The ORTEC Model 584 Constant-Fraction Discriminator allows good time resolution to be obtained from all commonly used detectors such as HPGe, silicon charged-particle, fast plastic, NaI(Tl), and photomultiplier tubes. Three timing modes are provided in the Model 584: constant-fraction, constant-fraction with slow-rise-time reject, and leading-edge. This economical unit has a minimum threshold of –5 mV, allowing good timing measurements to very low energies. The maximum input signal acceptable without saturation is –5 V, which provides a 1000:1 input dynamic range. The Model 584 is useful in high-count-rate applications to 50 MHz with ≤20 ns pulse-pair resolving time. The time walk of the Model 584 is ≤±100 ps for a 100:1 input dynamic range.

A variety of controls is provided, allowing optimization of the Model 584 in various applications. A precision 10-turn potentiometer sets the threshold from –5 mV to –1 V. The blocking time set by the Blocking Output Width is continuously adjustable from ≤10 to ≥1000 ns. This feature is useful for preventing multiple triggering on pulses from scintillators having long decay time, e.g., NaI(Tl). A front-panel LED indicates that the discriminator has been triggered and can therefore be used to set the threshold just above the noise. Walk is adjusted by a front-panel 20-turn potentiometer. The Constant-Fraction Monitor on the front panel can be used to optimize walk adjustment. Since the constant-fraction shaping delay is selected by external cable, the optimum delay for a specific detector application is easily selected.

Four NIM-standard output signals are available from the Model 584. The positive output signal is continuously variable from ≤0.5 to ≥2.5 μs by means of a printed wiring board (PWB) potentiometer. The polarity of the positive output is PWB selectable to be either a NIM-standard positive output signal or the complement signal. The two timing output signals are NIM-standard fast negative logic signals, each having a 2-ns rise time and a 5-ns width FWHM. The blocking output signal is a NIM-standard fast negative logic signal whose width is adjustable from ≤10 to ≥1000 ns.

The Model 584 can be gated externally. A rear-panel locking toggle switch selects either Gated or Ungated operation. In the Gated Mode, a printed wiring board jumper selects the Bin Gate line in the NIM bin, a NIM-standard positive signal via the rear-panel BNC connector, or a NIM-standard negative signal via the rear-panel BNC connector.

Logic current for the Model 584 is selected from either the –6 V or –12 V NIM supply by means of a rear-panel locking toggle switch. The Model 584 is within the allotment of current for a single-width NIM module for a NIM Class V power supply when the logic current is obtained from –6 V.

### Specifications

**PERFORMANCE**

**INPUT** Accepts negative input signals from 0 V to –5 V without saturation; dc-coupled; $Z_i = 50 \, \Omega$; reflections ≤±5% for $t_i ≤ 2$ ns.

**THRESHOLD RANGE** –5 mV to –1 V.

**THRESHOLD INTEGRAL NONLINEARITY** ≤±0.25% of full scale.

**THRESHOLD INSTABILITY** ≤±100 μV/°C, 0 to 50°C.

**PROPAGATION DELAY** Nominally 25 ns, with external CF Delay <2 ns.

**MINIMUM PULSE-PAIR RESOLUTION** ≤20 ns.

**DEAD TIME** Nominally 20 ns or Blocking Output Width, whichever is greater.

**BLOCKING OUTPUT WIDTH** Adjustable from ≤10 to ≥1000 ns.

**TIME WALK** ≤±100 ps for the 100:1 input range from –20 mV to –2 V. Conditions: External CF Delay = 2 ns; input rise time ≤1 ns; input pulse width = 10 ns.

**CONTROLS**

**THRESHOLD** Front-panel 10-turn precision locking potentiometer determines the discriminator threshold setting in the range from –5 mV to –1 V.

**TIMING MODE SWITCH** Front-panel 3-position locking toggle switch selects one of the three timing modes: CF (Constant-Fraction) Attenuation factor is internally set at f = 0.2 (can be changed upon request). An external 50-ohm coaxial cable must be provided for the constant-fraction shaping delay (CF Delay).

**SRT (Slow-Rise-Time) Reject** Provides constant-fraction timing and inhibits output signals that would be produced by leading-edge timing from the leading-edge arming discriminator. An input signal that does not cross the discriminator threshold before the constant-fraction zero-crossing time does not produce an output pulse.

**LE (Leading-Edge)** Inhibits timing from the constant-fraction circuitry. The timing is derived as the leading edge of the input signal crosses the discriminator threshold level.

---

*Good time resolution over a wide range of pulse amplitudes with scintillation and semiconductor detectors

*50-MHz count-rate capability

*5 mV minimum threshold

*Time walk ≤100 ps for 100:1 dynamic range

*Constant-fraction, leading-edge, and slow-rise-time reject modes*
Constant-Fraction Discriminator

GATE INPUT JUMPER (G+, G–, or BG) PWB jumper selects one of three Gate Input signal paths:
- G+ selects the rear-panel BNC Gate Input connector to accept slow positive NIM input signal levels for gating; dc-coupled; Zin > 1 kΩ.
- G– selects the rear-panel BNC Gate Input connector to accept fast negative NIM input signal levels for gating; dc-coupled; Zin > 1 kΩ.
- BG selects the Bin Gate line (pin 36 of the NIM power connector block) to accept slow positive NIM input signal levels greater than nominally 20 ns.

INPUT
Front-panel BNC connector accepts fast negative input signals from 0 V to –6 V without saturation; dc-coupled; Zin = 50 Ω; reflections ±5% for tR = 2 ns.

GATE INPUT REAR-POSITION BNC connector; input signals accepted according to PWB Gate Input Jumper.

G+ Jumper Position Accepts slow positive NIM input signal levels for gating; dc-coupled; Zin > 1 kΩ.

G– Jumper Position Accepts fast negative NIM input signal levels for gating; dc-coupled; Zin = 50 Ω.

OUTPUTS

TIMING
Two front-panel BNC connectors provide simultaneous NIM-standard fast negative logic signals; tR = 2 ns; tF = 3 ns; tr = 5 ns.

BK OUT
Front-panel BNC connector provides a NIM-standard fast negative logic pulse that occurs simultaneously with the Timing Outputs; width variable by front-panel adjustment from 10 to 1000 ns; tR = 2 ns.

POSITIVE
Front-panel BNC connector provides NIM-standard slow positive logic pulse simultaneously with Timing Outputs; Zin < 10 Ω; width variable by PWB width adjustment from 0.5 to 2.5 µs. The associated LED is triggered for approximately 3 ms (updating) by each positive output pulse.

Specifications subject to change
12/10/17

ELECTRICAL AND MECHANICAL

WEIGHT
Net 1.2 kg (2.6 lb).
Shipping 2.25 kg (5.0 lb)

DIMENSIONS NIM-standard single-width module 3.43 X 22.13 cm (1.35 X 8.714 in.) per DOE/ER-0457T.

POWER REQUIRED

LOGIC CURRENT SWITCH

<table>
<thead>
<tr>
<th>Position</th>
<th>–6 V (mA)</th>
<th>–6 V (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+12 V</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>–12 V</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>+6 V</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>–6 V</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+24 V</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>–24 V</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>117 V ac</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*See “NOTES” on Logic Current Switch, “Controls” Section of Specifications.

Ordering Information

To order, specify:

Model Description

584 Constant-Fraction Discriminator