NDT
EQUIPMENT SERVICES LTD

RM100 & RM2000 SURVEY METER

USER MANUAL

Scale shown in this manual is the RM100

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V2.0

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1.0 Health and Safety

- With the exception of AA cell replacement there are no user serviceable parts inside the equipment. The unit should not be disassembled beyond AA cell replacement level as there are high DC potentials of over 600 Volts present.
- Do not allow liquids or foreign objects to enter the unit.
- Do not make any adjustments inside the unit – this will alter the calibration of the device and may render it ineffective in detecting radiation.
- Do not modify or alter the unit in any way or this may affect its fitness for purpose.
- Do not store the survey meter at elevated temperature.
- Do not operate the meter at temperatures below -5 deg C or above 55 Deg C.
- If a fault is suspected the unit should be returned to the supplier for repair.
- The equipment may be internally damaged by dropping or heavy impact. To ensure reliable operation return the unit to the supplier for recalibration should incorrect handling occur.
- The user should ensure that the unit is correctly used. Any alarms or warnings given by the unit to the user should be interpreted responsibly. The manufacturer or supplier is not liable for incorrectly interpreted false alarms.
- The unit is intended as a measuring device for determining leakage of gamma radiation. It is not intended for use in any other application unless agreed by the supplier in writing.
- Ensure that the meter you have purchased is appropriate for the radiation energies present in your application.
- The unit should be calibrated annually to ensure accurate operation.

End of Life Statement

Do not dispose of this unit in normal household waste. Take to a commercial waste recycling facility. The unit contains batteries that may release toxic chemicals or explode if incinerated.

2.0 Application and Meter Types

The RM100/RM2000 Survey Meter is a measurement device that will detect the presence of Gamma and X Ray Radiation . The instrument provides an indication of radiation exposure rate in µSv/Hr with a measured value on the analog meter scale.

The meter may be supplied in various meter scale configurations depending on model purchased.

The unit produces µSv/Hr measurements and also has two further measurement modes: 'PEAK DOSE' and 'ACCRUED DOSE'. PEAK DOSE will retain the highest value displayed on the meter scale since the function was selected. ACCRUED DOSE will totalise radiation second by second to allow dose-over-time measurements.

The unit will emit a 'click' sound each time a radiation event is detected which may be muted if desired. The scale may also be illuminated if required during operation.

The RM100/2000 also has inbuilt fault detection and status monitoring and will warn if a fault or over-range is present or the batteries require replacement.

3.0 Controls, Features and Displays

The survey meter has a minimum of controls to enable quick and easy use.

3.1 Analogue Display

This provides a clear indication of the current measured reading. The current battery reserve is also indicated on the green scale section during power on. The scale can be illuminated if required by means of the 'Mute/Lamp' button.

3.2 Power On/Off Switch

Pressing this will switch the unit on. A red LED will light at the bottom of the switch to indicate the unit is powered on. If a low battery is detected the red LED will flash to warn that batteries require immediate replacement.

At switch on the unit will sweep the meter needle to full scale and perform an intelligent battery test to ensure the unit has sufficient battery power to run for several hours unattended. The needle will fall to the indicated battery level during the test. Once all power up operation checks are completed the meter will begin to operate and provide radiation measurements. The start up sequence and checks take less than 8 seconds to complete.

If any faults are detected the unit will sound an alarm.

3.2 Mute/Lamp Button

By default the unit will power up with the meter backlight off and with the 'click' speaker enabled. Pressing the button will run through each of four possible combinations of sounder on/off and backlight on/off. When the sound is turned off the LED at the switch will illuminate.

3.3 Peak Dose Button

Pressing this button will cause its LED to illuminate to indicate 'Peak Dose' mode. During operation the meter will retain the highest value detected and cause the needle to 'HOLD' the value. The speaker 'click' will still be heard, however the meter will only move in an upward direction (never downwards) once a higher dose level has been recorded. This function enables the meter to be safely left in a high radiation field without the operator being present. The operator can then return and safely read off the maximum value seen during the test. The function can be exited by pressing the button again or by selecting 'Accrued Dose' mode.

3.4 Accrued Dose Button

Pressing this button will cause it to add together second by second the dose present at the RM100/RM2000. For example, pressing the button in a 10µSv/h dose field and noting the reading after 60 minutes will show an indicated dose of 10µSv.

The function can be exited by pressing the button again or by selecting 'Peak Dose' mode.

3.5 Sounder

The sounder speaker is provided to give audible 'click' indication that a radiation event (count) has occurred. If an alarm condition occurs (radiation overload, low battery, etc) the unit will sound a constant rasping 2 KHz tone. The sounder can be turned off in normal operation by means of the Mute/Lamp button. Alarms will always be active and cannot be disabled.

3.6 Backlight

A backlight is provided to allow the meter to be read in low light conditions. The backlight can be turned on and off by means of the Mute/Lamp button. The default is backlight off. If the backlight flashes rapidly accompanied by an intermittent rasping sound from the speaker this is an indication of a meter over range situation.

4.0 Operation

To use the RM100/RM2000, press the 'Power On/off' button. The unit will sweep to maximum scale perform a systems check and intelligent battery test also indicate current battery level. The unit will then begin operating within 8 seconds. The unit may be switched off by pressing the button once more.

The RM100/RM2000 does not power off automatically for safety reasons. Once switched on it will remain operational until an operator manually turns the unit off.

The red LED in the On/Off button should be lit during operation. If it is flashing at any time the batteries require immediate replacement.

If the unit is heard to make a rasping constant tone this is indicating that either the batteries are flat or the unit has a fault. Replace batteries – if the unit still alarms contact NDT Equipment Services for advice.

4.1 Making a Measurement.

The unit will initially power up in 'normal' mode and will indicate real time uSv/h dose levels.

The unit has an integrated GM tube and the sensitive area is at the centre of the front vertical face of the unit immediately in front of the meter section marked with a black cross.

Move the meter to the area to be surveyed. In order to achieve a stable and accurate reading allow the meter to sample for no less than 10 seconds before noting the reading. When moving the meter to another measurement location allow a further 10 seconds for the reading to stabilise before observing the reading.

During measurement the unit will 'click' the speaker each time a 'radiation event' is sensed by the GM tube. The 'click' may be turned off if desired by the 'Mute/Lamp' button.

4.2 Peak Dose Feature.

Peak Dose can be selected by pressing the button. This feature is useful when measuring areas of potentially high gamma or X-ray leakage. The meter can be placed in position and the source exposed or X-ray set enabled. Once the radiation source is made safe the user can retrieve the instrument and read off the maximum dose recorded from the meter scale.

The held value can be 'cleared' by pressing the button to turn the feature off and revert back to 'Normal' measurement mode. Pressing the button again will instigate a further 'Peak Dose' measurement cycle.

4.3. Accrued Dose Feature.

In this mode the reading on the meter display will accrue over time.

For example, if the meter is switched to this position in a 10 µSv/h radiation field the meter will accrue measured dose at the rate of 10 µSv/h. In 60 minutes the meter will indicate an accrued dose of 10 µSv.

The reading is cleared by pressing the 'Accrued Dose' button again to turn the feature off. Pressing again will instigate a further accrued measurement period.

5.0 Batteries and Replacement

The unit uses two 1.5v AA cells, which are housed in the handle of the RM100/2000. A coin may be used to unscrew the cover at the end of the handle which will allow the batteries to slide out for replacement. It is recommended that Alkaline 1.5v cells are used.

DO NOT USE RECHARGEABLE BATTERIES as their cell voltage is normally 1.2v instead of the 1.5v required of alkaline cells. The RM100 will indicate early battery failure if rechargeable cells are used.

Insert the NEW **(don't re-use old or partially discharged batteries)** cells into the handle with the 'pip' (or pointed +V end) into the unit, and the flat base of the cells facing outwards from the handle. *The RM100/2000 is protected against damage due to polarity reversal, but the batteries will become rapidly discharged if left incorrectly fitted.*

Replace the end cover, being sure to tighten to get a good contact and to prevent entry of water to maintain the IP65 rating.

Batteries will typically last 200 – 250 hours of operation depending on radiation dose and use of the backlight.

Expired batteries will be indicated by the red Power On/Off LED flashing or the unit producing a rasping alarm tone. Remaining battery life is indicated on the meter at switch on time.

6.0 Problem Solving

If a fault is suspected, always replace the batteries first before investigating further.

The Survey Meter emits a continuous 'rasping' tone. Low Battery light is off.	The batteries may be critically low. Replace with a fresh set. If the fault is still present the unit has developed an internal fault and must be returned for repair.
The Survey Meter emits a continuous 'rasping' tone. Low Battery light is on.	The battery has passed the minimum acceptable voltage and the instruments can no longer function correctly. Fit new AA Alkaline or 'Ultra Lithium' batteries.
The Survey Meter powers up OK, but later emits an intermittent 'rasping' tone and continuously flashes the backlight during operation. Low Battery light is off.	The meter may be in a high radiation area and is either receiving a very high dose, or has saturated to maximum reading due to a very high dose level. Retreat to a safe area and check that the instrument is functioning correctly (alarm ceases). If the alarm condition stops there may be a dangerously high radiation field in the surveyed area.
The Battery Low LED is flashing or is constantly on.	This indicates that the battery level is low or becoming low. Change the batteries.
The meter pointer does not sweep to full scale when the 'Power On/Off' button is pressed.	This indicates that the meter has totally discharged batteries or has been damaged.
The meter pointer sweeps the meter scale at switch on, but then remains at zero, regardless of radiation sources and natural background radiation. No clicking is heard from the unit.	The meter may have developed a fault. If the meter or (optional) external probe has received heavy impact, the GM tube may have broken and require factory replacement and recalibration.
The meter pointer sweeps the meter scale at switch on, but then emits a continuous 'rasping' tone with the meter indicating full scale.	The unit has detected an internal fault, or the unit has been switched on in an area of very high radiation field and is over-ranged.
The meter pointer will not return to zero when I power off	The meter may have mechanical damage and require repair.

7.0 Specification

Weight	0.640Kg (Inc batteries)
Size	Max 20 x 11.5 x 8.5cm. (inc handle)
Protection	IP65
GM Tube type	LND 7231.
Measurement range	0-100µSv/h or 0-2000 µSv/h
Measurement Modes	'Normal' mode, Peak Dose and Accrued Dose functions
Additional Features	Meter Backlight.
Controls	Four button keypad.
Indicators	Power On/Low battery, Mute, Peak Dose, Accrued Dose, Over Range
Batteries	Two replaceable single use Alkaline 1.5v 'AA' cells, housed in handle.
Battery Life	Approx 200-250 hours for Alkaline AA cells depending on radiation activity and backlight use.
Temperature Range	Operation -5 to 55 Degrees C.