RT-22
User Manual

V2.16 August 2012

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V2.00 April 2010	User Manual for RT-30 with firmware version 5.52, edited by DJ Schooneveld	23 April 2010

1 DECLARATIONS AND CERTIFICATES

1.1 CE Conformity Declaration

We:

GEORADIS s.r.o., 619 00 Brno, Novomoravanska 41, Czech Republic

Declare under our sole responsibility that the product:

Hand-held gamma ray scintillometer – SUPER SCINT RT-22

To which this declaration relates is in conformity with the following standards:

Directive EU 89/336/EEC
EN 50082, EN 55011, EN 55022, EN 61000-4
IEC 1017-1, IEC 1017-2

1.2 Certificate of Origin

This is to certify that GEORADIS s.r.o., Novomoravanska 41, 619 00 Brno is only manufacturer of Radiation Detectors series RT-22, RS-121. All instruments are designed, manufactured and assembled in the Czech Republic.

Instruments of this series obtained certificate according to Directive 2004/108/EC (electromagnetic compatibility) and fulfil the requirement of EU norms and directives CE.

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2 GENERAL

The RT-22 SUPER SCINT series introduces a new generation of compact handheld Survey Instruments. These instruments are weather protected, lightweight and easy to use.

The large volume scintillation detector provides high sensitivity to look for any gamma-ray emitters. Due telescope version the RT-22T is the right answer to all scanning applications under most difficult conditions.

Quickly determining the location of lost radioactive sources in the environment or scrap, monitoring of waste in hospitals or waste incinerators, scanning people or baggage to disclose illicit trafficking of nuclear materials; all are typical applications for the RT-22 or RT-22T.

Built-in Bluetooth connectivity allows for integrated GPS location with the measurement. It also provides access for wireless headsets for audio feedback in high noise areas.

Image 1, RT-22 with shoulder strap

2.1 Features

- RT-22 – 2 x 2” (6.3 cu in = 104 cm3) Sodium-Iodide detector provides High sensitivity performance due to the large crystal. Energy response from 20 keV - 3000 keV.
- Large easy to read 5 digit display updated at 1/sec – giving a wide dynamic range, with no overflow and no range controls. Graphic display LCD with white backlight with automatic dimming, 128 x 64 pixels, 28 x 60 mm size
- Simple ONE BUTTON OPERATION.
- Fast response, easy-to-hear AUDIO at 20/sec sampling making source location easier and eyes free
- 1 GB memory standard on all units.
- New design state-of-the art electronics with advanced CPU capability.
- Special rugged design, robust aluminium casting construction with a heavy duty “Rubberized” outer coat which works as a shock absorber and provides thermal isolation.
- Outer coating gives a good grip even when wet, is simple to maintain and permits easy decontamination if required.

- Well balanced, easy to hold and designed for one hand control.
- RUGGED integrated telescope.
- IP-65 Dust and Water resistant
- Rechargeable battery kit supplied including NiMH battery pack module (4 x AA) batteries, Universal Charger (110/220 VAC) with adaptors for different countries.
- Typical 8+ hour battery life at 15°C on NiMH batteries.
- Size 1230 - 1920 x 81 x 91 mm – 3.6 kg with batteries.
- Operational Temperature range -10 °C to +50 °C (display is the limit).
- Spare battery module for "instant" replacement.
- Sensitivities (1 MBq from 1 m): Am-241 75 cps, Cs-137 160 cps, Co-60 270 cps.
- Modern CPU and spectrometer design.
- Large Graphic LCD with white backlight. Automatic dimming.
- USB and Bluetooth connection. Support to GPS and hands free audio sets.

USERS ARE REMINDED THAT THE RT-22, IN COMMON WITH OTHER SIMILAR INSTRUMENTS, USES A NAI(TL) CRYSTAL AS THE PRIMARY 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

3 SYSTEM INTRODUCTION

NOTE: RT-22 User Manual was derived from the RT-30 Series User Manual. Note that some RT-22 Screens slightly differ from the screens of RT-30. The RT-30 is the IDENTIFIER and has more functions then RT-22.

3.1 Button

The RT-22 Super-Scint instrument has only ONE control that is the front panel solid state PUSH-BUTTON referred to as **BUTTON**. The **BUTTON** has 3 primary actions:

- **SHORT CLICK** (less then 1 second **BUTTON** action)
- **LONG CLICK** – typically 3 second **BUTTON** action with display feedback
- **EXTRA LONG CLICK** for instrument switch OFF

Image 2, One button Operation

3.2 Batteries

3.2.1 General

LOAD BATTERIES IN HOLDER - the unit is shipped with batteries separate. Remove the Battery Cover by pressing the Battery Holder Clips at both sides. Load 4 x AA cells with negative at the spring end. Slide the battery Cover back in place ensuring that the side guides are lined up – if all is OK the Cover should fit smoothly on.

LOAD BATTERIES IN UNIT – slide the Battery Holder into the base of the RT-22 with the battery Terminals on the side of the copper terminals in the unit (if it is incorrectly the unit will not switch on). If all is OK the two sides mounted clips should "click" into place to hold the Battery Pack solidly into the RT-22 unit.

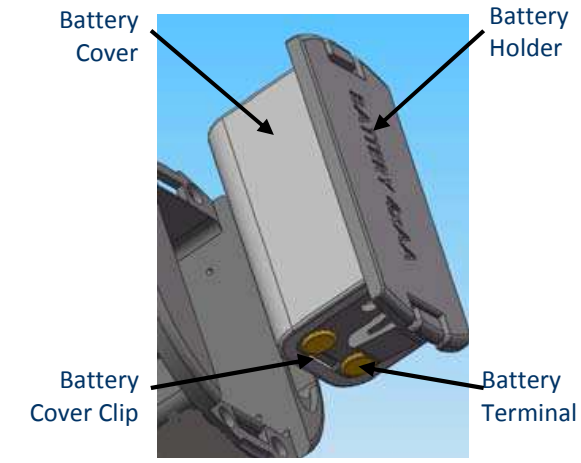


Image 3, Handy battery pack

THE RT-22 UNITS ARE SHIPPED WITH FULLY CHARGED BATTERIES. HOWEVER OVER A PERIOD OF TIME THESE BATTERIES WILL DISCHARGE SO USERS ARE ADVISED TO FULLY CHARGE BATTERIES BEFORE USE (4 HRS MINIMUM).

3.2.2 Selecting Battery Type

The Battery Type selection is required to let the unit know which batteries are used. Battery discharge rates vary according to the battery type, so that for Low Battery detection it is essential the unit knows the correct battery selection. Normally Rechargeable batteries are the correct option for the RT-22 as this is what is supplied with the unit.

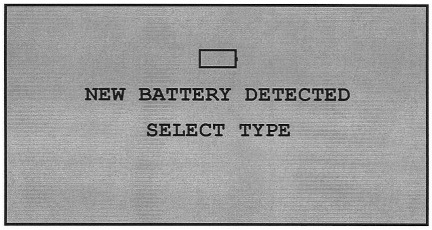


Image 4, battery change label

Press the **BUTTON** until the unit beeps then release the **BUTTON**. At first power on after a Battery Pack insertion, the unit shows the **battery change label**.

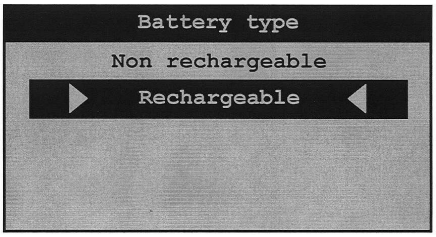


Image 5, battery selection menu

After a few seconds the **battery selection menu** appears, **SHORT CLICK** to move between selections. Once the correct selection is highlighted **LONG CLICK** until the **selection background** changes – release the Button for the correct selection. The next display is the **Start-up display** and shows for 3 Seconds then changes to the **Survey Display** (described below)

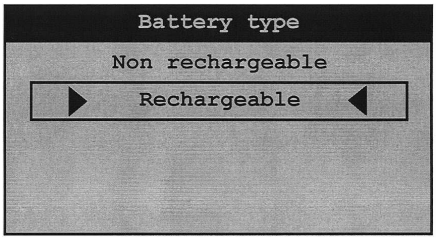


Image 6, selection background

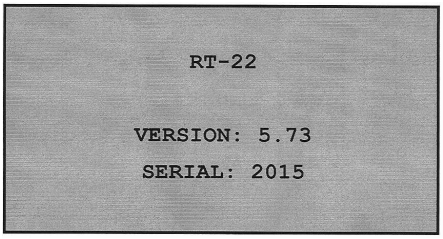


Image 7, Start-up display

	Shown in display when unit is working with Rechargeable batteries
	Shown in display when unit is working with non - rechargeable batteries.

WHEN USING ALKALINE OR DRY BATTERIES THE BATTERY TYPE PARAMETER NON RECHARGEABLE MUST BE SELECTED

3.2.3 Low Batteries

To indicate an approximate battery life, the battery icon is somewhat proportional to the battery life. When the Batteries are getting low during normal operation an audible beep is prompting the user to view the display. In case the Battery icon shows very little remaining capacity, see **Empty Battery icon**, the battery pack should be changed. At start-up, the display shows the **Low battery** screen. It is recommended that a spare Battery Pack is carried at all times to prevent field problems as changing is a matter of seconds. The RT-22 design provides NO loss of stored data. The RT-22 unit is supplied with two Battery holders.

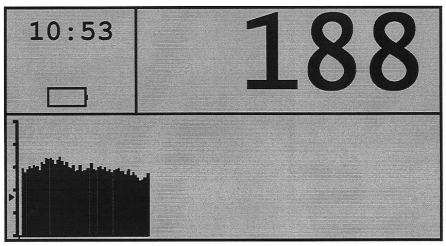


Image 8, Empty Battery icon

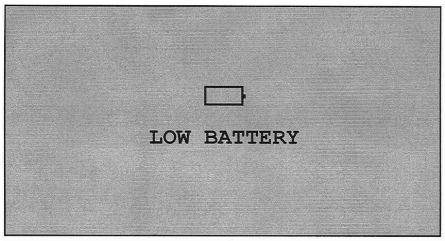


Image 9, Low battery

3.2.4 Charging Batteries

The RT-22 has a build in battery charger which is powered by an external 12 Vdc power suply, this allows the batteries to be recharged while operating the unit and without removing the batteries. Only rechargeable NiCd or NiMH batteries are rated for use with the RT-22. Regardless of the capacity of batteries used, the built-in charger will accommodate fully automatic charging.

To charge the RT-22 connect the unit to the cord of the supplied AC-adapter or 12 Vdc vehicle charging cable to the **12 Vdc connector** input. This input connector is located behind the hole in the rear wall under the rubber cover.


Image 10, 12 Vdc connector

Charging progress is indicated by an animated icon as shown in the **Charging Display**. Should instead the power icon be displayed then non-rechargeable batteries are selected at start-up. Power off the unit, remove and after several seconds re-insert the battery holder then on power on, select rechargeable batteries as described in paragraph **3.2.2 Selecting Battery Type**. Alternatively change the Battery type in the unit configuration, see paragraph **5.6.1 Battery type**.

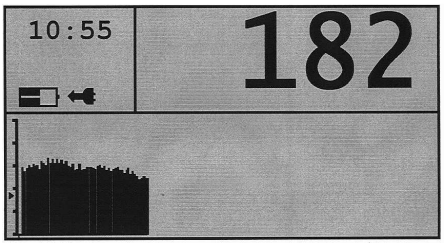


Image 11, Charging Display

Once connected the unit should take typically 4 hours (at 20 °C) to reach full charge – longer at colder temperatures. When the unit is switched OFF and then connected to the power source **Charging batteries** is indicated on the screen however the instrument remains switched OFF.

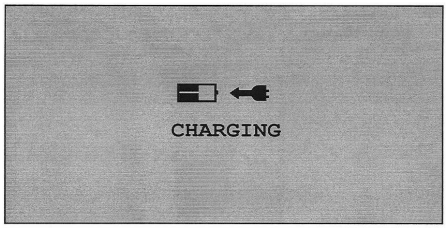


Image 12, Charging batteries

The batteries supplied with the RT-22 unit are NiMH rechargeable batteries. It is best to "condition" these batteries when first used to ensure a good battery life. Try to make at least 2 charge/discharge cycles. The ideal form of conditioning is:

- fully charge the batteries in the unit – minimum of 4 hrs
- completely discharge the unit – 10 hours
- fully charge the batteries a second time – minimum of 4 hrs
- completely discharge the unit a second time – 10 hours
- fully charge the batteries a third time – minimum of 4 hrs

Ensure when using the Vehicle Charging Cable the vehicle connection is powered on (red LED on the connector) as some units power OFF when the ignition key is switched off (check that

the unit is displaying the charging icon as shown in **Charging Display** even when ignition is OFF).

NOTE: Starting a vehicle can cause many bad voltage transients on the power line that can damage sensitive electronic equipment. For this reason users are advised to unplug the charger during vehicle starting.

ALKALINE OR DRY BATTERIES MUST NOT BE CHARGED. THE MANUFACTURER WILL NOT BE HELD RESPONSIBLE FOR DAMAGE TO THE UNIT CAUSED BY USE OF IMPROPER BATTERIES. ENTERING A WRONG BATTERY TYPE MAY LEAD TO UNPREDICTABLE DAMAGE ON THE UNIT AND WILL INVALIDATE THE WARRANTY.

3.3 Display

The Display is a back lighted **Graphical LCD display** optimized for high contrast in outdoor conditions. Display Backlighting is required in low light conditions to make the display readable but this reduces battery life.

To optimize battery life the backlighting automatically comes on only when required. Alternatively the backlighting can be activated or disabled permanently as the user finds suitable. The Display is used for various functions and messages.

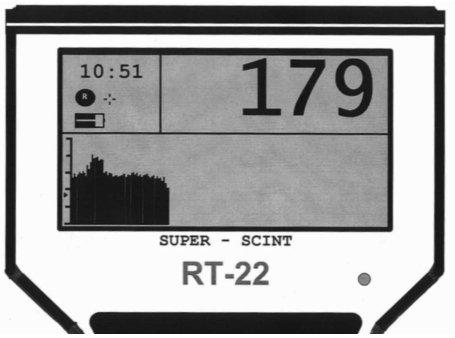


Image 13, Graphical LCD display

3.4 Audio

The RT-22 has an audio speaker inside the unit. The audio system is activated when the radiation level gets above a certain internally computed Audio Threshold. Once the Audio Threshold is exceeded then the audio pulse period pitch (frequency) will reflect the incoming count rate. Hence the audio pulse period pitch (frequency) is somewhat proportional to the incoming count rate or local radiation level.

In this manner a eyes-free search can be carried out that is usually highly recommended in many field situations where often the eyes are selecting the terrain. Without proper audio feedback, some significant count levels could be missed if the eyes are distracted. The Audio system can be fine-tuned in Parameter setup if required.

The Audio Threshold is computed from the background which is measured right after start-up. In case the environment or background has significantly changed, it might be needed to re-acquire the background for proper Audio Threshold, see paragraph **4.2.3 Re-acquire background**

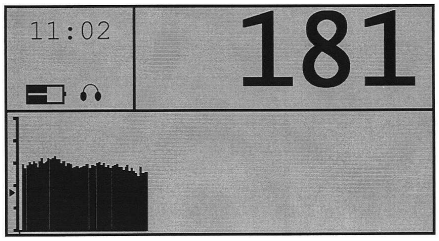


Image 14, External Audio

External Audio for covert scanning is available through Bluetooth by using standard available Bluetooth audio devices. The external audio icon is displayed to indicate a successful Bluetooth connection to the device.

3.5 Power On

Press the **BUTTON** until the unit beeps and the sign on display is seen; then release the **BUTTON**. After 3 seconds the sign on display changes to the Survey display and the unit goes to Survey

Mode, see paragraph **4.2.1 Survey Display**. Should the battery pack be removed before power on, then please refer to paragraph **3.2.2 Selecting Battery Type**.

3.6 Power Off

To power down the unit, press and hold the **BUTTON** for an **EXTRA LONG CLICK** and the unit switches OFF. The display shows a **Countdown** "TURNING OFF 3", "TURNING OFF 2", "TURNING OFF 1" then the unit finally switches off.

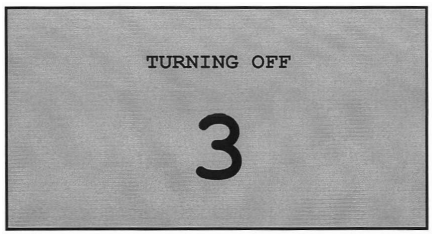


Image 15, Countdown

The countdown sequence could take a few seconds before initiating in case the unit is "busy" however typically no more than 5 seconds before the countdown sequence starts. If the **BUTTON** is released before completion of the power OFF sequence, the unit returns to normal operation.

The power off process is independent of the working status of the unit. In rare cases it may happen that the power OFF countdown will not appear on display as the unit might be overwhelmed with other tasks – typical USB of Bluetooth devices. However the power OFF process continues in the background and the unit will power down without further indication.

4 OPERATING MODES

4.1 Action Menu

The **Action Menu** is the main menu of the RT-22. As noted above the RT-22 only has one **BUTTON** to operate the instrument. To achieve the required system functions **SHORT CLICK** in Survey Mode and the **Action Menu** appears.

The user navigates through a menu using **SHORT CLICK** and the highlighting moves with the selection. Once the selection is made, **LONG CLICK** until the **Selection background** changes from Dark to Light (typically 2-3 seconds) then release the **BUTTON** to make the selection.

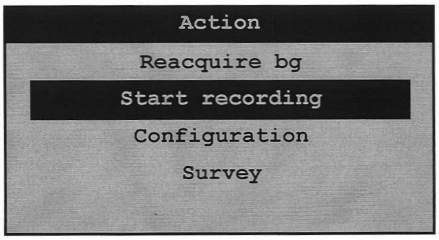


Image 16, Action Menu

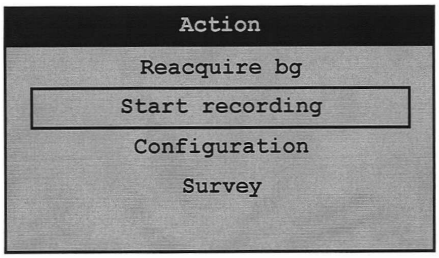


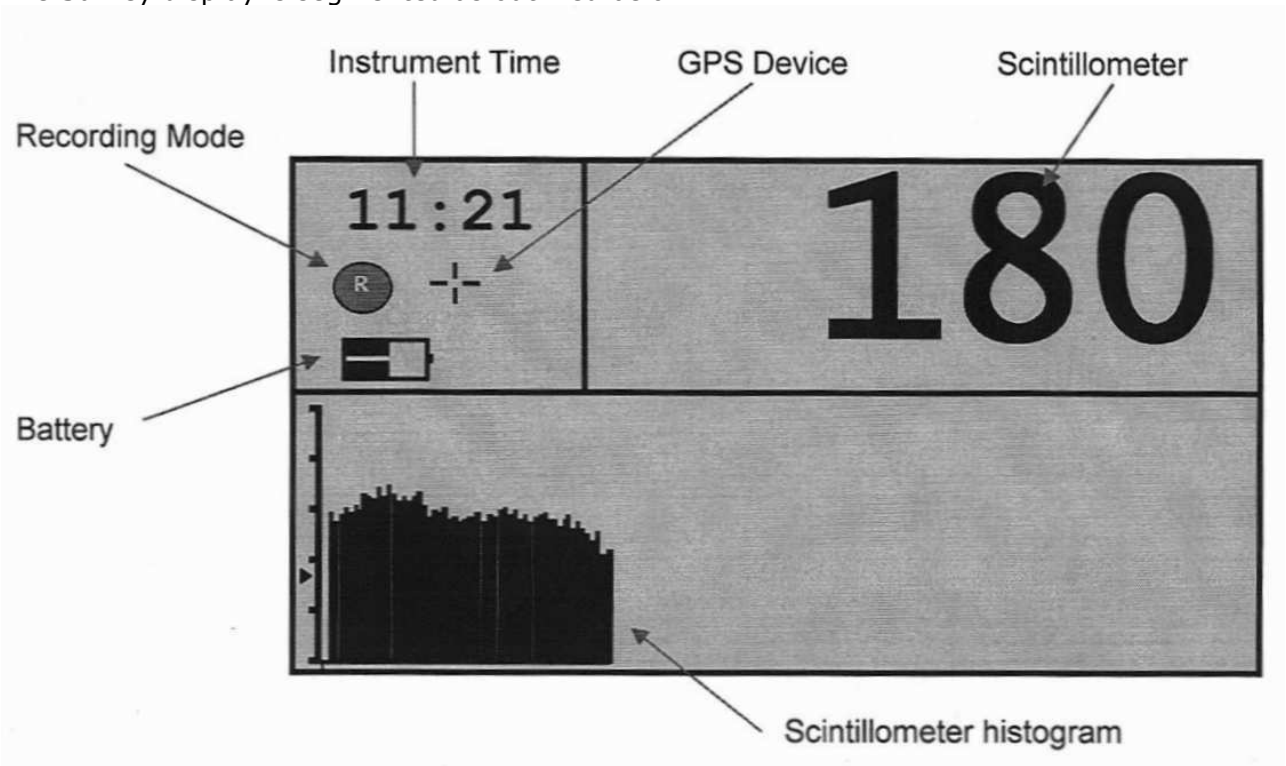
Image 17, Selection background

4.2 Survey Mode

This is the main working mode of the RT-22 and the instrument will immediately enter the Survey mode after start-up. The Survey Mode can also be activated from the Action Menu. In this mode the unit works as a sensitive gamma ray scintillometer. This mode is rated for fast and easy survey of large area or objects in search for lost or hidden radioactive sources.

4.2.1 Survey Display

The Survey display is segmented as outlined below:



Scintillometer reading	Shows the Total Count radiation level from the NaI detector in cps (counts per second) units. Please refer to paragraph **5.5.1 Total scan period** for optional settings.
Scintillometer histogram	A histogram of the above scintillometer readings; the last 120 measurements are displayed.
Battery icon	= Rechargeable battery = Non-rechargeable battery type = Exhausted battery
Instrument time	Local time inside the instrument. Please refer to paragraph **5.2 Date and time** to change the date/time setting.
Recording mode	R Indicates recording mode is active.
GPS device Operational	Indicates GPS device is connected, flashing icon means GPS has not locked onto satellite(s), steady icon indicates GPS positioning is locked.
Other Icons used (not shown above)	Remote BT connection to GeoView Remote USB connection to GeoView External BT handsfree connected External power connected External power connected and charging batteries

4.2.2 Recording mode

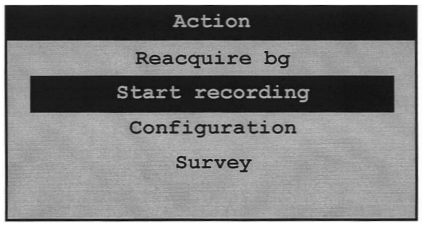


Image 18, Action menu

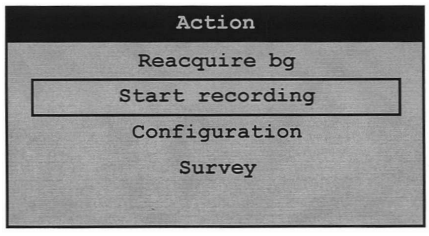


Image 19, Start recording

The RT-22 provides a recording capability that permits automatic recording of Total count data into memory. In addition an external GPS unit can be interfaced directly into the unit via the Bluetooth connection and the GPS data integrated directly into the internally stored data memory.

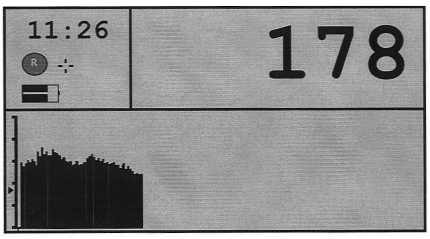


Image 20, Survey display

There is a huge space allocated in the instruments internal memory for Recording. Data from NaI/Tl detector are saved every second, date and time stamps as well as GPS coordinates are added every 30 seconds. Stored data can be retrieved from the instrument by connecting the unit to a PC and run the GeoView Software.

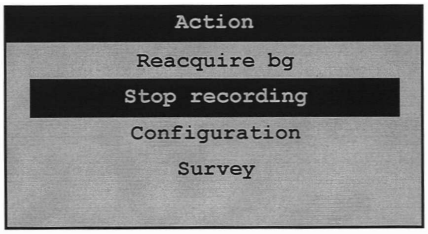


Image 21, Action menu

To activate recording while in Survey Mode **SHORT CLICK** and the **Action menu** appears. Using **SHORT CLICK** highlight the option **Start recording** and **LONG CLICK** until the background changes from Dark to Light (typically 2-3 seconds) then release the **BUTTON** to activate Recording. The R recording icon appears on the **Survey display** to indicate recording is activated and in case a GPS is connected the ⊹ GPS icon is displayed as well. If the GPS icon is flashing this means that the GPS has not found a good satellite lock so data recorded in the system for Lat/Long are zero. When the GPS acquires satellites the GPS icon is solid showing proper location data is being recorded.

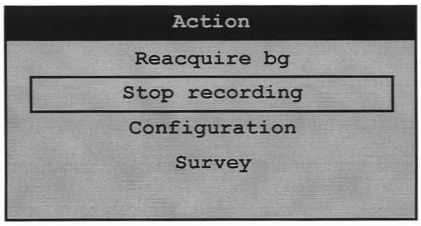


Image 22, Stop recording

To end the recording while in Survey Mode **SHORT CLICK** and the **Action menu** appears again. Using **SHORT CLICK** highlight the option "Stop recording" and **LONG CLICK** until the background changes from Dark to Light (typically 2-3 seconds) then release the **BUTTON** to **Stop recording**.

The system has been developed to work with the GARMIN 10 GPS system which has Bluetooth capability and communicates data directly to the RT-22. However the GPS output data stream (GGA format) is common to all units so other GPS units should work fine but they have not been tested at this time. For details how to set-up the GPS connection, please refer to chapter **5.6 Accessories**.

NOTE: when the GPS is activated it does nothing until the "Start recording" selection is made. Then the unit starts to automatically acquire satellites to get a good lock. It is very common that it takes 5-10 minutes to get a good lock with as many satellites as are available (this is the equivalent of a cold start). Once it has found ALL the satellites available it only needs 3 to get a good position. This means that once it has got all the satellites available it can continue to give good data even in areas where many satellites are lost.

4.2.3 Re-acquire background

When in Survey mode, the audio threshold is set using a preset parameter – usually 1 Sigma for sensitive and fast response. When the unit is powered on, after internal checks the **first three samples** are averaged and the Audio Threshold is computed from this average – then the Audio is enabled. If the count level exceeds this threshold the audio will sound as described in paragraph **3.4 Audio**. However in many areas the local background changes and this causes threshold problems.

Image 23, first three samples

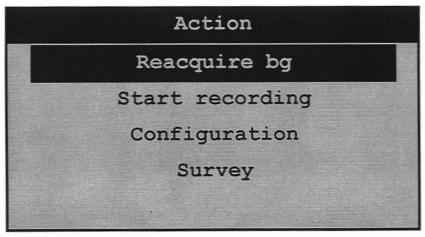


Image 24, Reacquire bg

As an example if the local background level was 100 cps then at 1 Sigma the Audio Threshold = 110 cps (100 + 1 Sigma). So if the count rate goes above 110 cps the audio will sound. However if the local Background increases substantially to 300 cps then the audio will be on continuously and the audio will not seem as sensitive to small local changes. Similarly if the local Background goes down to 50 cps then the local radiation would have to increase very substantially before the audio sounds – thus effectively desensitizing the audio system

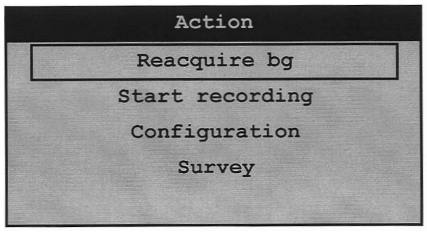


Image 25, Start Reacquire bg

To overcome this "problem" at any time the user can touch the **BUTTON** and **SHORT CLICK** to highlight **Reacquire bg** from the Action Menu and **LONG CLICK** to **Start Reacquire bg**. Then the instrument will return to the Survey display and automatically re-compute the Audio Threshold. The **first three samples** are taken as noted above and the message "UPDATING BG" appears on the screen. This means the user can "retune" the Audio Threshold at any time thus keeping the audio threshold optimized

USERS ARE ADVISED THAT "REACQUIRE BG" ALSO RESETS THE ACCUMULATED DOSE DATA ON THE SURVEY DISPLAY

5 CONFIGURATION

CHANGE OR IMPROPER SET UP OF SOME OF THE PARAMETERS MAY HAVE A NEGATIVE IMPACT ON FUNCTIONING OF THE UNIT. IN CASE OF DOUBT ABOUT THE IMPACT OF A PARAMETER CHANGE, PLEASE CONSULT GEORADIS.

5.1 Manual access to Parameters

There is a structured menu to help the user to set up the basic working parameters of the instrument. Access to all parameters is only possible using remote connection from the PC. Only parameters accessible from unit's user interface are described in this chapter.

Menus are placed into functional groups. For ease of use, the selection and activation logic is always the same. To select – **SHORT CLICK**, to activate - **LONG CLICK**. Each discrete parameter holds a set of permitted values. User must select one of them using **SHORT CLICK** and confirm it by **LONG CLICK**. To leave from a menu to the previous level there is the option "Go Back".

5.2 Date and time

Set up unit's date and time is important for correct date/time stamping of stored data. Year, month, day, hour and minute must be set separately from the list of predefined values.

To change the instrument date and time, go to the **Configuration Menu**, **SHORT CLICK** to highlight "Date and Time" from the Configuration Menu and **LONG CLICK** to **Select Date / Time** options.

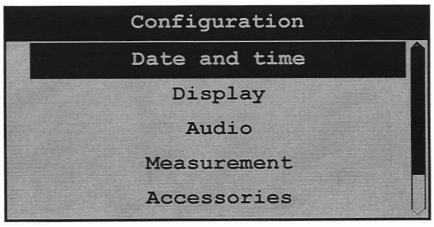


Image 26, Configuration Menu

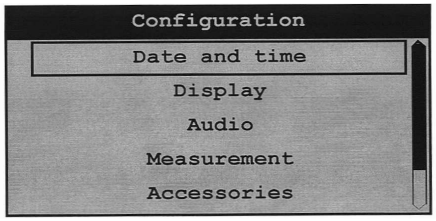


Image 27, Select Date / Time

The **Date and Time Menu** offers several selections as listed below.

5.2.1 Year

Sets the year for the internal clock. The display shows 2006, 2007, 2008 etc. **SHORT CLICK** to highlight the correct year then **LONG CLICK** to set this selection.

5.2.2 Month

Sets the month for the internal clock. The display shows apr, may, jun etc. **SHORT CLICK** to select the right month then **LONG CLICK** to set this selection.

Image 28, Date and Time Menu

5.2.3 Day

Sets the day (date) for the internal clock. The display shows 1, 2, 3…31. **SHORT CLICK** to select the right day then **LONG CLICK** to set this selection.

5.2.4 Hour

Sets the hour for the internal clock. The display shows 0,1,2,3…23. **SHORT CLICK** to select the right hour then **LONG CLICK** to set this selection.

5.2.5 Minute

Sets the minutes for the internal clock. The display shows 0,1,2,3…59. **SHORT CLICK** to select the right minute then **LONG CLICK** to set this selection.

5.3 Display

Almost all LCD devices are more or less sensitive on ambient temperature. The LCD used in RT-220 is rated to operating range from -10 °C to +50 °C.

5.3.1 Contrast

This parameter allows correct adjusted contrast in seven steps. The default value is 0, indicating the factory set contrast at room temperature. Selections are -3, -2, -1, 0, 1, 2, 3. -3 to -1 lighten the display, +1 to +3 darken it. **SHORT CLICK** to select the right contrast then **LONG CLICK** to set this selection.

5.3.2 Backlight

This parameter controls backlighting of the display. Selections are AUTO, ON, OFF.

AUTO the system automatically selects the required Backlighting using a light sensor to set the required level. This is the best selection but in dark shadow areas the Backlighting will come ON to make the display more visible. While often this is a required feature the downside of this is a significant reduction in battery life by typically 40% if the Backlighting is ON all the time

ON overrides the light sensor and sets the Backlighting ON all the time

OFF sets the Backlight permanently Off to conserve battery life.

SHORT CLICK to select the right option then **LONG CLICK** to set this selection.

5.4 Audio

5.4.1 Volume

Sets a percentage of maximum power of the internal voice amplifier. For permanent switch OFF (e.g. if headphones are used) select value OFF. Selections are OFF, 25 %, 50 %, 75 % and 100 %. **SHORT CLICK** to select the right volume then **LONG CLICK** to set this selection.

5.4.2 Filter length

The pitch of the audio tone in **Survey Mode** (see paragraph **4.2**) depends on the intensity of gamma radiation. The higher the radiation the higher tone is produced. Statistical variation in the radiation (it is a physics, intensity is never a constant value) leads to fast frequency changes. This can create additional tone modulation which could lead to discomfort to the user. The instrument samples the radiation level 20 times per second and to make the tone more smoother the filter length can be adjusted. A moving average filtering over giving number of samples is applied. Selections are a filter length of 1, 2, 3…10 samples. **SHORT CLICK** to select the right filter length then **LONG CLICK** to set this selection.

5.4.3 Threshold

Sets the Audio response threshold. Selections are 1…6 Sigma levels of the average of the first 3 seconds (in total 60 samples as the unit is sampling at 20Hz). **SHORT CLICK** to select the right threshold then **LONG CLICK** to set this selection.

If 3 Sigma is selected then when the unit starts the local radiation BACKGROUND is averaged for a 3 seconds period (display shows "Updating BG"). This local background average is then used to compute the selected 3 Sigma (3 Standard deviations) level and this is ADDED to the average background to set the AUDIO THRESHOLD. Each new radiation sample (at a 20/sec rate) are tested against this AUDIO THRESHOLD and if above it then the audio sounds. As an example – a typical local background level could be 100 cps (counts/second). So a selection of 3 Sigma would set the Audio Threshold = 100 + 3 x SqRt of 100 = 100 + 30 = 130. So if the count level goes above 130 cps the audio will sound.

For most applications, a 1 Sigma level is recommended and this is the DEFAULT setting. This means that occasionally the unit will "chirp" on local background but this is often comforting as a means of ensuring the unit is functioning. In some other operational areas this random chirping can distract the user so for these SPECIAL applications a 3 Sigma level can be used

5.5 Measurement

5.5.1 Total scan period

Time is an important factor to increase sensitivity in **Survey Mode** (see paragraph **4.2**). In case of extremely weak sources the user can extent sampling time in Survey mode up to 20 second per sample. Note that the display will be updated at the same rate as the selected Total Scan Period. Selections are 1, 2, 3…20, default is 1. **SHORT CLICK** to select the right total scan period then **LONG CLICK** to set this selection.

5.5.2 Total averaging

To suppress fast changes of total counts on the **Survey Display** (see paragraph **4.2**) a damping can be applied. Note the damping has an impact only on value on the display and is not applied on values stored into the instrument memory. The damping uses a floating average method over a given number of samples, selections are 1, 2, 3…5. **SHORT CLICK** to select the right filter length then **LONG CLICK** to set this selection.

5.6 Accessories

5.6.1 Battery type

Sets the type of Battery used. Selections are "Non rechargeable" or "Rechargeable". **SHORT CLICK** to select the Battery type then **LONG CLICK** to set this selection.

NON RECHARGEABLE selects Alkaline non-Rechargeable batteries. It is highly recommended that if non-rechargeable batteries are used then only alkaline batteries be chosen. Some non-Alkaline non-rechargeable batteries can leak and cause problems inside the instrument. If non-Alkaline are used then remove the battery clip after use to avoid this fairly common leak problem

RECHARGEABLE the internal battery system will automatically select battery type so NiCd or NiMH batteries can be used. However NiMH batteries (2500 series) are highly recommended as NiCd batteries have significant operational limitations in prolonged use.

WHEN USING ALKALINE OR DRY BATTERIES THE BATTERY TYPE PARAMETER NON RECHARGEABLE MUST BE SELECTED

5.6.2 GPS

This selection is used to couple an external GPS to the unit by Bluetooth (BT) link. The users manual of the GPS should be consulted too ensure that the unit batteries are charged. Once batteries are OK switch the units BT capability ON.

This selection is used to couple an external GPS to the Select "GPS" from the Accessories menu by **LONG CLICK** and the display shows **Looking for BT devices** then the messages "Found devices: 1" and "Querying names" follow and finally the **Select GPS Menu** is seen. **SHORT CLICK** to highlight the correct BT device (e.g. "TomTom Wireless", then **LONG CLICK** to select the device. Message says "Connecting to device" and then finally **GPS Connected** then the display goes back to the **GPS Menu**.

To evaluate the readings of the GPS receiver and to verify the correct functioning of it, select "Test GPS" from the **GPS Menu** and **LONG CLICK** to activate this function. The display shows the actual readings from the GPS device, see **GPS Test**. **LONG CLICK** to return to the **GPS Menu**.

The **GPS Test** display offers the following information.

STA : Is the Status of the GPS receiver;
"Not Connected" means there is no GPS receiver connected through BT.
"Connected" means there is a GPS receiver connected through BT however the GPS has not locked onto satellites.
"Fixed" means GPS receiver has locked onto satellites.

SAT : The number of satellites the GPS has been able to find.

LAT : The Lateral position.

LNG : The Longitudinal position.

ALT : The Altitude.

SHORT CLICK to return to the **GPS Menu**.

Note : the **Survey Display** will show the GPS icon ⊹ only in **Recording mode** (see paragraph **4.2.2**).

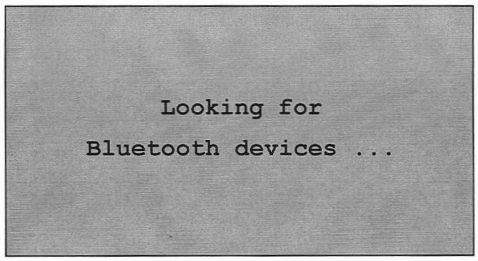


Image 29, Looking for BT devices

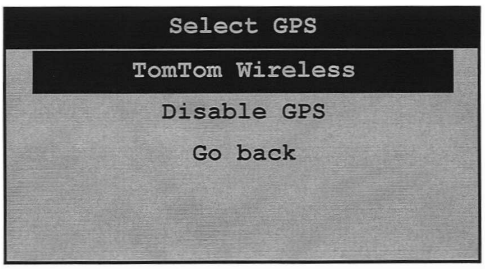


Image 30, Select GPS Menu

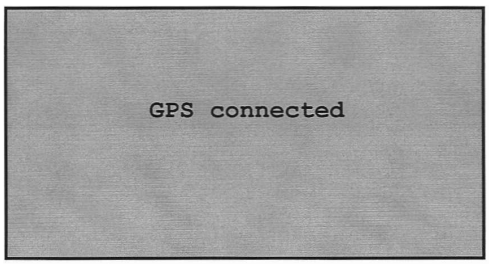


Image 31, GPS Connected

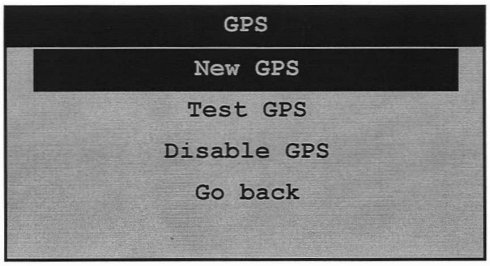


Image 32, GPS Menu

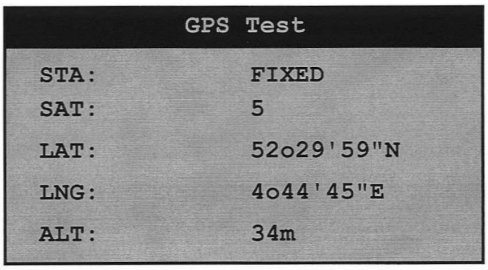


Image 33, GPS Test

5.6.3 Handsfree

This selection is used to connect an external BT earphone system to the unit. In the example below a JAWBONE system is described but most BT compatible earphones are supported. The users manual of the earphone should be consulted too ensure that the unit batteries are charged. Once batteries are OK switch the units BT capability ON.

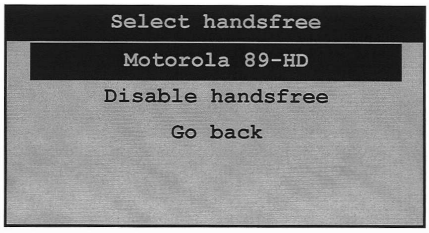


Image 34, Select Handsfree

Make sure the BT earphone is in so called "Pairing Mode", otherwise the RT-22 cannot find the device.

Select "Handsfree" from the Accessories menu by **LONG CLICK** and the display shows **Looking for BT devices** then the messages "Found devices: X" and "Querying names" follow and finally the Chyba! Nenalezen zdroj odkazů. Menu is seen. **SHORT CLICK** to highlight the correct BT device (e.g. "Jawbone", then **LONG CLICK** to select the device. Message says "Connecting to device" and then finally Chyba! Nenalezen zdroj odkazů. then the display goes back to the Accessories Menu.

Image 35, Handsfree connected

Now if the unit internal audio activates to sound the presence of radiation the earphone audio mirrors this data.

Note that the **Survey Display** (see paragraph **4.2**) will show the Handsfree icon 🎧 and the earphones own audio level control is used to control volume.

6 CONNECTION WITH PC

The RT-22 can be connected to a PC using the USB port or alternatively a Bluetooth connection. Users are advised to use the GeoView Software package which was delivered with the instrument.

Alternatively GeoView can be downloaded from our website www.georadis.com. please consult Georadis for advise on the correct version to be used.

For details on using this software package, see the separate user manual on GeoView.

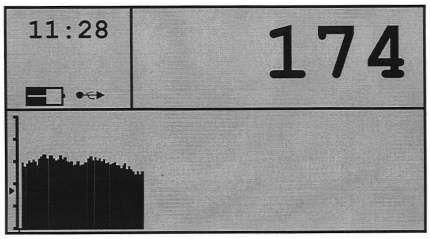


Image 36, USB active


Image 37, USB port

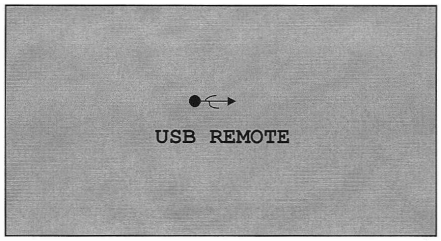


Image 38, USB Remote

6.1 USB connection

The RT-22 can be connected to a PC using the USB connection, the USB icon will appear at the Survey display showing **USB active**.

The RT-22 is supplied a with USB cable to connect to the instrument via the **USB port** which is situated next to the 12 Vdc connection and located behind the hole in the rear wall under the rubber cover.

In case the USB connection is made with the RT-22 switched OFF the **USB Remote** screen is shown however the instrument remains switched OFF.

6.2 BT connection

Connecting a PC through a Bluetooth connection can be done using standard BT software as supplied with the PC. The user is required to set-up a Bluetooth connection with COM port to the RT-22, e.g. COM40. In case a BT password is required use 0000 the standard BT password for RT-22.

GeoView offers the option to connect through a COM port and when the connection is successful the BT icon is shown on the Survey display indicating a **BT remote** connection.

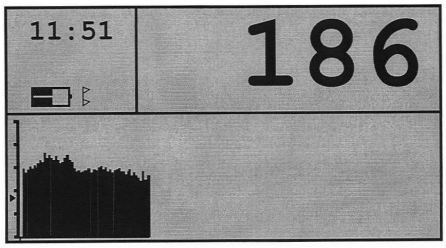


Image 39, BT remote

APPENDIX A, TECHNICAL SPECIFICATIONS

DETECTOR
NaI/(Tl), Φ51 x 51 mm (2" x 2"), 104 cm^3 (6.3 in^3)

SCINTILLOMETER
Sampling period 20/second

GAMMA RAY SENSITIVITY AT 1 M
160 cps/1 MBq for Cs-137
75 cps/1 MBq for Am-241
270 cps/1 MBq for Co-60

DISPLAY
Graphic LCD 128x64 pixels 28 x 60 mm
Automatic Backlight

ACOUSTIC INDICATION
Miniature piezo speaker, audio frequency is proportional to measured count rate

DATA STORAGE AND TRANSFER
1 GB memory for spectra, search profiles and dose
USB 2.0 and Bluetooth 1.2 Class 2
GPS Support
NMEA 0183

ENVIRONMENTAL
IP-65 Dust and Water resistant
Operating temperature range -10 °C to +50 °C
RFI/EMF Shielding complies with FCC (47 CFR part 15) for
Class A CE Certification

SIZE AND WEIGHT
L x W x H 1230 - 1920 mm x 81 mm x 96 mm
Weight 3.6 kg including batteries

PACKAGE
RT-22 instrument with Carrying Strap
AC Net power adaptor
USB Cable and GeoView Software
4 rechargeable batteries
Spare battery cartridge
User guide, CD
Rugged storage and transportation case

APPENDIX B, NOTES AND WARNINGS

The RT-22 (or RS-121T) is a delicate instrument and contains components (Crystal, Photomultiplier) very shock sensitive. **The detector assembly is not covered under warranty.**

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.

A. The "Warranty Period" begins on the date the Equipment is delivered and continues for 24 months.
B. Any repairs under this warranty must be conducted by an authorized Company service representative.
C. Excluded from the warranty are problems due to accidents, misuse, misapplication, storage damage, negligence, or modification to the Equipment or its components.

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