

Model 2128N

Constant Fraction Discriminator

FEATURES

- 100 Mhz Count Rate
- 1000 : 1 Dynamic range
- Three Operating Modes: CFT, CFRR constant fraction discriminator with slow risetime reject, and LET leading edge trigger
- Walk < 30 ps typically for 100 : 1 Range
- Simultaneous Dual Positive and Negative Outputs
- Multicolor Count Rate Indicator
- DC coupling

DESCRIPTION

The Model 2128N replaces the Model 2128. It is a fully dc-coupled constant fraction discriminator with a dynamic range of up to 1000:1. Selectable fraction and three operating modes provide optimum time resolution for many detector types and applications. For example:

CFT – Constant fraction mode for fast detectors

CFRR – Slow rise time reject mode for Ge detectors

LET – Leading edge mode for single photon counting

The unit accepts negative polarity pulses to the 50Ω terminated dc-coupled inputs. On customer request the module can be modified to accept positive input signals. The constant fraction composite signal is formed by the sum of a direct, attenuated (fraction $f=0.4$ standard) signal path and a delayed, unattenuated path. The delay time is selectable according to the propagation delay of a (external) 50Ω BNC cable. Careful selection of fraction and delay cable provides full compensation of timing distortions due to both amplitude and risetime variations in the input signal. Output signals are generated whenever the input signal exceeds the selected threshold set by a front panel potentiometer.

Four simultaneous, independent output signals are provided. The two positive outputs are adjustable in width, the width then determines the internal deadtime required to suppress spurious outputs due to input signal anomalies. The two negative outputs are fixed-width pulses keyed to the start of the dead time period.

The front panel ADJUST control and INSPECT output permit the user to trim the walk characteristics of the experimental setup for optimum timing resolution. A frontpanel LED indicates count rate by color change.



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SPECIFICATIONS

Inputs

Input: - accepts -5 mV to about -3.0 V linear pulses: width ≥ 1 ns, $Z_{in} = 50$ Ohms, dc coupled; front panel BNC connector.

Delay: two front panel BNC connectors accept 50 Ohm delay cable in order to form the internal constant fraction signal.

Outputs

Inspect displays signal of zero crossing discriminator for use in trimming time walk.

Neg output two independent negative current outputs, each providing -32 mA into 50 Ω , risetime < 3 ns, pulsewidth 5 ns nominal, dc coupled.

Pos output two independent positive voltage outputs, providing 2 V (minimum) into 50 Ω , risetime < 10 ns, width adjustable by front panel width trimming potentiometer, which also determines the internal dead time.

Controls

Threshold Front panel 10-turn locking dial potentiometer to set acceptance threshold for input pulses (range ≈ -5 mV to -1 V).

Adjust front panel trimming potentiometer (screwdriver) to compensate walk of the internal zero crossing discriminator

Leading edge width of the leading edge signal is internally set by the trimming potentiometer on the printed board to 20 ns.

CFRR-CFT-LET Frontpanel three-position switch to select constant fraction with slow rise time reject (CFRR), basic constant fraction (CFT), or leading edge timing (LET) modes of operation.

OUTPUT WIDTH Front panel 22-turn screwdriver adjustable potentiometer to set width of slow positive output pulse, which is equal to the internal dead time of the discriminator – max setting: 1.5 micro sec.

PERFORMANCE

Dynamic range 1000 : 1

CF mode Walk $\leq \pm 50$ ps (typically ± 30 ps) for -30mV to -3V range with <2ns rise time.

Count rate up to 100 MHz, limited by dead time (OUTPUT WIDTH setting)

Pulse pair resolution <10 ns, or as limited by dead time.

Threshold stability better than $\pm 0.02\%$ / $^{\circ}\text{C}$ (± 200 ppm / $^{\circ}\text{C}$)

Threshold linearity $\pm 0.25\%$ integral

Temperature range 0 $^{\circ}\text{C}$ to + 50 $^{\circ}\text{C}$

Delay cable typical lengths (RG-58)

for Plastic, NaI and Si (S.B.) detectors 0.5m to 1m,

for Planar Germanium detectors 1m to 2m

for Coaxial Ge 2.0 to 4m

Typical Power requirements

Standard version

+6.0V 150mA

-6.0V 450 mA

Physical

Size single width 1/12 NIM module

(3.43 x 22.13 cm; 1.35 x 8.71 inches) as per TID – 20893 (rev.)

Net weight 0.7 kg (2.0 lbs)

Options

- can be modified to accept positive pulses
- 12V Version available on request
- on request 220 V (ac) / 110V (ac) independent from a NIM bin
- Output width for negative output can be modified
- threshold setting supplied externally via rear panel connector
- signal shaping using small fractions and RC shaping by modifying f and capacitors.

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