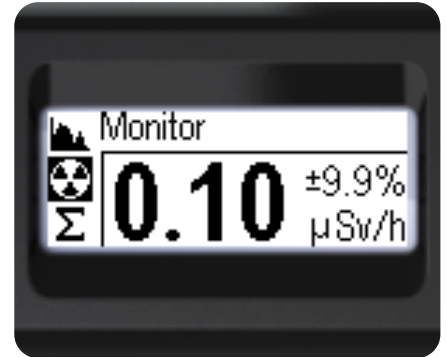
	Monitor	Display of the current dose rate or count rate — display mode
	Dose	Display of the accumulated dose of photon radiation (gamma and X-ray) — display mode
	Search	Search mode — display of the count rate as a graph
	Power off	Turning off the device — action
	Device info	Device serial number and software version

Menu navigation

The menu is opened from any display mode:



- Short-press the round button to go to the menu.
- At the top — the name of the current menu item (here — “Monitor”).
- The main menu item icons are arranged vertically.
- The active item is highlighted with a negative icon.



Seven items are available at the main menu level. Only three options are visible on the device screen at a time; the others become available when the “up/down” swing buttons are pressed again. The menu is cyclic at all levels.

Of the seven items, four [ Spectrum,  Monitor,  Dose,  Search] give access to the radiation environment display modes.

The [ Power off] is an action item: when confirmed with the round button, the device turns off.

The [ Settings] opens the device settings submenu.

The [ Device info] shows the device serial number and the firmware and bootloader versions.

Cyclic order at the main level when pressing “down”:



To select an item — short-press the “up/down” swing buttons; the selected item is highlighted with a negative icon. To confirm — short-press the round button.

The settings level and deeper menu levels can be exited via the [< Back] and [<< Menu quit] items.

Display modes

Modes overview

The device is designed for long standalone use and has a single mode of operation — continuous data collection, accumulation and analysis. At any moment, one of several ways of displaying the radiation environment estimate is available:

-  Spectrum — energy spectrum of photon radiation
-  Monitor — dose rate and count rate estimation
-  Dose — dose estimation
-  Search — operational search

During operation the device also detects the exceeding of all alarm levels, informing the user of a radiation hazard or a change in the radiation situation.

Spectrum

The mode shows the general view of the photon radiation (gamma and X-ray) energy spectrum. On the screen: status bar at the top; the energy spectrum.



Status bar (top, left to right):

log 00:04:55 s⁻¹ 🔊 🔒 🔌 🔋

- Amplitude scale of the photon radiation energy spectrum — linear or logarithmic
- Time since the start of spectrum accumulation: hours, minutes, seconds
- Sign of exceeding thresholds for dose rate, dose, count rate
- Sound status
- Bluetooth or USB connection
- Swing buttons lock sign
- Battery status

Bottom of the screen (left to right): graphical representation of the dose rate estimate; histogram of the energy spectrum.

Marks under the energy scale of the histogram:

- Dots — every 100 keV
- Dashes — every 500 keV
- Arrows — every 1000 keV

Hotkeys:

- Short ▲ — switch the spectrum amplitude scale between linear and logarithmic
- Short ▼ — cycle the energy scale range: 1 MeV → 2 MeV → 3 MeV → 1 MeV ...
- Long ▼ — clear the screen and start a new spectrum accumulation session
- Long ▲ — sound indication on/off

Monitor

The mode shows the dose rate or count rate. When turned on, the device starts in this display mode. All incoming data is accumulated and analysed. If a change in the radiation situation is detected, the device starts a new data accumulation interval. If there are no signs of change, averaging continues and the reliability of the estimate grows. The statistical error in Monitor mode is kept within 15% for the 2σ confidence interval at sufficient radiation intensity.

On the screen: status bar at the top; dose rate or count rate estimation parameters at the bottom.



Status bar (top, left to right):

13:03 27° γ =

- Current time: hours, minutes
- Radiation sensor temperature
- Sign of exceeding thresholds for dose rate, dose, count rate
- Sound status
- Bluetooth or USB connection
- Swing buttons lock sign
- Battery status

Bottom of the screen (left to right): graphical representation of the dose rate or count rate estimate; the dose rate or count rate estimate; the error in %; dose rate units — Sv/h, R/h — or count rate units — CPS, CPM.

The units can be selected via the menu: Sv/h or R/h when displaying dose rate; CPS or CPM when displaying count rate.

The type of estimate (dose rate or count rate) can be selected in the menu or switched with the device buttons.

Hotkeys:

- Short ▲ — switch between the types of photon radiation intensity display: dose rate or count rate
- Long ▲ — sound indication on/off
- Short ▼ — sound indication of registered photons (clicks) on/off. Works only when the overall sound is on.

Two alarm thresholds for the dose rate level and two for the count rate level can be set via the menu. When a threshold is exceeded, a pulsating sign is displayed in the status bar.

For dose rate:

“Alarm 1” —  ; “Alarm 2” —  ; “Alarm 3 (over-range)” — 

For count rate:

“Alarm 1” —  ; “Alarm 2” —  ; “Alarm 3 (over-range)” — 

Dose

The mode shows the accumulated dose. On the screen: status bar at the top; accumulated dose estimation parameters.



Status bar (top, left to right):



- Time since the start of dose accumulation: days, hours, minutes
- Sign of exceeding thresholds for dose rate, dose, count rate
- Sound status
- Bluetooth or USB connection
- Swing buttons lock sign
- Battery status

Bottom of the screen (left to right): graphical representation of the accumulated dose estimate; the accumulated dose estimate; dose units — Sv, R.

The units can be selected via the menu: Sv or R.

Hotkeys:

- Long ▼ — reset the accumulated dose to zero
- Long ▲ — sound indication on/off

Two alarm thresholds for the accumulated dose level can be set via the menu. When a threshold is exceeded, a pulsating sign is displayed in the status bar:

“Alarm 1” —  ; “Alarm 2” —  ; “Alarm 3 (over-range)” — 

Search

The mode shows the count rate as a search graph — for an operational search for a source or an area with an elevated radiation level. On the screen: status bar at the top; the count rate search graph at the bottom.



Status bar (top, left to right):

1/2s 8.00 CPS 77% 🔊 🔒 🔋

- Averaging time — one bar on the graph equals 1/2, 1, 2 or 4 seconds
- Current count rate value
- Count rate units — CPS or CPM
- Sign of exceeding thresholds for dose rate, dose, count rate
- Sound status
- Bluetooth or USB connection
- Swing buttons lock sign
- Battery status

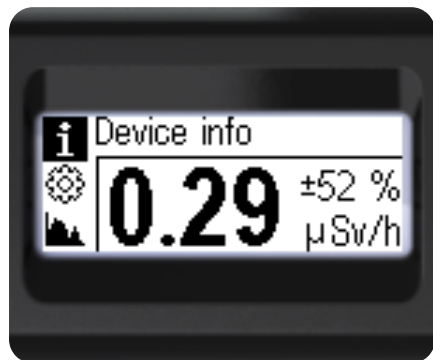
Bottom of the screen (left to right): graphical representation of the current count rate; the count rate search graph. The count rate units (CPS or CPM) can be selected via the menu.

Hotkeys:

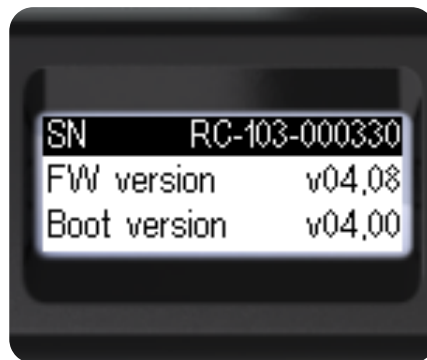
- Short ▲ — increase the averaging time
- Short ▼ — decrease the averaging time
- Long ▼ — clear the screen and start a new search session
- Long ▲ — sound indication on/off

Device info

The mode shows brief information about the device: device model and serial number; firmware version; bootloader version.



- Device model and serial number.
- Firmware version.
- Bootloader version.



Alarm system

How alarms work

Alarm sources: the current count rate value, the current dose rate value, the accumulated dose. Each source has three alarm thresholds.

If the current count rate, dose rate or dose value crosses any of the thresholds from below, an Alarm Event occurs: first threshold — Alarm 1; second threshold — Alarm 2; upper limit of the scale — Over-range.

The first and second level thresholds are set in the settings for each source and can be changed at your discretion. The third threshold — the upper limit of the scale — cannot be changed via the menu.

The device constantly compares the current count rate, dose rate and accumulated dose values with the thresholds. Exceeding any of them puts the device into the Alarm State.

Each Alarm Source defines one of 4 states:

- Normal — value below the first threshold (no alarm)
- Alarm 1 — value above the first threshold but not above the second
- Alarm 2 — value above the second threshold but not above the third
- Over-range — value above the third threshold, beyond the scale

Exceeding the upper count rate threshold makes the dose rate estimate unreliable. In this case the upper dose rate threshold is also considered exceeded.

When any dose rate, count rate or accumulated dose threshold is exceeded, the alarm is activated: if enabled, the device vibrates and emits the alarm sound. To turn off the signal, acknowledge it with a short press on the round button — the device continues to show the exceedance with a flashing icon. An accumulated dose alarm stops only when the dose is reset or its threshold is changed.

Each Alarm Event has Alarm Signals: a sound signal and a vibration signal. They can be turned on and off in the settings independently — for each level of any source. Stop the signal with a short press on the round button; it sounds again at the next Alarm Event.

The Alarm State is indicated by:

- Red LED flashes
- Alarm icons in the display status bar

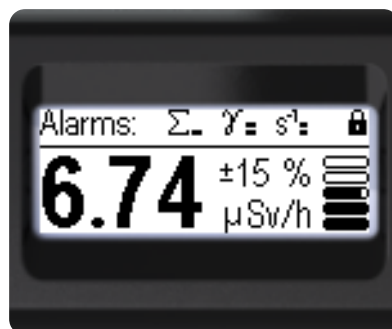
- The unacknowledged alarms status line

Icon	Description
	Count Rate Alarm 1
	Count Rate Alarm 2
	Count Rate over-range
	Dose Rate Alarm 1
	Dose Rate Alarm 2
	Dose Rate over-range
	Dose Alarm 1
	Dose Alarm 2
	Dose over-range

Light signals can be turned on/off in the settings.

Behaviour with locked buttons:

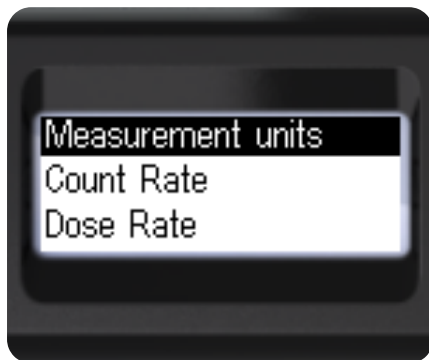
If the device is locked and alarm indication (sound and/or vibration) is enabled, after thresholds are exceeded the display shows a line of the maximum recorded levels of unacknowledged alarms:

**Rules for indicating alarm states and events on the display:**

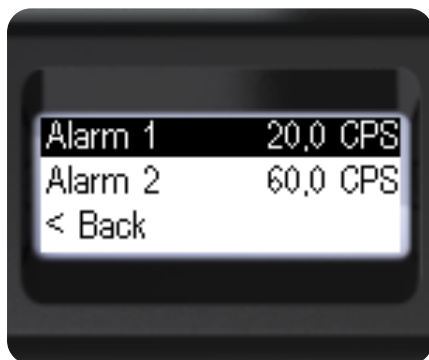
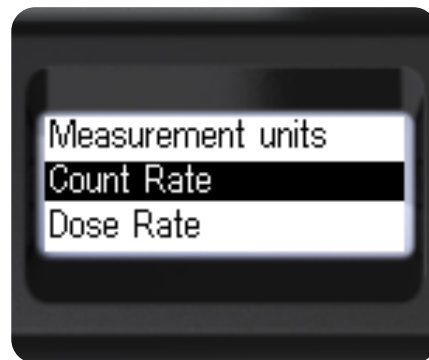
- If the swing buttons are locked, the status bar shows the message "Alarms:" and the icons of the maximum alarm levels reached from the moment the buttons were locked until now — one icon for each source
- A long press on the round button acknowledges viewing the list of maximum alarm levels; the swing buttons are unlocked and the normal status bar is displayed
- If Alarm Events occurred while the menu was displayed, then on exiting the menu the display shows the list of maximum alarm levels described above. The swing buttons are then locked
- If the swing buttons are unlocked and the display shows one of the display modes, the status bar shows the current alarm level icons for each source, alternating

Setting alarm thresholds

Two alarm thresholds can be set for each of the three quantities — count rate, dose rate, accumulated dose. The procedure is the same for all three; below it is shown using count rate as an example. The setting is made from the “Settings” submenu (for access, see chapter “Settings”).



- Navigate to the quantity — for example, [Count Rate].
- Enter the submenu.

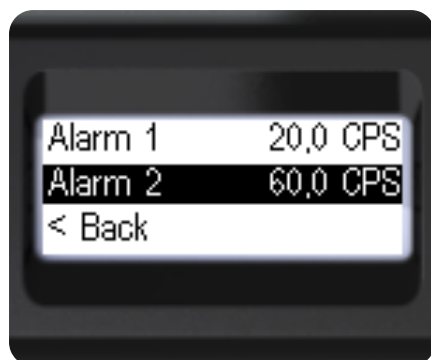


- Enter [Alarm 1].
- Select a digit, change its value.
- Set all digits.



- Select [Enter] or [Esc].
- Long-press to confirm.





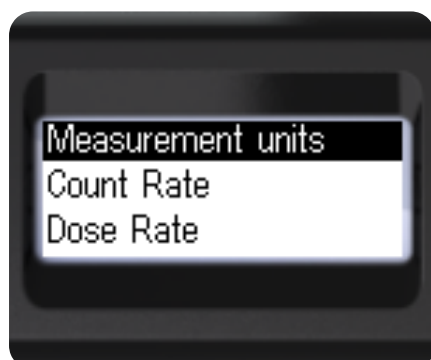
- Navigate to [Alarm 2]. Same procedure.



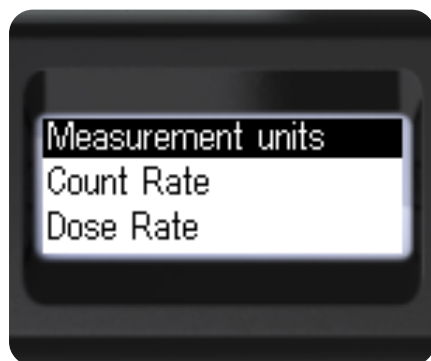
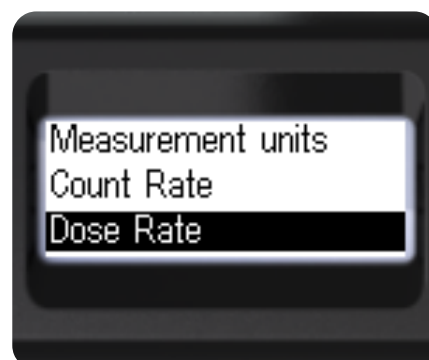
- To go back: [< Back] or [<< Menu quit].



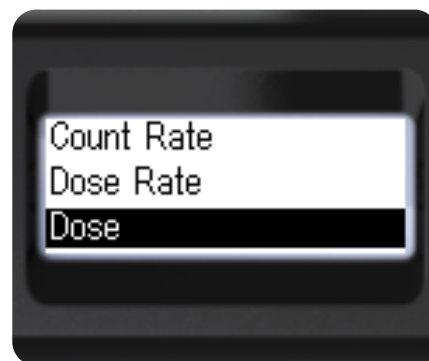
Other quantities — same procedure:



- [Dose Rate] → [Alarm 1] / [Alarm 2] — dose rate alarm thresholds.



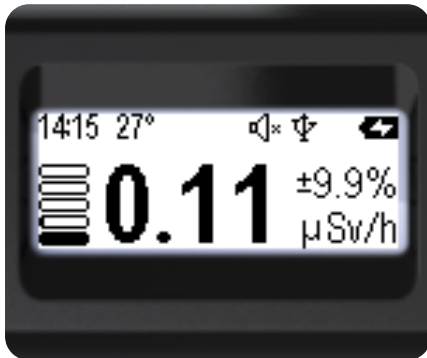
- [Dose] → [Alarm 1] / [Alarm 2] — accumulated dose alarm thresholds.



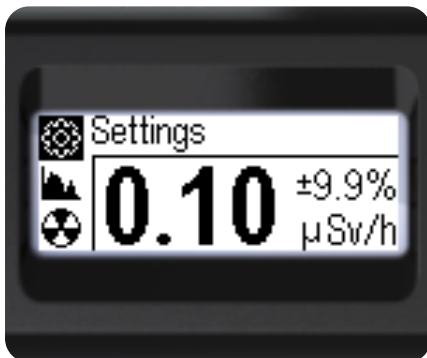
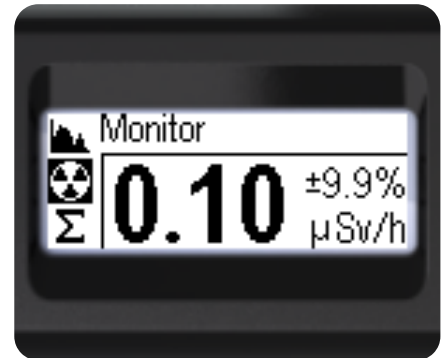
Settings

Settings menu

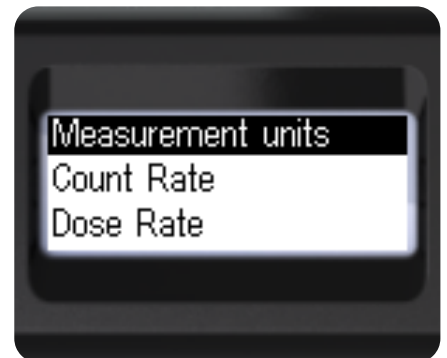
All settings are collected in the  [Settings] submenu.



- Short-press the round button to go to the menu.
- At the top — the name of the current menu item (here — “Monitor”).
- The main menu item icons are arranged vertically; the active item is highlighted with a negative icon.



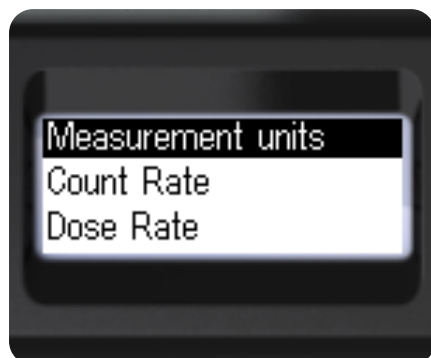
- Navigate to [Settings].
- Enter the submenu.



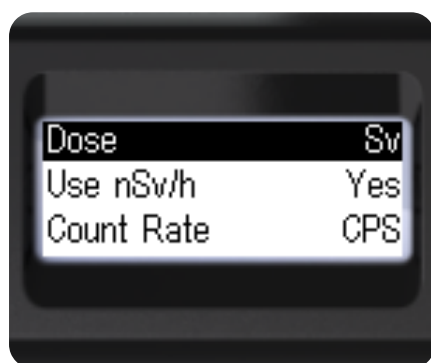
Navigate to the required item and make the setting. To go back from this or any deeper level: [**<** Back] or [**<<** Menu quit].

Items of the “Settings” submenu: Measurement units; Count Rate, Dose Rate, Dose (alarm thresholds — see section “Setting alarm thresholds”); Screen; Signals; Bluetooth; Language; Time; Device info (see section “Device info”); Factory settings.

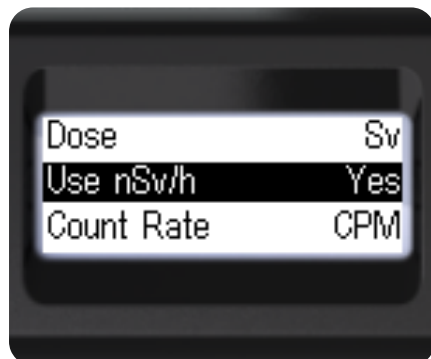
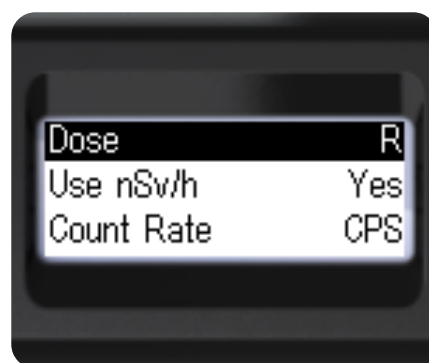
Selecting units of measurement



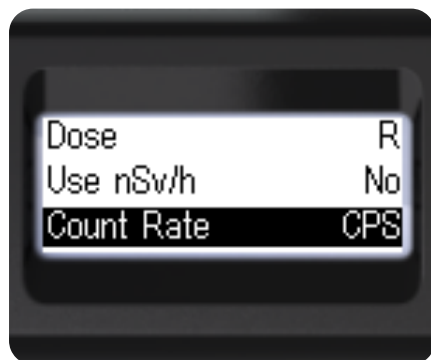
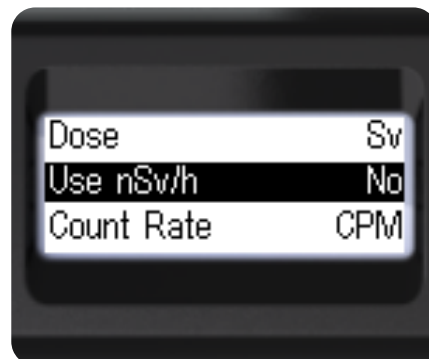
- Navigate to [Measurement units].
- Enter the submenu.



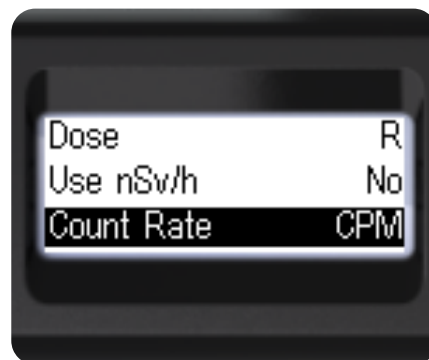
- Select dose rate units: Sv — sievert or R — roentgen.
- Move focus to [Use nSv/h].

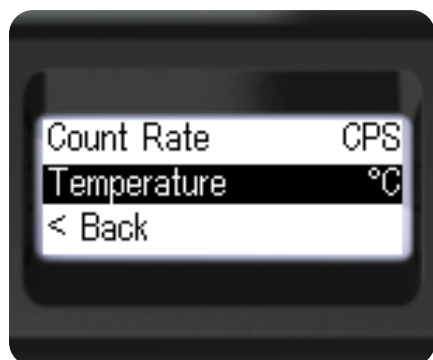


- Choose whether to use nSv/h when Sv is selected: [Yes] or [No].
- Move focus to [Count Rate].

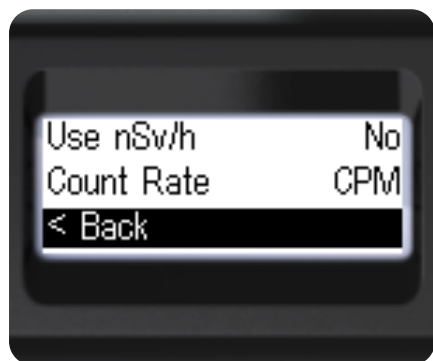
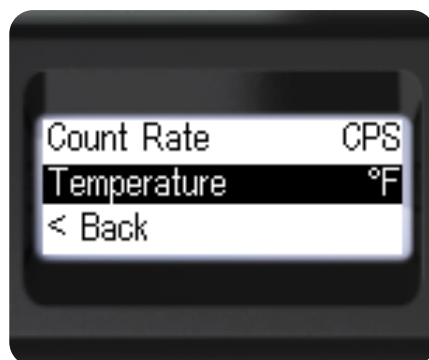


- Select count rate units: CPS — counts per second or CPM — counts per minute.

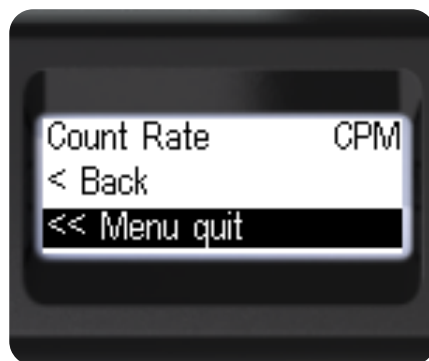




- Move focus to [Temperature]. Select temperature units: °C — Celsius or °F — Fahrenheit.



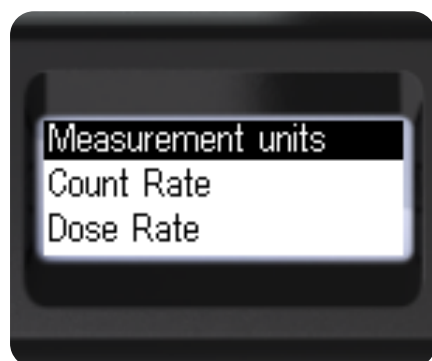
- To go back: [< Back] or [<< Menu quit].



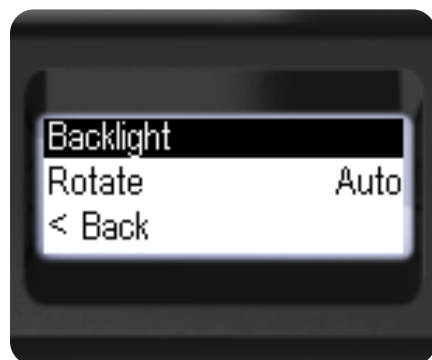
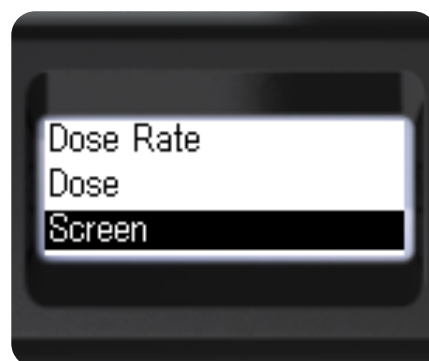
Screen settings

Backlight brightness — ten levels, from 0 to 9 (default 5); at low levels the battery drains more slowly. The backlight turns off automatically: delay — 5, 10, 15, 30 seconds or 2, 5 minutes. Turn-on mode: [Never] — backlight disabled; [By button] — turns on with any button press; [Auto] — turns on with a button press when the ambient light is insufficient.

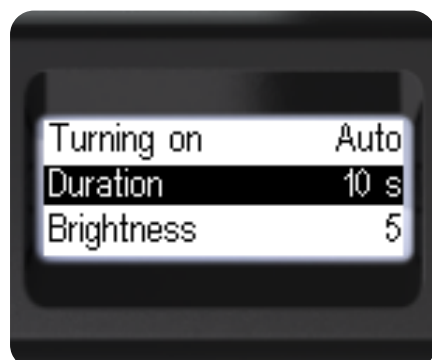
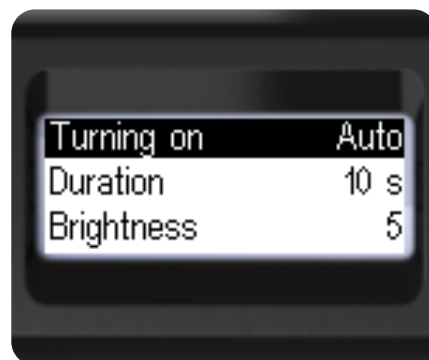
By default the screen rotates automatically for the right or left hand; the orientation can be fixed — [Right] or [Left].



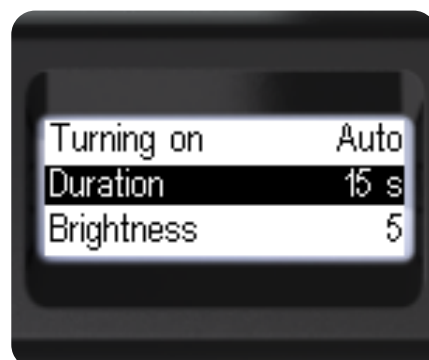
- Navigate to [Screen].
- Enter the submenu.

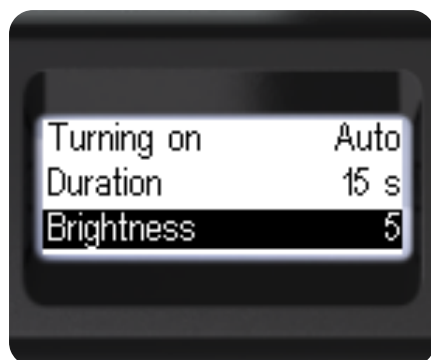


- Enter [Backlight].
- Move focus to [Turning on].
- Select mode: [Auto], [Never] or [By button].



- Move focus to [Duration].
- Select duration: 5, 10, 15, 30 s or 2, 5 min.

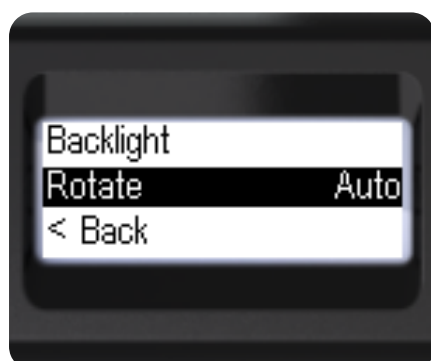




- Move focus to [Brightness].
- Select backlight brightness from 0 to 9.



- [< Back] to go back.



- Navigate to [Rotate].
- Select: [Auto], [Right] or [Left].



- [< Back] to go back.

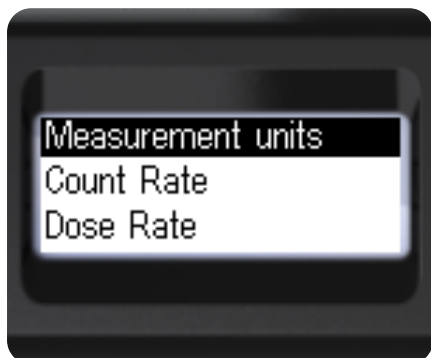


- To go back: [< Back] or [<< Menu quit].

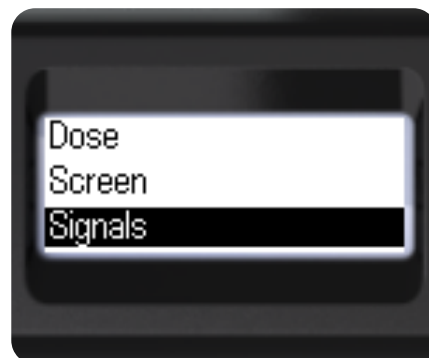


Signals — sound, vibration, light

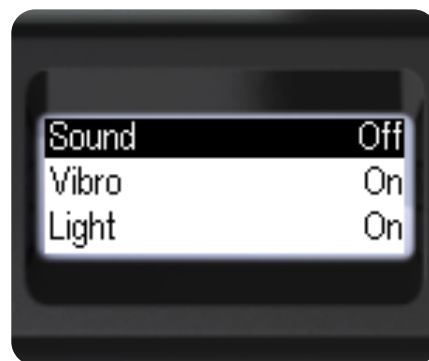
Combined interface: display, buttons, sound emitter, LEDs, vibration motor. Sound, light and vibration complement the display and give feedback on button presses (summary table of events and signals — see section “Indication: sound, vibration, light”). The mode of sound, light and vibration signalling is selected in the menu. Alarm sounds, button sounds and clicks are turned on separately.



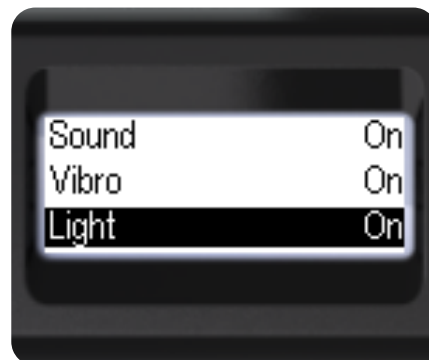
- Navigate to [Signals].
- Enter the submenu.



- Move focus to [Sound].
- Select: [On] — all enabled sounds, or [Off] — only the find-the-device and over-range sounds remain.



- [Vibro] and [Light] are set in the same way.
- Move focus to [Vibro] or [Light].
- Select [On] or [Off].

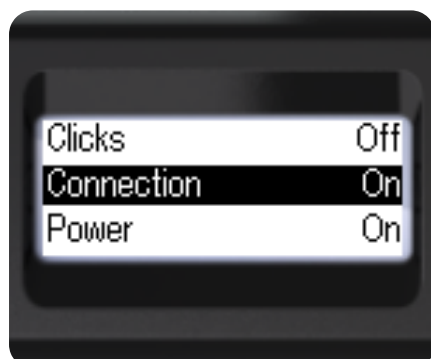
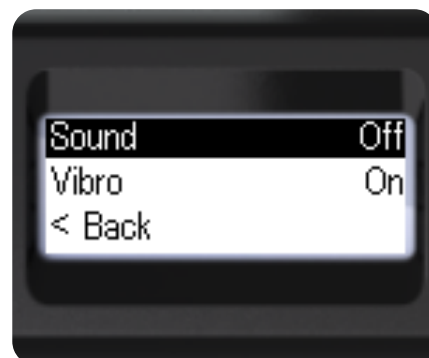




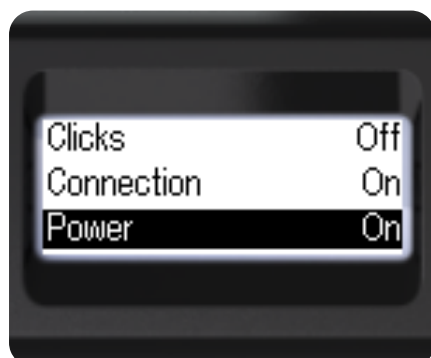
- [Clicks] — photon registration clicks, set separately.
- Move focus to [Clicks].
- Select [On] or [Off].



- Navigate to [Buttons].
- Move focus to [Sound] or [Vibro].
- Select the response type.



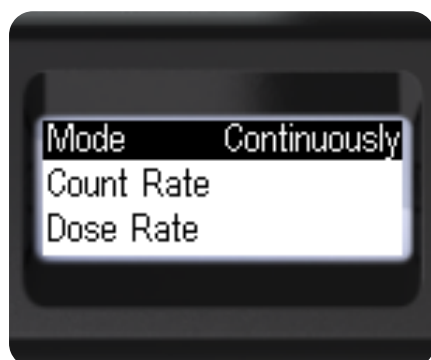
- [Connection] — connect/disconnect sound, set separately.
- Move focus to [Connection]. Select [On] or [Off].



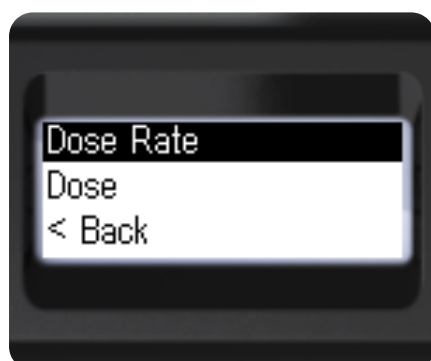
- [Power] — turning on/off sound, set separately.
- Move focus to [Power]. Select [On] or [Off].



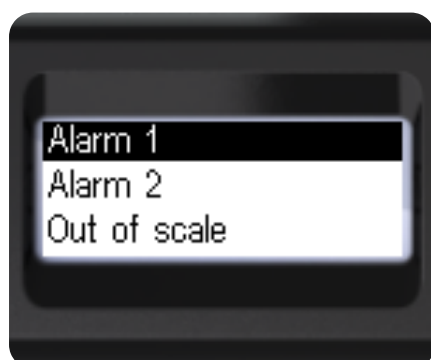
- To set up alarm signals: navigate to [Alarms].
- Confirm.



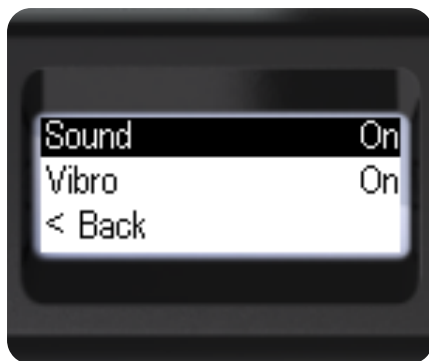
- Indication mode: [One-shot] or [Continuously].



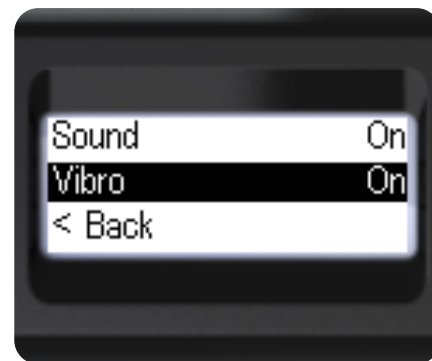
- Select a channel — for example, [Dose Rate].
- Confirm.



- Select level: [Alarm 1] or [Alarm 2].
- Confirm.



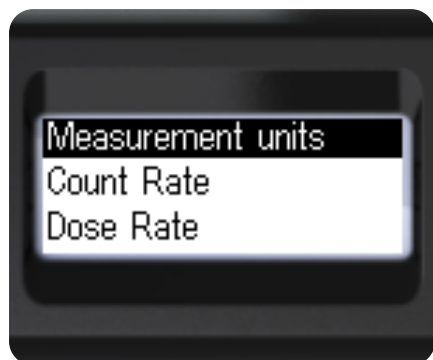
- Move focus to [Sound] or [Vibro].
- Select [On] or [Off].



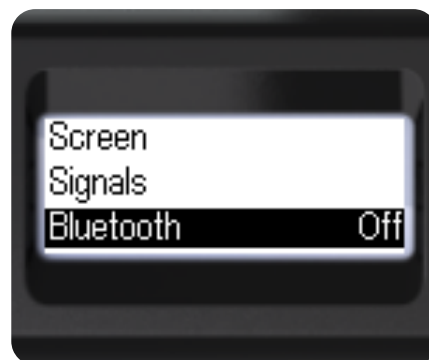
- To go back: [< Back] or [<< Menu quit].



Bluetooth settings



- Navigate to [Bluetooth].
- Select [On] or [Off].

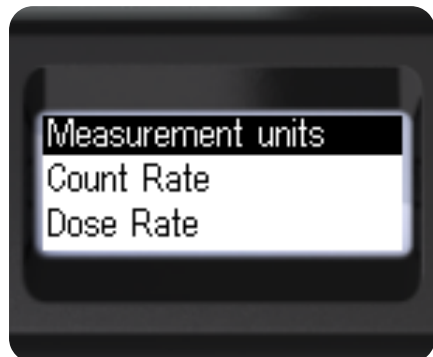


- To go back: [< Back] or [<< Menu quit].



Selecting the menu language

The device supports several menu and message languages.



- Navigate to [Language].
- Select the interface language.

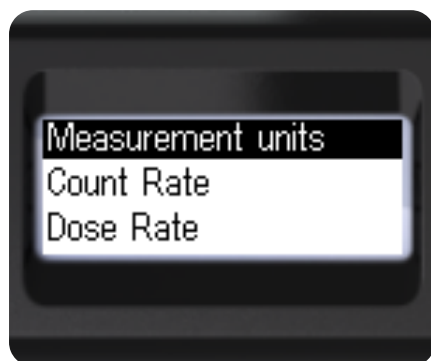


- To go back: [< Back] or [<< Menu quit].

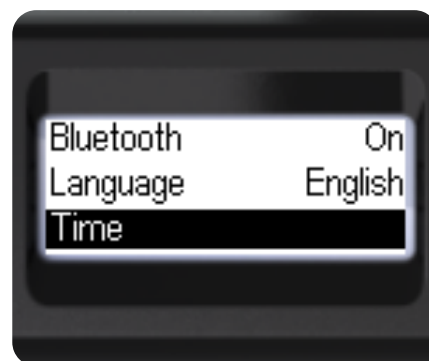


Setting the time

When connected to a smartphone or computer, the time is set automatically. Manual setting via the menu:



- Navigate to [Time].
- Confirm.



- Select an input field.
- Change the value with the swing buttons.
- Hold a swing button for fast change.



- Select [Enter] or [Esc].
- Long-press to confirm.
- The device returns to the previous menu level.

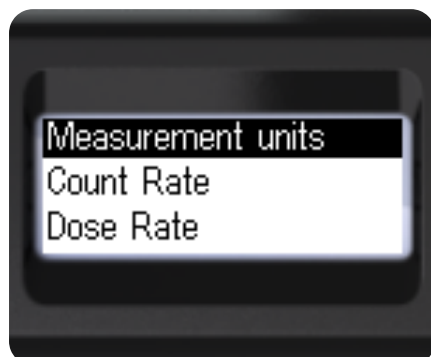


- To go back: [< Back] or [<< Menu quit].



Reset to factory settings

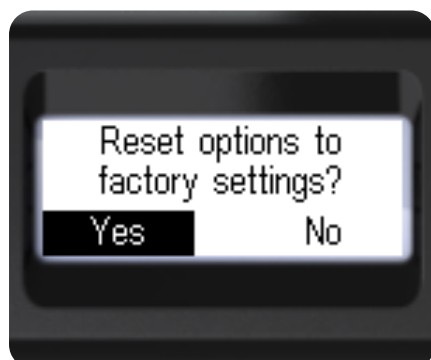
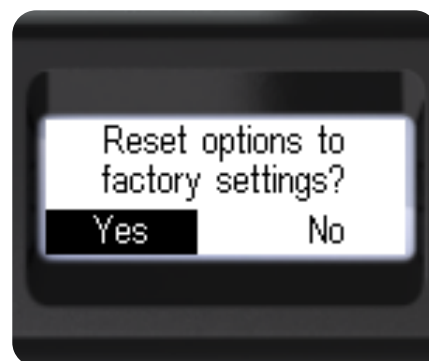
[Factory settings] resets the device settings to the factory defaults.



- Navigate to [Factory settings].
- Confirm.



- Select [Yes] or [No].



- Long-press to confirm.
- If [Yes] — the settings are reset and the device returns to the previous menu level.



- To go back: [< Back] or [<< Menu quit].



Connecting to a smartphone and computer

Smartphone

Besides standalone operation, the device connects to a computer via USB cable or to a smartphone (Android, iOS) via Bluetooth; to an Android smartphone — also via USB OTG. When connected, the accumulated data is transferred to the external device, and new data is sent there directly, without being stored in the built-in memory.

To pair with a smartphone, install the RadiaCode app on it: for Android — from Google Play or via the link downloads.radiacode.com/EN/RadiaCode.apk; the iOS app is available via the link apps.apple.com/cy/app/radiacode; all downloads are also available at www.radiacode.com/downloads.

Bluetooth connection: turn on Bluetooth on the device ([Settings] → [Bluetooth] → [On], see section “Bluetooth settings”) and select the device in the app.

USB OTG connection (Android only): connect the device using a cable and a USB OTG adapter, then allow the RadiaCode app to access the device.

A detailed description of the interface is built into the app.

With external power connected, a Bluetooth or USB connection can be established with the device regardless of whether it is on or off. This allows the device to be turned on and off remotely.

PC (Windows)

To connect to a computer, install the RadiaCode program. Download via the link downloads.radiacode.com/EN/RadiaCode.exe or on the downloads page www.radiacode.com/downloads. The RadiaCode program lets you transfer data to a computer, view it and control the device. Detailed help is built into the program.

With external power connected, a USB connection can be established with the device regardless of whether it is on or off. This allows the device to be turned on and off remotely.

Maintenance

Battery charging

To charge the battery:

- Plug the USB cable into the connector at the end of the device ([11] in the general view)
- Plug the USB cable into a computer connector or a dedicated charger
- Leave the device connected to the charging source until charging is complete. On

Radiacode-1XX series devices, next to the charge indicator  the battery charge level in % is also displayed

The blue indicator glows during charging ([18] in the general view). If the device is on, the screen shows the icon  or . When charging is complete, the blue indicator goes out and the icon changes to the external power sign  or .

Watch the charge level icon. The battery can be recharged or charging interrupted at any level.

Radiacode-10X series: check the charge level by the icons ; for a correct level estimate, wait at least 5 minutes.

Radiacode-1XX series: check the charge level by the icons ; the charge in % next to the icon is updated in real time.

If the charge indicator is empty  or , connect the device to a charger.

For correct charging and a long battery life, charging is blocked when the device temperature is above +40 °C or below 0 °C.

Use only USB chargers with a voltage of 5 V and a current of at least 0.5 A, or a computer USB port. An incorrect charging source can damage the device; such damage is not covered by the manufacturer's warranty.

A fully discharged device may not respond to turning on — charge the battery first. If charging does not start, connect the cable, then disconnect and reconnect it.

Firmware update

The developer regularly updates the firmware; the update function is built into the device. The current firmware version is shown in the “Device info” menu item.

Update via a computer (Windows)

1. Download the latest RadiaCode software via the link downloads.radiacode.com/EN/RadiaCode.exe or on the downloads page www.radiacode.com/downloads
2. Install the RadiaCode program on your computer and run it
3. Connect the device directly to a USB port of your computer using the USB Type-C cable
4. Turn on the device
5. If a newer firmware version is available, you will be prompted to update
6. Wait for the update to finish

Update via a smartphone (Android)

Install the latest RadiaCode app for Android from the app store or via the link downloads.radiacode.com/EN/RadiaCode.apk or on the downloads page www.radiacode.com/downloads.

If the device bootloader is version 4.0 or higher — the firmware can be updated via Bluetooth:

1. Launch the app
2. Open the menu — the button with three horizontal dashes at the top left
3. Select “Devices”
4. Select the Bluetooth interface and confirm by tapping [OK]
5. After connecting, confirm the device firmware update
6. Wait for the download and update process to finish. The red LED glows during the update

If the device bootloader is below version 4.0 — you will need a USB OTG adapter for your smartphone:

1. Connect the device to your smartphone using the cable and adapter
2. Allow the RadiaCode app to use the connected device
3. Launch the app
4. Open the menu — the button with three horizontal dashes at the top left
5. Select “Devices”
6. Select the USB interface and confirm by tapping [OK]
7. Confirm the device firmware update
8. Wait for the update to finish

Update via iPhone/iPad (iOS)

The firmware is updated via Bluetooth:

1. Download and install the RadiaCode app from the App Store or via the link apps.apple.com/cy/app/radiacode
2. Launch the app and grant it Bluetooth access
3. Select your device in the Devices list and connect to it
4. After connecting, open the Control Center — the button in the top right corner
5. If a firmware update is available, the Update button in the Firmware section becomes active. Tap it to start the update
6. The red LED glows on the device during the update
7. Wait for the process to finish. Do not close the app or turn off the device until the update is complete

Do not turn off the device or break the connection (USB or Bluetooth) until the process is complete! Interrupting the firmware update may cause device failure. To restore operation, contact the service centre.

Troubleshooting

Typical faults	Possible causes	Solutions
Does not turn on standalone	Battery discharged	Charge the battery
The device works only with external power connected	Battery defective	Contact customer support
Vibrates and shows the icon:  or 	Battery discharged	Charge the battery
After disconnecting the device from the charger, the charge level is below 100%	Battery not fully charged	Make sure the battery is charged fully, until the blue LED goes out
15 minutes after a full charge, the charge level is below 85%	Battery capacity has decreased significantly	Contact customer support
Not charging (the blue LED does not light up)	Temperature above +40 °C or below 0 °C	Ensure the correct temperature
The battery does not charge	Battery discharged below the minimum level	Connect and disconnect the charging cable. Charging starts after reconnecting. Do not let the battery discharge fully
Does not turn on, vibrates continuously, blue LED on	The device is in the bootloader	Contact customer support
The device is working; in Monitor mode it shows zero count rate values (0.00)	The device is faulty	Contact customer support
Shows "Instrument not calibrated" when turned on	No calibration data in the device memory	Contact customer support

The device turns off without a low battery message	Static electricity affects the device	Protect the device from static discharges
One dominant channel is observed in a random part of the spectrum	Static electricity affects the device	Turn the device off and on again. Protect the device from static discharges
Calibration coefficients a0 and a2 are zero	Calibration error	Reset the device to factory settings
The device shows: "Hardware error [1XX]"	Non-volatile memory error	Turn the device off and on again. If the error recurs regularly, contact customer support
The device shows: "Hardware error [2XX]"	Bluetooth module error	Turn the device off and on again. If the error recurs regularly, contact customer support
The device shows: "Hardware error [3XX]"	Accelerometer error	Turn the device off and on again. If the error recurs regularly, contact customer support
The device shows: "Hardware error [4XX]"	Optical sensor error	Turn the device off and on again. If the error recurs regularly, contact customer support
The device shows: "Hardware error [5XX]"	Thermometer error	Turn the device off and on again. If the error recurs regularly, contact customer support
The device shows: "Hardware error [6XX]"	Option status error	Turn the device off and on again. If the error recurs regularly, contact customer support

The device shows: "Hardware error [7XX]"

Charger error

Turn the device off and on again. If the error recurs regularly, contact customer support

In case of malfunctions, contact the service centre. Report other problems to customer support.

