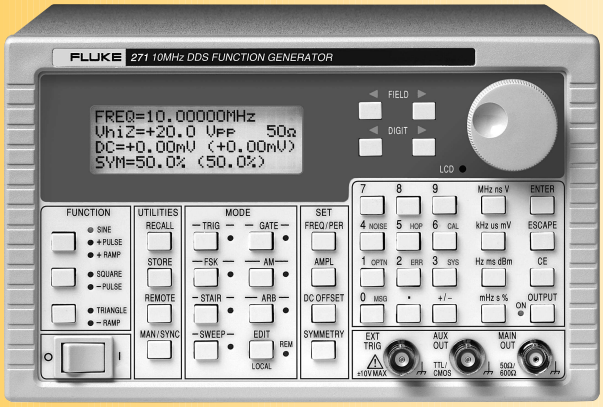
271 DDS Function Generator with ARB

FLUKE®

High performance function generator



- High stability 10 MHz DDS function generator
- Arbitrary capability with storage for five user defined waveforms
- Multiple standard and complex waveforms recalled from internal memory
- Extensive modulation capabilities include sweep, AM, Gating, Trigger/Burst, FSK and Hop
- GPIB and RS-232 interfaces

Tech Tip

Direct digital synthesis (DDS) is a technique for generating waveforms digitally using a phase accumulator, a look-up table and a digital-to-analog-converter (DAC). The accuracy and stability of the resulting waveforms is related to that of the crystal master clock. The DDS generator offers not only exceptional accuracy and stability but also high spectral purity, low phase noise and excellent frequency agility.

The 271 is a high performance function generator using Direct Digital Synthesis techniques. A wide variety of standard waveforms are provided and an arbitrary waveform capability allows it to be used to generate non-standard and user-defined waveforms. Extensive modulation capabilities make this a highly versatile signal source.

Waveforms

Standard waveforms are sine, square, positive pulse, negative pulse, triangle, ramp up, ramp down. Additionally arbitrary waveforms, multi-level squarewaves, waveform hopping and pseudo-random noise can be generated.

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Waveforms

Frequency	
All waveforms are available up to 10 MHz. However, the purity of triangle, ramp, and multi-level square wave waveforms is not specified above the frequencies indicated in the following section.	
Range	0.1 mHz to 10 MHz
Resolution	7 digits or 0.1 mHz
Accuracy	Typically < ± 10 ppm for 1 year, 18 °C to 28 °C
Tempco.	Typically < 1 ppm/°C outside 18 °C to 28 °C
Sinewave	
Distortion	< –60 dBc to 20 kHz, < –50 dBc to 300 kHz, < -35 dBc to 10 MHz
Spurii	Non -harmonically related spurii typically <- 60 dBc to 10 MHz
Squarewave	
Rise and fall times	< 22 ns
Triangle	
Linearity error	< 0.5 % to 30 kHz
Positive and Negative Ramp	
Linearity error	< 0.5 % to 30 kHz
Positive and Negative Pulse	
Rise and fall times	< 22 ns
Multi-Level Squarewave	
Up to 16 steps available per cycle, each step selectable for amplitude (10 bit resolution) and duration (1 to 1024 samples). Above 27 kHz a 36 ns edge uncertainty is introduced.	
Rise and fall times	< 22 ns
Arbitrary (and complex)	
A number of "complex" waveforms are pre-programmed in ROM . A further five, user defined, waveforms may be loaded via the digital interfaces and stored in non-volatile RAM. Frequency range: All waveform points can be continuously output up to 27 kHz, beyond which they are sampled.	
No. of samples	1024 10 bit samples
Noise	Wideband noise with variable amplitude and offset.
Symmetry	
Range	Sine — 1 % to 99 % at all frequencies; Other waveforms — 1 % to 99 % to 30 kHz, 20 % to 80 % to 10 MHz
Resolution	0.1 %

Main Output

Output impedance	50 Ω or 600 Ω switchable
Amplitude	5 mV to 20 V pk-pk open circuit (2.5 mV to 10 V into 50 Ω/600 Ω). Output can be specified as V-H: 2 (open circuit value) or V (Voltage into the characteristic impedance) in pk-pk, RMS or dBm. Note that in positive or negative pulse modes the amplitude range is 2.5 mV to 10 V pk-pk O/C.
Accuracy	Typically ±3 % ±1 mV at 1 kHz into 50 Ω/600 Ω
Flatness	±0.2 dB to 500 kHz; ±1 dB to 10 MHz
Pulse aberrations	<5 %+ 2 mV
DC offset	± 10 V from 50 Ω/600 Ω offset plus signal peak limited to ± 10 V from 50 Ω/600 Ω
Resolution	3 digits or 1 mV for both amplitude and offset

Modulation

Amplitude Modulation	
Carrier frequency	0.1 mHz to 10 MHz
Carrier waveforms	All
Depth	0 to 100 %, resolution 1 %
Internal source	1 kHz fixed sinewave or 0.005 Hz to 50 kHz square wave
External	See "VCA In" section
Frequency Shift Keying (FSK)	
Phase coherent switching between two frequencies at a rate defined by the switching signal source	
Carrier frequency	0.1 mHz to 10 MHz
Carrier waveforms	All
Switch repetition rate	dc to 50 kHz internal, dc to 1 MHz external
Switching signal source	Internal from keyboard or trigger generator. External from EXT TRIG input or remote interface.

Operating Modes

Trigger/burst	
Phase coherent signal keying — each positive edge of the trigger signal will produce one burst of the carrier, starting and stopping at the phase angle specified by the start/stop phase setting	
Carrier frequency	0.1 mHz to 10 MHz
Carrier waveforms	All
Number of cycles	1 to 1023 (resolution 1 cycle) or 0.5 to 511.5 (resolution 1/2 cycle)
Trigger rep. rate	dc to 50 kHz internal, dc to 1 MHz external
Source	Internal from keyboard or trigger generator. External from EXT TRIG input or remote interface
Gated	
Non phase-coherent signal keying — output is On while Gate signal is high and Off while low.	
Carrier frequency	From 0.1 mHz to 10 MHz
Carrier waveforms	All
Trigger rep. rate	dc to 50 kHz internal dc to 1 MHz external
Gate source	Internal from keyboard or trigger generator. External from EXT TRIG input or remote interface
Sweep	
Carrier waveforms	All
Sweep mode	Linear or logarithmic, single or continuous
Sweep width	0.1 mHz to 10 MHz. Phase continuous. Independent setting of the start and stop frequency.
Sweep time	10 ms to 999 s (3 digit resolution)
Markers	Two markers variable during sweep. Available at the TRIG/SWEEP OUT socket
Sweep trigger source	The sweep may be free run or triggered from: keyboard, EXT TRIG input, remote interface
Hop	
Up to 16 different "hop" waveforms can be defined in terms of function, frequency, amplitude, offset and duration. Duration setable per step 1 ms to 60 s.	
Start/Stop Phase	
Carrier frequency:	0.1 mHz to at least 1 MHz
Carrier waveforms	All
Range	–360 to +360 degrees
Resolution	1 degree
Accuracy	Typically 1 degree to 30 kHz
Trigger Generator	
Internal source 0.005 Hz to 50 kHz squarewave adjustable in 20 us steps. 3 digit resolution. Available for external use from TRIG/SWEEP OUT socket.	

Auxiliary Outputs

Aux Out
CMOS/TTL levels with symmetry and frequency of main output and phase of start-stop phase setting
Trig/Sweep Out
Multi-function output depending upon mode. Except in sweep mode, the output is that of the trigger generator at CMOS/TTL levels from 1 kΩ. In Sweep mode the output is a 3-level waveform, changing from high (+4 V) to low (0 V) at the start of sweep, with narrow 1 V pulses at each marker point.

Inputs

Ext Trig	
Frequency range	DC to 1 MHz
Signal range	TTL (1.5 V) threshold; maximum input ± 10 V
Min. pulse width	50 ns
VCA In	
Frequency range	DC – 100 kHz
Signal range	2.5 V for 100 % level change at maximum output
Input impedance	Typically 6 kΩ

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Phase Locking

Clock in/out	TTL/CMOS threshold levels; output impedance typically 50 Ω as an output
Sync out	TTL/CMOS logic levels from typically 50 Ω. The signals from these sockets are used to phase lock two or more generators.

Interfaces

RS-232	Variable Baud rate, 9600 Baud maximum. 9-pin D-connector.
IEEE-488	Conforming with IEEE488.1 and IEEE488.2

General

Display	20 character x 4 row alphanumeric LCD
Data entry	Keyboard selection of mode, waveform etc.; value entry direct by numeric keys or by rotary control.
Stored settings	Up to 9 complete instrument set-ups may be stored and recalled from battery-backed memory.
Size	3U (130 mm) height; half-rack (212 mm) width, 330 mm long
Weight	4.1 kg (9 lb)
Power	100 V ac, 110 to 120 V ac or 220 to 240 V ac +/– 10 %, 50/60 Hz ac by internal adjustment; 30 VA max.
Operating range	+5 °C to 40 °C, 20 to 80 % RH
Storage range	–20 °C to +60 °C
Options	IEEE-488 interface; 19-in rack mounting kit

Ordering Information

Models

271 10 MHz DDS Function Generator with Serial Cable

Options and Accessories

Y2801 271 Rackmount Kit