

Features

- Four CF discriminators in a single-width NIM
- 200 MHz count rate capability
- 1000:1 dynamic range
- Typical walk $<\pm 30$ ps for 100:1 dynamic range
- Selectable fraction or leading edge operation
- Output indicator LED
- Gated operation

Description

The Canberra Model 454 combines four 200 MHz Constant Fraction Discriminators in a single-width NIM module. The proven constant fraction technique generates precision timing signals from fast negative input signals up to a 1000:1 dynamic amplitude range. Each discriminator exhibits typical walk of less than +30 ps for a 100:1 input amplitude range.

Each of the four independent discriminators has selectable fraction modules which can be exchanged for optimum performance with a particular PM tube or solid state detector. The 20% fraction module is supplied for each discriminator section. Other fractions are available as inexpensive options. The discriminators can be converted to a conventional leading-edge discriminator by use of the appropriate module available from the factory. The delay required to internally generate the constant fraction timing signal is provided externally by the proper length of cable across the delay connectors.

Each discriminator has a separate threshold adjustment and monitor (T), and walk adjustment and monitor (Z). Another output (Z/C MON) is available to allow monitoring of the internally produced zero-cross signal which coincides with the constant fraction timing mark.

Three independent fast negative outputs are provided for each discriminator. A width adjustment allows the output to vary from less than 5 ns to greater than 500 ns in two ranges. This allows compatibility with certain devices such as counters being driven by the 454 and prevents false triggering from trailing edge noise which can be encountered with certain detectors. A visual indication of discriminator activity is provided by an output LED.

Rear panel inputs allow each of the discriminators to be independently gated from an external source. Also a master BIN gate signal available on special NIM bins may be used to control the 454. Internal switches allow any combination of the discriminator sections to be controlled by the BIN gate.

The 454 is compatible with the NIM-standard type V-H bin and power supplies that include ± 12 V and ± 6 V.

Specifications

INPUTS

INPUT – Front panel LEMO connector accepts negative signals in the range of -5 mV to -2.5 V or from -10 mV to -5.0 V depending on the position of an internal jumper. $Z_{in} = 50 \Omega$; dc coupled, protected to ± 100 V.

DELAY – Two front panel LEMO connectors between which a delay cable (50Ω impedance) is connected to form the internal constant fraction signal. Recommended lengths are based



on the propagation delay of coaxial cable and the rise time of the discriminator input signal.

GATE INPUT – Four rear panel BNC connectors labeled A-D corresponding to the four discriminators provide individual gate control for the respective discriminator. A logic “0” NIM level will disable operation and a logic “1” NIM level or no connection will enable operation.

OUTPUTS

Z/C MON – Front panel LEMO connector provides a constant fraction zero crossing monitor. The width of the pulse depends on the input signal level, delay cable and walk adjust setting. Characteristics when terminated by 50Ω : 100 mV positive pulse; dc offset = -200 mV.

OUT – Three independent front panel LEMO connectors provide fast negative discriminator output signals at the time of constant fraction zero crossing; 16 mA into 50Ω , width as set by W control; $Z_{out} = 50 \Omega$.

CONTROLS

T – Front panel screwdriver-adjustable potentiometer determines the lower level threshold setting. The adjustment range is -5 mV to -1.0 V in the 0 to -2.5 V range or -10 mV to -2.0 V when operating in the 0 to -5.0 V range.

Z – Front panel screwdriver adjustment for precise setting of walk compensation.

W – Front panel screwdriver adjustment for setting the width of the output signal. The range of the width adjustment is either

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M4168 3/03 Printed in U.S.A.

<5 ns to >100 ns or <10 ns to >500 ns depending on the position of an internal jumper.

GATED/UNGATED – Rear panel switch enables or disables gated operation. In the GATED position individual discriminator sections may be controlled by the respective rear panel BNC gate input.

INDICATORS

OUT – Front panel LED indicates when a pulse has exceeded the lower level threshold and meets criteria required to produce discriminator outputs for each channel.

PERFORMANCE

DYNAMIC RANGE – 1000:1.

INPUT PULSE CHARACTERISTICS – Negative inputs jumper selectable for either –5 mV to –2.5 V or –10 mV to –5.0 V. Input is protected to ± 100 V.

MINIMUM INPUT – Typically <700 ps pulse width.

PULSE PAIR RESOLVING TIME – <5 ns for input signals with rise time <2 ns, output width at minimum setting.

WALK – Measured with a 1 ns rise time input pulse:

CF MODE – $\leq \pm 100$ ps (typically $\leq \pm 30$ ps) for a 100:1 dynamic range.

LE MODE – $\leq \pm 400$ ps typical for a 10:1 dynamic range, (X2 to X20 of threshold); $\leq \pm 500$ ps typical for 100:1 dynamic range, (X2 to X200 of threshold).

COUNTING RATE – ≥ 200 MHz (typically 240 MHz), limited by output width setting.

PROPAGATION DELAY – Nominally 10 ns with a 30.5 cm (1 ft) length of RG-58/U (4.92 ns/m) external delay cable.

PROPAGATION DELAY INSTABILITY – ≤ 10 ps/ $^{\circ}$ C, 0 to 50 $^{\circ}$ C.

LOWER LEVEL THRESHOLD INSTABILITY – $\leq 0.02\%/^{\circ}$ C of full scale, 0 to 50 $^{\circ}$ C.

POWER REQUIREMENTS

+12 V – 35 mA +6 V – 205 mA

–12 V – 160 mA –6 V – 1.7 A*

*This current drain exceeds the normal –6 V Bin allotment of 833 mA for a single-width module.

PHYSICAL

SIZE – Standard single-width NIM module 3.43 x 22.13 cm (1.35 x 8.71 in.) per DOE/ER-0457T.

NET WEIGHT – 1.36 kg (3.0 lb).

SHIPPING WEIGHT – 2.27 kg (5.0 lb).

ENVIRONMENTAL

OPERATING TEMPERATURE – 0 to 50 $^{\circ}$ C.

OPERATING HUMIDITY – 0-80% relative, non-condensing. Tested to the environmental conditions specified by EN 61010, Installation Category I, Pollution Degree 2.

ACCESSORY

One 20% fraction module per channel included.

OPTIONS

10%, 30%, 40% and 50% fraction modules or leading edge module. Other fraction modules available on special order. Modifications to operate with fast microchannel plate electron multipliers are available.

