

MODEL 271

PROGRAMMABLE FUNCTION GENERATORS

12 MHz Pulse/Function Generator

- 0.01 Hz to 12 MHz Frequency Range
- Pulse Delay, Width and Complement
- 1 to 1,048,200 Burst Count
- GPIB (IEEE 488) Standard
- 200V Output Protection

Compact and Versatile

Model 271 Programmable Pulse/Function Generator is a light-weight, half-rack instrument for bench or ATE use. The 271 can generate precise sine, triangle, square, pulse, and external width controlled waveforms from 0.01 to 10Vp-p, and dc offsets within a $-5V$ to $+5V$ range into 50Ω . Waveforms can be continuous, gated or triggered.

True Pulse Capability

The 271's pulse capability provides variable pulse delay from 80 ns to 0.1 sec, variable pulse width from 40 ns to 0.1 sec, and double pulse. All

pulse functions may be complemented. For added convenience, period may be programmed rather than frequency, and upper and lower level rather than amplitude.

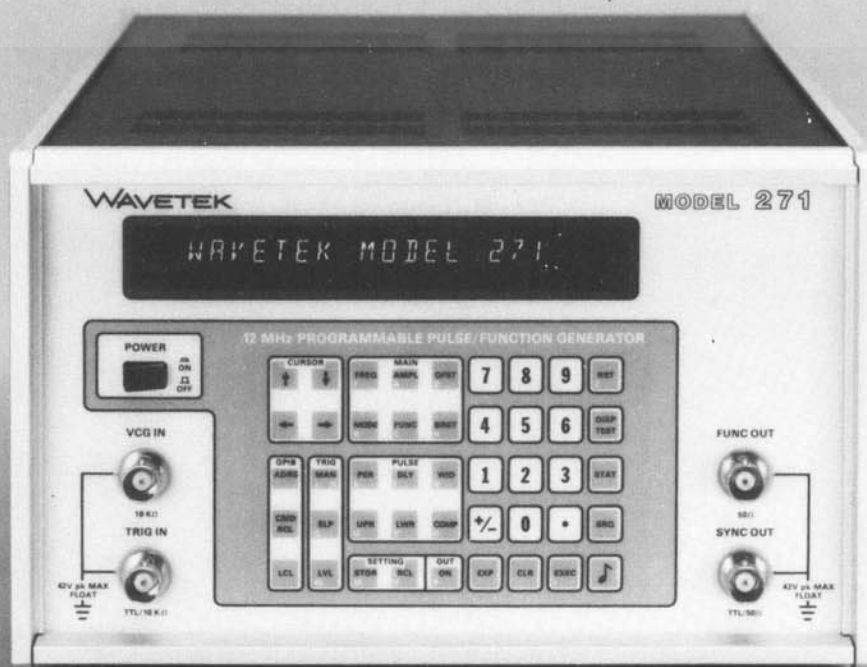
Ease of Programming

The GPIB entry sequence is identical to front panel entry and the ASCII character, for GPIB programming, appears with each key on the front panel. This makes it easy to transfer a manual setup to a controller program and vice versa. To help the operator even more, "command recall" can display up to 40 previous characters entered either at the front panel or by GPIB. The 271 also

features free-format numeric entry, parameter independence until a final execute command, and front panel GPIB address selection (which can, however, be locked out for security).

Protected Outputs

All 271 outputs are protected against short circuits and external voltages between $\pm 15V$. The main output is further protected against voltage inputs of up to 140 Vac or $\pm 200Vdc$. If a voltage greater than $\pm 15V$ is applied to the main output, the 271 generates an audible alarm, a front panel error message, and a GPIB service request. Inputs are protected against voltages up to $\pm 50V$.



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VERSATILITY

Waveforms

Programmable sine \sim , triangle \wedge , square \square , square complement \square , external width pulse \square , double pulse $\square\square$ or dc.

Operational Modes

Continuous: Output continuous.

Triggered: One cycle at programmed frequency when triggered by an external signal, GPIB or manually.

Gated: As triggered except output oscillates for the duration of the gate signal. Last cycle started is completed.

Burst: As Triggered except output oscillates for the number of cycles programmed into burst counter (1-1,048,200; burst rate 12 MHz max).

Frequency Range

10 mHz to 12 MHz.

Outputs

Function Output: Waveforms from 0.01 to 10 Vp-p into 50 Ω (0.02 to 20 Vp-p into ≥ 50 k Ω). DC or offset programmable from -5V to +5V into 50 Ω (-10V to +10V into ≥ 50 k Ω). Absolute peak amplitude plus offset may not exceed 5V into 50 Ω (10V into ≥ 50 k Ω).

Programming: May be Vp-p and offset or upper and lower levels: lower from -5 to +4.99V into 50 Ω , upper from -4.99 to +5V. Upper must be greater than lower.

Programmable Control Provides:
Output On (50 Ω source impedance);
Output Off, High Z (>500 k Ω);
Output Off, Low Z (approx 50 Ω termination).

Source Impedance: 50 Ω .

Protection: Output protected to 140 Vac or ± 200 Vdc without replacement of internal fuse.

Sync Output: TTL level square wave: ≤ 0.4 V to ≥ 2.4 V into 50 Ω , ≤ 0.8 V to ≥ 4.8 V into ≥ 50 k Ω .

Source Impedance: 50 Ω .

Timing: Concurrent with main output in square; lags sine and triangle by 90°.

Protection: Output protected against ± 15 V input minimum.

Inputs

VCG In: 0.01 to 12V into 10 k Ω , for up to 1200:1 frequency change. 10V gives range max, 12V gives 20% overrange. Slew Rate: 1V/ μ s.

Trig In: Level programmable: -10 to +10V, 20 mV resolution, ± 500 mV accuracy. Programmable to trigger on - or + signal slope.

Impedance: 10 k Ω .

Maximum Rate: 12 MHz (15 MHz in External Width).

Minimum Width: 20 ns.

Minimum Amplitude: 500 mVp-p to 1 MHz, 1 Vp-p to 24 MHz.

Protection: Inputs protected against ± 50 V input minimum.

Pulse

Delay: 80 ns to 0.1 sec. Measured from 1.25V point of leading edge of sync (into 50 Ω load) to leading corner of main output pulse. (In double pulse, to second pulse of pulse pair.)

Width: 40 ns to 0.1 sec. Measured from 50% of leading edge to 50% of trailing edge.

Delay/Width Duty Cycle:

50% when delay/width < 500 ns.

80% when delay/width ≥ 500 ns.

Normal/Complementary: All pulses may be complemented. Sine, triangle and square outputs cannot be complemented.

PRECISION

Frequency

Resolution: 3 digits.

Accuracy: $\pm 2\%$.

Repeatability (24 hr): $\pm 1\%$.

Jitter: $\leq 0.1\%$ ± 100 ps.

Amplitude

Resolution: 3 digits or 10 mV when absolute peak ampl plus offset > 0.5 V; 3 digits or 1 mV when absolute peak ampl plus offset ≤ 0.5 V.

Accuracy: $\pm 2\%$ of programmed value and: ± 5 mV for 0.1 to 1V (pk ampl + ofst < 0.5 V), ± 20 mV for 1.01 to 10V, ± 50 mV for all other.

Repeatability (24 hr): $\pm 1\%$ ± 10 mV.

Flatness: 0.1 dB to 100 kHz, 1.5 dB to 12 MHz for output at 5 Vp-p.

Offset

Resolution: 3 digits or 10 mV when absolute peak ampl plus offset > 0.5 V, 3 digits or 1 mV when absolute peak ampl plus offset ≤ 0.5 V.

Accuracy: ± 40 mV in DC function.

Repeatability (24 hr): $\pm 1\%$ ± 20 mV.

Pulse Delay and Width

Resolution: 3 digits.

Accuracy: $\pm 3\%$ of programmed value ± 10 ns.

Repeatability (24 hr): $\pm 1\%$ ± 3 ns.

Waveform Quality

Sine Distortion (at 5 Vp-p): THD

$< 0.5\%$ 10 mHz - 99.9 kHz

No Harmonics Above:

< -40 dBc 100 kHz - 999 kHz

< -30 dBc 1 MHz - 12 MHz

Time Symmetry: $\pm 1\%$ ± 8 ns.

Square Transition Time: < 15 ns.

Square Over/Undershoot: $< 5\%$ of pk-pk amplitude ± 20 mV.

Triangle Linearity: 99% to 100 kHz.

GENERAL

Stored Settings

Nonvolatile memory for 150 stored settings. Battery back-up with minimum 6 mo. retention (typ. 5 yr.), battery check and status display.

GPIB Programming

IEEE 488-1978 compatible. Non-isolated. Double buffered.

Address: 0-30, keyboard or internal switch selectable. Internal switch can lockout keyboard selection. Power-up address is internal setting.

Subsets: SH1 Complete source handshake, AH1 Complete acceptor handshake, T6 Basic talker, TE0 No extended talker, L4 Basic listener, SR1 Complete service request (software selectable), RL1 Remote/local and local lockout, PP0 No parallel poll capability, DC1 Complete device clear/selective device clear, C0 No controller capability, E2 Tri-state drivers.

Interface Timing

Parameter	Time
Frequency	11 ms
Amplitude	14 ms
Offset	14 ms
Mode	4 ms
Waveform	5 ms
Execute	8 ms
Other	4 ms

Environment

Temperature Range: 25°C \pm 10°C for spec operation, operates 0°C to 50°C; -50°C 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 and sea level (non-condensing).

Dimensions

21.7 cm (8.54 in.) wide (half-rack); 13.3 cm (5.25 in.) high; 39.4 cm (15.5 in.) deep.

Weight

5.9 kg (13 lb) net; 7.3 kg (16 lb) shipping.

Power

90 to 105, 108 to 126, 198 to 231, or 216 to 252 Vrms; 48 to 66 Hz; 1 phase; < 40 watts.

OPTIONS

002: Rear Panel Connectors

BNCs relocated to rear panel.

FACTORY/FOB

San Diego, CA

PRICE

Model 271	\$2995
Option 002	\$125