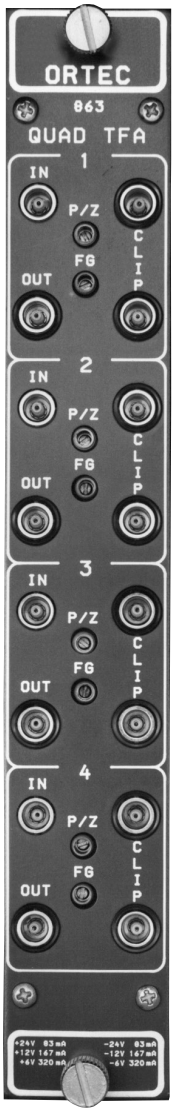
ORTEC®

AMETEK®

863
Quad Timing Filter Amplifier

- **Optimum pulse shaping and amplification for timing with germanium and other solid-state detectors**
- **Four amplifiers in a single-width NIM for experiments with a large number of detectors**
- **Selectable integration and differentiation filters**
- **Selectable cable clipping of the input signal**
- **Rise time <10 ns for outputs from 0 to ±5 V on a 50-Ω load**
- **Front-panel pole-zero adjustment**



The ORTEC Model 863 Quad Timing Filter Amplifier incorporates four separate timing filter amplifiers in a single-width NIM module. This design provides a compact and cost-effective solution for experiments where timing is required on a number of detectors. The unit can also be used for timing with other solid-state detectors, or operate as a general-purpose wideband amplifier with selectable bandwidth.

The signals from germanium or silicon detectors at the preamplifier output are not always optimum for achieving good timing resolution. Before presentation to a timing discriminator, the signals normally require amplification with a wideband amplifier, and they may need additional pulse shaping to minimize the noise contribution to the time resolution. The Model 863 provides a flexible approach in serving these two functions in order to handle a wide variety of solid-state detector types.

The Gain can be selected as either inverting or noninverting and is adjustable over the nominal range from 2 to 250. The Fine Gain is adjustable from 2 to 50 using a front-panel screwdriver potentiometer, while a printed wiring board (PWB) jumper selects a Coarse Gain of either 1 or 5. The output will drive a 50-Ω load to ±5 V with good linearity. This ensures that the full –50 mV to –5 V dynamic range of a constant-fraction timing discriminator can be used. Excellent DC stability of the output is maintained by a continuous baseline restorer.

Several means of bandpass limiting are included to achieve the pulse shaping that yields the optimum time resolution. With all jumpers in the Out position, the Model 863 is a wideband amplifier with an output rise time <10 ns. To reduce low frequency noise and shorten the output pulse width, the CR differentiation time constant can be decreased from 0.1 ms (Out position) to 200 ns using a PWB jumper. Alternatively, two front-panel connectors can be employed (using a 50-Ω coaxial cable) to add delay line clipping. This results in a more abrupt termination of the output pulse duration while reducing low frequency noise. Both the CR differentiation and the cable clip can be used together to yield a bipolar output signal for fast, zero-crossing timing.

In some cases it is beneficial to select a 50-ns RC integration time constant using the PWB jumper provided for that purpose. This reduces the high frequency noise while slowing the output rise time to 110 ns.

In addition to the two standard jumper selections incorporated into each of the Differentiation and Integration controls, a third position is provided for both jumpers. By adding the appropriate components to each third position, it is possible for the user to select a customized set of integration and differentiation time constants.

In order to ensure that the output pulse returns to baseline as quickly as possible, the differentiation circuit includes a front-panel pole-zero trimmer. This control permits compensation for the preamplifier decay time constant.

Each section of the Model 863 has five sets of PWB jumpers to control the various functions of the unit. These jumpers are accessible by removing the left side panel of the module.

Specifications

PERFORMANCE

INPUT SIGNAL AMPLITUDE RANGE 0 to ±1.0 V AC signal; 0 to ±2 V DC offset; maximum input ±2 V signal plus offset.

OUTPUT AMPLITUDE RANGE 0 to ±5 V linear into a 50-Ω load. Output DC-coupled with DC offset <±10 mV.

RISE TIME <10 ns with Integration and Differentiation time constants set to Out, or ≈2.2τ for other Integration settings and Differentiation Out.

CROSS TALK <0.01% from any output to any input measured at maximum gain with Integration and Differentiation time constants set to Out.

NOISE For maximum gain, rms noise referred to the input <50 µV with Integration and Differentiation set to Out; measured using a Hewlett-Packard 3400A true rms meter.

INTEGRAL NONLINEARITY <±0.5% over ±5 V into a 50-Ω load.

TEMPERATURE SENSITIVITY DC level <±10 µV/°C referred to the output. Gain sensitivity <±0.05%/°C.

OPERATING TEMPERATURE RANGE 0°C to 50°C.

CONTROLS

Each section of the Model 863 Quad Timing Filter Amplifier has separate controls for Coarse Gain, Fine Gain, P/Z, Differentiation, and Integration time constant.

COARSE GAIN PWB jumper selectable for nominally X1 or X5. The Model 863 is shipped with this jumper in the X5 position. Gain is reduced by a factor of 2 when using the cable clip.

FINE GAIN Front-panel screwdriver potentiometer continuously adjustable from nominally X2 to X50.

P/Z Front-panel screwdriver-adjustable potentiometer to adjust pole-zero cancellation for decay time constants from 25 µs to ∞.

DIFFERENTIATION Time constant PWB jumper selectable as either Out (equivalent to 0.1 ms) or 200 ns. A third position is available for custom modification. The Model 863 is shipped with this jumper in the Out position.

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INTEGRATION Time constant PWB jumper selectable as either Out or 50 ns. A third position is available for custom modification. In the Out position, the 10% to 90% rise time is <10 ns. The Model 863 is shipped with this jumper in the Out position.

INVERT/NONINVERT PWB jumper selectable to Invert or Noninvert the Output signal relative to the Input signal. The Model 863 is shipped with this jumper in the Noninvert position.

INPUT

INPUT Positive or negative polarity selectable with a PWB jumper; amplitude 0 to ±1 V AC signal; 0 to ±2 V DC offset; maximum input ±2 V signal plus offset. Input impedance is 100 Ω, protected to ±6 V. Front-panel LEMO connector.

CLIP Two front-panel LEMO connectors to provide delay line clipping of the input pulse using an external 50-Ω coaxial cable. Delay line clip is two times the cable propagation delay. Gain is reduced by a factor of two when using the cable clip.

OUTPUT

OUTPUT Front-panel LEMO connector furnishes the shaped and amplified signal through Z_o <1 Ω; amplitude to ±5 V, rise time and decay time controlled by the Integration and Differentiation time constant settings. Output is DC-coupled and controlled by a continuous baseline restorer.

ELECTRICAL AND MECHANICAL

POWER The Model 863 unit does not have an internal power supply and must obtain power from a NIM-standard power supply such as the ORTEC Model 4001A/ 4002D NIM Bin/Power Supply.

POWER REQUIREMENTS +24 V, 83 mA; –24 V, 83 mA; +12 V, 167 mA; –12 V, 167 mA; +6 V, 320 mA; –6 V, 320 mA.

WEIGHT
Net 1.5 kg (3.3 lb).
Shipping 3.1 kg (7.0 lb).

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

Ordering Information

Model	Description
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Specifications subject to change
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