The Geiger

Features

The Geiger measures beta, gamma, and x-radiation using a Geiger-Mueller tube. This 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. A red LED blinks and a beeper chirps with each count. You can mute the chirp by setting the switch to On instead of Audio.

The Geiger is powered by a standard 9-volt alkaline battery in the battery compartment on the lower rear of the instrument. A battery should last for 2-3 months of continuous use.

The Geiger uses a glass Geiger tube, which can be seen through the translucent part of the label on the back of the instrument. The Geiger tube fluoresces (gives off light) in a dark room when it is exposed to an elevated radiation level.

Two output ports are on the left side of the Geiger. The upper port provides audio output (a click for each count) through a 2.5 mm plug to an external audio amplifier, earpiece, or tape recorder. The lower port is a dual miniature jack that provides a data output that can be used to drive a CMOS or TTL device. 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 output at the tip of the plug provides a positive (5 volt) pulse each time the Geiger tube detects a count. A cable with an RS-232 connector for an IBM PC-compatible computer serial port and accompanying software are available from International Medcom.

Maintenance

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

> Do not contaminate the Geiger by touching it to radioactive surfaces or materials.

> Do not leave the Geiger in temperatures over 100 F (38 !C) or in direct sunlight for extended periods of time.

> Do not get the Geiger wet.

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

> Avoid using the Geiger in high-intensity radio frequency, microwave, electrostatic, and electromagnetic fields; it may be sensitive to these fields and may not operate properly.

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

> Change the battery promptly when the brightness of the LED fades.

Using the Geiger Software

If you purchased the Geiger with the cable and software, the software displays the radiation levels in counts per minute on your computer screen.

You can use the software directly from the floppy disk or install it on your hard disk. To install the software on your hard disk, use your file management program to first create a new directory and then copy the program file, GEIGER.EXE, into the new directory.

The Geiger program runs under MS-DOS. If you are using a Windows computer, exit Windows into MS-DOS or start the computer in MS-DOS mode before you run the program.

Before you start the Geiger program, plug the computer end of the cable into a serial port on your computer and the other end into the lower of the two ports on the left side of the Geiger. *Note:* The cable connects with a 9-pin serial port; if you have a 25-pin port, use an adaptor (available at most computer stores).

To start the Geiger program, follow these steps:

1. Turn on the computer and change to the disk or directory where the Geiger program is located.

2. Type **geiger** and press Enter. Press any key to continue.

3. At the prompt, select the port.

4. At the alert level prompt, type the number of counts per minute (for example, 100) you want for the alert level and press Enter. The program will show the alert level on the graph, and will sound an audible alert whenever the count reaches the alert level.

5. At the prompt, type a two-character station ID number and press Enter.

The operating screen appears, with the station ID, the current, 24-hour average, and minimum and maximum readings and a graph.

The program waits for the start of a new minute before it starts counting. Then, after the first full minute, it starts displaying data. Watch the screen for a few minutes to make sure the readings are being updated.

While the program is operating, you can press Escape at any time to exit.

You can toggle the audible alert off and on by pressing F3.

The first time you use the program, a configuration file is created, and you don't have to answer the prompts on subsequent sessions. To change a configuration setting (for example, alert level), you can either delete the configuration file REMOTE.CFG before you start the program or press F1 while the program is running.

If the software reports an error or doesn't collect data correctly, check to make sure that you have specified the correct com port and that no mouse drivers are installed for that port.

IMPORTANT: *The Geiger software depends on the computer's microprocessor to register the counts that come into it from the Geiger. Microsoft Windows uses some of the processor's time performing other tasks. For this reason, always exit Windows or restart the computer in MS-DOS mode before using the program. Also, the accuracy of the data collected by the software at elevated radiation levels is directly related to the speed of the microprocessor; older, slower microprocessors may not register all the counts at an elevated radiation level. This is not a problem at background radiation level or at a slightly elevated level.*

Reading the Data

Each day, the data is saved in a file, named with the station number and date. For example, the data file for station 02 for June 4, 1999 is named 02060499.TXT. A new file is started every day at midnight. If you restart the program on a day when it has already been operating, the data is appended at the end of the existing file for that day.

The file is in ASCII (plain text) format. It has one line for each minute's reading, which shows time and radiation level, separated by commas. For example, a line might read:

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02:21,45
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The file can be imported into a spreadsheet program such as Excel or Lotus as a comma delimited ASCII file.

Using the Geiger Without the Software

The Geiger is primarily designed to be used with companion software. You can use it as a stand-alone instrument to gather readings in counts per minute by counting the number of times the LED blinks or the instrument chirps. Use a watch or stopwatch to time each minute. You can also time a longer period, and divide by the number of minutes to find the count per minute.

In a higher radiation field, the counts per minute may become too frequent to count. You can tell increases and decreases in the filed by watching the frequency of the LED flashes and listening to the frequency of the clicks.

Interpreting the Data

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 Geiger, it is a good idea to establish the normal background radiation level for each area you plan to monitor. Counts per minute vary from minute to minute because of the random nature of radioactive disintegrations, so you need to get an average reading in counts per minute.

You can take an average with the Geiger software or by manually counting the LED flashes or the chirps. Using the software, you can see the average for the current session on the screen. If you are manually counting, determine the average over at least ten minutes. You can repeat the ten-minute average several times and see how close the averages are.

The longer the period an average is based on, the more accurate it is. A ten-minute average is moderately accurate; a 12- to 24-hour average taken with the software is very accurate.