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BERKELEY NUCLEONICS CORP.

Random Pulse Generator Model DB-2

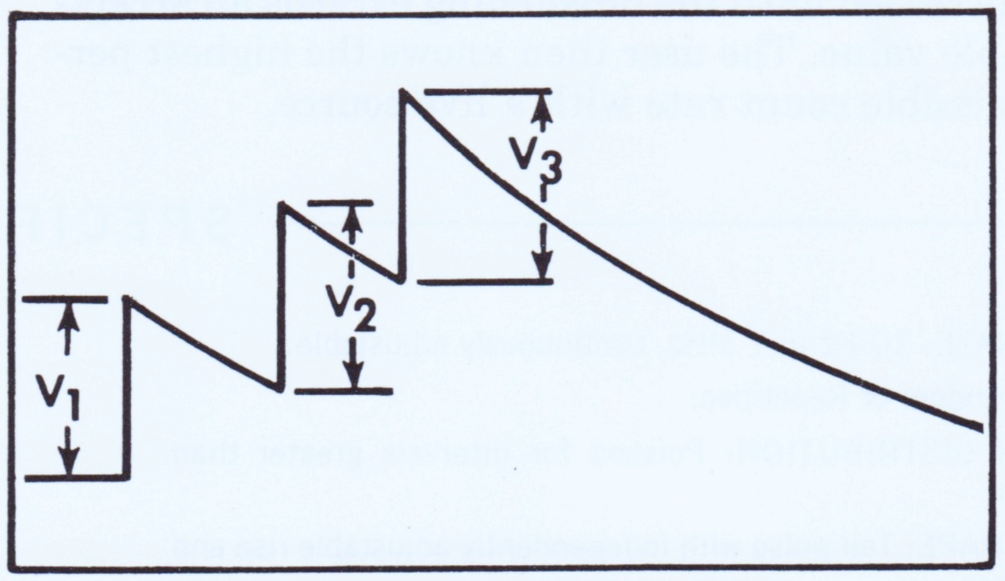
FEATURES

Random and Repetitive Modes

Count Rate 10 Hz to 1 MHz

Amplitude shift with count rate less than ±0.05%

Independently adjustable rise and fall times



Random Mode Showing Pileup.
$V_1 = V_2 = V_3$

The Model DB-2 is a pulse generator which accurately simulates the random and pileup characteristics of pulses from a radiation detector. It provides pulses which are monoenergetic over a broad range of average count rates.

Under high count rate conditions, the pulses will pileup as shown in the diagram above. This characteristic is useful in determining pile-up or count-rate effects and in measuring the resolution of high count rate spectroscopy systems.

Besides random pulses, the Model DB-2 also provides monoenergetic repetitive pulses. In this mode, the DB-2 is an excellent general purpose pulser. When the EXT REF input is used, the DB-2 provides sliding pulses to quickly check system or component linearity. Since the DB-2 is a random pulser, a general purpose pulser, and has sliding pulse capabilities, it is one of our most versatile models.

In both the random and repetitive modes, the rise and fall times and amplitudes are adjustable. The integral linearity of the DB-2 is ±0.1% and the pulse amplitudes are stable to better than 0.02%/°C. With the above combination of features, the DB-2 provides the necessary functions for testing stability, linearity, and resolution of both high and low count rate systems.

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APPLICATIONS: The Model DB-2 is ideally suited for high count rate or long tail time conditions. In other tail pulse generators, the pulse amplitude decreases when pulses start to ride up on the tail of the previous pulse. In the DB-2 the step amplitude is independent of pulse spacing.

There are two modes of operation: repetitive and random. In the repetitive mode the maximum output amplitude is 10 V. This range is useful for connecting directly to a linear amplifier to test stability and linearity. In the random mode, the maximum output amplitude is 1.0 V. This provides a large dynamic range, i.e., it allows for a larger number of pulses to pile up on the tails of each other without saturation.

A typical application of the random pulse mode is to connect the output of the Model DB-2 to a test capacitor input of a preamplifier in a pulse height analyzer system. The count rate is set low—about 1 kHz—and the pole-zero adjustment of the post-amplifier is made for minimum broadening of the line width on the analyzer. Then the count rate is increased until the broadening exceeds an acceptable value. The user then knows the highest permissible count rate with a live source.

Other applications of the Model DB-2 include testing the counting loss of scalers and ratemeters under random conditions and proper adjustment of base line restorers. With each output pulse occurs a Trigger Out pulse, which will enable the user to separately count output pulses. Also, when the frequency switch is set for External Frequency, the timing and the number of output pulses will be controlled by the timing and number of pulses present at the External Trigger connector.

Another useful application of the DB-2 is in the generation of sliding pulses. Sliding pulses result when the signal from a ramp generator, such as the BNC Model LG-1, is connected to the External Reference connector of the DB-2. (For sliding pulses the Reference toggle switch would be in the External position.) The resulting pulses, whose amplitudes linearly increase and decrease in time, can be connected to a multi-channel analyzer system to quickly and easily check the linearity of the system and its components. With the fast pulse repetition rates available, counts are quickly accumulated. For a linear MCA system, this results in an equal number of counts in all channels and hence a straight line in the counts versus channel number display.

SPECIFICATIONS

COUNT RATE: 10 Hz to 1 MHz, continuously adjustable.

MODE: Random or Repetitive.

RANDOM DISTRIBUTION: Poisson for intervals greater than 1.4 μs.

PULSE SHAPE: Tail pulse with independently adjustable rise and fall times.

PULSE AMPLITUDE (STEP) CHARACTERISTICS:
- a) Amplitude Shift with Count Rate: Less than ±0.05% from 10 Hz to 100 kHz.
- b) Jitter (resolution): 0.01% RMS.
- c) Temperature Coefficient: ±0.02%/°C.

FREQUENCY JITTER (Repetitive Mode): Less than 0.1%.

EXTERNAL TRIGGER: Requires 1 V positive pulse. Input impedance 1 k.

TRIGGER OUT: Positive 3 V pulse, 20 ns rise time, 100 ns width, 50 Ω output impedance.

RISE TIME OF OUTPUT (10-90%): 0.1 - 20 μs, in 8 steps.

DECAY TIME CONSTANT (100-37%): 5-1000 μs, in 8 steps. Rise and Decay time independent of each other for Decay Time/Rise Time >10.

OUTPUT AMPLITUDE RANGES: Repetitive only, ±10 V max.; Repetitive or Random, ±1.0 V max.; from 50 Ω source. Adjustable by ten-turn potentiometer from zero to maximum.

NORMALIZE: Ten-turn control varies amplitude by 60%.

OUTPUT IMPEDANCE: 50 Ω, AC coupled.

ATTENTUATION: 4 step attenuators of X2, X5, X10 and X10 for a maximum of X1000.

EXTERNAL REFERENCE INPUT: +10 V max.; 10k input impedance.

POWER REQUIREMENTS: ±24 V at 65 mA, +12 V at 140 mA, −12 V at 40 mA.

MECHANICAL: Double-width NIM module, 2.70" wide by 8.70" high in accordance with TID-20893 (Rev. 3).

WEIGHT: 3½ lbs. net; 7 lbs. shipping.

Prices and specifications subject to change without notice.

BERKELEY NUCLEONICS CORPORATION
1198 Tenth St., Berkeley, CA 94710 • Phone (415) 527-1121 • Telex 6771167

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