RADIATION
A • L • E • R • T
QUALITY HANDHELD DETECTORS

Digilert 100

Nuclear Radiation Monitor
Operation Manual

3/06

Contents **Page**

Precautions

To keep the Digilert 100 in good condition, handle it with care, and observe the following precautions:

* Do not contaminate the Digilert 100 by touching it to radioactive surfaces or materials.

* Do not leave the Digilert 100 in temperatures over 122* F (50 C) or in direct sunlight for extended periods of time.

* Do not get the Digilert 100 wet. Water can damage the circuitry and the coating of the mica surface of the Geiger tube.

* Avoid making measurements with the detector window in direct sunlight; this could affect the readings if the coating of the mica surface of the Geiger tube has been damaged by moisture or abrasion.

* Do not put the Digilert 100 in a microwave oven. It cannot measure microwaves, and you may damage it or the oven.

* If you expect to not use the Digilert 100 for longer than one month, remove the battery to avoid damage from battery corrosion.

* Change the battery promptly when the battery indicator appears on the display.

1 Introduction

The Digilert™ 100 is a health and safety instrument that measures alpha, beta, and gamma radiation. With the Digilert 100, you can:

* Monitor possible radiation exposure while working near radionuclides
* Ensure compliance with regulatory standards
* Check for leakage from X-ray machines and other sources
* Set the alert level and use the Digilert 100 in Alert mode; if the radiation goes above the level you set, the alert beeper sounds to let you know
* Screen for environmental contamination or environmental sources of radioactivity
* Connect the Digilert 100 to a computer or data logger to record and tabulate your data

This manual gives complete instructions for using the Digilert 100 and procedures for common applications.

How the Digilert 100 Detects Radiation

The Digilert 100 uses a Geiger-Mueller tube to detect radiation. The Geiger tube generates a pulse of electrical current each time radiation passes through the tube and causes ionization. Each pulse is electronically detected and registers as a count. The Digilert 100 displays the counts in the mode you choose: counts per minute (CPM), milliroentgens per hour (mR/hr), or total counts for a timed period. In SI units, counts per second (CPS) and microsieverts per hour (µSv/hr) are used.

2 Features

The Digilert 100 measures alpha, beta, gamma, and x-ray radiation. This chapter briefly describes the Digilert 100's functions. For more information on how to use the Digilert 100, see Chapter 3, "Operation."

The Digilert 100 counts ionizing events and displays the results on the liquid crystal display (LCD) (4). You control which unit of measurement is shown by using the mode switch.

Whenever the Digilert 100 is operating, the red count light (1) flashes each time a count (an ionizing event) is detected.

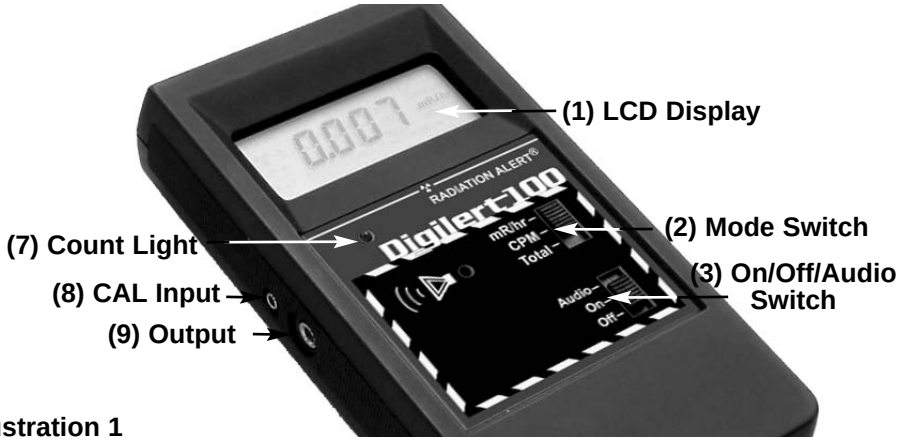


Illustration 1

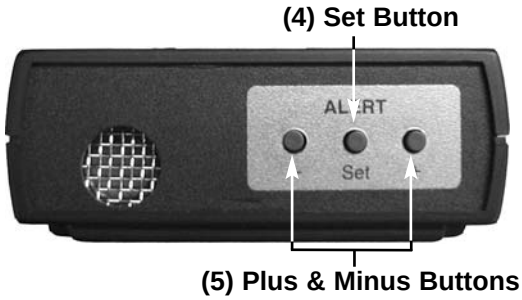


Illustration 2

The Display

Several indicators on the LCD (1)show information about the mode setting, the current function, and the battery condition.

- The numeric display (A) shows the current radiation level in the unit specified by the mode switch setting.
- A small battery (B) appears to the left of the numeric display to indicate low battery voltage.

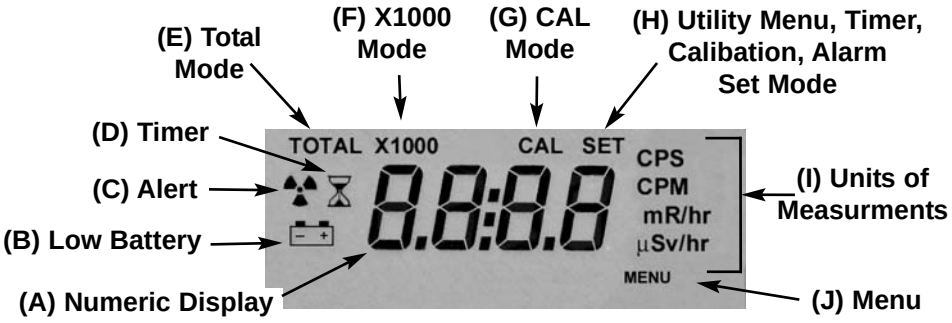


Illustration 3

" A radiation symbol (C) appears when the Alert feature is on.

" An hourglass (D) appears to the left of the numeric display during a timed count.

" TOTAL (E) appears when the Digilert 100 is in Total mode.

" X1000 (F) appears when the radiation level is displayed in X1000 mode.

" CAL (G) appears while you are calibrating the Digilert 100.

" SET (H) appears when you are setting the timer, the Alert level, or the calibration factor, or working in the Utility menu (the numeric display shows the setting you are adjusting instead of the current radiation level).

" The current unit of measurement (I)- CPM, CPS, mR/hr or µSv/hr--is displayed to the right of the numeric display.

" MENU (J) appears when you are in the Utility Menu.

The Switches

The Digilert 100 has two switches on the front, and three buttons on the end panel. Each switch has three settings, which are described below.

On/Off/Audio Switch (3)

Audio. The Digilert 100 is on, and it makes a clicking sound for each radiation event detected.

On. The Digilert 100 is operating, but audio is off.

Off. The Digilert 100 is not operating.

Mode Switch (2)

mR/hr. The numeric display shows the current radiation level in milliroentgens per hour from .001 to 110. When SI units are used, it shows the current radiation level in microsieverts per hour, from .01 to 1100.

CPM. The display shows the current radiation level in counts per minute from 0 to 350,000. When X1000 is shown, multiply the numeric reading by 1000 to get the complete reading. When SI units are used, the display shows the current radiation level in counts per second from 0 to 3,500.

Total. The display shows the accumulated total of counts starting when the switch is turned to this position, from 0 to 9,999,000. When X1000 is shown, multiply the numeric reading by 1000 to get the complete reading.

Set Button (Figure 2 (4))

The Set button is used to set the alert, select items in the Utility Menu, and set the Calibration settings. See “Using the Alert” and “Utility Menu” in Chapter 3 and “Calibration” in Chapter 5.

+ and - Buttons (Figure 2 (5))

The “+” and “-” buttons are used to adjust the numeric display for timed counts, alert settings, and calibration settings. See “Taking a Timed Count” and “Setting the Alert” in Chapter 3 and “Calibration” in Chapter 5.

The “+” and “-” buttons can also be used to make selections in the “Utility Menu”. For details, see “Utility Menu” in Chapter 3.

The Detector

The Digilert 100 uses a Geiger tube to detect radiation. Alpha radiation does not penetrate most solid materials, so this Geiger tube has a thin disk of mica, which alpha radiation can penetrate, on its end. The screened opening at the top of the Digilert 100 is called the window. It allows alpha and low-energy beta and gamma radiation to penetrate the mica end of the tube.

CAUTION: The mica end surface of the Geiger tube is fragile. Be careful not to let anything penetrate the screen.

The Ports

There are two ports on the left side of the Digilert 100.

The calibration input port (2) is used for calibrating electronically using a pulse generator. For more information, see "Calibrating Electronically" in Chapter 5.

The output port (3) below the calibration input port allows you to interface the Digilert 100 to a computer, data logger, or other device using a 3.5 mm stereo plug. For more information, see "Interfacing to an External Device" in Chapter 3.

3 Operation

The guidelines in this chapter describe how to use the Digilert 100.

Units of Measurement

The Digilert 100 is designed both for users of conventional units (milliroentgens per hour and counts per minute) and for users of SI units (microsieverts per hour and counts per second). To switch between conventional and SI units, use the Utility Menu. See "The Utility Menu" in this chapter.

Starting the Digilert 100

Be sure that a standard 9-volt alkaline battery is installed in the battery compartment in the lower rear of the Digilert 100. Note: When installing the battery, place the battery wires along the side of the battery and not under it.

To start the Digilert 100, set the top switch to the mode you want, and set the bottom switch to On or Audio. The Digilert 100 then does a four-second system check, displaying all the indicators and numbers.

After the system check, the radiation level is displayed in the selected mode. One minute after you start the Digilert 100, a short beep indicates that enough information has been collected to ensure statistical validity.

Operating Modes

When the mode switch is set to mR/hr or CPM, the numeric display is updated every three seconds. At low count rates, significant changes in the radiation level displayed can take up to one minute to stabilize. See "Operating Ranges and Response Times" in this chapter for more information.

CPM (or CPS) and timed total counts are the most direct methods of measurement; mR/hr (or µSv/hr) is calculated using a conversion factor optimized for Cesium-137, so this mode is less accurate for other radionuclides, unless you have calibrated the Digilert 100 for a specific radionuclide using an appropriate source. It is more appropriate to measure alpha and beta activity using CPM than using mR/hr. Conversion for alpha and beta emitters is calculated differently, and the Digilert 100's reading in mR/hr may not be accurate.

The most immediate indicators of the radiation level are the count light, the audio beep, and the alert. It takes three seconds before an increase is shown on the numeric display in the dose rate modes.

Operating Ranges and Response Times

The following table shows the radiation levels the Digilert 100 measures in each mode and how they are displayed. In some modes, when radiation levels increase over certain preset levels, the Digilert 100 uses autoranging, automatically changing to the X1000 scale. Whenever X1000 is shown above the numeric display, multiply the displayed reading by 1000 to determine the radiation level.

Mode	***Regular Range***	***X1000 Range***
mR/hr	.001-110	NA
µSv/hr	.01-1100	NA
CPM	0-9999	10,000-350,000 (displayed as 10.00-350, with X1000 indicator)
CPS	0-3500	NA
Total/Timer	0-9999	10,000-9,999,000 (displayed as 10.00-9999, with X1000 indicator)

Maximum level. When the maximum level for the current mode is reached, the

Digilert 100 beeps for three seconds, pauses for three seconds, and repeats that pattern. The numeric display flashes. The beeping pattern and the flashing continue until the level decreases or the Digilert 100 is turned off.

Display update and response time. In Total mode, the numeric display is updated each second. In the dose rate modes, the numeric display is updated every three seconds. When the radiation level is less than 1,000 CPM, the reading in any of the dose rate modes is based on the radiation detected in the immediately previous minute. In order to give a quicker response to changes, when the radiation level exceeds 1,000 CPM, the reading is based on the previous 3 seconds, as shown in the following table. This automatic change in response time is called auto averaging.

Radiation level	***Basis for reading***
<1000 CPM or 1 mR/hr	1 minute
>1000 CPM or 1 mR/hr	3 seconds

Note: You can set the response time to 3 seconds at all radiation levels using the Utility Menu; see "The Utility Menu" in this chapter.

Taking a Timed Total Count

The Digilert 100 can give you a total count for a timed period of from one minute to 24 hours.

A timed total count is useful for determining the average counts per minute over a period of time. The number of counts detected by the Digilert 100 varies from minute to minute due to the random nature of radioactivity. When a count is taken over a longer period, the average count per minute is more accurate, and any small increase is more significant.

Taking an average allows you to detect low-level contamination or differences in background radiation due to altitude or soil mineral content, and can be useful for educational purposes. For example, if one 10 minute average is one count higher than another 10 minute average, the increase may be due to normal variation. But over 12 hours, a one count increase over the 12 hour background average is statistically significant.

To take a timed count, follow these steps:

1. With the Digilert 100 operating, set the Mode switch to Total. The display shows SET, the hourglass, and the most recent timing period used. The first time you use the timer, the setting is 00:01, which means one minute.
2. Use the + and - buttons to set the timing period. The timed period can be for 1 to 10 minutes in one-minute increments, for 10 to 120 minutes in ten-minute increments, or for 1 to 40 hours in one-hour increments.
3. Press the Set button. The Digilert 100 starts totaling the counts it registers, and the numeric display is updated each time a count is registered. The hourglass indicator flashes during the timed period.

   During the counting period, if you want to see how many minutes remain, press the Set button. The display counts down from the time setting in hours and minutes to zero. For example, if the display shows 00:21, 21 minutes remain.
4. At the end of the timed period, the Digilert 100 beeps three times, and repeats the beeping several times. The number displayed is the total count.
5. To find the average dose rate for the timed period, divide the total by the number of minutes.

   The average count is in counts per minute. To convert to mR/hr for Cesium-137, divide by 1000.
6. Move the Mode switch to one of the dose rate modes to return to normal operation.

If you move the Mode switch to one of the dose rate modes while the Digilert 100 is taking a timed count, the timed count will stop.

Using The Alert

The Alert can be set in mR/hr or cpm. When using Utility Menu option #2 to switch units of measurements, the alert is reset to the default alert level of .1 mR/hr (1.0 mS/hr). Once the alert threshold is reached the beeper will sound until the alert is deactivated, or the radiation level drops below the set alert threshold.

1. To set the Alert, press the "SET" button on the end panel. The "ALERT" icon (radiation symbol) and the "SET" icon are displayed.
2. Use the "+" and "-" buttons to adjust the display to the desired level.

3. Press the "Set" button once to retain the setting in memory. Then press it again to turn the alert mode on. The "ALERT" icon is now displayed to indicate the instrument is operating in the Alert mode.
4. To use the previous alert setting, press the set button twice. Now the alert mode is on.
5. To deactivate the Alert mode, press the "Set" button again. The "ALERT" icon is no longer displayed.

The Utility Menu

The Utility Menu allows the user to change default settings for several operating parameters. Once a setting is changed, it remains in effect unless they are changed through the Utility Menu.

1. To activate the Utility Menu, hold down the “+” button while turning the instrument on. The display will show the "MENU" icon. Release the “+” button and a “1” indicating option 1 will appear along with the “Menu” icon.
2. Scroll through the menu by pushing the “+” or “-” buttons.
3. To select an option, push the “Set” button and the “SET” icon is displayed.
4. Use the “+” or “-” buttons to toggle between choices and press the “Set” button to enter the new value. The instrument will continue to operate in the Utility Menu mode, and the display will show "0" and "MENU". To adjust another Utility Menu option, repeat the above steps.
5. To exit the Utility Menu at any time, press the SET button again. The Digilert 100 continues with the normal start-up routine.

Options		Function	Comments
1.	Auto Averaging or 3 sec. Averaging	“on” selects Auto Averaging “oFF” selects 3 second (fast response) averaging	Refer to “Response Time (Autoaveraging)” in Chapter 3
2.	Units Of Measurements	Selects between mR/hr and CPM or µSv and CPS	

Options **Function** **Comments**

3.	Cal 100 Reset	Automatically resets Cal factor to 100	Press the set Button No toggling required
4, 5, 6		Reserved for future options	
7.	Cal Factor Adjust	Manually adjusts cal factor	Use “+” or “-” Buttons to increase or decrease the value
8.	Factory Default Reset	Automatically resets to Auto Averaging, mR/hr, CPM, and CAL 100	Press the set Button No toggling required
9.	Revision #	Displays software version number	

Interfacing to an External Device

The lower output jack on the left side of the Digilert 100 is a dual miniature jack that provides a data output that can be used to drive external devices. You can use it to record the counts on a computer, data logger, or accumulating counter. Use a 3.5 mm stereo plug to access this port. The outputs provide a positive pulse (9 volt peak, 1 Kohm impedance) each time the Geiger tube detects a count. At the tip of the plug, the pulse is approximately 1mS wide and is well suited for chart recorders and audio output. The ring signal is approximately 80uS wide and is suitable for high speed counting and RS-232 interfacing. A cable with an RS-232 connector (capacitor coupled) for an IBM PC-compatible computer serial port and accompanying software are available from International Medcom. A standard stereo or mono headphone can be plugged directly into the jack. For some types of headphone, external volume control may be needed.

4 Common Procedures

The following sections give guidelines for several commonly-used procedures. With any procedure, the user must determine the suitability of the instrument or procedure for that application.

Establishing the Background Count

Normal background radiation levels vary at different locations, according to

altitude and other factors, such as types of minerals in the ground. Levels differ at different distances from the ground, and may differ even in different areas of the same room. To accurately interpret the readings you get on the Digilert 100, it is a good idea to establish the normal background radiation level for each area you plan to monitor. You can do this with a total/timed count. Use the steps shown in "Taking a Timed Total Count" in Chapter 3 to get a ten-minute average.

A ten-minute average is moderately accurate. You can repeat it several times and see how close the averages are. To establish a more accurate average, take a one-hour count. In some locations, you may want to take a longer count, for example, 12 hours. If you need to determine whether there is prior contamination, take averages in several locations and compare the averages.

Environmental Area Monitoring

You can keep the Digilert 100 in CPM or mR/hr mode whenever you want to monitor the ambient radiation, and look at it from time to time to check for elevated readings. You can also use Alert mode to warn you if the radiation increases above the alert level.

If you suspect an increase in ambient radiation, use the timer to take a five or ten minute count, and compare the average to your average background count. If you suspect an increase that is too small to detect with a short timed reading, you can take a longer count (for example 6, 12, or 24 hours).

Checking an Object

To check an object, put the Digilert 100 next to it. The end window should be facing and close to the object; otherwise you may miss alpha and low-level beta radiation. If you want to find out if an object is slightly radioactive, place the Digilert 100 next to it and take a timed count over an appropriate period of time.

When you are not using the end window, hold the Digilert 100 so that the side wall of the tube is as close as possible to the object. Alinging the symbol marking the center of the detector close to the object is the best position. The illustration at the right shows the position of the Geiger tube in the Digilert 100.

To measure as much as possible of the radioactivity of an object, place the

Digilert 100 as close as you can without touching the object. The radiation level for gamma radiation from a localized source decreases according to the inverse square law. If you move to twice the distance from the object, the radiation drops by a factor of four.

CAUTION: Never touch the Digilert 100 to a object that may be contaminated. You may contaminate the instrument. A contaminated instrument will not be accepted for repair or servicing.

5 Maintenance

The Digilert 100 should be handled with care and can be calibrated as necessary to comply with regulations. Use the following guidelines to maintain the Digilert 100 properly.

Calibration

The Digilert 100 should be calibrated as often as your regulations require. The best way to calibrate is using a calibrated source. If no source is available, it is possible to calibrate electronically using a pulse generator.

The standard radionuclide for calibration is Cesium-137. A certified calibration source should be used. To calibrate the Digilert 100 for another radionuclide, you must use a calibrated source for that radionuclide or the appropriate conversion factor referenced to Cs-137.

CAUTION: In calibration mode, the smallest increment that can be adjusted is .010, which prevents fine adjustment of the calibration factor. Thus, errors can occur if you use a low-level source or background to set the calibration factor.

Calibrating Using a Source

Before you calibrate the Digilert 100, make sure the distance between the

Digilert 100 and the source is correct to produce the appropriate dose rate. Place the Digilert with the end panel facing the source and the center of the alpha window aligned with the center of the source. When using Cs-137 for gamma calibration, place the Digilert with the rear of the instrument facing the source (to filter the beta emissions) and the center of the Geiger tube (indicated by the symbol on the rear label) aligned with the center of the source. This filters the beta emissions. Follow these steps:

1. Start with the Digilert 100 turned off and the Mode switch set to mR/hr.
2. Hold down the - button on the end panel while you turn the On/Off/Audio switch to On. (Don't use the Audio setting.)

   The display shows CAL, and the Digilert 100 counts down for 15 seconds, beeping each second. This delay gives you a chance to move out of the field and then expose the source. At the end of the 15 seconds, the Digilert 100 beeps several times.
3. The Digilert 100 collects data for 60 seconds, beeping as it does so, with CAL and the hourglass indicator flashing. At the end of the 60 seconds, it beeps several times. The display shows CAL and SET. You can now seal or close the source.
4. Press the + and - buttons to adjust the reading to what it should be. When the reading is correct, press the Set button. The new calibration factor is automatically calculated from the adjustment you make.
5. The new calibration factor is displayed for several seconds, then the Digilert 100 beeps and resumes regular operation.

The calibration factor is set to 100 (percent) at the factory. If you change the reading, for example, to 20% higher than the factory reading, the new calibration factor would be 120. The current calibration factor is displayed during the system check when the Digilert 100 is first turned on.

Calibrating Electronically

You can calibrate electronically using a pulse or function generator. Electronic calibration requires a cable with a 2.5 mm plug, with the tip carrying the signal. Follow these steps:

1. Set the signal height to 3.3 volts (positive pulse) and the pulse width to 80 microseconds.

CAUTION: Do not inject a pulse when the Digilert 100 is turned off. Do not exceed 5 volts.

2. Plug the cable into the upper jack.
3. Start with the Digilert 100 turned off and the Mode switch set to mR/hr. Hold down the - button on the end panel while you turn the On/Off/Audio switch to On. (Don't use the Audio setting.)

   The display shows CAL, and the Digilert 100 counts down for 15 seconds, chirping each second. At the end of the 15 seconds, the Digilert 100 beeps several times.
4. The Digilert 100 collects data for 60 seconds, beeping as it does so, with CAL and the hourglass indicator flashing. At the end of the 60 seconds, it beeps several times. The display shows CAL and SET.
5. Use the following table to check the Digilert 100's accuracy. The table shows appropriate pulse generator count rates to calibrate for Cs137. If the accuracy is not within desired limits, follow steps 5-7. Note that the Digilert 100 automatically compensates for lost counts due to GM tube dead time. Thus, the display reading in CPM mode does not equal the input frequency. You can display uncompensated counts in CPM mode by continuously holding down the - (minus) button; the reading now corresponds to the input frequency.

Pulse Generator Input (PPM)	**CPM**	**mR/Hr**	**µSv/hr**	**CPS**
11,629	11,994	10	100	205
22,661	23,888	20	200	399
52,600	59,720	50	500	995
78,541	95,552	80	800	1,593
93,993	119,440	100	1,000	1,991

6. Press the + and - buttons to adjust the reading to what it should be. When the reading is correct, press the Set button. The new calibration factor is automatically calculated from the adjustment you make.
7. The new calibration factor is displayed for several seconds, then the Digilert 100 beeps and resumes regular operation.

Troubleshooting

The Digilert 100 is a highly reliable instrument. If it does not seem to be working properly, look through the following chart to see if you can identify the problem.

Problem	Possible Cause	What To Check
Display is blank	no battery, dead battery, poor battery connection defective LCD	install a new 9-volt battery if count light and audio work, the LCD may need to be replaced
Display works, but no to counts are registered	defective Geiger tube	look through the window check the mica surface of the tube; if it is wrinkled or a break is visible replace it
Reading is high, but another instrument; has a normal reading	contamination	scan the Digilert 100 with another instrument clean instrument with water and mild detergent
Instrument has false high reading	moisture	circuit board may be wet; dry the instrument in a warm dry place; if it still has a problem, it requires service

Problem	Possible Cause	What To Check
Instrument has false high reading	photosensitivity	remove from direct sunlight and ultraviolet sources; if the high count drops, the mica window coating may have washed off the Geiger tube due to getting wet; the tube will need to be replaced
Instrument has false high reading	continuous discharge	replace the Geiger tube
Instrument has false high reading	electromagnetic field	move the instrument away from possible sources of electromagnetic or radio frequency radiation

Service

If the Digilert 100 requires servicing, please contact your distributor or the manufacturer at the following address:

Do not attempt to repair the Digilert 100; it contains no user-serviceable parts and you could void your warranty.

CAUTION: Do not send a contaminated instrument for repair under any circumstances.

S.E. International, Inc
P.O. Box 39, 436 Farm Rd
Summertown, TN 38483-0039
Tel: 931-964-3561, Fax: 931-964-3564 E-mail: radiationinfo@seintl.com

6 Basics of Radiation and Its Measurement

This chapter briefly tells what radiation is and how it is measured. This information is provided for users who are not already familiar with the subject. It is helpful in understanding how the Digilert 100 works and in interpreting your

readings.

Ionizing Radiation

Ionizing radiation is radiation that changes the structure of individual atoms by ionizing them. The ions produced in turn ionize more atoms. Substances that produce ionizing radiation are called radioactive.

Radioactivity is a natural phenomenon. Nuclear reactions take place continuously on the sun and all other stars. The emitted radiation travels through space, and a small fraction reaches the Earth. Natural sources of ionizing radiation also exist in the ground. The most common of these are uranium and its decay products.

Ionizing radiation is categorized into four types:

X-rays are usually manmade radiation produced by bombarding a metallic target with electrons at a high speed in a vacuum. X-rays are electromagnetic radiation of the same nature as light waves and radio waves, but at extremely short wavelength, less than 0.1 billionth of a centimeter. They are also called photons. The energy of X-rays is millions of times greater than that of light and radio waves. Because of this high energy level, X rays penetrate a variety of materials, including body tissue.

Gamma rays occur in nature and are almost identical to X rays. Gamma rays generally have a shorter wavelength than X-rays. Gamma rays are very penetrating; thick lead shielding is generally required to stop them.

Beta radiation. A beta particle consists of an electron emitted from an atom. It has more mass and less energy than a gamma ray, so it doesn't penetrate matter as deeply as gamma and X-rays.

Alpha radiation. An alpha particle consists of two protons and two neutrons, the same as the nucleus of a helium atom. It generally can travel no more than 1 to 3 inches in air before stopping, and can be stopped by a piece of paper.

When an atom emits an alpha or beta particle or a gamma ray, it becomes a different type of atom. Radioactive substances may go through several stages of decay before they change into a stable, or non-radioactive, form.

An element may have several forms, or isotopes. A radioactive form of an element is called a radioisotope or radionuclide. Each radionuclude has a half-life, which is the time required for half of a quantity of the material to decay.

Measuring Radiation

Alpha, beta, gamma, and x-rays ionize material they strike or pass through. The amount of radiation is generally measured by measuring the resulting ionization.

The Geiger tube used in the Digilert 100 consists of an anode and a cathode (positive and negative electrodes) separated with a mixture of argon, neon, and either chlorine or bromine gases. The cathode is a thin-walled metallic cylinder sealed at each end with an insulating disk to contain the gas. The anode is a wire that extends into the cylinder. A high voltage is applied to the electrodes to create an electrical field within the chamber. When radiation passes through the chamber and ionizes the gas, it generates a pulse of current. The Digilert 100 electronically processes these pulses to display the radiation level.

Radiation Measurement Units

Several different units are used to measure radiation, exposure to radiation, and dosage.

A roentgen is the amount of X-radiation or gamma radiation that produces one electrostatic unit of charge in one cc of dry air at 0* C and 760 mm of mercury atmospheric pressure. The Digilert 100 displays readings in milliroentgens per hour (mR/hr). A milliroentgen is one one-thousandth of a roentgen.

A rad is the unit of exposure to ionizing radiation equal to an energy of 100 ergs per gram of irradiated material. This is approximately equal to 1.07 roentgen.

A rem is the dosage received from exposure to a rad. It is the number of rads multiplied by the quality factor of the particular source of radiation. The rem and millirem (one one-thousandth of a rem) are the most commonly-used measurement units of radiation dose in the U.S. One rem is generally considered to equal one rad.

A sievert is the standard international measurement of dose. One sievert is equivalent to one hundred rems. A microsievert (Sv) is one millionth of a sievert.

A curie is the amount of radioactive material that decays at the rate of 37 billion disintegrations per second, approximately the decay rate of one gram of radium. Microcuries (millionths of a curie) and picocuries (trillionths of a curie) are also often used as units of measurement.

A bequerel (Bq) is equivalent to one disintegration per second.

Determining What Is a High Reading

Due to the random nature of radioactivity, the Digilert 100 reading varies from minute to minute. In one location with only background radiation, the reading in mR/hr might vary in ten minutes from .007 to .018. In an hour, the reading might vary from .004 to .021. The averages for both periods would be very close.

Normal radiation levels in different locations can vary greatly due to soil composition, altitude, and other factors. For example, normal background at 10,000 feet might be double that at sea level. On an airplane, the radiation at 35,000 to 40,000 feet may be as much as 30 to 50 times the normal level on the ground.

When monitoring radiation levels in one location, it's helpful to determine what reading is the highest you can normally expect to see in that location. If you use Alert mode, you want to set the alert level to one that rarely gives a false alarm, yet sounds the alert when the radiation is higher than normal.

A single alert may occur occasionally and is not significant unless there is also an elevation in the average count. If you suspect an elevation and you have previously taken an average background count in the same location, you can take a total count to get the current average count for 30 minutes or another period. You can then compare the current average to the previous average to see whether there is an elevation. See "Taking a Timed Total Count" in Chapter 3 for more information.

Appendix A Technical Specifications

Detector:	Halogen-quenched Geiger-Mueller tube with mica end window . Mica window density 1.5-2.0 mg/cm2. Side wall is .012" thick #446 stainless steel.
Display:	4-digit liquid crystal display with mode indicators
Operating Range:	mR/hr: .001 to 110 CPM: 0 to 350,000 Total: 1 to 9,999,000 counts µSv/hr: .01 to 1100 CPS 1 TO 3,500
Energy Sensitivity:	1000 CPM/mR/hr referenced to Cs-137
Accuracy:	±10% typical, ±15% maximum
Alert Range: Beeper sounds the alert	mR/hr: 0 to 50 CPM: 0 to 160,000
Count light:	Red LED flashes with each count
Beeper:	Operational in Audio mode only (can be muted)
Ports:	Dual miniature jack sends counts to CMOS-compatible devices, including computers, data loggers, earphones, and data collection systems Submini jack provides calibration input.
Anti-Saturation:	Protection allows readout to hold at full scale in high radiation fields
Temperature Range:	-20° to +50° C , -4° to +122° F
Power: hours	One 9-volt alkaline battery; battery life is average 2160 at normal background, average 625 hours at 1mR/hr.
Size:	150 x 80 x 30 mm (5.9" x 3.2" x 1.2")
Weight:	225 grams (8 oz) including battery

Appendix B - Options
Digilert 100 Protective Case

Ideal for military applications, this is the ultimate case for protection from severe weather, drops, and more. Made from a nearly indestructible material, it has been designed to house the Inspector+ in a dustproof, air proof, and watertight case while still providing you with access to your Inspector+ for data, regardless of the conditions (Gamma detection only).

Easily use The Inspector+ through recessed, clear plastic screen.

Meets ANSI Standard for homeland security

Crushproof, Waterproof, Dustproof & Airtight

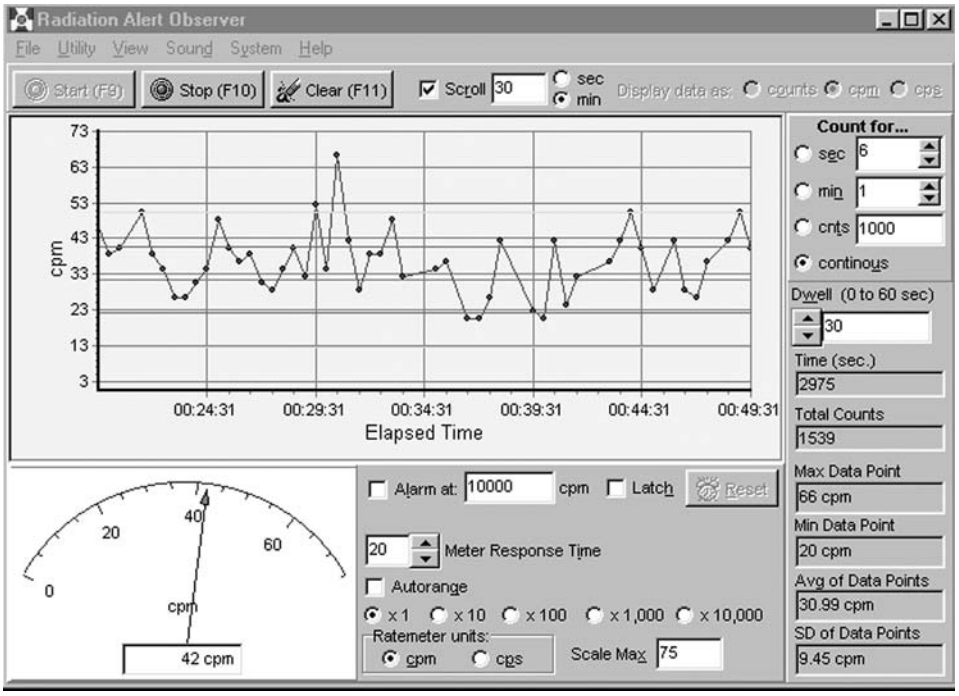
Adjustable Velcro hand strap - easy to use with gloves

Size: L 8.5 x W 1.37 min (W 5.25 max) x D 2.4 (L216 x W 111 min (W 133 max) x D 61 mm)

Observer Software

The Observer software runs on a Windows platform and can be used with the Inspector, Digilert 50, and Geiger Radiation Monitors. As an option, any of our Radiation Alert® instruments can be modified to interface with the Observer.

The Observer reads in Counts, CPM, and CPS and has the ability to collect, log, and perform statistical analysis on the data received. The data is displayed on a graph as well as digital and analog on-screen meters and can be saved or printed in various ways including a spreadsheet format. The dwell/count time can be adjusted for each point on the graph. You can also set the length of time for the count. The on-screen meters in the software have adjustable settings as well as a settable alarm in CPM. There are both visual and audio indicators, and you can play the meter click through your PC speakers.



Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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