DoseRAE Pro

User's Guide

RAE SYSTEMS by Honeywell

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1 Read before Operating

This manual must be carefully read by all individuals who have or will have the responsibility of using, maintaining, or servicing this product. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.

FCC Part 15 Class A Equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

FCC Information

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Electronic Waste Disposal

This symbol WEEE (crossed-out wheeled bin) indicates separate collection of waste electrical and electronic equipment in the EU countries.

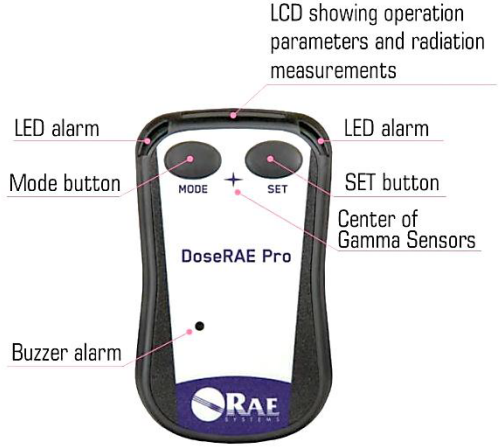
This product may contain one or more Nickel-metal hydride (NiMH), Lithium-ion or Alkaline batteries. Specific battery information is given in this user guide.

Batteries must be recycled or disposed of properly. At the end of its life, this product must undergo separate collection and recycling from general or household waste. Please use the return and collection system available in your country for the disposal of this product.

2 Warnings

For safety reasons, this equipment must be operated and serviced by qualified personnel only. Read and understand the user manual completely before operating or servicing.

3 DoseRAE Pro Features

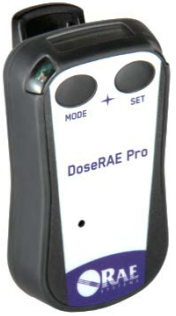


Front View

Rear View

Bottom View

4. General Information



The DoseRAE Pro is an electronic personal dosimeter that can directly read X-ray or Gamma-ray dose equivalent and dose equivalent rate in a rugged, lightweight package. It provides dose measurement, dose rate measurement, and chirp alarms and has many outstanding features such as water resistance, bright flashing LEDs, a loud, 85dB alarm, a vibrating alarm, long battery life, long calibration life, wireless computer interface and dose history management capabilities. The DoseRAE Pro is specially designed for use in nuclear power plants, nuclear fuel and components factories, nuclear waste-processing plants, as well as in radiation source management, nuclear medicine, and environmental monitoring organizations. DoseRAE Pro has dual-channel detectors that employ a semiconductor diode and a scintillation crystal as sensors. It can detect radiation rapidly in a wide energy range, and its energy compensation ensures accurate readings.

5 Inserting & Replacing the Battery

The DoseRAE Pro uses a single AA alkaline battery as its power source. To change the battery:

1. Use a coin or screwdriver to open the cover on the bottom of the unit. Turn the cover counterclockwise to loosen the cover, and then take the cover off.
2. Insert the battery into the compartment with the positive (+) end of the battery facing into the unit. You should see the negative (-) end of the battery.
3. Replace the cover and turn it clockwise to secure the cover.

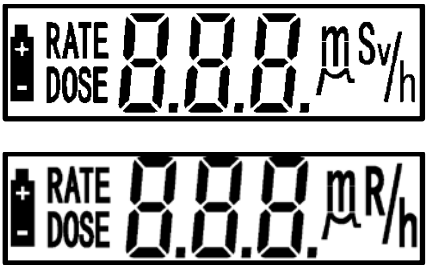
CAUTION: Wait at least ten (10) seconds after removing the battery before reinstalling a new one.

The DoseRAE Pro is able to use any standard AA battery between 1.25 and 3.2 V. However, for availability, waste disposal, discharge characteristics, and cost reasons, it is recommended that a standard alkaline battery be used.

6 User Interface

The DoseRAE Pro's user interface consists of an LCD display, LED alarms, buzzer alarm, vibration alarm and **MODE** and **SET** buttons. The display provides visual feedback that includes time, functional mode, battery condition, and radiation measurements.

6.1 LCD Display



User interface icons employed on the display are described on the next page.

6.2 User Interface Icons

Icon	Indication
	Battery status: flashes/solid when battery voltage is low
	RATE icon: flashes during Dose Rate and Dose Rate Warning alarms
	DOSE icon: flashes during Dose and Dose Warning alarms
	Radiation Measurement: three (3) significant digits, self-ranging
or	Dose rate unit: automatically provides correct units for the given measurement (µSv/h, mSv/h, Sv/h) or (µR/h, mR/h, R/h)

LCD Backlight

Pressing the **MODE** or **SET** button will turn on the LCD backlight and the backlight will automatically turn off after six (6) seconds, if the **MODE** or **SET** button has not been pressed again.

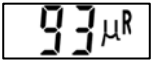
7 Turning DoseRAE Pro On

Press and hold the **MODE** button for five (5) seconds. As the DoseRAE Pro starts up, the following occurs:

1. The LCD screen illuminates and checks the display segments.

2. The current firmware version is displayed. The LEDs and alarm undergo a self-test.

3. The unit displays the total dose, and is now operating.

(or 

)

8 Turning DoseRAE Pro Off

With the DoseRAE Pro in normal detection mode (refer to section 9.1), press and hold **MODE** for five (5) seconds. There is a five-second countdown, and when it reaches 0, the word "OFF" is displayed. Release **MODE**, and the display goes blank in three (3) seconds.

8.1 Low-Voltage Shutoff

When the battery voltage is lower than 1.2V in Normal Operating Mode and if there are no alarms, the battery status icon flashes on the LCD and the LEDs flash in green once per minute. When the voltage further drops to lower than 1.0V, or when the DoseRAE Pro continuously operates for 48 hours after its voltage reached 1.2V, the DoseRAE Pro shuts down automatically.

Note: It is not recommended to start data communications between the DoseRAE Pro and the PRR-1 Dosimeter Reader when the instrument is in a low voltage state.

9 Operation

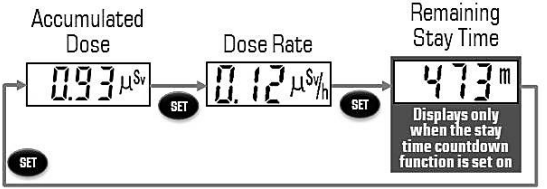
DoseRAE Pro has three (3) operating modes:

- Normal Operating Mode
- Confirmation Mode
- Programming Mode

Normal Operating Mode is the default. After the unit is turned on, it is in Normal Operating Mode, displaying the current accumulated dose reading. Programming Mode is described in section 9.3.

9.1 Normal Operating Mode

In Normal Operating Mode, the DoseRAE Pro measures gamma radiation dose rate and accumulates readings for dosage data. Pressing **SET** steps you through screens displaying the current readings of accumulated dose, dose rate and remaining stay time (only displays when the stay time countdown function is set to "on").



Accumulated Dose: Displays the accumulated dosage (in units of μSv, mSv, Sv or μR, mR, R, automatic ranging) since last reset.

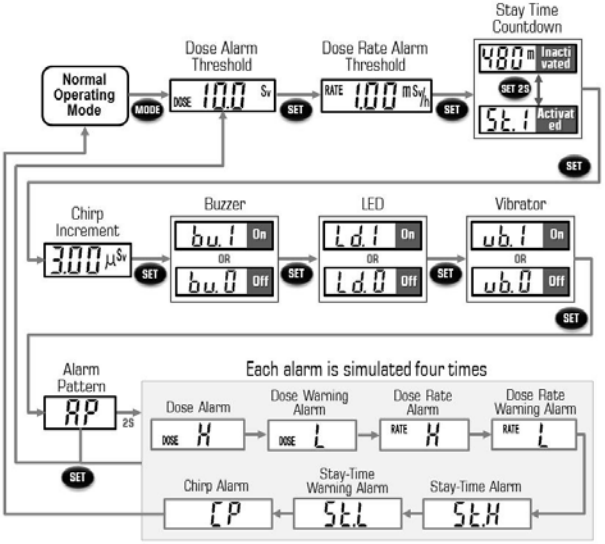
Dose Rate: Displays the dose rate from background to 10 Sv/h or 999R/h (in units of μSv/h, mSv/h, Sv/h or μR/h, mR/h, R/h, automatic ranging).

Remaining Stay Time: Displays a count-down timer of the time remaining until a Stay-Time alarm is activated. If the time left is greater than 999 minutes, 999 minutes will be displayed.

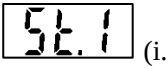
9.2 Confirmation Mode

This mode allows you to check alarm settings and indicator statuses, turn on/off stay time countdown and perform an alarm pattern test. Press **MODE** button from Normal Operating Mode to enter Confirmation Mode.

The following chart shows how to navigate Confirmation Mode (pressing **SET** repeatedly steps through the screens):



As illustrated in the above figure, to enable or disable the stay time countdown function, press and hold the **SET** button for 2 seconds until the display switches from

to 

(i.e., being activated), or the reverse (i.e., being inactivated).

After the alarm pattern test finishes, the unit will automatically return to Normal Operating Mode.

Press the **MODE** button at any point during the Confirmation sequence to return to Normal Operating Mode.

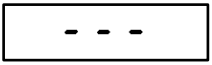
9.3 Programming Mode

This mode allows you to change alarm and instrument settings (such as measurement unit, temperature unit, and time).

Note: If you do not press a key for 60 seconds while the unit is in any submenu of Programming Mode, the display reverts to the next item of the main menu.

9.3.1 Entering Programming Mode

From Normal Operating Mode, simultaneously press and hold **MODE** and **SET** for three (3) seconds. The password entry screen is shown:

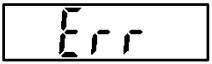


Press **MODE** to advance to the next digit, and press **SET** to increase the value of a digit from 0 to 9.

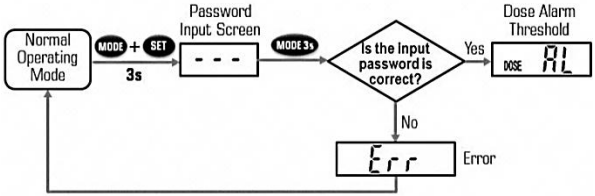
Note: The default password value is "000".

After the password is input, press and hold **MODE** for three (3) seconds to enter Programming Mode.

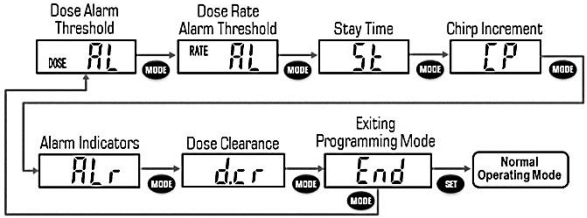
Note: If the password input is not correct, an error message screen will be displayed, and the unit remains in Normal Operating Mode.



If the password is correct, the screen for dose alarm threshold setting is displayed.



The next chart shows how to navigate Programming Mode using the **MODE** and **SET** keys.



9.3.2 Setting Dose Alarm Threshold

At the menu for setting a threshold at which an accumulated dose of radiation triggers the corresponding alarm, the following screen is shown:

Press **SET** to enter and change the setting. Press **MODE** to advance to the next menu.

The LCD displays the current value. Change the value by pressing **SET**, or return to the previous screen by pressing **MODE**.

To change the value:

1. Press **SET** to increase an active (flashing) digit (0 through 9; it "wraps" back to 0 again after 9).
2. Press **MODE** to advance to the next digit.
3. After moving to the last digit and making changes, press **MODE**. The decimal point starts to flash. Press **SET** to shift the decimal point to the next position on the right.
4. After the decimal point moves to a proper position, press **MODE**. The unit symbol starts to flash. Press **SET** and the symbol changes from Sv to µSv to mSv ("wraps" back to Sv when pressing while mSv is displayed).
5. press and hold **MODE** until you see the following screen:

The "dn" is short for "done," and confirms that you have saved your alarm threshold value. Press **MODE** to advance to the next menu.

9.3.3 Setting Dose Rate Alarm Threshold

At the menu for setting a threshold at which a

radiation dose rate triggers the corresponding alarm, the following screen is shown:

Press **SET** to enter and change the setting. Press **MODE** to advance to the next menu.

The LCD displays the current value. Change the value by pressing **SET**, or return to the previous screen by pressing **MODE**.

To change the value:

1. Press **SET** to increase an active (flashing) digit (0 through 9; it "wraps back to 0 again after 9).
2. Press **MODE** to advance to the next digit.
3. After moving to the last digit and making changes, press **MODE**. The decimal point starts to flash. Press **SET** to shift the decimal point to the next position on the right.
4. After the decimal point moves to a proper position, press **MODE**. The unit symbol starts to flash. Press SET and the symbol changes

from mSv/h to Sv/h to µSv/h (it "wraps" back to mSv/h when pressing while µSv/h is displayed).

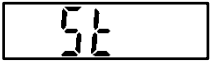
5. press and hold **MODE** until you see the following screen:

The "dn" is short for "done," and confirms that you have saved your alarm threshold value. Press **MODE** to advance to the next menu.

9.3.4 Setting Stay Time Value

This menu allows you to set the value of a countdown timer. The default value is 480 minutes (8 hours).

Press **SET** to enter and change the setting when the following screen is shown:



The LCD displays the current value. Change the value by pressing **SET**, or return to the previous screen by pressing **MODE**.

To change the value:

1. Press SET to increase an active (flashing) digit (0 through 9; it "wraps back to 0 again after 9).
2. Press **MODE** to advance to the next digit.
3. After a proper value is selected, press and hold **MODE** until you see the following screen:

The "dn" is short for "done," and confirms that you have saved your desired stay time. Press **MODE** to advance to the next menu.

9.3.5 Setting Chirp Increment Value

This menu allows you to set the value of Chirp Increment. If it is not set to zero, a chirp or beep will sound each time an accumulated dose equates to the preset value.

Press **SET** to enter and change the setting when the following screen is shown:

The LCD displays the current value. Change the value by pressing **SET**, or return to the previous screen by pressing **MODE**.

To change the value:

1. Press SET to increase an active (flashing) digit (0 through 9; it "wraps back to 0 again after 9).
2. Press **MODE** to advance to the next digit.
3. After moving to the last digit and making changes, press **MODE**. The decimal point starts to flash. Press **SET** to shift the decimal point to the next position on the right.
4. After the decimal point moves to a proper position, press **MODE**. The unit symbol starts to flash. Press **SET** and the symbol changes from Sv to μSv to mSv ("wraps" back to Sv when pressing while mSv is displayed).
5. press and hold **MODE** until you see the following screen:

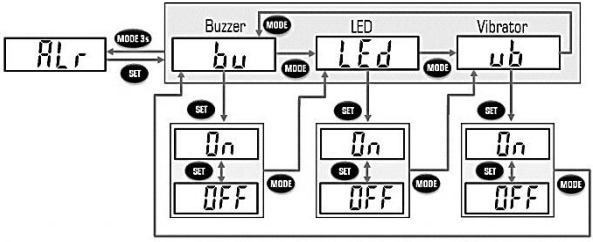
The "dn" is short for "done," and confirms that you have saved your chirp value. Press **MODE** to advance to the next menu.

9.3.6 Turning On/Off Alarm Indicators

This menu allows you to further turn on or off one or more alarm indicators (LEDs, buzzer and vibrator) on the basis that there is always at least one indicator left on.

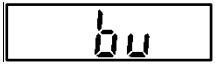
Press **SET** to enter and change the setting when the following screen is shown:

The following chart shows how to navigate the menu using the **MODE** and **SET** keys.



Turning Buzzer On/Off

At the submenu for turning the buzzer on/off, the following screen is displayed:



Press **SET** to change the buzzer alarm from on to off.

Press it again to change from off to on.

Once you are satisfied with your choice, press **MODE** to confirm your selection and advance to

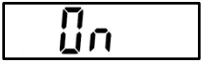
the next submenu.

Turning Visible Alarm (LEDs) On/Off

At the submenu for turning the LEDs on/off, the following screen is displayed:

Press **SET** to change the visible alarm from on to off.

Press it again to change from off to on.



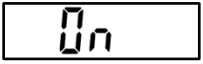
Once you are satisfied with your choice, press **MODE** to confirm your selection and advance to the next submenu.

Turning Vibrator On/Off

At the submenu for turning the vibrator on/off, the following screen is displayed:

Press **SET** to change the vibrator alarm from on to off.

Press it again to change from off to on.

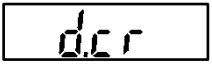


Once you are satisfied with your choice, press **MODE** to confirm your selection. The screen display reverts to that for turning on/off the buzzer.

Pressing and holding **MODE** steps you back to the upper menu.

9.3.7 Clearing Accumulated Dose

This menu allows you to clear the dose history and reset the dose reading to zero.



Press and hold SET until you see the following screen:

The "dn" is short for "done," and confirms that the accumulated dose has been successfully cleared.

9.3.8 Exiting Programming Mode

Press **SET** when the following screen is displayed to exit Programming Mode and enter Normal Operating Mode.

Note: If you do not press any key for 60 seconds while it is in Programming Mode, the DoseRAE Pro unit exits Programming Mode automatically.

10 Specifications*

Detector	PIN photodiode and CsI (Tl) crystal + PIN photodiode
Applicable radiation type	X-ray and Gamma radiation
Size	52mm x 89mm x24 mm (2.0" x 3.5" x 0.9") excluding a clip
Weight	130g (4.6oz.) with battery

Dose range	0.01µSv to 9.99Sv (1µR to 999R)
Dose rate range	0.01µSv/h to 9.99Sv/h (1µR/h to 999R/h)
Dose accuracy	±15%
Dose rate accuracy	±20% from 10µSv/h to 9.99 Sv/h (1mR/h to 999R/h) ±30% or 0.1µSv/h (10µR/h) from 0.01µSv/h to 10µSv/h (10µR/h to 1mR/h)
Energy response	50keV to 6MeV for X-ray and gamma radiation
Dose rate response time	5s (dose rate >10uSv/h)
Dose alarm levels	Adjustable from 1.0µSv to 9.99Sv (0.1mR to 999R)
Dose rate alarm levels	Adjustable from 1.0µSv/h to 9.99Sv/h (0.1mR/h to 999R/h)
Datalog	3,000 data points
Shock resistance	Passed drop test from 59" (1.5m) onto hardwood surface
Alarm indicators	Buzzer (> 85dB@30cm), vibrator, and LED's

Chirp	One beep per preset dose increment.
Angle response	0º to 75º: ≤ ±20% for ^{137}Cs ≤ ±50% for ^{241}Am
Display	Segment LCD
Environmental	Operating temperature: -20°C to 50° C Storage temperature: -30°C to 70°C Humidity: 0% to 95% (non-condensing)
IP rating	IP-54
Power	One alkaline AA battery (typically 750 hours)

** Specifications are subject to change*

11 Technical Support

To contact RAE Systems Technical Support Team:

Monday through Friday,
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