DoseRAE 2

Electronic Personal Dosimeter
For X-Ray & Gamma Radiation
User's Guide

P/N 035-4025-000 Rev. A
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ISO 9001 CERTIFIED

RAE SYSTEMS

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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.

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.

WARNING

Substitution of components may impair safety.

This product 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.

DoseRAE 2 User's Guide

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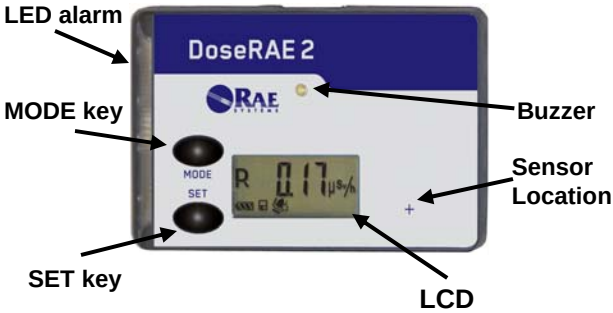
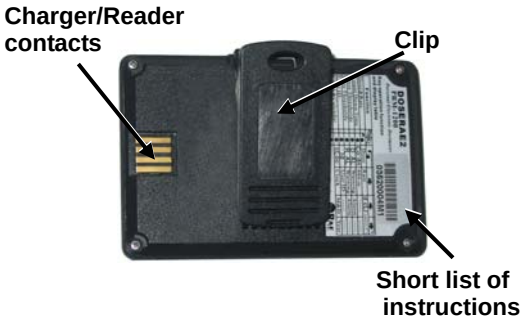
3 DoseRAE 2 Features

Front View



Rear View



Protective Pocket Wearing Option

Pocket Clip Wearing Option

4 General Information

The DoseRAE 2 personal dosimeter is a thin electronic monitor that can directly read X-ray or Gamma-ray dose equivalent and dose equivalent rate. It is specially designed for use in nuclear power plants, nuclear fuel and nuclear components factories, and nuclear waste-processing plants, as well as in radiation source management, nuclear medicine, and environmental monitoring organizations. DoseRAE 2 has dual-channel detectors that employ a semiconductor diode and a scintillation crystal as sensors. It can detect radiation rapidly in a wide range, and its energy compensation ensures accurate readings.

5 Charging The DoseRAE 2

Charge the DoseRAE 2 before its first use, and charge it when it is not in use. The DoseRAE 2 must be placed in its Charger/Reader for battery charging.

5.1 Charger/Reader

The DoseRAE 2 Charger/Reader can be used for DoseRAE 2 battery charging, parameter modification and datalog reading (when connected to a computer running ProRAE Dosimeter software). It can provide a DoseRAE 2 with up to 100 mA of current. The minimum charging time is 1.5 hours.

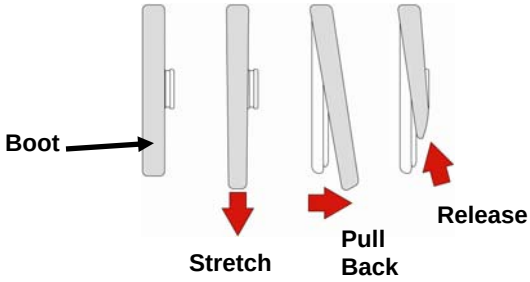
The red LED indicates the USB power supply is on (Power). The green LED indicates the data transferring is on (Status).

The DoseRAE 2 Charger/Reader can be plugged directly into a computer's USB port, or an extension USB cable can be employed between the Charger/Reader and the computer if plugging directly into the port isn't convenient. (For information on connecting the Charger/Reader to a computer, refer to page 62.)

5.2 Removing The Silicone Boot

If the boot is installed, it must be partially removed in order to expose its electrical contacts to meet with the corresponding contacts in the Charger/Reader.

Pull down on the bottom of the boot and stretch it, pulling it partially off of the DoseRAE 2. Release it, and it stays out of the way of the contacts.



Then place the DoseRAE 2 in the Charger/Reader.

After the battery is charged, reverse the process to stretch the boot back over the DoseRAE 2.

5.3 Low Battery

When the battery voltage is low, the green LED flashes once per minute and the LCD displays the "battery low" icon:

After 12 hours in the "battery low" state, the instrument automatically shuts off. Recharging is needed after the instrument has automatically shut off.

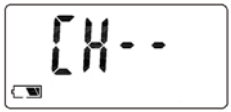
5.3.1 Charging With Instrument On

During charging, the DoseRAE 2's green LED flashes once per second and the LCD displays the battery voltage change:

When the battery is fully charged, the green LED stops flashing, and the LCD displays the "battery full" icon:

5.3.2 Charging With Instrument Off

While the battery charges, the green LED flashes once per second and the LCD displays this:

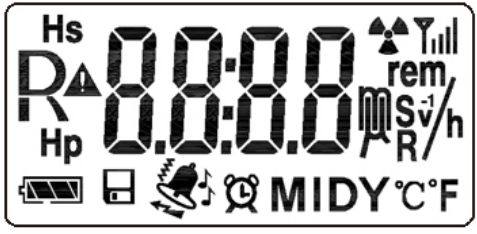


When the battery is fully charged, the green LED stops flashing and the LCD displays this:

6 User Interface

The DoseRAE 2's user interface consists of an LCD display, LED alarm, buzzer alarm, and [MODE] and [SET] buttons. The display provides visual feedback that includes time, functional mode, battery condition, and radiation measurements.

6.1 Display



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

6.2 User Interface Icons

Icon	Indication
	Battery status
	Datalog history
	Alarm: sound, light, vibration
	Clock and countdown
MIDY	Month(M), Date(D), Year(Y) and user ID (ID)
℃	Celsius
℉	Fahrenheit
D	Dose
R	Dose rate
	Error warning
	Dose or Dose Rate alarm
	Dose rate rem unit: µrem/h, mrem/h, rem/h
	Dose rate Sievert unit: µSv/h, mSv/h, Sv/h
	Dose rate Roentgen unit: µR/h, mR/h, R/h
	Display: 4 digits, 8 segments
V	Battery voltage

OL	Over load
▲L-SF	Low-channel sensor failure
▲H-SF	High-channel sensor failure
SA--	Stand-alone mode
SC--	System control mode
Cadn	Countdown time
D AL	Dose alarm value
R AL	Dose rate alarm value
Id	User ID
CLOC M DY	Clock/Calendar

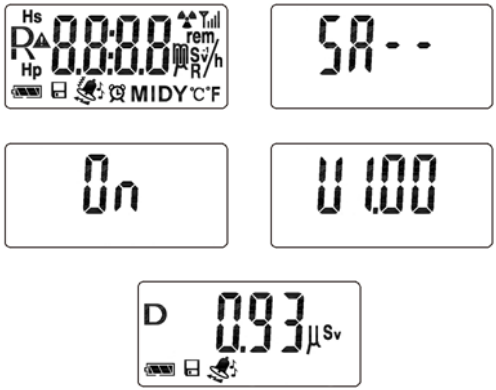
6.2.1 Advanced Version Icons

The following icons are only found on the Advanced Version of the DoseRAE 2:

Icon	Indication
	Wireless communication
Hs	Shallow dose equivalent or dose rate
Hp	Deep dose equivalent or dose rate

7 Turning DoseRAE 2 On

Press and hold the [MODE] button for 5 seconds. As DoseRAE 2 starts up, the LCD screen illuminates and checks the display segments and backlight. It then checks the display, working mode, startup, and firmware version before performing a 30-second countdown. After the countdown, the reading display is shown and it begins normal detection.



The normal display shows the accumulated dose value.

Press [SET] to see the background dose rate values:

8 Turning DoseRAE 2 Off

With the DoseRAE 2 in normal detection mode, press and hold [MODE] for five 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 seconds.

8.1 Low-Voltage Shutoff

When the battery voltage is lower than 3.3V in normal detection mode and if there are no alarms, the DoseRAE 2 shuts off automatically after 12 hours. It must then be recharged before it is used again.

9 Operation

DoseRAE 2 has two operating modes:

- Normal Operating Mode
- Programming Mode

Normal Operating Mode is the default. After the unit is turned on, it is in Normal Operating Mode. Programming Mode is described on page 28.

9.1 Normal Operating Mode

In Normal Operating Mode, DoseRAE 2 measures gamma radiation dose rate and accumulates readings for dosage data. Press [MODE] and sequentially step through all functions. Press [SET] to step through the sub-functions.

Note: When you reach the last function or setting, it loops back to the first item in the list (this is indicated in the table on the next page by the thick, dark line with an arrowhead).

Normal Operating Mode Functions

Function	SET / MODE				
Dose & Dose Rate	⇩	Dose	Dose rate	Clear dose (hold 5 S)	
Countdown Time	⇩	Cadn	Countdown time	------	-----
Dose Alarm set value	⇩	D AL	Pre-alarm value	Alarm value	-----
Dose Rate Alarm set value	⇩	R AL	Pre-alarm value	Alarm value	-----
User ID	⇩	Id	User ID	------	-----
Clock/ Calendar	⇩	cLoc (12 M DY)	Clock	Month & Date	Year
Ambient temper-ature		Show current ambient temperature			

9.1.1 Dose And Dose Rate

When the DoseRAE 2 is turned on, it is in Normal Operating Mode and the screen shows current accumulated dosage:

Press [SET] to see the current background dose rate:

Press [SET] again, and this is displayed:

"dcLr" means "Do you want to clear accumulated dose?"

To clear the dose, press and hold [SET] for five seconds. When it is done, the display shows "dn":

The final, cleared dose display looks like this:

If you do not want to clear the dose, then press [SET]. It returns to the dose-accumulating screen:

Note: When the DoseRAE 2 is in normal display mode, you can shut off the buzzer and alarms by pressing and holding [SET] for five seconds. To turn them back on, press and hold [SET] again for five seconds.

When the alarms are on, this icon is visible:

When the alarms are turned off, the icon is not shown.

9.1.1.1 Changing To Countdown

Press [MODE] to change to Countdown:

You can check the total stay time or start to count down from this screen. The factory default value is 480 minutes (8 hours).

Press [SET] to see this display:

Press and hold [SET] for five seconds to start the countdown. The "clock and countdown" icon starts to flash:

Note: To end the countdown, press and hold [SET] again.

When the remaining time reaches the pre-alarm value (the default setting is 20% of the total time), the DoseRAE 2 starts pre-alarming, with two beeps and two flashing orange lights. When the total time is used up, the instrument alarms with three beeps and three flashing red lights.

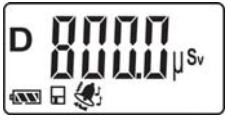
Note: If you do not change a setting or press a button for 60 seconds, the DoseRAE 2 reverts to displaying current readings.

9.1.2 Dose Alarm Value

The Dose Alarm alerts you when a dose threshold is exceeded.

You can switch the DoseRAE 2 from Countdown to Dose Alarm operation. At the Countdown and time-remaining screen (where it says, for example, 480m), press [MODE]. The letter "D" appears in the upper left portion of the screen, along with "AL":

Press [SET], and the screen displays the dose pre-alarm value.



In Dose Alarm mode, the pre-alarm value is calculated based on the alarm-setting value. (The default pre-alarm value is 80% of the alarm value.)

Press [SET] to get the dose alarm value display screen.

The Factory default dose alarm setting's value is 1.000mSv:

When the Dose alarm is activated, this symbol is shown on the screen:

Note: If you do not change a setting or press a button for 60 seconds, the DoseRAE 2 reverts to displaying current readings.

9.1.3 Dose Rate Alarm

The Dose Rate Alarm alerts you when the dose value per hour exceeds the set value.

From the Dose Alarm screen, press [MODE] to switch to Dose Rate Alarm:

The letter "R" appears in the upper-left portion of the screen, along with "AL."

To see the dose rate pre-alarming value, press [SET]:

In Dose Rate Alarm mode, the pre-alarm value is calculated based on the alarm-setting value. (The default pre-alarm value is 80% of the alarm value.)

Press [SET] to get to the Dose Rate Alarm value screen. The Factory default alarm setting's value is 1.000mSv/hr:

When the Dose Rate pre-alarm or alarm is activated, this symbol is shown on the screen:

Note: If you do not change a setting or press a button for 60 seconds, the DoseRAE 2 reverts to displaying current readings.

9.1.4 User ID

From the Dose Rate Alarm screen, press [MODE] to switch to User ID.

User ID can be used to distinguish individual workers and track each worker's dose record. The User ID that can be set in Programming Mode or via a PC running ProRAE Dosimeter Software.

Note: If you do not change a setting or press a button for 60 seconds, the DoseRAE 2 reverts to displaying current readings.

9.1.5 Clock/Calendar

From the User ID screen, press [MODE] to switch to Clock/Calendar.

The DoseRAE 2 has an internal clock and calendar that can be set in Programming Mode or via a PC running ProRAE Dosimeter Software.

Note: If you do not change a setting or press a button for 60 seconds, the DoseRAE 2 reverts to displaying current readings.

9.1.6 Ambient Temperature

From the Clock/Calendar screen, press [MODE] to switch to Ambient Temperature.

The ambient temperature unit can be selected to show as Fahrenheit (°F) or Celsius (°C) in Programming Mode or via a PC running ProRAE Dosimeter Software.

Press [MODE] to switch to the dose-accumulating screen.

Note: If you do not change a setting or press a button for 60 seconds, the DoseRAE 2 reverts to displaying current readings.

9.2 Programming Mode

Programming Mode is used for changing alarm and instrument settings (such as measurement unit, temperature unit, and time).

Note: If you do not press a key for 60 seconds while in Programming Mode, the display reverts to the top of the list of submenu items in the current menu.

9.2.1 Entering Programming Mode

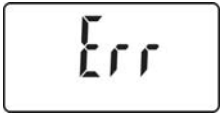
From Normal Operating Mode, simultaneously press and hold [MODE] and [SET] for three seconds. The password entry screen is shown:

Press [MODE] to advance to the next digit, and press [SET] to increment each digit from 0 to 9.

Note: The default password value is 0000.

After you enter the password, press and hold [MODE] for three seconds. The DoseRAE 2 is now in Programming Mode.

Note: If the password is not correct, you will see this error screen:



The display then reverts to the normal reading display.

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If the password is correct, then the first Programming Mode screen looks like this:

This screen is for viewing and changing the settings for light, buzzer, and vibration alarms, plus datalog mode.

The chart on the next page shows how to navigate Programming Mode by using the [MODE] and [SET] keys.

Programming Mode Settings

Settings	SET / MODE	1	2	3
To select alarms (light, buzzer, vibration) and datalog mode	ALEr	LEd	On	OFF
		bu	On	OFF
		U.ib	On	OFF
		dLo9	On	OFF
Set dose alarm value	D AL	D 1000	-----	-----
Set dose rate alarm value	R AL	R 1000	-----	-----
Set clock and calendar	cLoc HM DY	1653	-----	-----
		0628	-----	-----
		2008	-----	-----
Set countdown time	Co.dn	480	-----	-----
Set user ID	Id	8888	-----	-----
Select dose unit	dunt	1	2	3
Select display	diSP	dP-0	dP-2	-----
Select temperature unit	tunt	1	2	-----
Exit programming mode	End	-----	-----	-----

9.2.2 Navigating Programming Mode

Once you have entered Programming Mode, you can step through settings organized by nine main menu screens. Each menu screen has submenus, accessed by pressing [SET].

9.2.3 Alarms & Datalog Mode

Once you enter Alarms & Datalog Mode's main menu, you see this screen:

Press [SET] to reach the submenu for turning the LED visible (LED) alarm on or off.

Note: If you do not want to make a change to one or more submenus, you can step through them by pressing [MODE] repeatedly.

Visible Alarm (LED) On/Off

At the Visible Alarm submenu, you see this screen:

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, Buzzer On/Off.

Buzzer On/Off

At the Buzzer On/Off submenu, you see this screen:

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, Vibration Alarm On/Off.

Vibration Alarm On/Off

At the Vibration Alarm On/Off submenu, you see this screen:

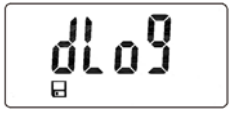
Press [SET] to change the vibration alarm from on to off.

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, Datalog On/Off.

Datalog On/Off

At the Datalog On/Off submenu, you see this screen:



Press [SET] to change the datalog from on to off.

Press [SET] again to change from off to on.

Once you are satisfied with your choice, press and hold [MODE] for three seconds to confirm your selection and advance to the next menu, Dose Alarm Value.

9.2.4 Dose Alarm Value

Dose Alarm Value lets you set the threshold at which a dose of radiation triggers the alarm.

When you reach the Dose Alarm Value screen, you see this:

Press [SET] to view the screen showing the current Dose Alarm Value:

To bypass making changes, press [MODE].

To make changes, press [SET]. The first digit blinks. Press [SET] to increment each digit (0 through 9; it "wraps back to 0 again after 9). Press [MODE] to advance to the next digit.

After the last digit, press [MODE], and the decimal point blinks. You can move the decimal point by

pressing [SET]. Each time you press [SET], the decimal point moves one digit to the right. (When it is moved to the right of the last digit, you no longer see a decimal point.)

Once you are selected with the value, press [MODE] for the measurement unit symbol to blink. Press [SET], and it changes from mSv to Sv to µSv (press again, and it "wraps" back to mSv).

When you are satisfied with the measurement unit selection, press and hold [MODE] until you see this screen:

Press [MODE] again to advance to Dose Rate Alarm Value.

9.2.5 Dose Rate Alarm Value

Dose Rate Alarm Value lets you set the rate at which radiation levels change to trigger the alarm.

When you reach the Dose Rate Alarm Value screen, you see this:

Press [SET] to view the screen showing the current Dose Rate Alarm Value:

To bypass making changes, press [MODE].

To make changes, press [SET]. The first digit blinks. Press [SET] to increment each digit (0 through 9; it "wraps back to 0 again after 9). Press [MODE] to advance to the next digit.

After the last digit, press [MODE], and the decimal point blinks. You can move the decimal point by pressing [SET]. Each time you press [SET], the decimal point moves one digit to the right. (When it

is moved to the right of the last digit, you no longer see a decimal point.)

Once you are selected with the value, press [MODE] for the measurement unit symbol to blink. Press [SET], and it changes from mSv/h to Sv/h to µSv/h (press again, and it "wraps" back to mSv/h). When you are satisfied with the measurement unit selection, press and hold [MODE] until you see this screen:

Press [MODE] again to advance to Clock & Calendar.

9.2.6 Clock & Calendar

Clock & Calendar lets you set the time, date, and year.

When you reach the Clock & Calendar screen, you see this:

9.2.6.1 Time

Press [SET] to enter the clock settings. You see the time (in 24-hour, military-style mode):

Press [SET], and the first "hour" digit blinks. Increase the number by pressing [SET] again (your choices are 0, 1, and 2; it then "wraps" back through the numbers).

Press [MODE] to advance to the second "hour" digit. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers).

Press [MODE] to advance to the first "minute" digit. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers).

Press [MODE] to advance to the second "minute" digit. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers).

When you are done setting the time, press and hold [MODE] until you see this:

The "dn" is short for "done," and confirms that you have saved your time choice. The date (month and day) is now shown.

9.2.6.2 Month & Day

The date screen shows the month and day:

The first two digits are the month, followed by two digits for the day (the letters "M" and "D" tell you the format).

Press [SET], and the first "month" digit blinks. Increase the number by pressing [SET] again (your choices are 0 and 1; it then "wraps" back through the numbers).

Press [MODE] to advance to the second "month" digit. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers).

Press [MODE] to advance to the first "day" digit. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0, 1, 2, and 3; it then "wraps" back through the numbers).

Press [MODE] to advance to the second "day" digit. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices

are 0 through 9; it then "wraps" back through the numbers).

When you are done setting the date, press and hold [MODE] until you see this:

The "dn" is short for "done," and confirms that you have saved your month/date choice. The year is then shown.

9.2.6.3 Year

The display shows the four-digit year:

Press [SET], and the third "year" digit blinks. (The first two digits, "2" and "0" cannot be changed.) Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers).

Press [MODE] to advance to the fourth "year" digit. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers).

When you are done setting the year, press and hold [MODE] until you see this:

The "dn" is short for "done," and confirms that you have saved your year choice. Press and hold [MODE], and the screen now shows "Co.dn," which is short for "countdown."

9.2.7 Countdown Time

This sets the Countdown Time, expressed as a number that counts down to zero. The default value is 480 minutes (8 hours).

Press [SET] to access the screen showing the current setting:

Press [SET] to initiate changes. Increase the number by pressing [SET]. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers). Press [MODE] to step through the digits.

Press and hold [MODE] until you see "dn." Then press [MODE] exit to the next screen, User ID.

9.2.8 User ID

The DoseRAE 2 can be assigned a unique 4-digit ID, which is referenced in the datalog data. At the User ID screen, you see this:

Press [SET] to enter ID editing:

The first digit blinks. Press [SET] to increase the number. Each time you press [SET], the number increases. Your choices are 0 through 9; it then "wraps" back through the numbers). Press [MODE] to step through the digits.

Press and hold [MODE] to save the change. When you see "dn," the change is saved. Then press [MODE] to exit to the next screen, Dose Unit.

9.2.9 Dose Unit

You can set the Dose Unit via this screen's menu options.

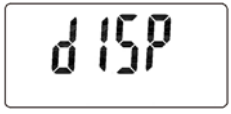
Press [SET] to make changes. Press [SET] to cycle through the three options, Sv (Sieverts), rem, and R (Roentgen). Each is assigned a number (in addition to its abbreviation), so it's easy to see which one you have selected:

Displayed Number	Measurement Unit
1	Sv
2	rem
3	R

Once your selection is made, press [MODE] to register your choice and advance to the next submenu, Display.

9.2.10 Display

Display sets the Dose Rate display range. The screen looks like this:



There are two options for setting the Dose Rate display range, dP-0 and dP-2. Each of these corresponds to a different range (dP-0 is narrower, while dP-2 is wider).

Select from the options shown in this table:

Selection	Dose Rate Range
dP-0	1 µSv/h to 10 Sv/h
dP-2	0.01µSv/h to 10 Sv/h

Press [SET] to change the selection. When you are satisfied with your selection, press [MODE] to register it and advance to the next submenu, Temperature Unit.

9.2.11 Temperature Unit

The Temperature Unit submenu lets you set whether the display shows degrees in Celsius or Fahrenheit. This screen is shown when you start:

Press [SET] to change the Temperature Unit. Then press [SET] to switch between the two options.

Select from the options shown in this table:

Selection	Temperature Unit
1	Celsius (°C)
2	Fahrenheit (°F)

Once you have set the Temperature Unit, press [MODE] to register the change and advance to the End screen.

9.2.12 End

After you have checked settings and/or made edits, this is the final screen in Programming Mode.

Press [MODE] to re-enter the Programming Mode submenus.

Press [SET] to exit Programming Mode and normal monitoring.

Note: If you press [MODE] and re-enter Programming Mode, but do not press any key in 60 seconds, then the DoseRAE 2 exits Programming Mode automatically.

10 ProRAE Dosimeter Software

10.1 Overview

ProRAE Dosimeter is system software for modifying DoseRAE 2 parameters and for transferring datalog data to a computer for storage and review.

10.2 Requirements

ProRAE Dosimeter requires the following:

10.2.1 Hardware Requirements

- Pentium CPU, 1GHz
- VGA monitor (minimum resolution: 1024 x 768, 16-bit color)
- More than 410MB hard disk space
- CD-ROM drive
- Minimum of 512MB RAM (more than 1GB recommended)

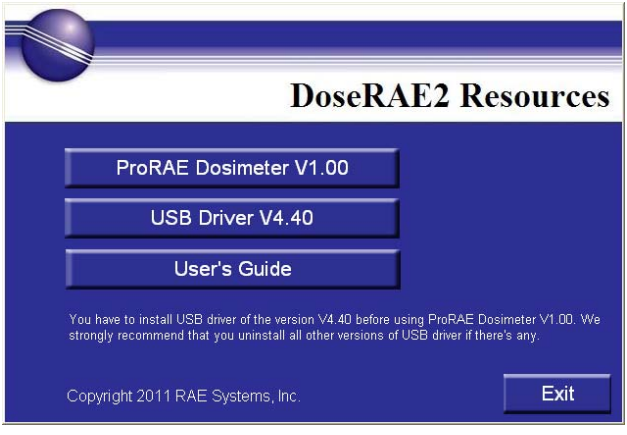
10.2.2 Software Requirements

- Microsoft Windows XP (SP2), Windows Vista
- Microsoft Office Excel 2003 or later version
- USB driver for CP210x USB-to-UART Bridge Controller (4.40.1.0)

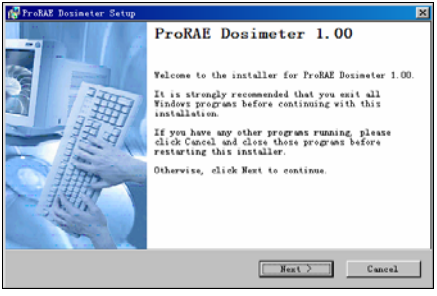
10.3 Installation

Insert the ProRAE Dosimeter CD into the computer's CD-ROM drive. After a few seconds, the installer automatically starts. (If not, open the CD's directory and double-click "autorun.exe" to start it.)

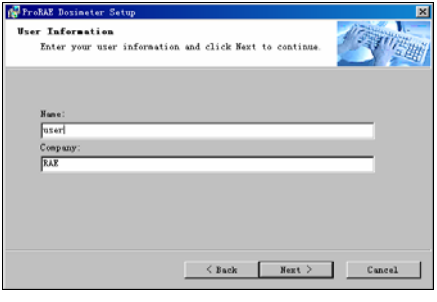
The initial screen is shown:



1. Click "ProRAE Dosimeter V1.00."
2. When this screen appears, read the installation notice.

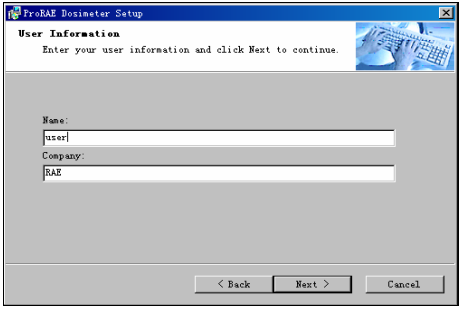


3. Close other running applications and Click "Next."
4. This screen is shown:

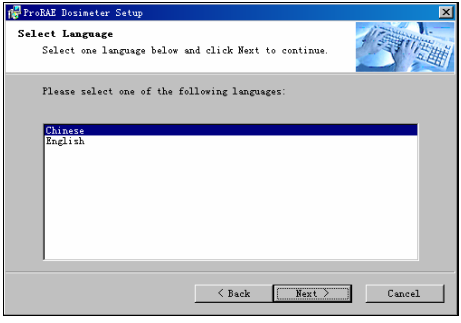


Fill in the Name and Company fields and click "Next."

5. At this screen, select an installation folder for the program. If you want to use the pre-selected location, click "Next." Otherwise, click "Change," select a location, click "Confirm" to finish the selection, and then click "Next."

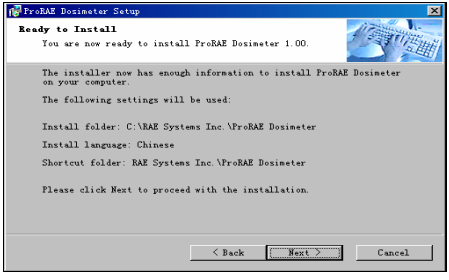


6. Select a language at the next screen:



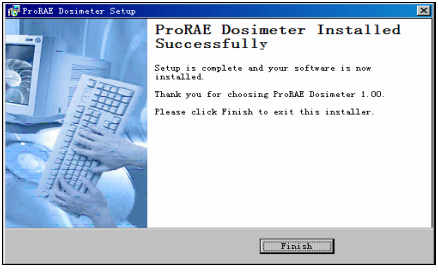
7. Click "Next" to register the language selection and proceed to the next screen.
8. Set a location for a shortcut icon for ProRAE Dosimeter. You can use the pre-selected default location shown and click "Next" to proceed, or you can use the pull-down menu and choose another location. Then click "Next."

9. The "Ready to Install" screen is shown. It provides a summary of your selections so far, and waits for you to click "Next" to proceed with installation.



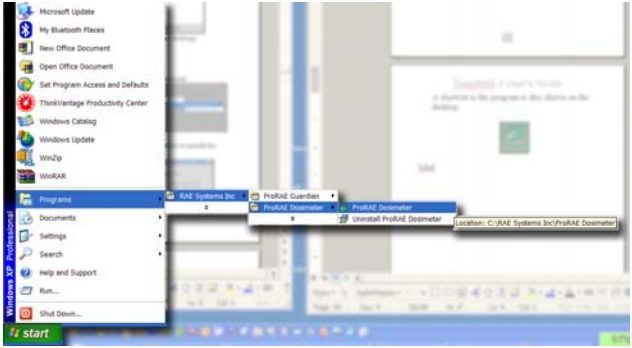
When you are ready to start, click "Next."

10. Once installation is complete, this screen is shown:



A shortcut to the program is also shown on the desktop:

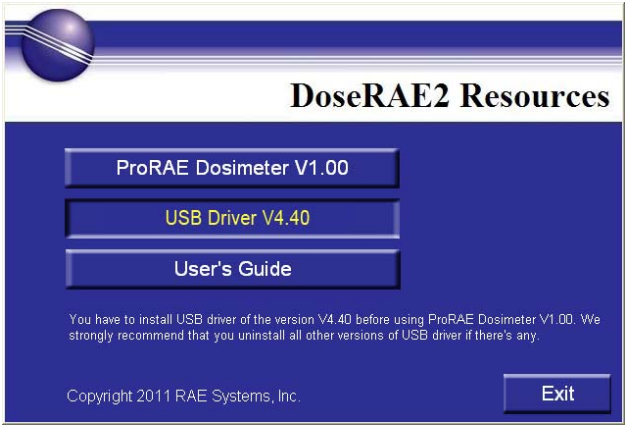
Note: The program should also show up in your programs list. For example, on Windows XP, follow this path from the "Start" button.



10.3.1 USB Driver Installation

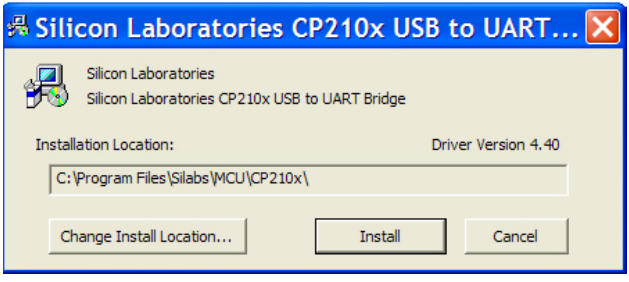
If your computer does not have USB Driver V4.40 installed, then you must install it to have ProRAE Dosimeter run properly.

Click "USB Driver V4.40" on the main menu screen to install the driver:



Important! If an earlier USB Driver version is installed, it is highly recommended that you uninstall it before installing this version.

After you click on the "USB Driver V4.40" button, this message appears, prompting you to either change the installation location or to begin installation.



Click "Change Install Location…" to select another location. Otherwise click "Install" to begin installation of the USB driver.

Once the driver is installed, you see a message telling you it was installed successfully.

Note: You will have to restart your computer after installing the USB driver.

10.3.2 Accessing The User's Guide

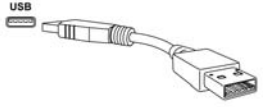
If you want to read the User's Guide on your computer instead of in paper form, insert the DoseRAE 2 Software Resource CD and click "User's Guide." The manual is in PDF format, so your computer must have Adobe's free Acrobat Reader installed (it is available at www.adobe.com).

10.4 Using ProRAE Dosimeter Software

Before you use ProRAE Dosimeter, you must connect the DoseRAE 2 Charger/Reader to the computer via USB, and then place the DoseRAE 2 into the Charger/Reader.

10.4.1 Connecting The DoseRAE 2 Charger/Reader To A Computer

Connect the DoseRAE 2 Charger/Reader to a PC as shown:



Plug USB-to-USB extender into computer's USB port

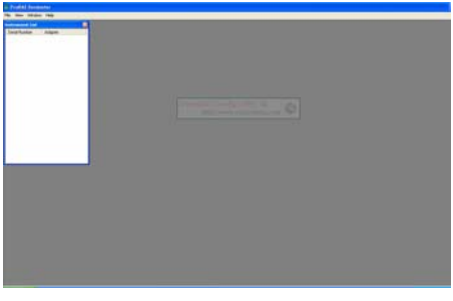
Plug Charger/Reader's USB output into computer's USB port or into receptacle end of USB-to USB extender

If the computer is on, the Charger/Reader's "Power" LED should glow red when connected to the USB port.

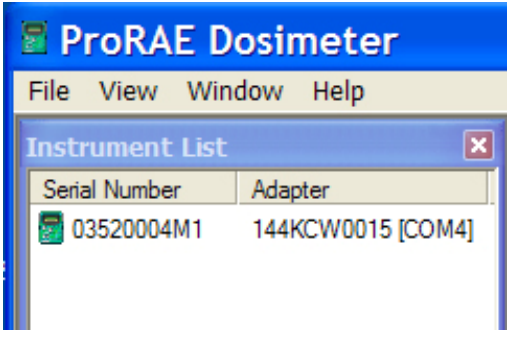
10.5 Software Operation

Double-click the shortcut icon on the computer's desktop (or open it from the programs list).

The Instrument List table opens:



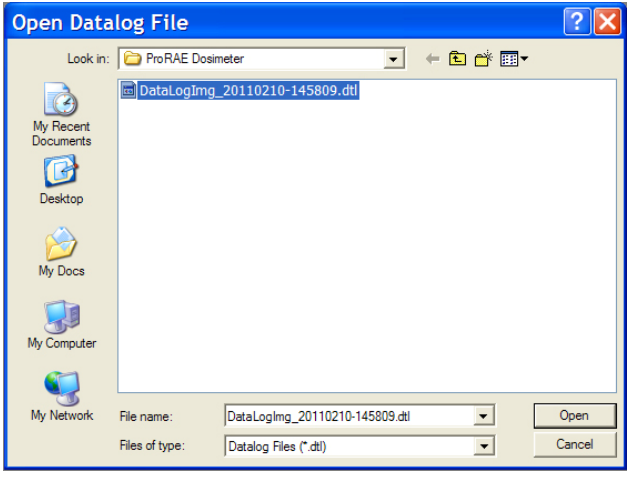
Once the Instrument List is shown, any instruments linked to the computer are shown:



Included for each instrument is its serial number, as well as the Com (communications) port number, such as COM4.

10.5.1 Open Datalog

If you have a saved datalog, you can open it in ProRAE Dosimeter. Select "File" and then "Open Datalog." The list of datalogs, which end in a ".dtl" suffix is shown:

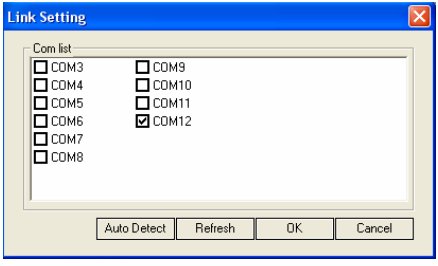


Click on the name of the file to highlight it, and then click "Open." The datalog loads into the ProRAE Dosimeter window for examination.

10.5.2 Link Setting

You can set the link through the Com port, although it is usually connected automatically.

To update the link setting, select "File" and then "Link Setting…" The Link Setting window with the available ports is shown, with the current connection checked.



If the port that the instrument uses is not checked, click with the mouse to check it. Then click "OK." The system now communicates with the instrument through this port.

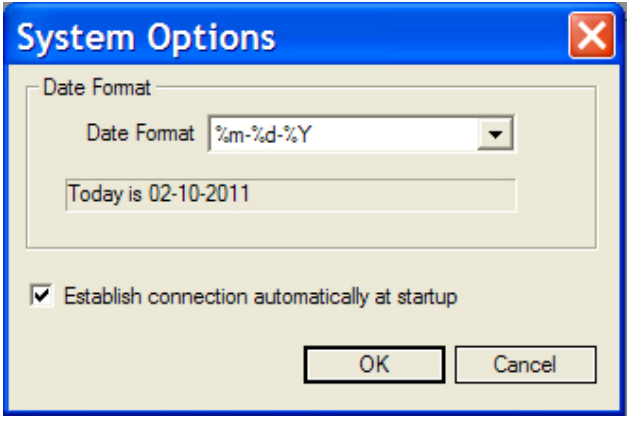
The communication can be set using the "Auto Detect" method. The system tries to communicate

with all available ports. This is typically the easiest method to use.

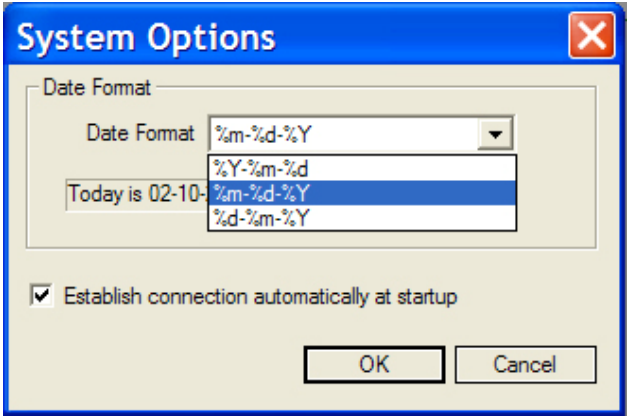
If you connect any new DoseRAE 2s to the system, click "Refresh" to display them in the window.

10.5.3 System Options

You can set the date format via this menu. Select "File" and then "System Options."



When the System Options window appears, you can change the format of the year, month, and date:



Your options are:

- Year-Month-Date
- Month-Date-Year
- Date-Month-Year

If you check the box labeled "Establish connection automatically at startup," the system will search Reader and DoseRAE 2 automatically. Otherwise,

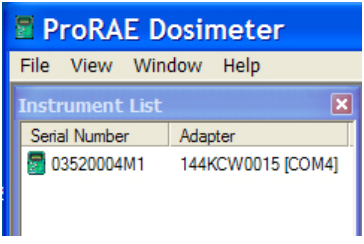
you should manually use "Link Setting" to select a communication port.

10.5.4 Help

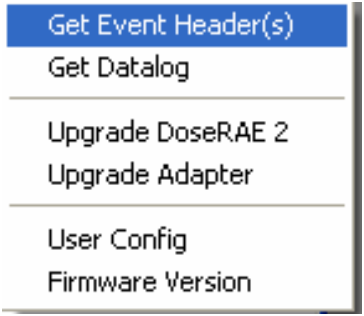
If you want to know information about the ProRAE Dosimeter, click "Help" and then "About ProRAE Dosimeter…" This will bring up a window that shows the current software, its version and build date.

10.5.5 Instrument List Window

After you establish communication, any DoseRAE 2 plugged into the Charger/Reader is included in the Instrument List window:



Use your mouse to right-click on the instrument's name, and this menu is shown:



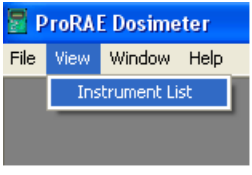
This menu is divided into three sections. The first allows you to Get Event Header(s) or Get Datalog. This means you can either get a list of events stored in the datalog or the complete datalog. If you select either one, it must download from the DoseRAE 2 to your computer.

The second section of the menu includes Upgrade DoseRAE 2 and Upgrade Adapter. These allow you to load new firmware to the DoseRAE 2 or its Charger/Reader. In both cases, follow the instructions in the window. You will have to choose a file to use during the upgrade process.

Note: When you click "OK" to perform the upgrade, all related windows are closed.

The third section of the menu allows you to access information on the User Config(uration) and the Firmware Version. The User Config includes all parameters and settings for the DoseRAE 2, while Firmware Version tells you only the currently used firmware in a small window.

Note: If you close the Instrument List, you can reopen it by selecting the menu item View, and then selecting Instrument List:



10.5.6 User Configuration

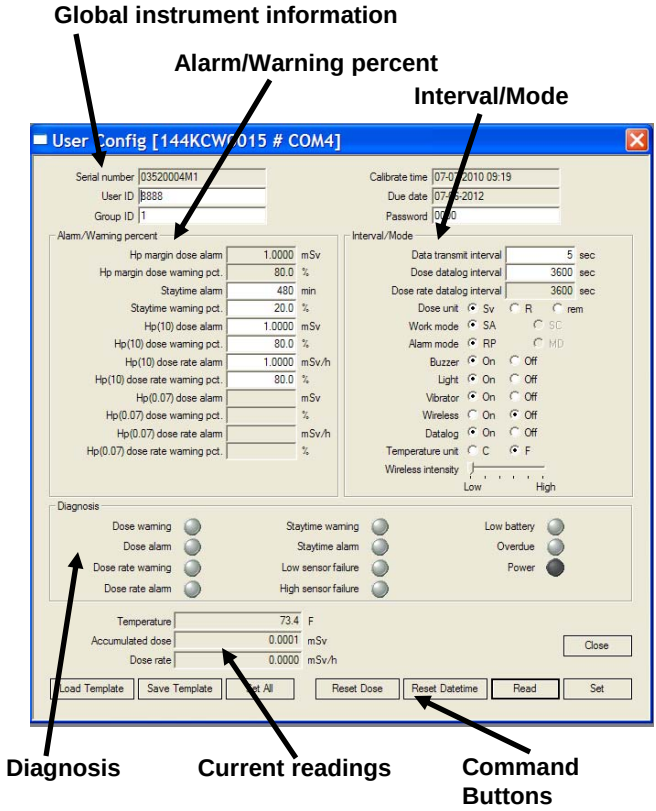
At the Instrument List, double-click the instrument listed, or right-click and select "User Config" to view the User Configuration window.

The window is divided into functional sections:

- Global instrument information
- Alarm/Warning percent
- Interval/Mode
- Diagnosis
- Current readings
- Command buttons

DoseRAE 2 User's Guide

User Configuration Screen's Functional Sections

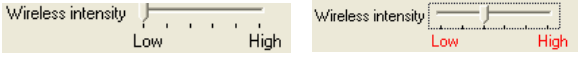


10.5.7 Changes And Safeguards

When you make a change to any parameter, the color changes from black to red, indicating the change. In the case of something you input, the numbers will be shown in red:

For parameters that are not numbers, differences are indicated by the parameter labels changing to red. For example:

and

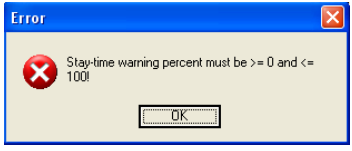


When you are satisfied with your change(s) click the "Set" or "Set All" button to save the change and set it in the DoseRAE 2.

If you enter an illegal value, a message informs you of the error when you click Set or Set All. It also explains the reason for the message.

For example, if you set a Staytime value of 600:

An error window pops up and describes the error:



If the parameter is set successfully, this message is shown:

10.5.8 Global Instrument Information

The global instrument settings that control identification and access are included here. You can change the User ID, Group ID, and Password. All other information is static or automatically set.

- Serial Number (cannot be changed)
- User ID
- Group ID
- Calibrate Time (cannot be changed)
- Due Date (cannot be changed)
- Password

10.5.9 Alarm/Warning Percent

This section contains readings as well as settable parameters for Staytime alarm, dose alarm, dose rate alarm, and dose rate alarm percentage. Units can be in Sv, R, and rem (units are selected in the Interval/Mode section). When the units are changed, the values are recalculated and shown.

There are both read-only and editable parameters. Hp Margin Dose Alarm and Hp Margin Dose Warning Pct. are read-only. In addition Hp(0.07) readings are not implemented.

Note: Changing Dose Unit in the Interval/Mode section changes the units expressed for readings under Alarm/Warning Percent. They change as follows:

Dose unit	Alarm/Warning Value
Sv	mSv
R	mR
rem	mrem

Changing the Dose Unit not only changes the units under Alarm/Warning Value, but also tells ProRAE Dosimeter to recalculate the values so that they correlate correctly with the unit values.

Note: Hp is a standard notation for Total Dose. The value Hp(10) is the personal dose equivalent in soft tissue measured at a depth of 10mm below a specified point on the body.

Values you can change include:

- Staytime alarm
- Staytime warning pct.
- Hp(10) dose alarm

- Hp(10) dose warning pct.
- Hp(10) dose rate alarm
- Hp(10) dose rate warning pct.

10.5.10 Interval/Mode

Most of the DoseRAE 2's parameters are set in this section, either by inputting new values or by clicking buttons.

Note: If you select "Off" for all three alarms (Buzzer, Light, Vibrator) and try to save the parameters, you will see an error message informing you that you cannot turn off all three types of alarms. At least one alarm type must be functional.

Editable numerical values include:

- Data transmit interval
- Dose datalog interval

Type in a value in each of these to change their interval.

In addition, you can click the radio buttons to set the on/off status of the following:

- Dose unit (on or off)
- Work mode (on or off)
- Alarm mode (on or off)
- Buzzer (on or off)
- Light (on or off)
- Vibrator (on or off)
- Wireless (on or off)*
- Datalog (on or off)
- Temperature (Celsius or Fahrenheit)

Note: Changing Dose Unit in the Interval/Mode section changes the units and values under Alarm/Warning Percent and current readings.

Finally, associated with Wireless communication is the control for Wireless Intensity, which is a sliding control, adjustable from Low to High power.

* Wireless connectivity is not currently implemented. It will be available in future releases.

10.5.11 Diagnosis

The buttons shown in this section indicate whether an alarm is triggered, status, etc. This is real-time data transferred at the dose rate data transfer interval.

Differently colored lights indicate the current status of DoseRAE 2 parameters:

Normal status

Dose or dose rate pre-alarm, high/low channel sensors failure, low battery, and calibration overdue

Dose or dose rate alarm

Power on

Power off

Indicators are included for:

- Dose warning
- Dose alarm
- Dose rate warning
- Dose rate alarm

- Staytime (countdown) warning
- Staytime (countdown) alarm
- Low sensor failure
- High sensor failure
- Low battery
- Overdue (calibration overdue)
- Power

Dose Warning
When the dose exceeds the set level, this warning is shown.

Dose Alarm
When the dose alarm is triggered, this is indicated.

Dose Rate Warning
When the dose rate exceeds the set level, this warning is shown.

Dose Rate Alarm
When the dose rate alarm is triggered, this is indicated.

Staytime (Countdown) Warning
When the countdown reaches the percentage value you set, this warning is shown.

Staytime (Countdown) Alarm
When the staytime countdown reaches zero and the alarm is triggered, this is recorded.

Low Sensor Failure
If the low dose rate gamma sensor fails, this is indicated here.

High Sensor Failure
If the high dose rate gamma sensor fails, this is indicated here.

Low Battery
If the battery's charge is low, then this is indicated here.

Overdue (calibration)
The DoseRAE 2 is factory calibrated. It is typically designed with a calibration interval of two years, although this may vary depending on national or local requirements.

Power

This indicates whether the DoseRAE 2's power is on.

10.5.12 Current Readings

Three readings are shown here:

- Temperature
- Accumulated dose
- Dose rate

They are "live" data (changing as temperature and dose information are sent from the DoseRAE 2) at the dose rate transfer interval, but you cannot change them.

10.5.13 Command Buttons

The buttons in this section allow you to load or save a template of the parameters (useful for having the same settings on multiple DoseRAE 2 units), registering settings, performing resets, getting current data, and closing the User Configuration window.

- Load Template
- Save Template

- Set All
- Reset Dose
- Reset Datetime
- Read
- Set
- Close

Load Template

Load a previously saved template of parameters and settings from your computer. The file has an extension of ".utm" (example: RadiationLab1.utm).

Note: This overwrites the current settings in the DoseRAE 2, and they cannot be retrieved once overwritten.

Save Template

You can save a template of the current parameter settings (most recent readout from the DoseRAE 2 plus any changes you have entered) on your computer's hard disk. The file has a ".utm" extension (example: RadiationLab1.utm).

Set All

This re-stores all parameters in the DoseRAE 2 and is usually implemented together with a template transfer operation.

Reset Dose

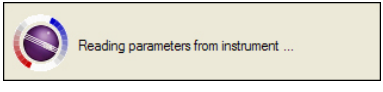
Click this button to clear the accumulated dose. The dose should read zero after you reset it.

Reset Datetime

Click this to resynchronize the DoseRAE 2's internal date and time to your computer's date and time.

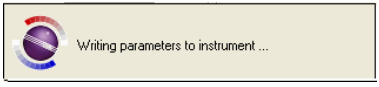
Read

Clicking the Read button takes the configuration data from the DoseRAE 2 and populates the User Configuration window. While it is getting the data, this window appears:



Set

Clicking the Set button sends only the parameters you have modified in ProRAE Dosimeter. When the data is transferred, you see this window:



Close

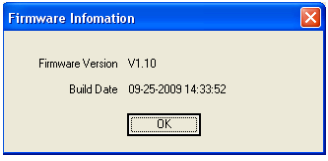
When you click the Close button, the User Configuration window closes.

Important! If you have made any changes (indicated in red) without pressing Set or Set All, then those changes are lost. Make sure to transfer any changes you want implemented before clicking Close.

10.5.14 Firmware Version

If you want to know the current version of the firmware employed in the DoseRAE 2, right-click on the instrument in the Instrument List and select "Firmware Version."

A window showing the firmware version and build date appears:

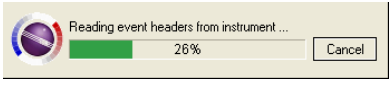


10.5.15 Read Event Headers

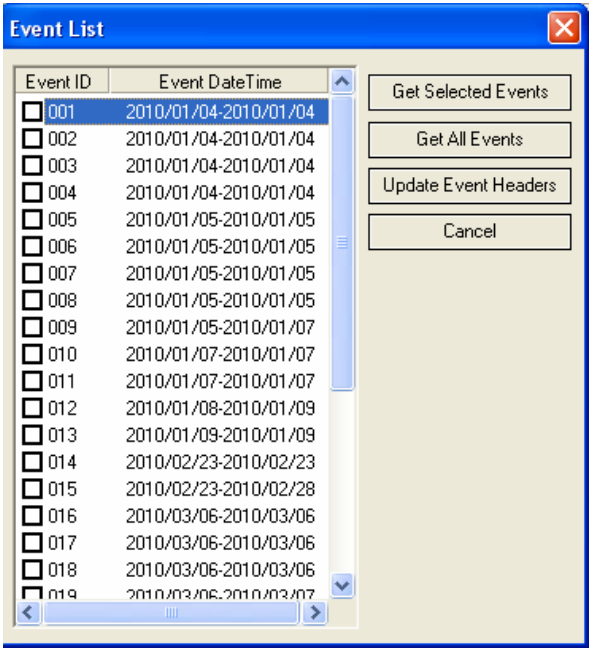
Right-click the instrument shown in the Instrument List and select "Get Event Header(s)" to download event header(s).

Note: This only includes the event summary, not the datalog.

While the event header(s) are being transferred, a window shows the progress:



After the operation is finished, this window appears:



This window shows all instrument events including event ID and event date time.

Four buttons are stacked along the right side of the list:

Get Selected Events. Download the datalog for selected events shown in the list, regardless of whether the datalog has been downloaded.

Get All Events. Download all datalogs, regardless of whether the event datalog has been downloaded.

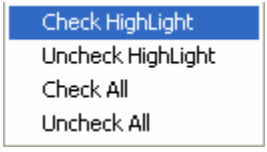
Update Event Headers. Tells ProRAE Dosimeter to only update event headers, but not to download the event datalog.

Cancel. Close the Event List window.

10.5.16 Selecting An Event

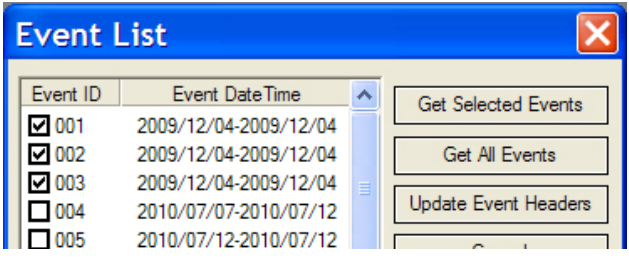
There are two ways to select an event:

1. Check the box to the left of the listed event or double-click the entire line.
2. Right-click the event line, and this window is shown:



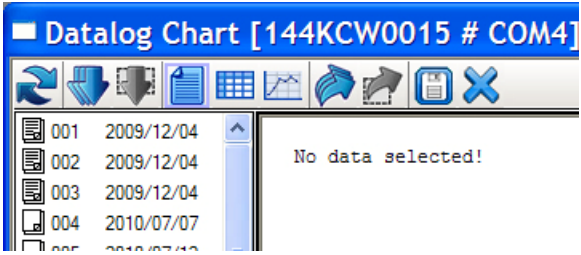
You can select Check All/Uncheck All or only select the highlighted items.

To view a selected event, first select the event by checking the box next to the event header and then clicking Get Selected Events.



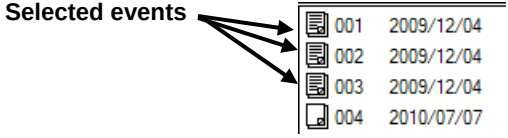
Note: If you click "Get Selected Events" without first checking an event's box, this message appears:

After you successfully download an event, you see a screen like this:



Note that it says "No data selected!" and that two of the buttons are grayed out. Click on one or more of the icons to the left of the events, and the buttons change from gray to blue, meaning they are active.

Selected events are shown as pages with information written on them, while unselected (un-downloaded) events are plain pages:



10.5.17 Datalog Buttons

Buttons are provided for controlling the data downloading, storage, and views:

When any of these is selected, it is highlighted with a colored box around it:

The following section explains the buttons and their functions:

Refresh Event Information. When you click this button, the events are downloaded.

Get All Events. Download all events in the datalog.

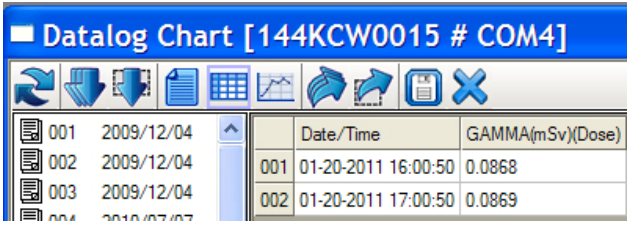
Get Selected Events. Only download items that you have selected from the list. If you want to download events directly from the datalog display, you can first pick multiple events by pressing the "Shift" key while pressing the left mouse button. (Ctrl-click on each event.) Then press the right mouse button to choose "Get Selected Event(s)" from the pop-up menu.

Summary. This views the current event's summary information.

Sheet. The sheet views all data of the current event.

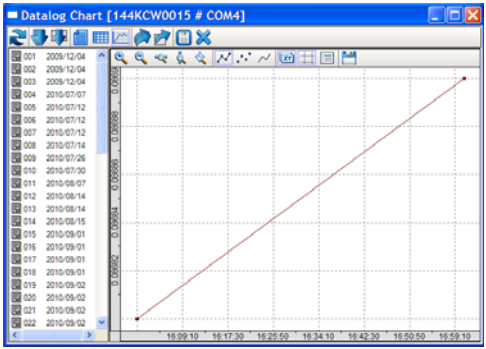
Note: You can copy content from this grid if you want to paste it into a report, etc. Use Shift-left click

to select and Control-C to copy. (Most programs let you use Control-V to paste, but check your program's user's guide to be sure.)



Graph. The graph shows the trend line of the current event's data. When you select this graph view, an additional toolbar appears, with options for viewing.

The graph shows the trend line of the current event's data.



When you select this graph view, an additional toolbar appears, with options for viewing:

Button	Function
	Zoom in
	Zoom out

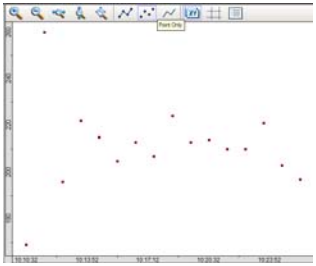
	Fit width
	Fit height
	Fit page
	Points-and-lines graph
	Points-only graph
	Lines-only graph
	Show/hide X and Y information
	Show/Hide axis (graph lines)
	Show/hide notes
	Export graph

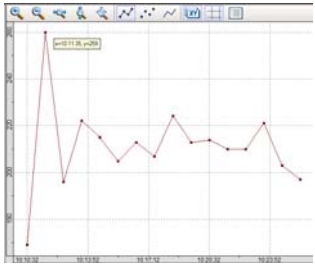
Zoom In and **Zoom Out** give you different enlargements of the graph, and can be helpful when trying to examine dense data.

Fit Width, Fit Height, and **Fit Page** also provide different views, compressing or expanding the graphic area to fit your needs.

The **Points-and-lines, Points-only,** and **Lines-only** graph styles change the references so that you can see different representations of the data with greater or less reference information. Only one of these three options can be selected at a time.

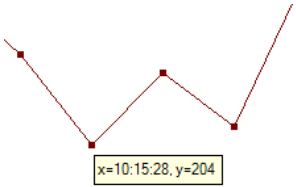
Here are examples of two different graph views:





Note: You can move the graph around in the window by clicking and dragging with your mouse. In addition, if "Show X and Y Information" is on, wherever you point with the mouse, a tool tip shows you the coordinates (time vs. dose, for example).

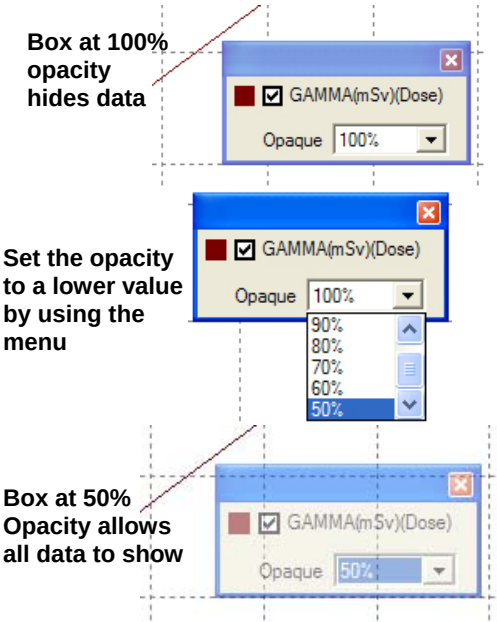
Show/Hide X and Y information lets you turn on or off a tool tip that follows your cursor as you move your mouse. The tool tip window shows the cursor's X and Y locations on the grid, which is helpful during discussions of locations and trending.



Show/Hide graph lines, as its name implies, turns on and off the vertical and horizontal grid behind the graph.

Show/Hide notes allows you to view part of the graph with a label that tells you what the line

represents. The small dialog box indicates the line color, allows you to show or hide the line by clicking the check box, and set the dialog box's opacity (50% to 100%). A lower opacity value makes the box seem more transparent. This lets you reduce interference with the chart display.



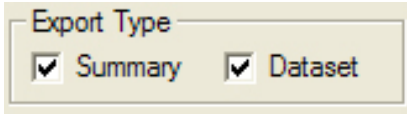
Export Graph lets you save the current event's graph as a ".png" graphics file.

Export All Events. Export all events in the datalog to a file in Microsoft Excel (.xls) format. A dialog box appears, which allows you to select where the file will go, plus you can name it. The .xls file can be opened for later reference.

To save the file:

1. Click the Export All Events icon.

2. When the dialog box comes up, check the Export Type boxes labeled "Summary" and "Dataset."



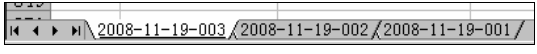
3. Give the file a name, or use the name supplied by the program.

4. Click "Save." The file is saved as a .xls (Microsoft Excel spreadsheet).

When you open the saved file, note that each event has been saved on a separate Worksheet, named with the same event name shown in the Event List. Each event is a session that runs from the time the instrument is turned on until it is turned off.

Note: If an event contains more than 1,000 lines in its datalog, a new event is created.

The order of the Worksheets (indicated by the tabs along the bottom of the page) follows event time from the newest to the oldest, arranged from left to right:



There are two columns on each Worksheet. The left column provides the Summary:

Summary	
Unit Name:	DoseRAE2
Unit SN:	03520004M1
Unit Firmware Ver:	V1.10
Measure Type:	Dose
Datalog Mode:	Continuous
Datalog Type:	Auto
Wrap Mode:	Yes
Diagnostic Mode:	No
Stop Reason:	Pause in Communication Mode
Begin:	2010-4-18 20:16
End:	2010-4-19 4:10
Sample Period(s):	30
Record Number:	948
Sensor:	GAMMA(mSv)
Warn Value:	0.8
Alarm Value:	1
Over Alarm Value:	9999.9999
Calibration Time:	2010-6-29 8:12

The right column gives original data:

Raw Data	
Date/Time	GAMMA(mSv)(Dose)
2010-4-18 20:16	0.002
2010-4-18 20:17	0.002
2010-4-18 20:17	0.002
2010-4-18 20:18	0.002
2010-4-18 20:18	0.002
2010-4-18 20:19	0.002

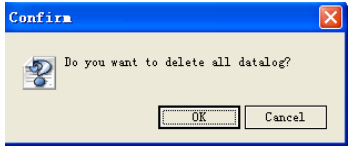
Export Selected Events. Export selected events to a file in Excel (.xls) format. You can select more than one event and export them simultaneously into a single file. Select from the list of events by Control-clicking on each item to select. When they are highlighted, click the Export Options button. A dialog box appears, which allows you to select where the file will go, plus you can name it. The .xls file can be opened for later reference.

Save Datalog. The datalog from a DoseRAE 2 can be saved on the computer's hard disk as a binary file with the extension ".dtl." You will be prompted to find a location where the file should be stored.

Erase datalog. This erases the entire datalog in the instrument.

CAUTION! If you erase the datalog, it cannot be recovered—all data is deleted. Therefore, if you must keep the datalog's information, save it first.

To delete all datalog from DoseRAE 2, the system will ask you to confirm the request:



Click "OK" to delete the entire datalog. Otherwise, click "Cancel" to return back to Datalog Chart window.

10.6 Exiting ProRAE Dosimeter

When you are done using ProRAE Dosimeter and want to exit the program, make sure you have saved any data that you need to transfer or retain. Once that is done, click "File" and select "Exit" from the menu.

ProRAE Dosimeter closes. You may now disconnect your instrument from the computer and place it back in operation.

IMPORTANT!

Before using the instrument, check its parameters and settings in order to make sure that no incorrect data was transferred while you were using ProRAE Dosimeter.

11 DoseRAE 2 Technical Specifications

Sensors	Silicon PIN diode and CsI (Tl) crystal + PIN diode
Radiation detection	X-ray and Gamma radiation
Size	3.3" × 2.2" × 0.4" (85mm × 55mm × 9.6mm) without clip
Weight	1.8 oz (50 gm) with battery and clip
Dose range	0 µSv to 10Sv (0 µR to 1140 R)
Dose rate range	0.01µSv/h to 10Sv/h (1µR to 1140 R/h)
Dose accuracy	±15%
Dose rate accuracy	±20% (10µSv/h to 10Sv/h or 1.14mR/h to 1140R/h) ±30% (0.01µSv/h to 10µSv/h or 1µR/h to 1.14mR/h)
Energy response	20keV to 6MeV for X- and gamma radiations
Dose alarm levels	Adjustable from 1.0µSv to 10Sv or 114µR to 1140R

Dose rate alarm levels	Adjustable from 1.0µSv/h to 10Sv/h or 114µR/h to 1140R/h
Datalog	> 3000 data points (30 to 3600 seconds, in adjustable intervals)
Shock resistance	Passes drop test from 59" (1.5m)
Alarm indication	Buzzer (> 85dB @ 12"/30 cm), vibration, and LED light alarms
Environment	Temperature: -4° F to 122° F (-20° C to 50° C) Humidity: 0% to 95% (non-condensing)
IP Rating	IP-54
Battery type	LIR2450 rechargeable battery
Battery runtime per charge	200 hours
Communications	USB
Standard	IEEE ANSI N42.20 "American National Standard Performance Criteria for Active Personnel Radiation Monitors"

Specifications are subject to change

12 Technical Support

To contact RAE Systems Technical Support Team:

Monday through Friday,
7:00AM to 5:00PM Pacific (US) Time
Phone (toll-free): +1 888-723-4800
Phone: +1 408-952-8461
Email: tech@raesystems.com

Critical after-hours support is available:

+1 408-952-8200 select option 9

13 RAE Systems Contacts

RAE Systems
World Headquarters
3775 N. First St.
San Jose, CA 95134-1708 USA
Phone: +1 408.952.8200
Fax: +1 408.952.8480
E-mail: customerserv@raesystems.com
Web Site: www.raesystems.com

RAE Systems Europe ApS
Kirstinehøj 23 A
DK-2770 Kastrup
Denmark
Phone: +45 86 52 51 55
Fax: +45 86 52 51 77
orders@raeeurope.com
sales@raeeurope.com
service@raeeurope.com
Web: www.raesystems.eu

RAE Systems UK Ltd
D5 Culham Innovation Centre
Culham Science Centre
Abingdon, Oxon OX14 3DB
United Kingdom
Phone: +44 1865408368
Fax: +44 1235531119
Mobile: +44 7841362693
Email: raeuk@raeeurope.com

RAE Systems France
336, rue de la fée des eaux
69390 Vernaison
France
Phone: +33 4 78 46 16 65
Fax: +33 4 78 46 25 98
Email: info-france@raeeurope.com
Web: www.raesystems.fr

RAE BeNeLux BV
Hoofdweg 34C
2908 LC Capelle a/d Ijssel
Phone: +31 10 4426149
Fax: +31 10 4426148
Email: info@rae.nl
Web: www.rae.nl

RAE Systems Spain, s.l.
Av. Remolar, 31
08820 El Prat de Llobregat
Spain
Phone: +34 933 788 352
Fax: +34 933 788 353
Mobile: +34 687 491 106
Email: mdelgado@raespain.com
Web: www.raespain.com

RAE Middle East
LOB 7, Ground Floor, Office 19,
Jebel Ali Free Zone
Dubai, United Arab Emirates
Phone: +971.4.887.5562
Email: mesales@raesystems.com

RAE Systems (Hong Kong) Ltd.
Room 8, 6/F, Hong Leong Plaza
33 Lok Yip Road
Fanling, N.T, Hong Kong
Phone: +852.2669.0828
Fax: +852.2669.0803
Email: hksales@raesystems.com

RAE Systems Japan
403 Plaza Ochanomizu Bldg. 2-1
Surugadai Kanda Chiyoda-Ku
Tokyo, Japan
Phone: 81-3-5283-3268
Fax: 81-3-5283-3275
Email: jpsales@raesystems.com

RAE Systems Korea
#1010, DaeMyungAnsVill First,
Sang-Dong 412-2, Wonmi-Gu, Bucheon,
Kyungki-Do, Korea
Phone: 82-32-328-7123
Fax: 82-32-328-7127
Email: krsales@raesystems.com

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Arsitec AG Industrie Neuhof 25 3422 Kirchberg BE fon 034 427 00 58 fax 034 427 00 68 info@arsitec.ch www.arsitec.ch

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