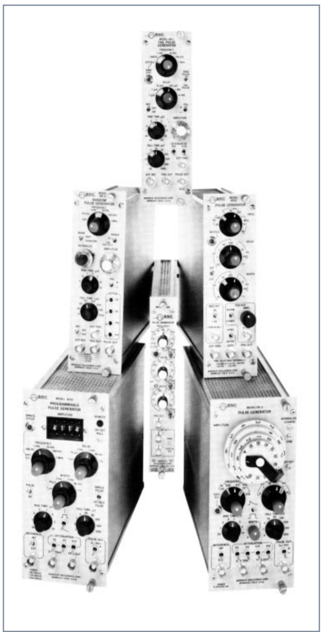
BNC NIM Modules for Many Applications



BNC Pulsers

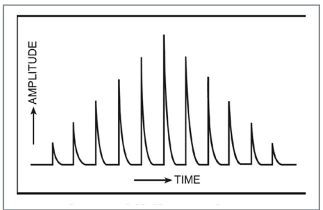


Fig. 1 Sliding Pulses

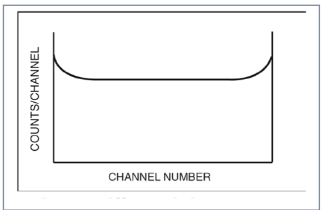
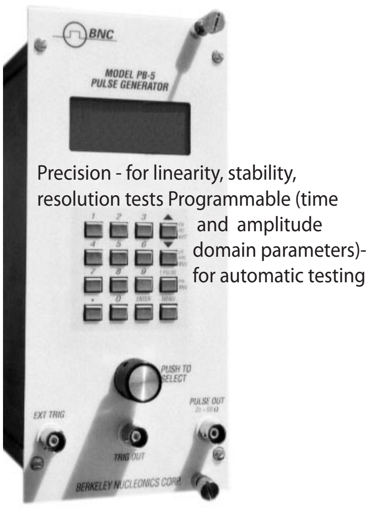


Fig. 2 Differential Reponse

PB-5



Precision - for linearity, stability, resolution tests Programmable (time and amplitude domain parameters)- for automatic testing

FAST ComTec represents in Germany, Austria and Switzerland products from Berkeley Nucleonics Corporation (BNC). There is a large product range available from General purpose Pulse Generators to Digital Delay Generators. Random-, Tail-, Ramp-, Delay-Generators and optical Modules as Benchtops or as NIM-Modules. Here is the list of Nuclear Pulse Generators.

- Check MCA linearity quickly and easily
- Calibrate at specific energies and test discrimnator and ADC levels
- Test pile-up, dead time, scaling, and coincidence
- Simulate detected events and detector risetimes from 3 ns to 50 µs
- Match decay time constants from 5 ns to 1 ms

An Easy, Accurate Way to Check Amplifier-Analyzer System Linearity

Users of pulse height analyzers (PHA) and multichannel analyzers (MCA) systems must check the linearity of their system. What is needed is a complete check of all channels. Sometimes discrete energy sources are used to check linearity. This technique relies on spot checks at different energies and then interpolation and curve fitting. This method is incomplete in that it does not check all channels. On the other hand, linearity tests using a sliding pulser check all channels rapidly and accurately making the sliding pulser method superior to all other available methods.

The Importance of a Complete Check

Linearity has been measured with radioisotopes. One gets a few data points and then, assuming no discontinuities, uses some curve fitting techniques to derive a linearity curve. Often this method involves careful determination of centroids and then meticulous curve fitting. This process may be accomplished automatically by computer, but it still uses a relatively small number of fixed data points and supposes no discontinuities. One is not certain of the areas between data points, areas in which important data may be processes and stored. Thus, errors caused by malfunctioning in some portion of the analog or digital circuitry may go undiscovered. On the other hand, the sliding pulse method is a more through test and allows examination of the entire system.

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BH-1

Fast Tail Pulser for simulating tail pulses as narrow as 5ns FWHM

DB-2

Random - to test pile-up, dead- time, count-rate effects

The Necessity to Check Systems

PHA and MCA systems are complex electronic systems that process, store and finely resolve information from widely varying pulse waveforms. Such complex high resolution electronics systems drift and change as a result of temperature changes, line voltage fluctuations and transients, component aging and failure, and radiation. Consequently, there is a need for easily and regularly checking and calibrating such a system completely. The sliding pulse method gives the user a way to check and calibrate his system regularly and completely.

Sliding Pulsers

Asliding pulser generates pulses whose amplitudes linearly increase and decrease in time. (See figure 1.) The pulse amplitudes change at a constant rate and cover the range of amplitudes to test a system. In testing, the sliding pulser's output is connected to an amplifier-analyzer system input. If the system is linear, an equal number of counts accumulate in all of the channels, and the count versus channel number displays is a straight line.

Testing Ease

The sliding pulse method will enable one to spot gross errors within half a minute.
To make linearity measurements, connect the sliding pulser to the input of the analyzer, press the start button about two minutes later, observe the result.
Any problem areas will be immediately apparent.

A Method for Data Correction

The sliding pulse method measures directly the differential response of an amplifier-analyzer system and can be used to obtain a response curve (see Figure 2.). One can then use the response curve to correct data for the nonlinearities in the system.

Measure and Calibrate Differential Nonlinearity.

The sliding pulse method may be used for directly measuring differential nonlinearity. Differential nonlinearity (DNL) can be calculated by: $DNL=100(1-N_x/N_{avg})\%$ where N_{avg} is the average number of counts in all channels and N_x is the number of counts in channel X.
For statistical reasons it is important to acquire a large number of counts. Modern sliding pulsers operating at high count.
An older pulser operating at 60Hz requires 36,000 hours to get a 0.1% linearity with 8K channels.

Short Test Times

For linearity tests of any accuracy you must use a high rate pulse generator. Sliding pulsers can operate at repetition rates up to 50MHz. Older designs used electromechanical mercury relays with repetition rates of 60Hz or 100Hz. With the higher repetition rates of modern pulsers, test times are signicantly shortened and problems of drift while testing can be avoided.

The Versatility of Sliding Pulsers

You can tailor the pulses to closely duplicate the live conditions under which your system will operate. Rise times, fall times, and amplitude can be adjusted over a wide range.
You can operate with a tail pulse or a at top pulse.
Dierent rates of change of pulse amplitudes can be selected. You can select a pulse repetition rate or even a random pulse distribution.
Your ability to tailor a pulse to virtually any shape gives you the opportunity of inserting the proper waveform at the preamp, linearamplier, or PHA to test any number of parameters and to isolate problem areas.

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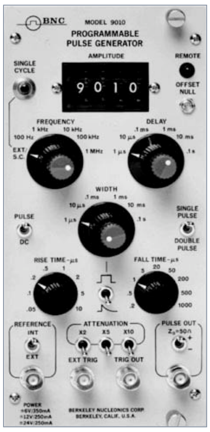
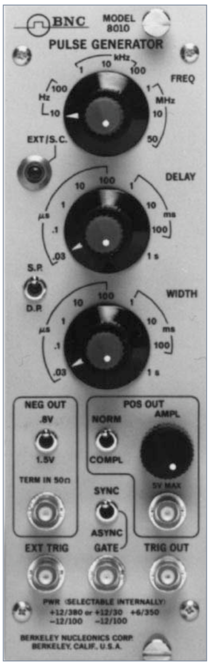
9010
Pulse Generator

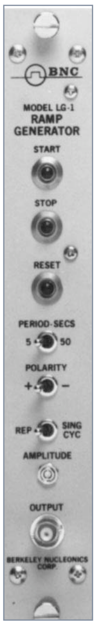


8010
Pulse Generator



8020
Pulse Generator

LG-1



Numerous Other Uses

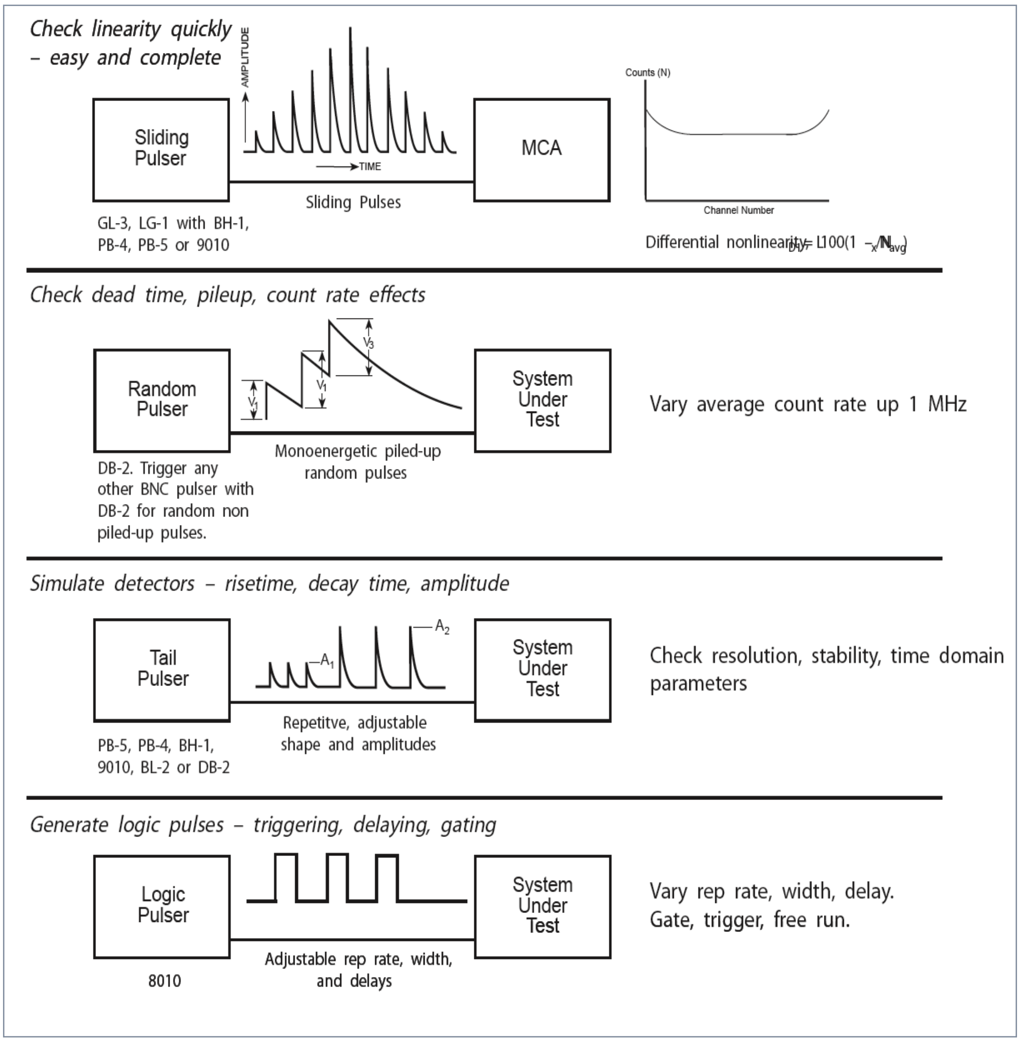
With their higher repetition rates and numerous controls, sliding pulsers are used in a number of other performance tests. Sliding pulsers can be used to test system components. The modern sliding pulser is comprised of a ramp generator and a pulser (precision pulser, random pulser, tail pulser, etc…). The pulsers, when used without the ramp generator, are an excellent test tool by themselves. The pulsers could be used to help one determine counting losses, count rate eects, risetime eects, overload eects, temperature eects, and channel proles.

BNC Sliding pulsers

BNC manufactures both self-contained sliding pulsers and NIM modules with which you can form your own sliding pulser.
Our GL-3 rack-mounted, self-contained sliding pulser is both a sliding pulser and precision pulser.

As for NIM modules that can be interconnected to form a sliding pulser, we have the LG-1 ramp generator the BH-1 Tail Pulser, the PB-4 Precision Pulser, the PB-5 Programmable Precision Pulser, the 9010 Programmable Pulser, the DB-2 Random Pulser and the BL-2 Fast Tail Pulser.

BNC provides a NIM pulser for every application.



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