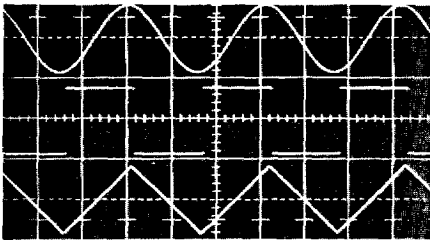




MODEL 171

FUNCTION GENERATORS

# Synthesizer / Function Generator



- Combination Function Generator/Synthesizer
- 4½ Digit or 1000:1 Dial Control
- 0.005% Frequency Accuracy
- -70 dB Spurious Noise
- 0.1 Hz to 2 MHz Frequency Range

### Combination Function Generator/Synthesizer

Model 171 combines a function generator and 4½ digit resolution frequency synthesizer in one package.

### 4½ Digit or 1000:1 Dial Control

Frequency control is by dial or digital switch. You can use digital control in the synthesizer mode with frequency resolution from 0.001 Hz on the lowest decade range to 100 Hz on the highest range. Resolution is a full 4½ digits (1.9999). Dial control, in the generator mode, provides

± 3% full scale accuracy with infinite resolution.

### 0.005% Frequency Accuracy

In the synthesizer mode, the output waveform is phase locked to an internal crystal providing ± 0.005% frequency accuracy with frequency stability of 0.0001% per °C.

### -70 dB Spurious Noise

In the synthesizer mode, the spurious signals are typically 70 dB below the fundamental for frequencies up to 20 kHz.

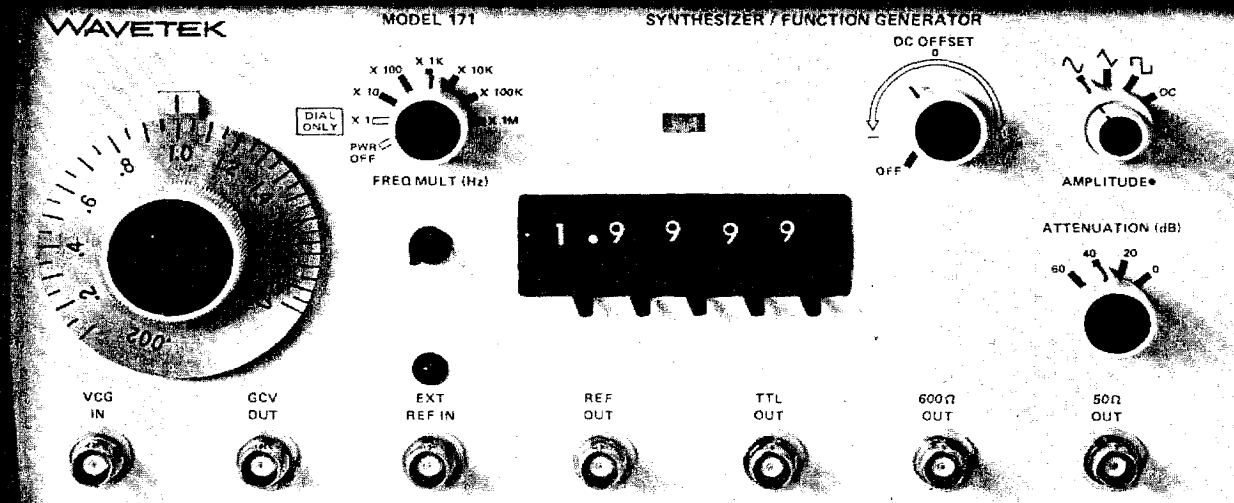
### 0.1 Hz to 2 MHz Frequency Range

Model 171 frequency range is 0.1 Hz

to 2 MHz in the function generator mode. In the synthesizer mode, range is from 1 Hz to 2 MHz. You have either mode, function generator or synthesizer, with the flip of a switch.

### Two Simultaneous Outputs

Model 171 features two simultaneous outputs with a maximum of 10 volts peak-to-peak into matched termination. The outputs are from 50 and 600Ω sources. The output is continuously variable from 0 to -80 dB with a combination step and vernier attenuator.

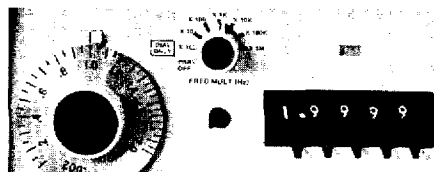


## MODEL 171

## FUNCTION GENERATORS

**VERSATILITY****Waveforms**

Sine  $\sim$ , triangle  $\nabla$ , square  $\square$  and DC selectable. TTL pulse  $\square$  and 1 MHz reference pulse  $\square$ .

**Operational Modes**

Dial or Digital Switch Selection

**Synthesizer:** Operates as a synthesizer with function generator outputs locked to the synthesizer frequency. The frequency is determined by the frequency multiplier switch and the digital switch settings. The digital switch is operable between 0.1000 and 1.9999 on all ranges above the  $\times 1$  range.

**Function Generator:** Operates as a conventional VCG. The frequency is controlled by the dial, multiplier and external VCG voltage on all ranges.

**Frequency Range**

0.1 Hz to 2 MHz in 7 overlapping decade ranges with dial; 6 overlapping ranges with digital switch.

*NOTE: Digital switch valid with all frequency multipliers except  $\times 1$  (first range). Frequency ratio of 1000:1 on dial, 20:1 on digital switch.*

**Main Output**

$\sim$ ,  $\nabla$ ,  $\square$  variable to 20 Vp-p (10 Vp-p with matching load at either 50 $\Omega$  or 600 $\Omega$ ) output. Attenuation from 0 to 80 dB: 60 dB in 20 dB steps with a 20 dB vernier.

**DC Offset and DC Output**

DC offset of waveform and dc output are selectable and variable through  $\pm 10$  V ( $\pm 5$  V into matching load). Waveform plus offset is limited to  $\pm 10$  V peak (open circuit). Step attenuator attenuates dc level.

**TTL Pulse Output**

TTL pulse has an approximately 50% duty cycle at generator frequency and can drive up to 20 TTL loads.

**GCV—Generator Controlled Voltage**

0 to +2V (nominal, open circuit) proportional to frequency of main generator. Output impedance 600 $\Omega$ .

**VCG—Voltage Controlled Generator**

VCG in function generator mode only. Up to 1000:1 frequency change with external 0 to  $\pm 2$  V signal. Upper frequency is limited to maximum of selected range.

**Input Impedance:** 2 k $\Omega$ .

**Slew Rate:** 0.1 V/ $\mu$ s.

**External Synthesizer Reference Input**

**Frequency:** 1 MHz

**Waveform:** Sine or Square.

**Level:** 1 to 10 Vrms

**Impedance:** 5 k $\Omega$ .



Ext Ref Input

**Synthesizer Reference Output Signal**

TTL 1 MHz pulse train (in synthesizer mode only).

**FREQUENCY PRECISION****Synthesizer Mode**

**Accuracy:** 0.005% of setting.

Range	Digital Resolution
1.000 Hz to 20 Hz	0.001 Hz
10.00 Hz to 200 Hz	0.01 Hz
100.0 Hz to 2 kHz	0.1 Hz
1.000 kHz to 20 kHz	1.0 Hz
10.00 kHz to 200 kHz	10 Hz
100.0 kHz to 2 MHz	100 Hz

**Locking Time:** Within .01% of final frequency in <300 ms on  $\times 1$ K,  $\times 10$ K,  $\times 100$ K and  $\times 1$ M range.

**Function Generator Mode**

**Dial Accuracy:**  $\pm 3\%$  of full scale for 0.1 Hz to 200 kHz.  $\pm 5\%$  of full scale to 2 MHz.

**Time Symmetry:**  $\pm 1\%$  on all ranges except  $\times 1$ M range.

**AMPLITUDE PRECISION****Amplitude Change With Frequency**

Sine variation less than:  
 $\pm 0.1$  dB for 0.1 Hz to 200 kHz.  
 $\pm 0.5$  dB for 200 kHz to 2 MHz.

**Step Attenuator Accuracy**

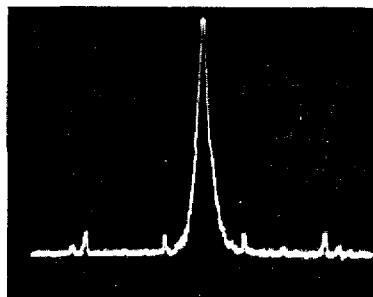
$\pm 0.3$  dB per 20 dB step.

**WAVEFORM CHARACTERISTICS****Sine Distortion**

Less than:  
 0.5% for 0.1 Hz to 20 kHz.  
 1.0% for 20 kHz to 200 kHz.  
 All harmonics 30 dB below fundamental on  $\times 1$  MHz range.

**Spurious Signals**

Typically 70 dB below fundamental to 20 kHz and 40 dB below fundamental to 2 MHz (in synthesizer mode only).



Typical Spectral Purity in the Synthesizer Mode

**Integrated Signal to Phase Noise**

Typically 30 dB to 200 kHz measured over  $\pm 15$  kHz bandwidth excluding carrier  $\pm 10$  Hz (in synthesizer mode only).

**Triangle Linearity**

Greater than 99% to 200 kHz.

**Square Wave Rise and Fall Time**

Less than 75 ns.

**TTL Pulse Rise and Fall Time**

Less than 25 ns (15 ns typical).

**GENERAL****Synthesizer Stability**

**Frequency:** 1 ppm/ $^{\circ}$ C.

**Internal Crystal Frequency:** 4 MHz.

**Aging Rate:** 20 ppm/year.

**Function Generator Stability**

Amplitude, dc offset and frequency.

**Short Term:**  $\pm 0.05\%$  for 10 minutes.

**Long Term:**  $\pm 0.25\%$  for 24 hours.

**Environment**

Specifications apply at 23 $^{\circ}$   $\pm$  5 $^{\circ}$ C. Instrument will operate from 0 $^{\circ}$  to +50 $^{\circ}$ C.

**Dimensions**

28.6 cm (11  $\frac{1}{4}$  in.) wide; 13.3 cm (5  $\frac{1}{4}$  in.) high; 27.3 cm (10  $\frac{3}{4}$  in.) deep.

**Weight**

3.9 kg (8.5 lb) net; 5.5 kg (12 lb) shipping.

**Power**

90 to 110V, 105 to 125V, 180 to 220V or 210 to 250V; 50 to 400 Hz; less than 20 VA.

*NOTE: All specifications apply when frequency dial is between 0.1 and 2.0 or digital switch is between 0.1000 and 1.9999, amplitude is at 10 Vp-p and output is from the 50 $\Omega$  BNC into a 50 $\Omega$  load.*

**FACTORY/FOB**

San Diego, CA