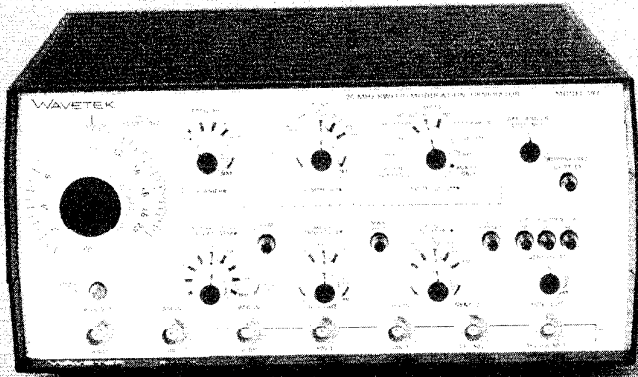


**MODULATION/FUNCTION  
GENERATORS  
MODEL 193**



# 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

## MAIN GENERATOR

**Waveforms:** Selectable sine, triangle, square, AM sine and dc.

**Symmetry:** From 1:19 to 19:1.

**Operational Modes:** Continuous, triggered and gated.

**Frequency Range:** 0.002 Hz to 20 MHz.

**Function Output:** 30 Vp-p (15 Vp-p into 50Ω), 50Ω 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 50Ω).

**Func Sync Output:** TTL level pulse into 50Ω.

**GCV Output:** 0 to +5V open circuit voltage level proportional to main generator frequency, 600Ω 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, 600Ω input impedance.

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

**Carrier Null (Suppressed Carrier AM):** Adjustable ±2% of full amplitude at function output.

**VCG—Voltage Controlled Generator:** Up to 1000:1 frequency change with external 0 to ±5V signal. Upper frequency limited to max. of range.

**Slew Rate:** 2% of range per μs.

**Linearity:** ±0.5% through ×100K range; ±5% on ×1M and ×10M.

**Impedance:** 10 kΩ.

## Trigger Input

**Input Range:** 1 Vp-p to ±10V.

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

**Impedance:** 1.5 kΩ shunted by 1.5 pF.

**Pulse Width:** 25 ns minimum.

## FREQUENCY PRECISION

### Dial Accuracy

×0.1 Hz to ×1 MHz: ±3% of full scale.

×10M Range: ±5% of full scale.

## WAVEFORM CHARACTERISTICS

### Sine Distortion

×1K and ×10K Ranges: <0.5%.

×0.1 and ×100 Ranges: <1.0%.

×100K, ×1M Range: All harmonics 30 dB below fundamental.

×10M 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:**

<±1% to 200 kHz.

<±10% to 20 MHz.

### Triangle Linearity

0.002 Hz to 200 kHz: >99%.

## AUXILIARY GENERATOR

**Waveforms:** Selectable  $\sim$ ,  $\Delta$ ,  $\square$ ,  $\wedge$  and  $\perp$ . Symmetry of  $\wedge$  and  $\perp$  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 600Ω).

**Auxiliary Sync Output:** Rear panel BNC, TTL level pulse coincident with AUX GEN output.

**AUX VCG Input:** Rear Panel BNC. Up to 33:1 frequency change with external ±5V signal.

## 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 ΔF:** Allows vernier setup of peak deviation. Vernier range is up to ±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 ΔM:** 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: ±0.05% for 10 minutes, ±0.25% for 24 hours.

**Environment:** Specifications apply at 23° ±5°C. Operates 0° to +50°C.

**Dimensions:** 28.6 cm (11 1/4 in.) wide; 13.3 cm (5 1/4 in.) high; 28.6 cm (11 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.

**FACTORY/FOB  
San Diego, CA**