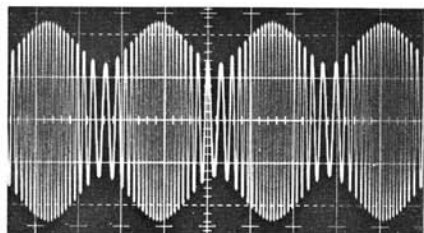


MODEL 193

FUNCTION GENERATORS

20 MHz Sweep/Modulation Generator



- 0.002 Hz to 20 MHz Frequency Range
- Independent Auxiliary Function Generator for AM, FM and Sweep Operation
- Static Setting of Modulation Parameters
- 30 Volt Peak-to-Peak Output

Sweep/Modulation

Model 193, a full 0.002 Hz to 20 MHz Generator, gives you sweep, frequency modulation and suppressed carrier modulation — all with precision waveforms from two independent function generators. The two generators each have sine, triangle and square waveforms with symmetry control. The main generator can be triggered and gated for single cycle or bursts of output.

Convenient Setups

Each modulation parameter has a

static setup feature to allow its exact selection. Independently set these parameters: sweep start and width, AM carrier level and modulation level, suppressed carrier null, and FM center frequency deviation.

Auxiliary Generator

The auxiliary generator, in addition to being an internal modulation generator, can be independently used with its own output. This generator has its own waveforms, with symmetry control, and can be

frequency modulated by an external signal. As an independent generator, it can be used to externally AM or FM the main generator in modes not available internally; for example, frequency shift keying.

30V Peak-to-Peak Output

The output amplifier provides up to 30V peak-to-peak amplitude from a 50Ω source. Zero to 80 dB attenuation lets you select signals down to 1.5 mV.



MODEL 193

FUNCTION GENERATORS

MAIN GENERATOR

Waveforms

Selectable sine \sim , triangle ∇ , square \square , AM sine \diamond and dc.

Symmetry

Symmetry control produces sawtooth \nearrow and variable duty cycle pulse \square from 1:19 to 19:1.*

Operational Modes

Continuous, triggered and gated.

Frequency Range

0.002 Hz to 20 MHz.

Function Output

Waveforms variable to 30 Vp-p (15 Vp-p into 50 Ω). Waveforms may be attenuated continuously to 80 dB. 50 Ω source impedance.

DC Output and DC Offset

Adjustable between ± 15 Vdc (± 7.5 Vdc into 50 Ω) with signal peak plus dc offset limited to ± 15 Vdc (± 7.5 Vdc into 50 Ω). DC offset and waveform attenuated proportionately 10 dB/step to 70 dB.

Func Sync Output

TTL level pulse into 50 Ω . Duty cycle varies with SYM control. 50 Ω source impedance.

GCV Output

0 to +5V open circuit voltage level proportional to main generator frequency. 600 Ω source impedance.

AM—Amplitude Modulation

External signal at AM IN (or external plus AUX GEN signal if AUX GEN AM selected) amplitude modulates main generator sine in selectable 0 to 100% AM or suppressed carrier modes.

AM Input: 5 Vp-p gives 100% modulation; 10 Vp-p gives suppressed carrier operation. 600 Ω input impedance.

Carrier Level (0 to 100% AM): Adjustable 10 to 50% of full amplitude at function output.

Carrier Null (Suppressed Carrier AM): Adjustable $\pm 2\%$ of full amplitude at function output.

VCG—Voltage Controlled Generator

Up to 1000:1 frequency change with external 0 to ± 5 V signal. Upper frequency limited to max. of range.

Slew Rate: 2% of range per μ s.

Linearity: $\pm 0.5\%$ through $\times 100$ K range; $\pm 5\%$ on $\times 1$ M and $\times 10$ M.

Impedance: 10 k Ω .

Trigger Input

Input Range: 1 Vp-p to ± 10 V.

Trigger Level Adj: -5 V to $+5$ V.

Impedance: 1.5 k Ω shunted by 1.5 pF.

Pulse Width: 25 ns minimum.

Repetition Rate:

Input

± 1 V

± 2.5 V

Max Rep Rate

1 MHz

10 MHz

FREQUENCY PRECISION

Dial Accuracy

$\times 0.1$ Hz to $\times 1$ MHz: $\pm 3\%$ of full scale.

$\times 10$ M Range: $\pm 5\%$ of full scale.

AMPLITUDE PRECISION

Sine Frequency Response

All Ranges through $\times 100$ K: $< \pm 0.2$ dB.

$\times 1$ M Range: $< \pm 0.5$ dB.

$\times 10$ M Range: $< \pm 1.5$ dB.

Step Attenuator Accuracy

10, 20 and 40 dB Setting: ± 0.3 dB.

30, 50 and 60 dB Setting: ± 0.6 dB.

70 dB Setting: ± 0.9 dB.

WAVEFORM CHARACTERISTICS

Sine Distortion

$\times 1$ K and $\times 10$ K Ranges: $< 0.5\%$.

$\times 0.1$ and $\times 100$ Ranges: $< 1.0\%$.

$\times 100$ K, $\times 1$ M Range: All harmonics 30 dB below fundamental.

$\times 10$ M Range: 25 dB below fundamental.

Square Wave

Rise/Fall Time:

< 15 ns (10% to 90%).

Total Aberrations:

5% of full amplitude (each peak of waveform).

Time Symmetry

Square Wave Variation From 0.1 to 2 on Dial:

$\pm 1\%$ to 200 kHz.

$\pm 10\%$ to 20 MHz.

Triangle Linearity

0.002 Hz to 200 kHz: $> 99\%$.

AUXILIARY GENERATOR

Waveforms

Selectable \sim , ∇ , \square , \nearrow and \square .

Symmetry of \nearrow and \square adjustable 1:19 thru 19:1.*

Frequency Range

0.1 Hz to 100 kHz in 4 ranges.*

Auxiliary Output

Waveforms selectable and variable to 10 Vp-p (5 Vp-p into 600 Ω).

Auxiliary Sync Output

Rear panel BNC. TTL level pulse coincident with AUX GEN output. Duty cycle varies with symmetry control.

AUX VCG Input

Rear Panel BNC. Up to 33:1 frequency change with external ± 5 V signal. Upper frequency limited to maximum of selected range. 11 k Ω input impedance.

MODES OF OPERATION

Internal auxiliary generator used as the modulation source.

FM

Two setup and one operate mode.

Set-Freq/Aux-Gen-Off: Disables auxiliary generator for main generator adjustment.

Set Δ F: Allows vernier setup of peak deviation. Vernier range is up to $\pm 10\%$ of main generator range.

FM: Operate mode.

Sweep

Two setup and one operate mode.

Set Start: Allows setup of main generator start frequency.

Set Width: Allows vernier setup of main generator stop frequency.

Sweep: Operate mode.

AM

Two setup and one operate mode for double sideband or suppressed carrier operation.

Set Carrier: Allows setup of carrier amplitude.

Set Δ M: Allows the setup of the modulation level.

AM: Operate mode. 0 to 100% AM or suppressed carrier modulation of main generator by auxiliary generator plus external signal if present at AM IN.

Aux Out Only: Disconnects the modulator for independent operation of auxiliary generator.

GENERAL

Stability

Amplitude, frequency and dc offset at FUNC output after 2 hour warm-up:

$\pm 0.05\%$ for 10 minutes.

$\pm 0.25\%$ for 24 hours.

Environment

Specifications apply at $23^\circ \pm 5^\circ$ C. Operates from 0° to $+50^\circ$ C.

Dimensions

28.6 cm (11 $\frac{1}{4}$ in.) wide; 13.3 cm (5 $\frac{1}{4}$ in.) high; 28.6 cm (11 $\frac{1}{4}$ in.) deep.

Weight

4.6 kg (10 lb) net; 5.9 kg (13 lb) shipping.

Power

100/120/220/240V ($+5\%$, -10%), 48 to 66 Hz, ≤ 70 VA.

NOTE: All Specifications apply from 0.1 to 2.0 on frequency dial, when FUNC OUT amplitude is max and 50 Ω terminated, and with SYM control OFF.

SYMMETRY and VERNIER controls affect frequency calibration. Maximum possible asymmetry is a function of frequency setting.

*In ∇ and \square modes, indicated frequency is divided by approximately 10.

FACTORY/FOB

San Diego, CA

PRICE

Model 193

\$1495