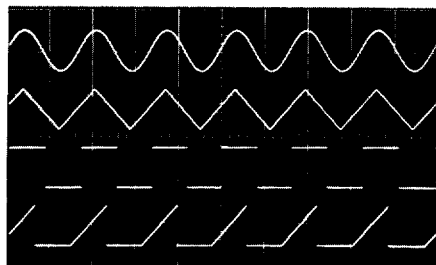# Programmable Waveform Generator

- **GPIB Programmable**
- **1 Hz to 3 MHz Frequency Range**
- **3 Digit Resolution and Amplitude Resolution**
- **Continuous, Triggered and Gated Modes**

GPIB Programmable
Model 159 is ASCII programmable and compatible with the General Purpose Interface Bus (GPIB). Besides being remotely programmable, it has a complete front panel keyboard and display of programmed parameters for local control. When used with the GPIB option, Model 159 complies with all requirements of IEEE 488-1978, and can quickly and easily be integrated into our automatic test system.

Three Digit Resolution
Amplitude, frequency and dc levels can be automatically or manually selected with full three digit resolution for excellent accuracy and

repeatability in all of your test applications.

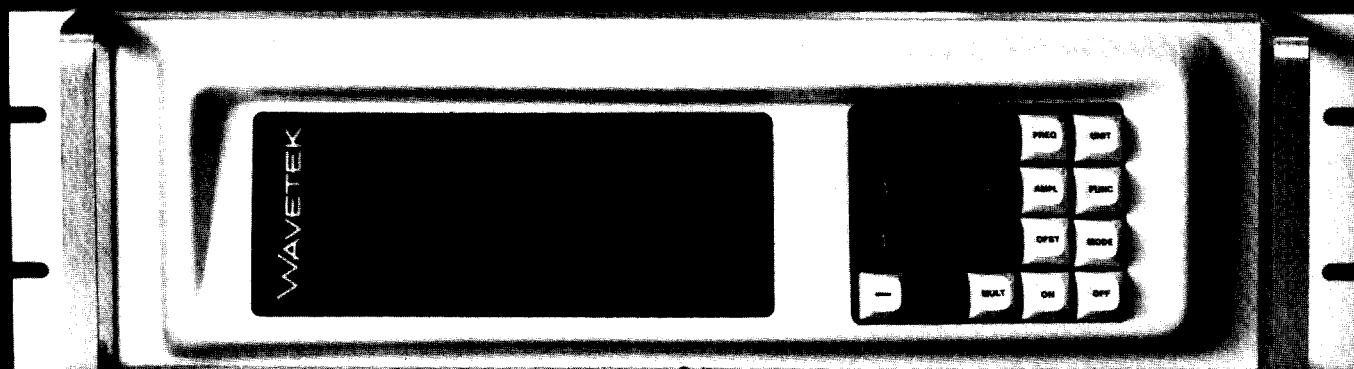### Sine, Square, Triangle and Ramp Waveform Generator
Wide frequency range and the multiple waveform outputs let you use the generator in many applications. Typically, the sine wave can be applied to such things as frequency response tests, filter checkout and audiometric studies. The square wave can be used as a programmable pulse generator, a system clock, and as a check of system response time. The triangle and ramp waveforms have applications in amplifier and mechanical testing, as well as electrochemical and bioengineering studies.

Frequency Modulation
Frequency may be modulated with the application of an external ac waveform for testing FM discriminators. The frequency can also be swept over a 1000:1 range with the application of a ramp to the analog frequency control input (VCG). This wide band sweep capability is extremely valuable for filter testing or frequency response tests.

Phase/Amplitude Inversion
The phase of all output waveforms may be digitally changed 180°. The amplitude of all waveforms may also be inverted with respect to signal ground using the dc offset polarity command.

MODEL 159   PROGRAMMABLE FUNCTION GENERATORS

VERSATILITY

Waveforms
Sine $\sim$, square $\sqcap$, triangle $\wedge$, ramp $\angle\!\!\!\sqcap$ (50% duty cycle) and TTL sync pulse $\sqcap$. Waveforms may be inverted.

Operational Modes
Continuous: Generator oscillates continuously at selected frequency.
Triggered: Generator quiescent until triggered by an external signal, then oscillates one cycle at selected frequency.
Gated: As triggered mode, except generator oscillates for the duration of the external signal.

Frequency Range
$\wedge$, $\sqcap$, $\wedge$ from 1 Hz to 3 MHz in 7 ranges with 3 digit resolution. $\angle\!\!\!\sqcap$ from 1 Hz to 1 MHz in 6 ranges.

NOTE: Generator is usable from 0.01 Hz with derated accuracies.

Main Output
$\wedge$, $\sqcap$, $\wedge$, $\angle\!\!\!\sqcap$ selectable and variable to 10 Vp-p into 50Ω (20 Vp-p open circuit). Three digits of calibrated amplitude from 10 mV to 10 Vp-p into 50Ω in 3 ranges (10^0, 10^{-1}, 10^{-2}). Output impedance 50Ω.

DC Offset
Waveform offset selectable to ±5V with 3 digit resolution into 50Ω. DC offset plus waveform peak value may not exceed 10V peak into open circuit or 5V peak into 50Ω.

TTL Pulse Output
A TTL compatible 0 to 2.5V square wave output, which provides 50 mA sinking current to sync up to 30 TTL loads.

VCG—Voltage Controlled Generator
Up to 3000:1 frequency change with +7.5V signal.
Up to 1000:1 with ±2.5V. Upper and lower frequencies limited to 3 MHz and 0.01 Hz.
Input Impedance: 5 kΩ.
Slew Rate: 4% of range per μs.

Trigger and Gate
Input Range: 2 to 50V.
Impedance: 1 kΩ.
Manual trigger on front panel.

Data Entry
Bit parallel, character serial ASCII programming and front panel keyboard entry.

FREQUENCY PRECISION

Accuracy
±1% of program value ±1 digit for 10 Hz to 100 kHz.
±2% of program value ±1 digit for 100 kHz to 1 MHz.
±4% of program value ±1 digit for 1 to 3 MHz.

Time Symmetry
1% to 100 kHz.

AMPLITUDE PRECISION

Accuracy
Sine and Square Waveforms:
±2% of program value ±1 digit for 10 Hz to 100 kHz.
±5% of program value ±1 digit for 100 kHz to 1 MHz.
Triangle and Ramp Waveforms:
±2% of program value ±1 digit for 10 Hz to 10 kHz.
DC Offset; ±2% of program value ±1 digit.

NOTE: Accuracy stated is for 10^0 amplitude multiplier. For 10^{-1} and 10^{-2}, add 1% per step.

Amplitude Change With Frequency
Sine variation less than:
±0.1 dB for 0 to 100 kHz.
±0.5 dB for 100 kHz to 1 MHz.
±1.0 dB for 1 to 3 MHz.

Amplitude Symmetry
1% of max p-p amplitude to 100 kHz.

WAVEFORM CHARACTERISTICS

Sine Distortion
Less than:
0.5% for 0 to 3 kHz with range multipliers 10^0 through 10^3.
1.0% for 3 to 300 kHz with range multipliers 10^0 through 10^4.
All harmonics at least 34 dB down to 1 MHz.

Triangle Linearity
Greater than 99% to 100 kHz.

Square Wave Rise and Fall Time
Less than 50 ns.

Total Aberrations
Less than 5% of program value ±20 mV.

GENERAL

Stability
Amplitude, dc offset and frequency.
Short term: ±0.05% for 10 min.
Long term: ±0.25% for 24 hours.

Environmental
Specifications apply at 25°C ±5°C. Instrument will operate from 0°C to +5°C.

Rack Mount
48.3 cm (19 in.) rack adapter hardware and program mating connectors included.

Dimensions
43.8 cm (17¼ in.) wide; 13.3 cm (5¼ in.) high; 43.2 cm (17 in.) deep.

Weight
6.8 kg (15 lb) net; 10.4 kg (23 lb) shipping.

Power
90 to 110V, 105 to 125V, 180 to 220V or 210 to 250V; 50 to 400 Hz; less than 45 watts.

OPTION

005: GPIB Programming
Provides General Purpose Interface Bus (GPIB) programming fully compatible with IEEE Standard 488-1978. This allows the Model 159 to be directly connected to the GPIB. For applications requiring more than 1 independent signal source up to 9 additional Wavetek generators can be programmed through this single GPIB option. Interface is isolated from the generator with optical couplers.

NOTE: Specifications apply for settings from 1.00 to 9.99.

PRICE (FOB San Diego)

Model 159	**$1995**
Option 005	**$695**