THE LUDLUM REPORT

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A QUARTERLY NEWSLETTER FROM
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BETTER PRICES ON SCALERS

Good news for scaler users! Prices of the Ludlum Models 2220 and the 2300 have been adjusted downward. The 2220 portable scaler/ratemeter is now $1495.00, down from $1645.00. The Model 2300 scaler/ratemeter with voice synthesizer output (the one that talks) is now only $1595.00, instead of $1945.00. Headphones are included in the price of the Model 2300.

DUAL PURPOSE SURVEY METERS

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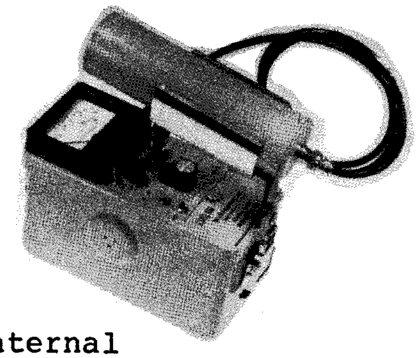


THE MODEL 3-98

If you have a need to count betas and low level gammas, the Model 3-98 is for you. This versatile portable survey instrument features an internal pancake G-M tube for beta-gamma detection (the same tube we use in our 44-9 pancake detector), along with the capability of utilizing an external probe. Changing from the internal to the external detector is as easy as flipping a switch. This handy configuration of two probes on one instrument will save you time, space and money.

The standard probe, which is included in the price, is the Ludlum Model 44-3 low energy gamma scintillator, which is ideal for detecting I-125 and X-rays. However, any Ludlum G-M or scintillation probe will work with the 3-98 because the high voltage for the external detector is adjustable from 400 to 1500 volts.

The internal pancake G-M has a gamma efficiency of 1900 CPM/mR/hr for Cs-137, and a beta efficiency of 560,000 CPM/uCi for Tc-99. The active counting area is 15.5 cm . A 1.5mm thick phenolic slide protects the window.

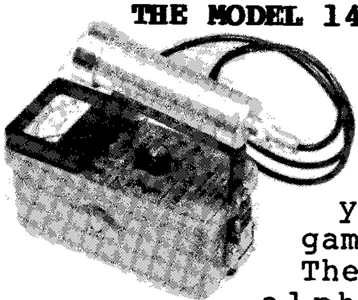
The efficiency for the Model 44-3 gamma scintillator is 38%, or 675,000 CPM/mR/hr for I-125. The energy response is approximately total absorption for gamma energies between 10 keV to 60 keV. Below 10 keV, efficiency drops due to window absorption. Above 60 keV, efficiency declines due to thin crystal.

Power is supplied by two standard "D" cell flashlight batteries.

The meter face reads 0-5K CPM, and four linear ranges allow a reading of 0 - 500,000 Counts per Minute.

The Model 3-98 is featured on page 2-5 of the Ludlum catalog. The price of $795.00 includes the 44-3 scintillator.

THE MODEL 14C



Another of our portable survey instruments that does double duty is the Model 14C, pictured here with the Model 44-7 end window G-M detector. The 14C has one internal range of 0-2000 mR/hr, and four external ranges of 0-200 mR/hr. This is very handy should you need an instrument that can count up to 2R on gammas, but also have the versatility of our Model 3. The external probe can be a G-M detector for detecting alpha, beta, and gamma, or, a beta or a gamma scintillation probe. It works very well for contamination monitoring.

Because there is a choice of probes, the Model 14C is priced by itself at $385.00. This is a change in our pricing policy, as our old catalogs have the 14C priced with the Model 44-7. We are now pricing these separately to allow the customer more flexibility, and to eliminate confusion. For prices on probes see the Ludlum catalog. Detector specifications are in section 3.

SINGLE CHANNEL ANALYZER CALIBRATION Oct 1986

A number of instruments have window and threshold controls that allow single isotope analyzing when used with a scintillation or proportional detector. The window control has no function with a G-M detector, since the amplitude of the output pulse from a G-M detector does not vary with energy.

The scaler ratemeters have ten turn potentiometers for the threshold and window controls. This allows for the threshold dial setting, plus one-half of the window width, to be equivalent to the peak energy of the source.

The window control is calibrated such that one turn on the control is equal to one turn on the threshold control. That is, if the threshold control is calibrated to 100 keV per turn, the window control is equal to 100 keV/turn. Example: Cs-137 energy is 662 keV. If the window setting is at 1.00, the threshold dial would be set at 6.12 (6.62 minus 0.50 window).

To find the peak energy of an isotope, the operating characteristics of the detector must be determined. A plateau of 50 volt increments should be taken with the window out and plotted for both background and a reference source, such as Cs-137 to calibrate at 100 keV/turn, or Am-241 to calibrate at 10 keV/turn. The peak energy of the source is located where the count from the source "just starts" to appear above background. Note the high voltage in this area. This will be the region of the operating point for the reference source. Place the window in-out switch to in, and set the window and threshold controls. Reduce the high voltage below the point where the source count is not seen above background. Expose the source to the detector. Slowly increase the high voltage. The source count should increase, then decrease with increasing high voltage. Reduce and refine the high voltage until the source count peaks. The source count with the window in should be 1/10 to 1/2 of the plateau count with the window out.

If in doubt, plot count vs. high voltage with the window in. The count should show a peak below the knee of the plateau, taken with the window out.

Other window widths may be selected. A window of 50 keV would result in a window dial setting of 0.50 and a threshold dial of 6.37 for Cs-137. Once the instrument is peaked, lock the high voltage control. Changing the threshold control for another energy may require tweaking the high voltage to repeak the instrument.

To calibrate the threshold for 10 keV/turn, repeat the above procedure using an Am-241 source (60 keV). Selecting a window width of 2.00, the threshold dial would be set at 5.00, which would be equivalent to 50 keV. The 60 keV peak then would be centered in the window. It follows that the threshold dial for I-125 (35 keV) would be set at 2.50 or 25 keV with the window at 2.00.

The Model 2500 and Model 2600 instruments are equipped with an energy multiplier control, allowing selection of several

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precalibrated energy ranges, (keV/turn), for the threshold and window controls.

For instruments without dials, it will be necessary to use a pulser to measure input sensitivity of the threshold and window settings. Typically for a Model 16, set the threshold for 30 millivolts and the window for 40 millivolts. Place window to out position, and select appropriate range on meter. If there is no meter indication, increase amplitude on Model 500 so that meter counts/min reads the same as the Model 500 counts/min. Place the window switch to the in position. Increase pulser amplitude. Count should appear at 30 millivolts and disappear at 40 millivolts. With the window out, run a plateau for background and reference source count. Remember that the high voltage, when peaked, will be below the plateau voltage. Now place the window in and peak the source by adjusting high voltage. (Note: the range selector may have to be positioned to the next lower range.) Energy relations can now be calibrated in MEV/mV using the pulser as a substitute for dials.

To calculate system resolution, use a narrow window (50 keV). Record source count with window centered at 662 keV (Cs137). Decrease the threshold setting until the count rate declines by 1/2. Record the threshold keV at this point. Now increase the threshold setting above the peak until the source count again declines by 1/2 from the peak value. Record the threshold keV at this point. Resolution may be calculated as:

$$\frac{\left(E_{(1/2\ H)} - E_{(1/2\ L)} \right)}{E_{(C)}} \times 100\%$$

E(1/2 H) is the energy level where the count rate declines by one half from the peak count on the high side. E(1/2 L) is the energy level below the peak when the count rate drops to one half of the peak level, and E(C) is the energy level for the peak reading. This is calculated by threshold energy plus 1/2 of window width.

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