11 MHz Stabilized Function Generator

- **100 μHz to 11 MHz Range**
- **Crystal Stabilized to 0.09%**
- **External Reference and Waveform Hold**
- **LCD Display With Annunciator**
- **Triggered, Gated and Haver Waveforms**

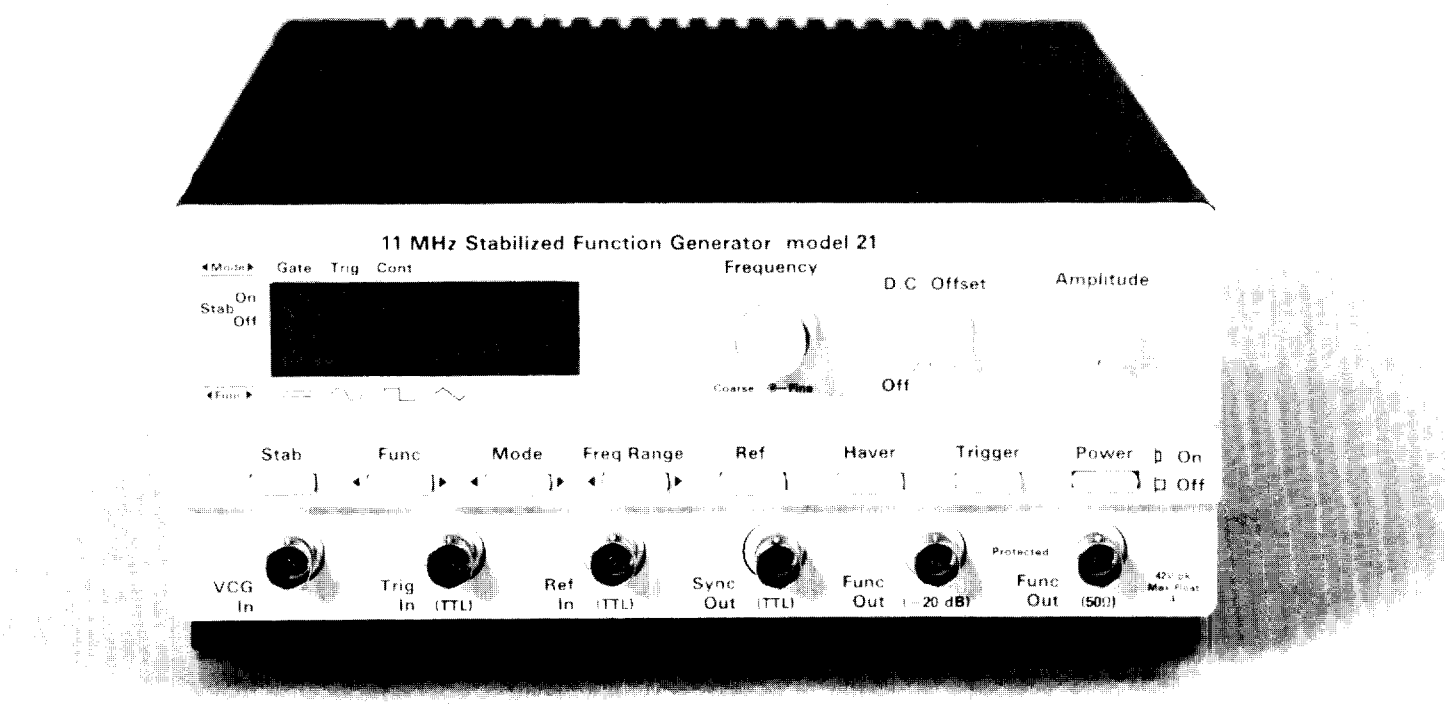
Crystal Stabilized Operation
Model 21 features frequency stabilized operation. Stabilization extends tight short-term specs (0.09% of range) to indefinite periods throughout the entire 100 μHz to 11 MHz range.

Low-Frequency Waveform Synthesis
Waveforms below 1.1 kHz are synthesized digitally to provide additional features of up and down ramps, haverwaves, instantaneous hold/continue, and operation down to ultra-low frequencies with external reference.

Triggered, Gated, and Haver Waveforms
These waveforms give the instrument additional flexibility. In triggered mode, output is a DC baseline until a manual or external signal initiates a single cycle of the selected waveform. By selecting "Haver" a haverwave is produced. This waveform is a useful simulation of a shock pulse used in mechanical testing. Gated mode is similar to triggered except the generator produces a burst of waveform cycles for the duration of the external triggering signal.

LCD Display
Frequency is monitored by a 3½ digit LCD display. Display annunciators point to selected parameters to show the instrument setup at a glance.

20 Vp-p Amplitude
Output is 20V peak-to-peak (10 Vp-p into 50Ω) at the primary output. A second output is attenuated 20 dB with respect to the first. Both outputs can be varied 20 dB, which gives a full 40 dB output range.



MODEL 21 FUNCTION GENERATORS

VERSATILITY

Waveforms
Sine ∿, triangle △, square ⊓ and dc ⎓; additionally, below 1100 Hz ramp up ◿, ramp down ◺ and haverwaves ⩚, ⩛.

Operational Modes
Continuous: Generator runs continuously at selected frequency.
Triggered: Generator is quiescent until triggered by external signal or manual trigger, then generates one complete waveform cycle at selected frequency.
Gated: Generator output is continuous for duration of external or manual trigger.
Haver: Same as triggered or gated modes except waveform starts at 270° phase.

Frequency Range
100 μHz to 11 MHz in 9 overlapping decade ranges. Each range capable of 1100:1 frequency change.

Frequency Control
Value or VCG.
Value: Range is selected with front panel key; frequency within range is set with coarse and fine tune controls.
VCG: Up to 1100:1 frequency change with external 0 to ± 5V signal applied to VCG input connector. Upper and lower frequencies limited to maximum and minimum of selected range. VCG input is disconnected when stabilizer is engaged.
Input Impedance: 5kΩ.
Slew Rate: 0.1 V/μs (max.).

Amplitude Range
20 dB range up to 20 Vp-p (10 Vp-p into 50Ω) at Func Out (50Ω). Additional output attenuated 20 dB with respect to main output for total amplitude range of 40 dB.

DC Offset and DC Output
Variable up to ± 10V maximum (± 5V into 50Ω). Calibrated zero offset position. Signal peak plus offset limited to ± 10V (± 5V into 50Ω).

Outputs
Func Out (50Ω): Main waveform output.
Func Out (– 20 dB): Output attenuated 20 dB with respect to main output.
Sync Out: TTL pulse (50% duty cycle) at generator frequency. Will drive 10 LS TTL loads.

Inputs
VCG In: BNC input for voltage control of generator frequency in nonstabilized modes.
Trig In: BNC input accepts TTL compatible signal to trigger or gate the generator. Generator triggers on positive edge of input or gates on for duration of high level input. External signal pulse width is 50 ns minimum with a maximum repetition rate of 5 MHz.
Ext Ref: BNC input for external reference operation or electrical waveform hold.

Stabilizer
When stabilizer is selected, generator frequency is stabilized at displayed frequency to a crystal-controlled reference. Stabilizer improves long term frequency stability for all durations to be equal to the 10 minute short term value.

Display
1100 count LCD frequency display with frequency ranging units (mHz, Hz, kHz and MHz) and decimal point. Annunicators indicate selection of modes and functions.

External Reference
External Reference switch provides selection of internal or external control of waveform output frequency and also provides a means of holding or releasing the waveform manually, electrically or through external contact closure. External Reference connector accepts either TTL compatible signal (1.1 MHz maximum repetition rate, 200 ns minimum pulse width) or contact closure. Operation with external reference provides output frequency 1/1000 of reference frequency. Contact closure to ground stops waveform; opening contact causes waveform to start again exactly where it stopped.

FREQUENCY PRECISION

Frequency Display Accuracy
± 1 count of 1100 counts, which is 0.09% of range. Stabilizer maintains same reading indefinitely.

Time Symmetry
Square waveform variation from 100 to 1100 counts on display less than: ± 0.1% to 1100.00 Hz (across bottom five specified ranges), ± 1% to 110.00 kHz,
± 5% to 11.00 MHz.

AMPLITUDE PRECISION

Sine Variation with Frequency
Referenced to 1 kHz.
All ranges to 110.0 kHz: < ± 0.2 dB
To 11.00 MHz: < ± 1.5 dB.

WAVEFORM CHARACTERISTICS

Sine Distortion
1.00 to 11.00 kHz range: <0.5% THD.
10.0 to 110.0 kHz range: <1% THD.
0.100 to 1.1 MHz range: < – 40 dBc.
1.0 to 11.0 MHz range: < – 28 dBc.

Triangle Linearity
To 110 kHz: >99%.

Square Wave Rise and Fall Times
<22 ns at Function Out with 10 Vp-p into 50Ω.

Square Wave Total Aberrations
Each peak <5% of p-p amplitude.

Stability
Amplitude, frequency (nonstabilized) and dc offset after 30 minute warm-up:
± 0.10% of range for 10 minutes.
± 0.50% of range for 24 hours.
Frequency (stabilized):
± 0.09% of range for ⩾10 minutes, 0 to 50°C.

GENERAL

Output Protection
Function outputs are protected against a short circuit to any voltage between ± 10 Vdc and have internal fused protection (both output and common conductors) against accidental application of up to 250 Vac or 350 Vdc.

Environment
Temperature Range: 23° ± 5°C for specified operation, operates 0° to + 50°C, – 20° to + 75°C for storage.
Warm-up Time: 20 minutes for specified operation.
Altitude: Sea level to 10,000 ft. for operation. Sea level to 40,000 ft. for storage.
Relative Humidity: 95% at 25°C at sea level (noncondensing).

Dimensions
211 mm (8.3 in.) wide; 85 mm (3.4 in.) high; 305 mm (12 in.) deep.

Weight
3.4 kg (7.5 lb) net; 4.5 kg (10 lb) shipping.

Power
90 to 128, 180 to 256V, 48 to 66 Hz, less than 35 VA.

NOTE: All specifications apply for display between 100 and 1100 frequency counts; amplitude at 10 Vp-p into 50Ω.

FACTORY/FOB

San Diego, CA