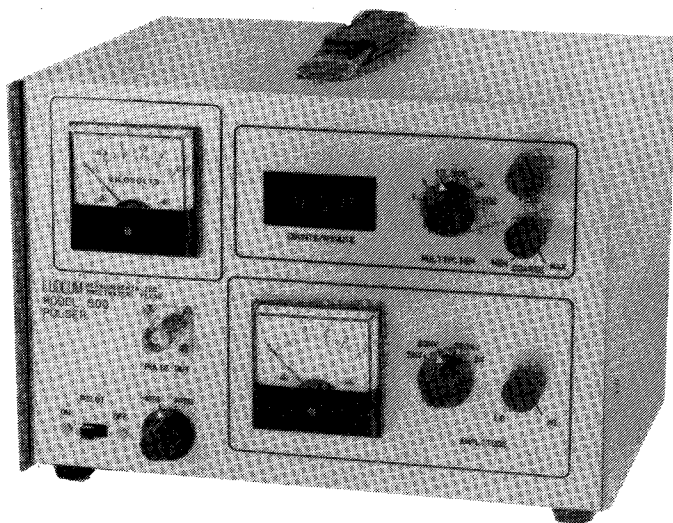


LMI MODEL 500 PULSE GENERATOR

March 1990



The repair and calibration of nuclear radiation detection instruments sometime require the use of a pulse generator. The Ludlum Model 500 Pulse Generator provides an easy means of reading the survey or scaler instruments's high voltage (HV), frequency, and input sensitivity. The HV is read directly from the M 500 in the range of 0 -2.5 kV.

The pulse rate, which is in counts per minutes (cpm) and the input sensitivity are determined by the selection of the appropriate range multipliers and potentiometer adjustment control.

The HV, frequency and pulse amplitude provides the necessary information for determining accurate instrument response and performances specifications for the instruments. The Model 500 accessories are a series "C" to BNC or series "C" to MHV adaptor, and a voltage current converter (a shielded 10k resistor with connectors on both ends). The voltage current converter is required for proper instrument operation if the instrument sensitivity is less than 1 millivolt and has a charge sensitive input.

The Model 500 produces either negative or positive pulse with a 0.5 micro second lead, a 1.5 microsecond width and a 5 microsecond tail which is similar to a radiation pulse. The M 500's high voltage readout scale is 0 - 2.5k and is measured by a high impedance voltmeter on the pulse out connector. The voltmeter impedance is 2.5×2500 megohms $\pm 10\%$.

The pulse rate is displayed on a 3 digit LED readout and is determined by the position of the multiplier switch. Coarse and fine adjustments controls easy selection of the desired frequency. Dividing the M 500 cpm setting by 60 will provide calibration of an instrument whose scale is in counts per seconds (cps). The pulse rate range is 10 cpm to 9 million cpm $\pm 2\%$ of reading.

Pulse amplitude is read on an analog 0 - 5 scale and is determined by a 4 position switch from 0 - 5 $\pm 7\%$ of full scale. An amplitude adjustment knob allows the selection of the desired amplitude.

CALIBRATION TIPS *March 1990*

LMI instruments with counts per minute (cpm) meter faces are usually calibrated with a pulse generator (pulser). The pulser should have a negative pulse, a 0.5 microsecond lead, a 1.5 microsecond width and a 5 microsecond tail. The pulse size is similar to the size of the pulse the instrument is capable of recognizing. In our Calibration Department, we use our Ludlum Model 500 pulser to calibrate instruments which require cpm readouts. The Model 500 supplies the correct pulse size and digital readout in cpm with continuous adjustment from 10 to 9 million cpm, plus it offers a high voltage readout from 0 to 2500 volts.

To begin calibration, connect the instrument to the pulser and determine the sensitivity of the instrument. For example, the Ludlum Models 2, 3, and 14C Portable Survey Meters which have fixed Thresholds, should have a sensitivity of $35 \text{ mV} \pm \text{mV}$. Simply multiply this sensitivity reading by 2 and set the pulser to that reading. Next, check the High Voltage (HV) by looking at the analog meter. The HV on our portable survey instruments may vary depending on the detector used with that particular instrument. LMI instruments used with Geiger-Mueller (GM) detectors should be operated at 900 volts. Also, the HV on instruments using scintillation detectors is determined by running a plateau.

To continue to calibrate the instrument, follow the ANSI 32-1978 guidelines, which states that the instrument should be calibrated to 80 % and 20 % of meter scale. Determine the 80 % scale of your instrument and set the pulser to the same reading. If your instrument does not read the same as the reading on the pulser, adjust the potentiometer so your instrument reads the same as the pulser. Below is an example of the necessary steps to calibrate an instrument.

We will use an LMI Model 3 Survey Meter with a 0-5k cpm meter face. 80 % scale = 4k, 20 % scale = 1k. The ranges on the Model 3 includes X100, X10, X1, and X0.1. To calibrate this instrument, set the pulser to 400k cpm and calibrate the X100 range to equal this amount. To check the 20 % scale, dial the pulser down to 100k cpm and make sure the instrument is within $\pm 10 \%$. If your instrument does not comply within these figures, consult your instrument manual for meter linearity. Continue to decrease both pulser and instrument down to the next decade range and follow the same procedures as above until you have calibrated each range.