RIGOL

Data Sheet

DG1000 Series Dual-Channel Function/Arbitrary Waveform Generator

Product Overview

DG1000 series Dual-Channel Function/Arbitrary Waveform Generators adopt Direct Digital Synthesis (DDS) technology, which enables to generate stable, high-precision, pure and low distortion signals.

Applications

- Analog Sensor
- Practical Environment Signals
- Circuit Function Test
- IC Chip Test

Easy to Use Design

- A variety of display modes
- Clear graphical interface
- Provide Chinese and English menu and input
- Built-in help system makes help information acquistion more convenient.
- File management (store file in USB flash storage device or the internal memory)

Main Features

- Adopt advanced DDS technology; dual channel output; 100 MSa/s sampling rate; 14 bits vertical resolution
- Output 5 standard waveforms; built-in 48 arbitrary waveforms
- Abundant modulation functions: AM, FM, PM and FSK
- Provide linear/logarithm sweep and burst
- Abundant output and input interfaces: waveform output; synchronous signal output, external modulation source, external clock reference (10 MHz) input, external trigger input
- Channel coupling and channel copy
- Built-in high precision and wide band counter, the measurement range: 100 mHz to 200 MHz (single channel)
- Standard configuration interfaces: USB Device & USB Host
- Seamlessly interconnect with DS1000 series digital oscilloscope
- Powerful arbitrary waveform editing software (UltraWave)
- Support remote control by commands

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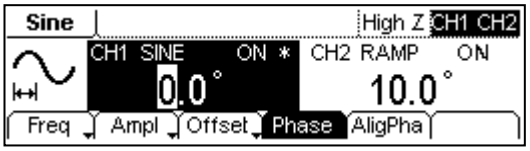
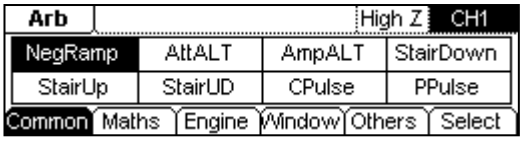
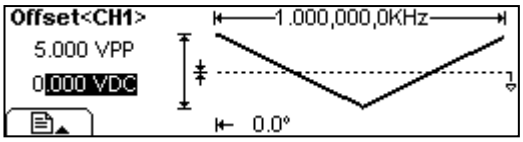
RIGOL TECHNOLOGIES, INC.

➢ Dual-channel Output, Built-in and Editable Arb Waveform







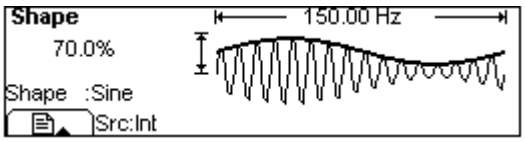
Dual Channel Output: Separately setup the wavefrom and parameter as well as the output state of two channels. The phases from two channels could be synchronous while outputting based on the "**AligPha**" function from operation menu.

Built-in Waveform Output: The instrument has 48 built-in arbitrary waveforms (contains DC) which including common, math, engineering, window function and other common waveforms.

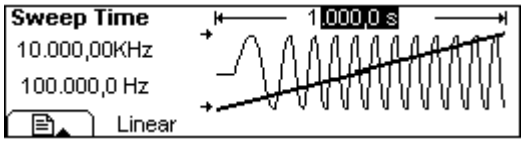
Editable Arb Waveform: Enable to edit and output an arbitrary waveform with 14bits, 4kpts. In addition, the instrument provides 10 nonvolatile memories for storing custom arbitrary waveforms. According to Ultrawave, more waveforms could be edited and saved.

➢ Abundant Modulation Functions, Sweep, Burst

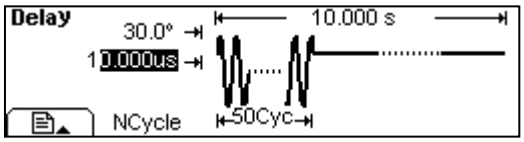
Abundant Modulation Functions: Support AM, FM, PM and FSK, the modulated waveforms are intuitively shown on the screen. It can be used in Education & Training area proverbially.



Sweep: It can generate "sweep" from the start frequency to the stop frequency during appointed sweep time (1 ms to 500 s) you specify. Sweeping can be generated by Sine, Square, Ramp or Arbitrary waveform.



Burst: It can generate pulse sequence for a variety of waveform function, and the waveform could continuously cycle within specific time or apply external gating signal.

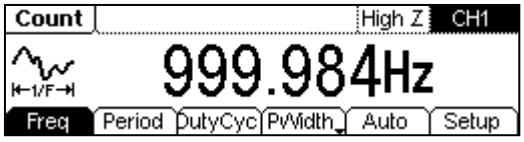


➢ Channel Coupling and Copy

Channel Coupling: Once you setup the base channel and the Frequency/Phase deviation of the two channels, the Frequency/Phase of the other one will vary with the base channel and will still keep the deviation you have selected.

Channel Copy: According to this function, the parameters from one channel could be copied to another channel with no change of the waveform shape.

➢ Built-in Frequency Counter

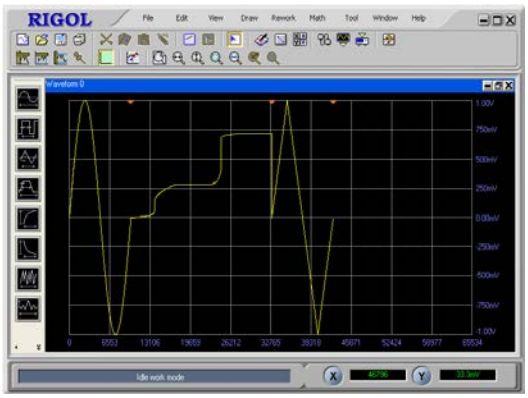


The counter coulde be used to measure these parameters: frequency, period, duty cycle, positive pulse width and negative pulse width within the range of 100 mHz to 200 MHz.
Two modes of counter are available:

Auto mode: The coupling mode, sensitivity, trigger level and the switch of high frequency reject could be set automatically.

Manual mode: DC/AC, sensitivity (low, mid, high), trigger level, the switch of high frequency reject could be set manually.

➢ Powerful Waveform Editing Software "UltraWave"



In order to meet the most basic needs of users, UltraWave provides 9 standard waveforms: Sine, Square, Ramp, Pulse, ExpRise, ExpFall, Sinc, Noise and DC. In addition, hand drawing, line (point by point) drawing and arbitrary points drawing are also offered to make it easier to create complex waveforms and to edit multiple waves simultaneously through the multi-file management interface.

- Windows operation: enable to perform math operations such as"＋"、"－"、"×" for the waves in two windows.
- Absolute operation: enable to perform absolute operation for the selected waves.
- Filter: enable to perform low pass filtering or smoothing for the whole wave.

Either, UltraWave has following utilitarian functions:

- Save the arbitrary wave that has been created as the format of .txt (text file), .csv (CSV file) and .rdf (arbitrary waveform file).
- Read the wave files stored as the format of .Wfm from DS series Digital Oscilloscope.
- Print wavefroms.
- Download the waves have heen created to the internal storage of DG1000.

Specifications

All the specifications below apply to DG1000 series Dual-Channel Function/ Arbitrary Waveform Generator unless where noted. To come up to these specifications, two conditions must be met firstly:

- The instrument must have been operated continuously for 30 minutes under the specified operating temperature (18°C to 28°C).
- Variation of the operating temperature should be within 5 °C.

Note: All specifications are guaranteed unless where marked "typical".

Specifications

Frequency		
Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb	
	DG1022	**DG1022A**
Sine	1 μHz to 20 MHz	1μHz to 25MHz
Square	1 μHz to 5 MHz	1μHz to 5MHz
Pulse	500 μHz to 3 MHz	500μHz to 5MHz
Ramp/Triangle	1 μHz to 150 kHz	1μHz to 500kHz
White Noise	5 MHz bandwidth (-3 dB)	5MHz bandwidth (-3dB)
Arb.	1 μHz to 5 MHz	1μHz to 5MHz
Resolution	1 μHz	
Accuracy	±50 ppm in 90 days ±100 ppm in 1 year 18°C to 28°C	
Temperature Coefficient	< 5 ppm/°C	

Sine Waveform Spectrum Purity				
Harmonic Distortion	**CH1**		**CH2**	
	≤1 Vpp	>1 Vpp	≤1 Vpp	>1 Vpp
DC-1 MHz	-45 dBc	-45 dBc	-45 dBc	-45 dBc
1 MHz - 5 MHz	-45 dBc	-40 dBc	-45 dBc	-40 dBc
5 MHz - 25 MHz	-45 dBc	-35 dBc	-45 dBc	-35 dBc
Total Harmonic Distortion	DC to 20 kHz, 1 Vpp <0.2%			
Spurious Signal (non-harmonic)	DC to 1 MHz < -70 dBc 1 MHz to 10 MHz < -70 dBc + 6 dB/octave			
Phase Noise	10kHz Offset, –108 dBc / Hz (typical)			
Square				
Rise/Fall Time	< 20 ns (10% to 90%), (typical, 1 kHz, 1 Vpp)			
Overshoot	< 7.5% (Typical, 1 kHz, 1 Vpp)			
Duty Cycle	1 µHz to 3 MHz: 20% to 80%			
	3 MHz (not contain) to 4 MHz: 40% to 60%			
	4 MHz (not contain) to 5 MHz: 50%			
Asymmetry (below 50% Duty Cycle)	1% of period + 20 ns (typical, 1 kHz, 1 Vpp)			
Jitter	6 ns + 0.1% of period (typical, 1 kHz, 1 Vpp)			
Ramp				
Linearity	< 0.1% of peak output (typical, 1 kHz, 1 Vpp, 100% Symmetry)			
Symmetry	0% to 100%			
Pulse				
Pulse Width	2000 s max period; 20 ns min period; 1 ns resolution			
Overshoot	< 7.5%			
Jitter	6 ns + 100 ppm of period			
Arb	**CH1**		**CH2**	
Waveform Length	4k points		1k points	
Vertical Resolution	14 bits (including sign)		14 bits (including sign)	
Sampling Rate	100 MSa/s		100 MSa/s	
Minimum Rising /Falling Time	35 ns (Typical)		35 ns (typical)	
Jitter (RMS)	6 ns + 30 ppm (typical)		6 ns + 30 ppm (typical)	
Nonvolatile Storage (Total:10 Waveforms)	10 waveforms		10 waveforms	
Output Characteristics	**DG1022**		**DG1022A**	
Amplitude (50 Ω)	CH1	CH2	CH1	CH2
	2 mVpp to 10 Vpp	2 mVpp to 3 Vpp	⩽20MHz: 2 mVpp to 10 Vpp; >20MHz: 2 mVpp to 5 Vpp;	2 mVpp to 3 Vpp
Accuracy (1 kHz Sine) [1]	±(2% of setting +2 mVpp)			
Amplitude Flatness (relative to 1 kHz, 5 Vpp Sine wave) [1]	<100 kHz: 0.1 dB		<100 kHz: 0.1 dB	
	100 kHz to 5 MHz: 0.15 dB		100 kHz to 5 MHz: 0.15 dB	
	5 MHz to 20 MHz: 0.3 dB		5 MHz to 25 MHz: 0.3 dB	
DC Offset	**CH1**		**CH2**	

Range (DC)	5 V (50 Ω) 10 V (High Z)	1.5 V (50 Ω) 3 V (High Z)
Offset Accuracy	±(2% of the |Offset Setting| + 2 mV)	
Waveform Output	**CH1**	**CH2**
Impedance	50 Ω (typical)	50 Ω (typical)
Protection [2]	Short-circuit protected, overload relay automatically disables main output	Short-circuit protected
AM (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulation Waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2 mHz to 20 kHz)	
Depth	0% to 120%	
FM (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulation Waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2 mHz to 20 kHz)	
Frequency Deviation	DC to 10 MHz	
PM (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulation waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2 mHz to 20 kHz)	
Phase Deviation	0 to 360°	
FSK (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulating Waveforms	square (2 mHz to 50 kHz) with 50% duty cycle	
Sweep (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Type	Linear or Logarithmic	
Direction	Up or Down	
Sweep Time	1 ms to 500 s ± 0.1%	
Trigger Source	Internal/External/Manual	
Burst (CH1)		
Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb (except DC)	
Types	Count (1 to 50,000 periods), infinite, gated	
Start Phase	-180° to +180°	
Internal Period	1 µs to 500 s ± 1%	
Gate Source	External Trigger	
Trigger Source	Internal/External/Manual	
Rear Panel Connector[3]		
External Modulation	± 5 Vpk = 100% modulation 10 kΩ input impedance	
External Trigger	TTL compatible	
Trigger Input		

Input Level	TTL compatible		
Slope	Rising or falling (selectable)		
Pulse Width	> 100 ns		
Input Impedance	> 10 kΩ, DC coupled		
Latency	Sweep: < 500 µs (typical)		
	Burst: < 500 ns (typical)		
Trigger Output			
Electrical Level	TTL compatible		
Pulse Width	> 400 ns (typical)		
Output Impedance	50 Ω (typical)		
Maximum Rate	1 MHz		
Sync Output (CH1)			
Electrical Level	TTL compatible		
Pulse Width	> 50 ns (typical)		
Output Impedance	50 Ω (typical)		
Maximum Frequency	2 MHz		
External Reference Input			
Lock Range	10 MHz ± 50 Hz		
Level	1.5 Vpp to 5 Vpp		
Lock Time	<2 s		
Input Impedance (Typical)	1 kΩ, AC Coupling		
Counter Specification			
Function	Frequency, period, positive/negative Pulse width, Duty cycle		
Frequency Range	Single channel: 100 mHz to 200 MHz		
Frequency Resolution	6 digits/second		
Voltage Range and Sensitivity (non-modulation signal)			
Auto mode	1 Hz to 200 MHz		200 mVpp to 5 Vpp
Manual mode	DC coupled	DC offset range	±1.5 VDC
		100 mHz to 100 MHz	20 mVRMS to ±5 Vac+dc
		100 MHz to 200 MHz	40 mVRMS to ±5 Vac+dc
	AC coupled	1 Hz to 100 MHz	50 mVpp to ±5 Vpp
		100 MHz to 200 MHz	100 mVpp to ±5 Vpp
Pulse width and Duty cycle Measure	1 Hz to 10 MHz (100 mVpp to 10 Vpp)		
Input adjust	Input impedance	1 MΩ	
	Coupling mode	AC, DC	
	High frequency restrain	High frequency noise restrain (HFR) On or Off	
	Sensitivity	Low, Medium, High	
Trigger mode	The trigger level can adjust manually or automatically.		
	Trigger level range: ±3 V (0.1% to 100%)		
	Resolution: 6 mV		

Remark:

[1] In atypical condition, the specification may have minor differences.

[2] In normal temperature, short circuit in less than half hour will be tolerable.

- CH1 is provided with **Overvoltage** function. When the output terminal is connected to an external circuit, the relationships between the output voltage "Vout" of generator and the voltage "Vin" possibly generated by external circuit are:

  If Vout≤1V_{DC}, the protective range of Vin is ±3V

  If Vout>1V_{DC}, the protective range of Vin is ±12.5V

Therein, Vout=Amplitude/2+|Offset|, the Amplitude and Offset are the parameters of the signal outputted from generator.

The generator will turn off the output automatically when Vin exceeds the specified range.

- The voltage inputted to the output connector of CH2 should be within ±3V.

[3] External input voltage should be within ±5V, or else the generator may be damaged.

General Specifications

Display		
Display Type		Black and White LCD Screen
Display Resolution		256 Horizontal x 64 Vertical
Grey Degree		4 Level Grey
Display Contrast (typical)		150 : 1
Backlight Brightness (typical)		300 nit
Power Supply		
Supply Voltage		100 to 240 VAC_{RMS}, 45 to 440 Hz, CAT II
Power Consumption		Less than 40 W
Fuse		2 A, T Level, 250 V
Environment		
Ambient Temperature		Operation: 10℃ to +40℃
		Non-operation: -20℃ to +60℃
Cooling Method		Natural cooling
Humidity Range		Below +35℃: ≤90% relative humidity
		+35℃to+40℃: ≤60%relative humidity
Height above sea level		Operation: below 3,000m
		Non-operation: below 15,000m
Mechanism		
Dimension	Width	232 mm
	Height	108 mm
	Depth	288 mm
Weight	Net Weight	2.65 kg
	Gross Weight	4 kg
IP Protection		
IP2X		
Calibration Interval		
One year suggested		

Ordering Information

Name of Product

RIGOL DG1000 series Dual-Channel Function/Arbitrary Waveform Generator

Standard Accessories

- A Power Cord that fits the standard of destination country
- A CD (including User's Guide and application software)
- A Quick Guide
- A BNC Cable

Optional Accessories

- BNC to Alligator Clip Cable
- USB Cable
- 40dB Attenuator
- Power Amplifier

Warranty

Thank you for choosing **RIGOL** products!

RIGOL warrants that the product mainframe and product accessories will be free from defects in materials and workmanship within the warranty period.

If a product proves defective within the respective period, **RIGOL** guarantees free replacement or repair of any defective products within a reasonable period of time. To get repair service, please contact with your nearest **RIGOL** sales or service office.

There is no other warranty, expressed or implied, except such as is expressly set forth herein or other applicable warranty card. There is no implied warranty of merchantability or fitness for a particular purpose. Under no circumstances shall **RIGOL** be liable for any consequential, indirect, ensuing or special damages for any breach of warranty in any case.

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