

Model 609E-6-FG

High-Voltage Function Generator



The Trek Model 609E-6-FG High-Voltage Function Generator is a combination of a high-voltage DC-stable power amplifier and a function generator. The high power amplifier is designed to provide precise control of bi-polar output voltages in the range of 0 to ± 4 kV DC or peak AC with an output current capability of ± 20 mA DC or peak AC. The function generator is capable of generating square, triangle, and sine waveforms in the frequency range of 0.2 Hz to 10 kHz.

Applications for the Model 609E-6-FG include AC and DC biasing of electrophotographic charger rollers, electrorheological fluid research, dielectric material characterization, and utilization as a general purpose high-voltage function generator. In the amplifier mode, the 609E-6-FG can be configured as a noninverting, inverting, or differential amplifier with a fixed gain of 1000 V/V. Features include an all-solid-state design for a slew rate greater than 150 V/ μ s, a large signal bandwidth of DC to greater than 6 kHz, and low noise operation. The four-quadrant active output stage sinks or sources current into reactive or resistive loads throughout the output voltage

range which is essential for achieving the accurate output responses and high slew rates demanded by reactive loads.

The 609E-6-FG features a switch selectable mode for current trip or current limit that is adjustable from 1 to 20 mA using the Current Trip/Limit Adjust potentiometer on the front panel. When the Model 609E-6-FG enters a current trip condition, the high-voltage output is disabled, the Trip Status indicator will illuminate and the Trip Monitor output will provide a TTL low. The Model 609E-6-FG is protected against over-voltage and over-current conditions that may be generated by active loads or by output short circuits to ground. Precision voltage and current monitors provide low-voltage output signals for monitoring purposes or for use as feedback signals in closed-loop control systems. This makes the 609E-6-FG suitable for automated or computer controlled systems. A Digital Enable feature provides a connection for a remote device to turn the high voltage on and off. The Model 609E-6-FG can be operated on a bench top or, with optional hardware, in a standard 19-inch rack.

Square, Triangle, and Sine Waveforms in the ranges of 0.2 Hz to 10 kHz

Dynamics Adjust optimizes output voltage waveform

Output Voltage range 0 to ± 4 kV

Output Current range 0 to ± 20 mA

Slew Rate greater than 150 V/ μ s

DC Voltage Gain accuracy 0.1% of full scale

Inverting, Noninverting or Differential Amplifier Input configurations

Adjustable Current Limit or Current Trip

Voltage Monitor and Current Monitor

CONTROL WITHOUT COMPROMISE



Model 609E-6-FG Primary Specifications

All specifications are with no load unless otherwise noted.

Amplifier Mode

Output Voltage Range

0 to ± 4 kV DC or peak AC.

Output Current Range

0 to ± 20 mA DC or peak AC.

(See Automatic Power Limit feature.)

DC Voltage Gain

Noninverting Configuration (A)

1000 V/V.

Inverting Configuration (B)

-1000 V/V

Differential Configuration

Function of the difference between two input signals. Represented by the equation: $V(\text{out}) = 1000[V(A) - V(B)]$ where A and B are the differential inputs.

DC Voltage Gain Accuracy

Better than 0.1% of full scale.

Slew Rate (10% to 90%, typical)

Greater than 150 V/ μ s.

Large Signal Bandwidth (1% distortion)

DC to greater than 6 kHz.

Small Signal Bandwidth (-3dB)

DC to greater than 35 kHz.

Settling Time (to 1%)

Less than 150 μ s for a 0 to 4 kV step.

Offset Voltage

Less than ± 1 V.

Output Noise

Less than 80 mV rms (measured using the true rms feature of the Hewlett Packard Model 34401A digital multimeter). Detailed information concerning the output noise is available upon request.

Input Voltage Range

0 to ± 4 V DC or peak AC.

Input Impedance

25 k Ω , nominal (noninverting).

50 k Ω , nominal (inverting).

50 k Ω , nominal (differential).

Generator Mode

Function Generator

Able to select among Sine, Square, or Triangle output waveforms.

Output Voltage Range

0 to ± 4 kV DC or peak AC.

Output Current Range

0 to ± 20 mA DC or peak AC.

(Automatic Power Limit feature will limit current to prevent the 609E-6-FG from overheating. Contact TREK, INC. for detailed information.)

Generator Mode (cont.)

Frequency Range

0.2 Hz to 10 kHz.

Frequency Accuracy

$\pm 5\%$ of full scale.

Square Wave Symmetry

Better than 3% at 100 Hz.

Square Wave Rise and Fall Rate

Greater than ± 150 V/ μ s.

Range Select

Push button selects designated frequency spectrum among: 0.2 Hz to 2.0 Hz, 2 Hz to 20 Hz, 20 Hz to 200 Hz, 0.2 kHz to 2.0 kHz, and 2 kHz to 20 kHz. (A 100 kHz range is provided to produce output frequencies up to 35 kHz at reduced amplitude due to slew rate and bandwidth limitations of the amplifier.)

Frequency Dial

Adjusts the frequency within the selected range.

Duty Cycle

This dial determines the time interval and symmetry of the output waveform.

DC Offset

This dial controls the amount of DC bias voltage added to the output voltage waveform.

Attenuator Switch

Switch selectable to 0 dB or -20 dB (attenuation) of the output waveform.

Invert

Inverts the output waveform. The DUTY control determines which portion of the waveform is affected.

Features

Amplifier Input

Three pin input connector that can be configured for inverting, noninverting, or differential amplification.

Digital Enable

An input providing a connection for a TTL compatible signal to turn on and off the high-voltage output.

Response Adjust

A graduated one-turn potentiometer used to optimize the AC response of the Model 609E-6-FG under various load configurations.

Out Of Regulation Indicator

An indicator will illuminate when the Model 609E-6-FG fails to produce the required high-voltage output such as during a current limit.

Features (cont.)

Voltage Monitor

A buffered output providing a low-voltage replica of the high voltage output.

Scale

1/1000th of the high-voltage output.

DC Accuracy

Better than 0.1% of full scale.

Output Impedance

0.1 Ω .

Current Monitor

A buffered output providing a low-voltage representation of the load current.

Scale

0.5 V/mA.

DC Accuracy

Better than 0.5% of full scale.

Output Impedance

47 Ω .

Trip/Limit

Switch selectable for either Current Trip mode or Current Limit mode adjustable from 1 to 20 mA.

Trip Status

An indicator will illuminate and the Trip Monitor BNC connector will provide a TTL low when the high-voltage output is disabled due to the output current exceeding the current trip level.

Automatic Power Limit

Automatically limits the internal power dissipation to prevent the 609E-6-FG from overheating. Contact TREK, INC. for detailed information.

General

Stability

Drift with Time

Less than 100 ppm/hr, noncumulative.

Drift with Temperature

Less than 200 ppm/ $^{\circ}$ C.

Dimensions

204 mm H x 432 mm W x 439 mm D
(8" H x 17" W x 17.25" D).

Weight

15 kg (33 lb).

High-Voltage Output Connector

Alden high-voltage connector.

Amplifier Input

Amphenol panel mount.

Power Requirements/Line Voltage

Factory set for one of two ranges:
90 to 127 V AC or 180 to 250 V AC,
at 48 to 63 Hz (specify when ordering).

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