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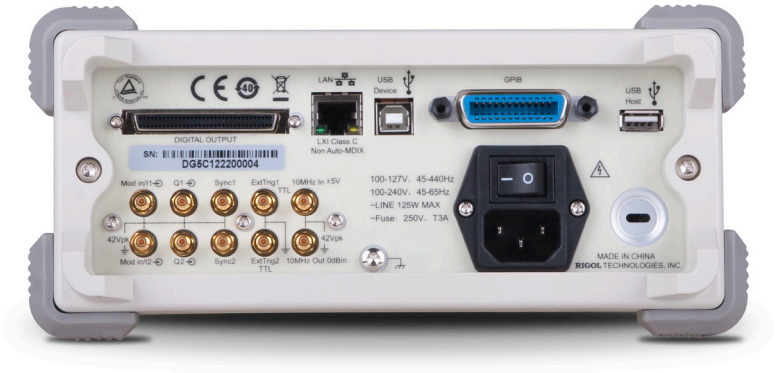
RIGOL

DG5000 series Waveform Generators

DG5000 is a multifunctional generator that combines many functions in one, including Function Generator, Arbitrary Waveform Generator, IQ Baseband Source/IQ IF Source, Frequency Hopping Source (optional) and Pattern Generator (optional). It provides single and dual-channel models. The dual-channel model, with two channels having complete equivalent functions and precisely adjustable phase deviation between the two channels, is a real dual-channel signal generator.

DG5000, adopting the Direct Digital Synthesizer (DDS) technology, can provide stable, precise, pure and low distortion signal. The user-friendly interface design and panel layout bring users exceptional experience. Besides, the remote control of the generator can be easily done through different standard configuration interfaces, which provides more solutions for users.

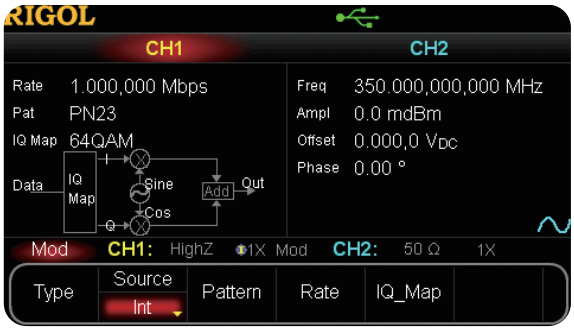
DG5000 series Waveform Generators



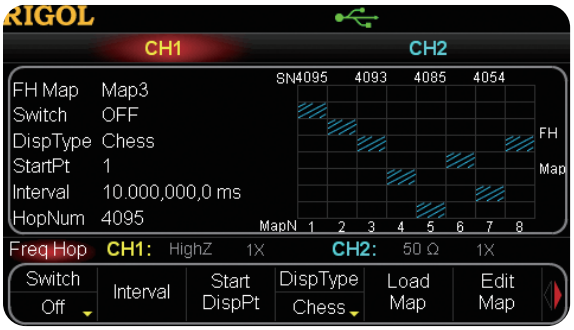
Features and Benefits

- 4.3 inches, 16M true color TFT LCD.
- 350 MHz, 250 MHz, or 100 MHz or 70 MHz maximum sine output frequency, 1 GSa/s sample rate, 14 bits resolution.
- Single/dual-channel models. The dual-channel model supports frequency and phase coupling.
- The 16+2 channels digital output module (optional) together with the analog channel can rebuild the more mixed signals in daily practice.
- Support an external power amplifier (optional) that can be configured online.
- Support frequency hopping(optional) with hopping interval up to 80 ns and arbitrary editing frequency hopping patterns.
- 14 standard waveform functions: Sine,Square,Ramp,Pules,Noise,Sinc,Exponential Rise,Exponential Fall,ECG,Gauss,Haversune, Lorentz,Dual Tones and DC.
- Rise/Fall Time of the Pulse could be adjusted separately.
- Enable to edit arbitrary waveform up to 512 kpts and output arbitrary waveforms up to 128 Mpts.
- Support AM,FM,PM,ASK,FSK,PSK and PWM modulations.
- Support user-defined IQ vector signal modulation and IQ baseband/IF source output.
- Support Frequency Sweep and Burst output.
- Abundant I/O: waveform output, synchronous signal output, modulation input, 10 MHz clock input/output, trigger input/output.
- Enable to store and recall waveform data and instrument state, and support versatile file types. Standard configuration with 1 GBytes flash memory.
- Plenty of standard interfaces: double USB Hosts, USB Device, LAN, and GPIB (IEEE-488.2).
- Seamlessly interconnected with RIGOL USB-TMC digital oscilloscopes for loading and reappearing waveforms.
- Support USB flash device storage for FAT files.
- Support PictBridge printer.
- Provide security lock hole.
- Support remote control through 10/100M Ethernet web.
- Conform to LXI-C instrument standards (Version 1.2).
- Provide Chinese and English built-in help and input methods.
- Provide powerful waveform editing PC software.

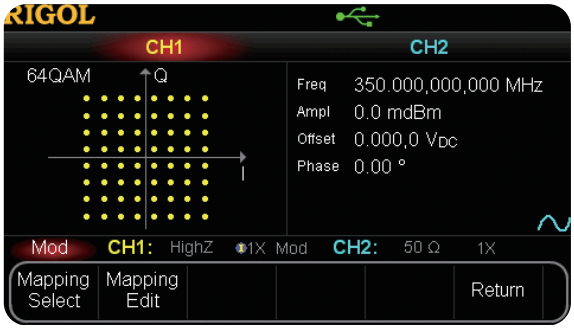
Advanced functions



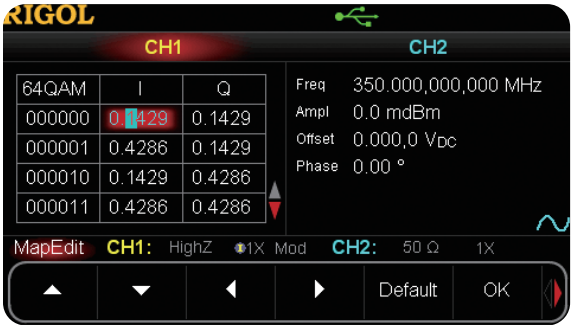
IQ Modulation



Frequency Hopping



IQ Mapping Selection



IQ Mapping Edit

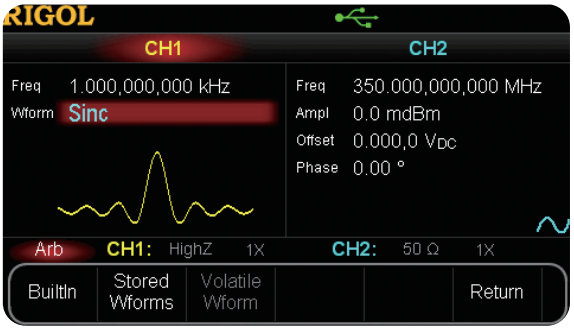
AM

PWM

FSK

Burst

Sweep



ARB

Specification

All the specifications can be guaranteed if the following two conditions are met unless where noted.

- The generator is within the calibration and has performed self-calibration.
- The generator has been working continuously for 30 minutes at specified temperature (18°C ~ 28°C).

All the specifications are guaranteed unless those marked with "typical".

Model	DG5352 DG5351	DG5252 DG5251	DG5102 DG5101	DG5072 DG5071
Channel	2/1	2/1	2/1	2/1
Maximum Frequency	350 MHz	250 MHz	100 MHz	70 MHz
Sample Rate	1 GSa/s			
Waveforms				
Standard Waveforms	Sine, Square, Ramp, Pulse, Noise			
Arbitrary Waveforms	Sinc, Exponential Rise, Exponential Fall, ECG, Gauss, HaverSine, Lorentz, Dual-Tone, DC			

Frequency Characteristics				
Sine	1 μHz to 350 MHz	1 μHz to 250 MHz	1 μHz to 100 MHz	1 μHz to 70 MHz
Square	1 μHz to 120 MHz	1 μHz to 120 MHz	1 μHz to 100 MHz	1 μHz to 70 MHz
Ramp	1 μHz to 5 MHz	1 μHz to 5 MHz	1 μHz to 3 MHz	1 μHz to 3 MHz
Pulse	1 μHz to 50 MHz	1 μHz to 50 MHz	1 μHz to 50 MHz	1 μHz to 50 MHz
Noise	250 MHz Bandwidth			
Arb	1 μHz to 50 MHz	1 μHz to 50 MHz	1 μHz to 50 MHz	1 μHz to 50 MHz
Resolution	1 μHz			
Accuracy	±1 ppm, 18 °C to 28 °C			

Sine Wave Spectrum Purity				
Harmonic Distortion	Typical (0 dBm) ≤100MHz: <-45dBc >100MHz: <-35dBc	Typical (0 dBm) ≤100MHz: <-45dBc >100MHz: <-35dBc	Typical (0 dBm) ≤100MHz: <-45dBc	Typical (0 dBm) ≤ 70MHz: <-45dBc
Total Harmonic Distortion	<0.5% (10 Hz to 20 kHz, 0 dBm)			
Spurious (non-harmonic)	Typical (0 dBm) ≤100MHz: <-50dBc >100MHz: -50dBc+6dBc/octave	Typical (0 dBm) ≤100MHz: <-50dBc >100MHz: -50dBc+6dBc/octave	Typical (0 dBm) ≤ 100MHz: <-50dBc	ypical (0 dBm) ≤ 70MHz: <-50dBc
Phase Noise	Typical (0 dBm, 10 kHz deviation) 10 MHz: <-110 dBc			

Signal Characteristics				
Square				
Rise/Fall Time	Typical Value (1Vpp) < 2.5 ns	Typical Value (1Vpp) < 2.5 ns	Typical Value (1Vpp) < 3 ns	Typical Value (1Vpp) <4 ns
Overshoot	Typical Value (1Vpp) < 5%			
Duty Cycle	≤ 10 MHz: 20.0% to 80.0% 10 MHz to 40 MHz: 40.0% to 60.0% > 40 MHz: 50.0% (fixed)			
Non-symmetry	1% of period + 5 ns			
Jitter (rms)	Typical Value (1Vpp) ≤ 30 MHz: 10ppm+500 ps > 30 MHz: 500 ps			

Ramp				
Linearity	≤ 0.5% of peak output			
Symmetry	0% to 100%			
Pulse				
Period	20 ns to 1000000 s			
Pulse Width	4 ns to 1000000 s			
Leading/Trailing Edge Time	2.5 ns to 1 ms	2.5 ns to 1 ms	3 ns to 1 ms	4 ns to 1 ms
Overshoot	<5%			
Jitter (rms)	Typical Value (1Vpp)			
	10 ppm+500 ps			

Arb	
Waveform Length	Normal Mode: 2 to 16Mpts
	Play Mode : 2 to 128Mpts
Vertical Resolution	14 bits
Mode	Normal Mode, Play Mode
Sample Rate	Normal Mode (Waveform Length is from 2 to 16Mpts): 1G Sa/s (fixed)
	Play Mode (Waveform Length is from 2 to 128Mpts): ≤1G Sa/s (variable)
Minimum Rise/Fall Time	Typical Value (1Vpp)
	≤3 ns
Jitter (rms)	3 ns
Interpolation Method	Close, Linear, Sinc
Edit Method	Edit Point, Edit Block
Non-Volatile Memory	1G Bytes

Output Characteristics				
Amplitude (into 50 Ω)				
Range	≤ 100 MHz: 5 mVpp to 10 Vpp	≤100MHz: 5mVpp to 10Vpp	5mVpp to 10Vpp	5mVpp to 10Vpp
	≤ 300 MHz: 5 mVpp to 5 Vpp	≤250MHz: 5mVpp to 5Vpp		
	≤ 350 MHz: 5 mVpp to 2 Vpp			
Accuracy	Typical (1 kHz Sine, 0 V Deviation, >10 mVpp, Auto)			
	± 1% of setting ± 1 mVpp			
Amplitude	<10MHz: ±0.1dB	10MHz: ±0.1dB	<10MHz: ±0.1dB	<10MHz: ±0.1dB
Flatness	10MHz to 60MHz: ±0.2dB	10MHz to 60MHz: ±0.2dB	10MHz to 60MHz: ±0.2dB	10MHz to 60MHz: ±0.2dB
(relative to 100	60MHz to 100MHz: ±0.4dB	60MHz to 100MHz: ±0.4dB	60MHz to 100MHz: ±0.4dB	60MHz to 70MHz: ±0.4dB
kHz, 1.25Vpp Sine	100MHz to 250MHz: ±1.0dB	100MHz to 250MHz: ±1.0dB		
wave,	>250MHz: ±1.5dB			
50Ω)				
Units	Vpp, Vrms, dBm, High Level, Low Level			
Resolution	0.1 mV or 4 digits			

Offset (into 50 Ω)	
Range	±5 Vpk ac + dc
Accuracy	1% of setting + 5mV + 0.5% of amplitude
Waveform Output	
Impedance	50 Ω (typical)
Isolation	42 Vpk max. to Earth
Protection	Over-temperature protected, Short-circuit protected, Overload relay automatically disables main output

FH Characteristic				
FH Bandwidth	1.5 MHz to 250 MHz	1.5 MHz to 250 MHz	1.5 MHz to 100 MHz	1.5 MHz to 70 MHz
FH Rate	1 Hop/s to 12.5M Hop/s			
Frequency Point Numbers	4096			
Sequence Length	4096			

Modulation Characteristics	
Modulation Types	AM、FM、PM、ASK、FSK、PSK、PWM、IQ

AM	
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)
Source	Internal/External
Modulating Waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz)
Depth	0% to 120%

FM	
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)
Source	Internal/External
Modulating Waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz)

PM	
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)
Source	Internal/External
Modulating Waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz)
Phase Deviation	0° to 360°

ASK	
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)
Source	Internal/External
Modulating Waveforms	Square with 50% duty cycle (2 mHz to 1 MHz)

FSK	
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)
Source	Internal/External
Modulating Waveforms	Square with 50% duty cycle (2 mHz to 1 MHz)

PSK	
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)
Source	Internal/External
Modulating Waveforms	Square with 50% duty cycle (2 mHz to 1 MHz)

PWM	
Carrier Waveform	Pulse
Source	Internal/External
Modulating Waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz)
Width Deviation	0% to 100% of Pulse Width

IQ				
Carrier Waveform	Sine (max. 200 MHz)	Sine (max. 200 MHz)	Sine (max. 100 MHz)	Sine (max. 70 MHz)
Source	Internal/External			
Code Pattern	PN Sequence, 4 bits code pattern, User			
IQ Mapping	4QAM, 8QAM, 16QAM, 32QAM, 64QAM, BPSK, QPSK, OQPSK, 8PSK, 16PSK, User			
Code Rate	1 bps to 1 M bps			

Burst Characteristics				
Carrier Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb (except DC)			
Carrier Frequency	1 μHz to 120 MHz	1 μHz to 120	1 μHz to 100 MHz	1 μHz to 70 MHz
Burst Count	1 to 1 000 000 or Infinite			
Start/Stop Phase	0° to 360°			
Internal Period	1 μs to 500 s			
Gated Source	External Trigger			
Trigger Source	Internal, External or Manual			
Trigger Delay	0 ns to 85 s			

Sweep Characteristics				
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)			
Type	Linear, Log or Step			
Direction	Up or Down			
Start/Stop Frequency	1 μHz to 250 MHz	1 μHz to 250 MHz	1 μHz to 100 MHz	1 μHz to 70 MHz
Sweep Time	1 ms to 300 s			
Hold/Return Time	0 ms to 300 s			
Trigger Source	Internal, External or Manual			
Marker	Falling edge of Sync signal (programmable)			

Programming Time			
Configuration Times (typical)			
	USB2.0	LAN	GPIB
Function Change	500ms	510ms	510ms
Frequency Change	50ms	50ms	50ms
Amplitude Change	300ms	310ms	310ms
Select User Arb	500ms	510ms	510ms
Arb Download Times (binary transfer)			
1 Mpts/s			
Note: Download times do not include setup or output time.			

Trigger Characteristics	
Trigger Input	
Level	TTL-compatible
Slope	Rising or falling (selectable)
Pulse Width	> 50 ns
Latency	Sweep: <100 ns (typical)
	Burst: <300 ns (typical)

Trigger Output	
Level	TTL-compatible
Pulse Width	> 60 ns (typical)
Maximum Rate	1MHz

Clock Reference	
Phase Offset	
Range	0° to 360°
Resolution	0.001°(arb waveform),
	0.03° (other waveforms)

External Reference Input	
Lock Range	10 MHz ± 50 Hz
Level	80 mVpp to 10 Vpp
Lock Time	< 2 s
Internal Reference Output	
Frequency	10 MHz
Level	632 mVpp (0 dBm), nominal value
Sync Output	
Level	TTL-compatible
Impedance	50 Ω, nominal value

General Specifications

Power	
Power Voltage	100-127 V, 45-440Hz
	100-240 V, 45-65Hz
Power Consumption	Less than 125 W
Fuse	250V, T3A
Display	
Type	4.3-inch TFT LCD
Resolution	480 Horizontal × RGB × 272 Vertical Resolution
Color	16 M color
Environment	
Temperature Range	Operating: 10℃ to 40℃
	Non-Operating: -20℃ to 60℃
Cooling Method	Cooling by fans compulsively
Humidity Range	Less than 35℃: ≤90% Relative Humidity (RH)
	35℃ to 40℃: ≤60% Relative Humidity (RH)
Altitude	Operating: Less than 3000 meters
	Non-Operating: Less than 15000 meters
Mechanical	
Dimensions (W×H×D)	230 mm ×106 mm×501 mm
Weight	with no package: 4.3 kg
	with package: 5.84 kg
Interfaces	USB Host (2), USB Device, GPIB, LAN
IP Protection	IP2X
Calibration Interval	Recommend 1 year for standard interval

Ordering Information

	Description	Order Number
Model	DG5352 (350 MHz, dual-channel)	DG5352
	DG5351 (350 MHz, single channel)	DG5351
	DG5252 (250 MHz, dual-channel)	DG5252
	DG5251 (250 MHz, single channel)	DG5251
	DG5102 (100 MHz, dual-channel)	DG5102
	DG5101 (100 MHz, single channel)	DG5101
	DG5072 (70MHz, dual-channel)	DG5072
	DG5071 (70MHz, single-channel)	DG5071
Standard Accessories	Power Cord	-
	USB Cable	CB-USB
	BNC Cable (1 meter)	CB-BNC-BNC-1
	Quick Guide (Hard Copy)	-
	Resource CD (including User's Guide and Application Software)	-
	SMB(F) to BNC(M) Cable (1 meter)	CB-SMB(F)-BNC(M)-1
Options	Frequency Hopping Module	DG5-FH
	Logic Signal Output Module	DG-POD-A
	Power Amplifier	PA1011
Optional Accessories	SMB(F) to SMB(F) Cable (1 meter)	CB-SMB(F)-SMB(F)-1
	SMB(F) to BNC(F) Cable (1 meter)	CB-SMB(F)-BNC(F)-1
	40 dB Attenuator	ATT-40dB
	Rack Mount Kit	RMK-DG-5

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