GEORADIS

RT-20 – HANDY SCINT

User's Manual

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1 GENERAL

The **RT-20 HANDY SCINT** is a compact hand held radiation detector specifically designed to quickly determine the location of radioactive material.

The high sensitivity **RT-20** is an ideal instrument for surveying people, packages or materials, quickly and simply detect Gamma Ray emitting radioactive sources in various combinations and in most situations.



1.1 Main Features

- High sensitivity with NaI/Tl crystal 30 x 30 mm (1,18" x 1,18") 21.2 cm^3 (1.3 in^3)
- Numeric LCD display 4 ½ digits.
- Readings in counts per second. Sampling rate 10 per second.
- Adjustable audio threshold.
- Automatic warning of high dose rate
- Plastic protection boot.
- Sprinkling water and dust resistant (IP66).
- Lightweight and well balanced 1.3 kg (2.8 lb).
- Powered from 4 AA type batteries. Minimum 50 hours battery life at 20 °C
- Alkaline, NiCd or NiMH batteries.
- Fully automatic charger integrated in unit.
- Supplied in a plastic suitcase with moulded insert.

1.2 RT-20T - version with the detector on the telescopic arm

RT-20 can be designed as a simple hand-held instrument or with the detector on the telescopic arm length 1 – 2 meters. The model with telescope is labeled by character "T" following the model number. The following picture shows two handles of the instrument and a carrying strap necessary for better manipulation. The basic dimensions are 121.5 x 6.5 x 13 cm and weight 2.85 kg.



The main advantage of this model is comfortable manipulation during searching in hardly accessible positions in terrain, scrap yard or during searching for sources in the wagons or camions loaded by metal scrap.

Rotation of the black nut on the telescope to the right involves moving of the detector side out to set the proper telescope length. Rotation to the left fixes the current position of the detector.

The instrument can be manipulated only using the one handle on the telescope in case of its minimal length. Both handle manipulation is necessary when longer length is used.

2 SYSTEM OPERATION

2.1 Batteries

Open back door and remove battery holder. Load batteries in the battery holder. Respect polarity, negative pole against springs in the holder. Slide the Battery Holder back into the base of the RT-20 ensuring the battery terminals are on the side of the holder against the terminals in the unit. Close and lock the back door.

2.2 Button

The RT-20 instrument has only ONE control which is the PUSH-BUTTON on the handle referred to as **BUTTON**. The Button has 3 primary actions:

- Short CLICK – less than 1 second button action
- Long CLICK – typically 3 second with display feedback
- Extra long CLICK for instrument switch OFF.

2.3 Display

The RT-20 has a backlit LCD display. Backlighting is required in low light conditions to make the display readable. The Backlight is controlled automatically. Ambient light is measured by a sensor under the main panel. To conserve battery power the backlight automatically switches off after 10 minutes of inaction (backlight timeout). The backlight is re-activated with a short CLICK. The Display consists of 4 ½ digits combined from seven LCD segments. The maximum numeric range is 19999. Also various character combinations as abbreviations of important messages are shown.

2.4 Power ON

Press the button. The following sequence of actions then takes place: All segments on the display "**LOW BAT**" and "**:188.8.8**" will be active for approximately one second accompanied by an audio tone beep (if not previously disabled).



The unit then makes a series of internal verification tests. Where an error is detected the display message "**tESt**" will be replaced by "**Er n**" where "**n**" is the number of the error message. The error message remains on the display for 15 seconds or until confirmed by the user with a short CLICK. The unit then continues with the next tests.



The last test checks the battery capacity and displays it for 1 second in form "**C xxx**", where **xxx** is battery capacity in percentage.

When all tests are completed the unit switches to main working mode regardless of the presence of any error.

(N.B. Where errors are detected the unit continues to perform but with a limited function. Guidance on error messages is in Section 2.10).

The unit automatically recognizes if new batteries are inserted. When new batteries are inserted it is necessary to inform the unit about the type of batteries used. Message "**nrb**" or "**rb**" is followed with a Battery type screen. Using a button click (short CLICK) the user should select "Non rechargeable nrb" for Alkaline type or "Rechargeable rb" for NiCd or NiMH type of batteries. A long CLICK enters the selection and the unit continues the start up sequence.

Each start until the next battery change will automatically skip the battery selection screen and jump immediately to survey mode.

2.5 Main Working Mode

Survey mode starts with a measurement of current background response. This is important for correct audio function. The background measurement takes 5 seconds and user should hold the unit away from any area with increased radiation. While upgrading the background measurement the display messages "**b 5**", "**b 4**", …,"**b 1**" indicates progress. Then the unit computes the actual average background and related audio threshold. The unit temporarily shows this computed background measurement on the display (with "**:**" on the left side of the display) before automatically switching to search mode.



In search mode, the unit scans for radiation 10 times per second and displays an integrated value in one second intervals. The 1/10 seconds samples are used for audio tone pitch adjusting and the integrated value is shown on the display.



A combination of acoustic and visual methods can help to locate the radioactive source quickly and effectively.

2.6 Audio

The RT-20 has an audio speaker inside the unit. The audio system is automatically activated when the detected radiation level rises above certain (internally computed) Audio Threshold. Once the computed Audio Threshold is exceeded then the rate of audio signals will reflect the incoming count rate to provide a varying rate and intensity of audio signals that relates directly to the local radiation intensity. For normal use the speaker volume can be set by the user in the following manner:

During the start-up hold the button. A message "**Ldnx**", where **x** is the volume step, will appear on the display.

- **x=0** for audio OFF,
- **x=1** for low volume and
- **x=2** for high volume.

Use a short button click to swap values and a long click to enter the requested value and leave the setup mode. If no action takes place within 20 seconds the setup mode is terminated by timeout.

2.7 Re-acquire Radiation Background

The AUDIO THRESHOLD is set using the preset parameter factor (usually 3 Sigma). The relation between Audio Threshold and local background is explained in the following example:

If the local background level was 100 counts per scan then at 3 Sigma the Audio Threshold = 130 counts per scan (100 + 3 Sigma). Sigma is the square root of counts per sample. So if the count rate goes above 130 cps the audio will automatically sound.

However, once set, if the local Background increases substantially to more than 130 counts per scan then the audio will sound continuously and the audio will not seem as sensitive to small local changes. Similarly if the local Background goes down to 50 counts per scan then the local radiation would need to increase very substantially before the audio sounds – thus effectively desensitizing the audio system.

To set-up a new Audio threshold the user must re-acquire the Radiation Background. Pressing the button shortly (short CLICK) at any time will activate background reset and the unit will automatically return to main measure mode. While upgrading the background messages "**b 5**", "**b 4**", ….,"**b 1**" indicates progress.



Long press down displays "**AL n**", where **n** is a number of Standard Deviations for audio alarm threshold calculation. Short press down modifies the **n** value **3**, **4**, **5**, **1**, **2**… Long press down saves the last value of **n** to the instrument memory and starts new background acquisition and new audio threshold calculation. If operator waits for 20 seconds without any action the instrument automatically goes to background acquisition.

2.8 POWER OFF

To power OFF the unit, press and hold the BUTTON and the unit powers OFF. The display shows a countdown "**AL x**", "**OFF3**", "**OFF2**", …, "**OFF0**" then the unit finally powers off. At anytime before power OFF, if the BUTTON is released the unit continues to function.

2.9 Low Battery

When the Batteries are getting low an indication "**LOWBAT**" will appear on display. User should replace the batteries or, if using rechargeable batteries, connect the unit to an electricity supply.

2.10 Error messages

Er 1 – Number of counts from detector is less than 10 cps. Bad detector or wrong energy calibration. Switch the unit OFF and ON again in the place with "normal" background (no steel or lead shielding around).

Er 2 – Number of counts from detector is more 1000 cps. Noisy detector or wrong energy calibration. Switch the unit OFF and ON again in the place with "normal" background (no radioactive source around).

Er 3 – Internal voltage +3 V out of tolerance range 10 %.

Er 4 – Internal voltage +4 V out of tolerance range 10 %.

Er 5 – internal voltage -3 V out of tolerance range 10 %.

Er 6 – High voltage error.

Er 7 – Default parameters reset. Switch unit OFF and check the setting according to the Section 2.7.

Er 8 – Battery current greater than 300 mA.

LOWBAT – battery voltage is less than 4.2 V. The measured value of Voltage is displayed in form **x.xx** as well. Replace the battery or connect the external power supply if rechargeable batteries are used.

APPENDIX A – TECHNICAL DATA

Package
- RT-20 HANDY SCINT
- Batteries
- Power adaptor
- Plastic protection boot
- User manual

Display
- 4 ½ segment LCD – max 19999
- reflective LCD with backlight

Energy range
- 30 keV to 3.0 MeV

Detector
- NaI/Tl 30 x 30 mm (1.18" x 1.18"), 21.2 cm^3 (1.3 in^3)

Temperature range
- Working: -10 °C to + 50 °C
- Storage: -20 °C to + 60 °C

Power
- 4 "AA" type batteries, alkaline or rechargeable (NiCd or NiMH)
- lifetime about 50 hours of operation at 20 °C for NiMH batteries 2100 mAh
- lifetime about 80 hours of operation at 20 °C for alkaline batteries
- An automatic charger built-in

Operation
- Single touch button with multifunction

Audio
- Miniature loudspeaker
- Audio pitch proportional to registered gamma ray intensity

Weight and size
- 1.3 kg (2.8 lb).
- L x W x H 22 x 6.5 x 14.5 cm

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NOTES AND WARNINGS

Note:

Users are reminded that the RT-20, in common with other similar instruments, uses a sodium-iodide crystal as the detector. These crystals are fragile and even though the unit has been ruggedized for field use, great care should be taken to avoid abusing the instrument as the very expensive crystal is not covered under warranty assembly if defects to the detector assembly are caused by mishandling, accident or other improper use.

Warranty:

Manufacturer warrants to the original purchaser of Equipment that for the Warranty period, the Equipment will be free from material defects in material and workmanship. Georadis warranty covers only those defects which arise as a result of normal use of this product, and does not cover any other problems which arise as a result of

a. Improper use outside the product's specification.
b. Mishandling, including immersing in liquids, dropping or subjecting to external hard shocks.
c. Being subjected to extreme environmental conditions or rapid changes in such conditions.
d. Improper maintenance or modification and unauthorized opening.
e. Accident or other acts beyond the reasonable control of Georadis.
f. The "Warranty Period" begins on the date the Equipment is delivered and continues for 24 months.
g. Any repairs under this warranty must be conducted by an authorized Company service representative.

Certificate of Origin:

This is to certify that GEORADIS s.r.o., Brno is the only manufacturer of Radiation Detectors series RT-20 and RT-20T. All instruments are designed, manufactured and assembled in Czech Republic.

Instruments of this series obtained a certificate according to Directive 2004/108/EC (electromagnetic compatibility) and fulfill the requirements of EU norms and CE directives