AFG-3081/3051

Arbitrary Function Generator

FEATURES

- Wide Frequency Range from 1μHz ~ 80/50MHz
- 1μHz Frequency Resolution throughout Full Range
- Standard Waveform : Sine, Square, Triangle, Ramp, Pulse, Noise
- Built-in AM, FM, PWM, FSK, Sweep, Burst Functions
- 16bit, 200MSa/s, 1M-Point Deep Arbitrary Waveform
- DWR (Direct Waveform Reconstruction) Capability
- Arbitrary Waveform Editing PC Software
- 4.3" High Resolution LCD Display
- USB, RS-232, GPIB Standard Interfaces

GW INSTEK
Simply Reliable

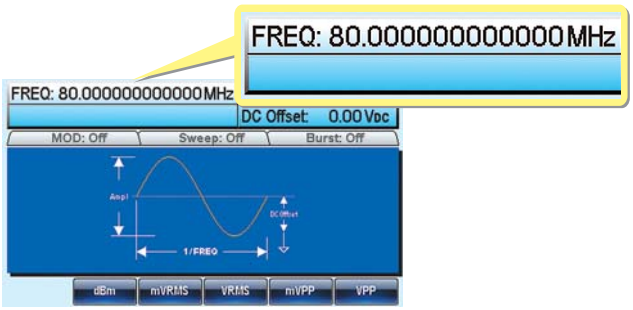
Fulfilling Your Diversified Waveform Needs

The AFG-3000 Series is an Arbitrary Waveform and Digital-Synthesized Function Generator designed for industrial, scientific research and educational applications. The series comes with a bandwidth of 80MHz for AFG-3081 and 50MHz for AFG-3051. The AFG-3000 Series, featuring 200MSa/s sampling rate, 16-bits vertical resolution and 1M points waveform length, is a very useful and flexible signal source to meet diversified application needs in the market today.

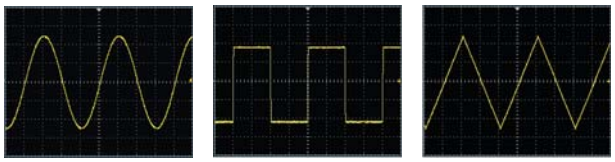
The user-friendly operation, the On-Screen Help, and the multiple ways of arbitrary waveform editing make AFG-3000 just a plug-and-play equipment. The point by point waveform data entry or standard waveform clip piling through front panel operation, the CSV file waveform data download, the direct waveform reconstruction through DSO waveform data import, and the PC software edited waveform download are the 4 ways available for arbitrary waveform editing.

A 4.3-inch high resolution TFT LCD in the AFG-3000 front panel is used to display waveform and set parameters. The large and high-resolution screen is especially useful when the arbitrary waveform construction is done through front panel operation. The impedance of AFG-3000 can be selected between 50 Ohm and Hi-Z to ensure right impedance compatibility between AFG and DUT.

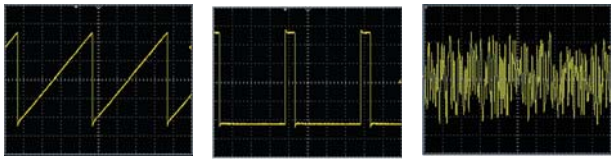
A. WIDE FREQUENCY RANGE FROM 1μHz to 80/50MHz



The Minimum 1μHz Resolution



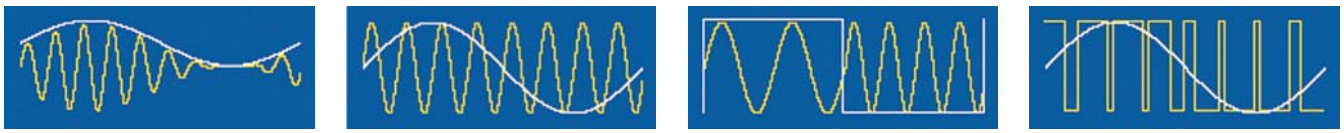
Sine **Square** **Triangle**



Ramp **Pulse** **Noise**

The AFG-3000 Series arbitrary waveform/ function generator employs direct digital synthesis (DDS) technology to generate and output a variety of stable and precise waveforms. The frequency operates at up to 80MHz (AFG-3081) or 50MHz (AFG-3051), with a minimum resolution of 1μHz for the entire frequency range. The built-in standard waveforms include sine, square, triangle, ramp, pulse, noise and other types of waveforms.

B. MODULATION, SWEEP and BURST FUNCTIONS



AM **FM** **FSK** **PWM**

Sweep **Burst**

PWM to Control & Test the Motor Speed

The Modulation functions, including AM, FM, FSK and PWM, are provided to cover a broad range of market requirements. A dedicated terminal for the modulating signal output is available in the front panel for modulation monitoring or other control purposes. Either an internal signal or an external signal can be selected to perform the modulation.

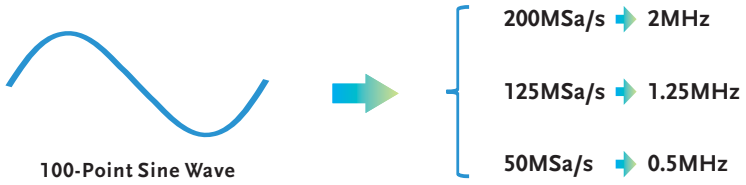
FSK is a frequency modulation scheme in which digital information is transmitted through signal frequency variation. The BFSK (binary FSK) modulation, using two frequencies to represent data 1 and 0 respectively, is commonly applied for Call ID and Remote Metering applications.

PWM is a digital modulation scheme that can be used to adjust the output power level by controlling the pulse width of the driving signal. The examples include the speed control of motor rotation and the luminance control of LED lighting instrument. With the pulse width variation of driving signal, the rotating speed of motor and the luminance of LED will change accordingly.

The Sweep function supports three trigger modes of INT, EXT and manual, and two sweep modes of LOG and LIN. Each time a sweep signal is perceived, the function generator will start to sweep through the user-defined frequency range by the frequency variation of either Log curve or Linear curve.

The Burst function supports two modes of Gate and N Cycle. To run burst function, the burst repetitive rate has to be set first, then the time duration of each burst has to be defined under Gate mode, or the number of the waveform cycles in each burst has to be set under N Cycle mode. Under both Gate mode and N Cycle mode, the burst waveform polarity and phase can be controlled.

C. HIGH 200MSa/s SAMPLING RATE



High Sampling Rates Achieve Higher Frequency Ranges

The profile of arbitrary waveform is composed of a series of data. The frequency of arbitrary waveform is derived from sampling rate divided by the number of points constructing a complete waveform, i.e. frequency = sampling rate / the number of points in a waveform. Based on the above, the higher the sampling rate, the higher the arbitrary waveform frequency can be available.

A Sine waveform composed of 100 points waveform data is able to have a 2MHz frequency with 200MSa/s sampling rate, but can only have 1.25MHz frequency with 125Msa/s sampling rate and 0.5MHz frequency with 50M sampling rate. AFG-3000, possessing a sampling rate of 200Msa/s, is able to generate a waveform up to 100MHz for a simple waveform composed of 2 points of data.

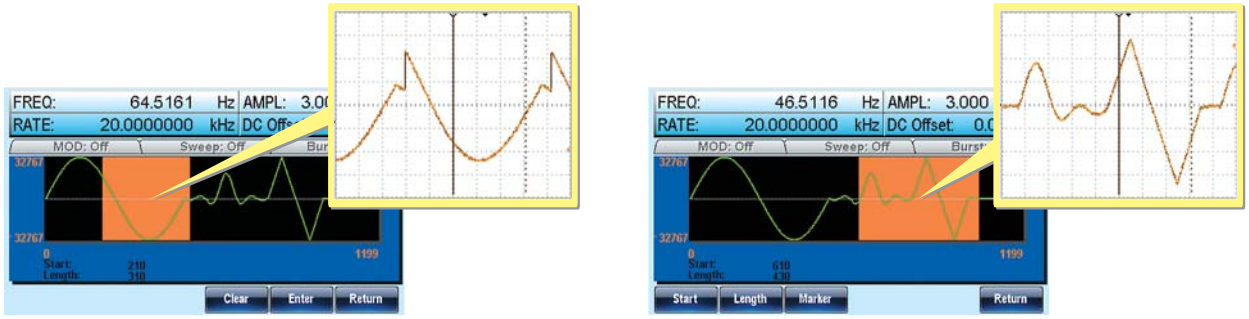
D. 16-BIT AMPLITUDE RESOLUTION

16-bit Allows Greater Details

The 16-bit amplitude resolution can display smooth waveforms, while a lower bit resolution will display jagged or less smooth waveforms.

For example, if 10V is divided into 10,000 equal parts, each part would have a resolution of 1mV. When using a 16 bits resolution, the smallest possible bit resolution is 0.15mV (from 10V). With 16 bits resolution, the 10,000 parts will appear to be a smooth straight line, while the bit resolution of 12 bits would be 2.4mV, greater than the 1mV needed. In this case the straight line would appear like a ladder.

E. OUTPUT FROM ANY SECTION OF 1M-POINT-LONG WAVEFORMS



Arbitrary Editing / Output

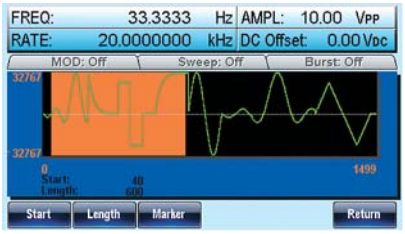
The AFG-3000 Series provides 10 sets of memory for user save and recall applications. Each set of memory is able to store a set of front panel setting and a set of 1M-point arbitrary waveform data. With 1M long memory, AFG-3000 can store more complex waveforms consisted of more data.

Furthermore, any section of waveform within this 1M memory can be edited or output independently. This is a unique feature allowing more flexibility for user to do waveform storage and extraction.

F. EASY OPERATION AND FLEXIBLE ARBITRARY WAVEFORM EDITING

The AFG-3000 presents four ways to generate custom arbitrary waveforms from direct front panel operation, PC software, a CSV file loading, and GDS-2000 series oscilloscope input.

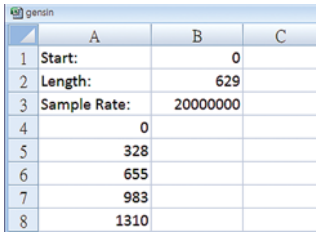
• Front Panel Operation



Panel Operation

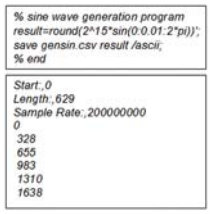
Everything from waveform editing, I/O configuring, and panel setting storage and recall can be completed directly through front panel operation. Front panel operation allows users to edit arbitrary waveform, which is correspondingly updated on the screen, a feature of "What You See is What You Get".

• CSV file Download



	A	B	C
1	Start:	0	
2	Length:	629	
3	Sample Rate:	20000000	
4	0		
5	328		
6	655		
7	983		
8	1310		

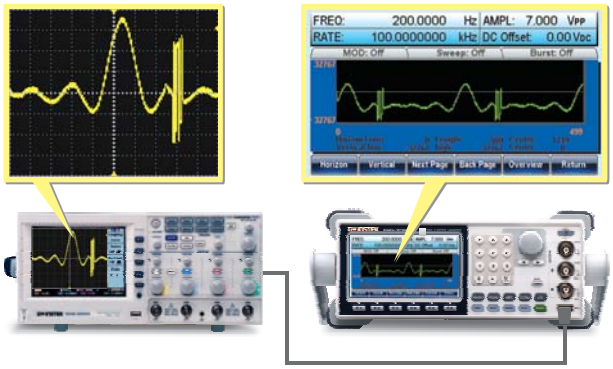
Supports CSV file



From Math Computing Software, Program and Result in CSV File

AFG-3000 supports CSV file editing for arbitrary waveform generation. The CSV file can be created in many ways, including using EXCEL spreadsheet, PC client software, front panel editing or math computing software. The computing result of math software, Octave for example, can be saved into CSV file. Edited CSV file can be downloaded from either USB flash or PC to AFG-3000 for arbitrary waveform output.

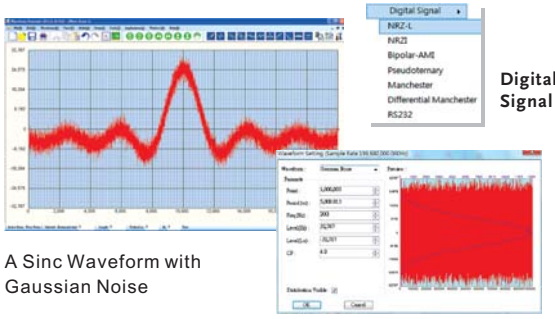
• Direct Waveform Reconstruction (DWR)



Direct Waveform Reconstruction from the GDS-2000 Series

The AFG-3000 can be directly connected to GW Instek GDS-1000, GDS-2000 and GDS-3000 Serials DSO with USB cable for waveform data download. Under "DSO Link" mode of AFG-3000, the DSO will transfer the captured waveform data from its memory to AFG-3000 for creating an approximative waveform output.

• Arbitrary Waveform Editing PC Software



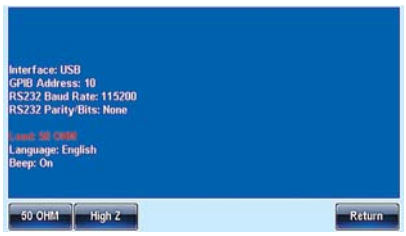
Digital Signal

A Sinc Waveform with Gaussian Noise

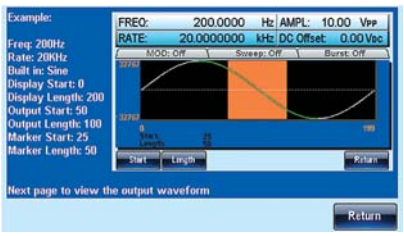
Gaussian Noise

A PC software for AFG-3000 waveform editing is supported. The software contains not only waveform drawing tools but also a wide variety of waveform editing functions, such as waveform arithmetic operations. The most commonly used waveforms, including Rayleigh, Gaussian, Normal Noise, Pseudo Ternary, Bipolar AMI, Manchester, Differential Manchester, RS-232, and NRZ etc., are available in the library for user to tailor specific waveforms as needed.

G. IMPEDANCE SWITCH & ON-SCREEN HELP



Impedance Switch



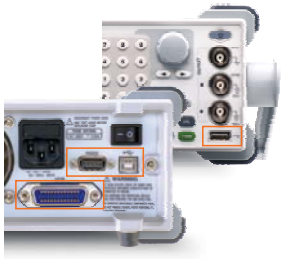
On-Screen Help

AFG-3000 allows users to select the suitable impedance between 50 ohm and High-Z, ensuring a right impedance compatibility.

The built-in On-Screen Help allows users to understand AFG-3000 operations and the definition of each function key.

PANEL INTRODUCTION

STANDARD COMMUNICATION INTERFACE



The AFG-3000 provides GPIB, RS-232, and USB as standard communication interfaces. AFG-3000 supports IEEE 488.2 protocol and command for users to integrate system or remotely control the instrument.

4.3" HIGH RESOLUTION LCD DISPLAY

The AFG-3000 is equipped with a 4.3" LCD screen of 480 x 272 resolution. In addition to displaying all of the settings on the screen, the large graphic display also allows users to observe complete waveforms at a glance.

SPECIFICATIONS

			AFG-3081	AFG-3051
WAVEFORMS	Standard Waveform		Sine, Square, Ramp, Pulse, Noise, DC, Sin(x)/x, Exponential Rise, Exponential Fall, Negative Ramp	
ARBITRARY WAVEFORMS	ARB Function		Built in	
	Sample Rate		200 MSa/s	
	Repetition Rate		100MHz	
	Waveform Length		1M points	
	Amplitude Resolution		16 bits	
	Non-Volatile Memory		Ten 1M waveforms *1	
	User define Output Section		Any section from 2 to 1M points	
	User define Mark Output		Any section from 2 to 1M points	
FREQUENCY CHARACTERISTICS	Range	Sine, Square	80MHz	50MHz
		Triangle, Ramp	1MHz	
	Resolution		1 μHz	
	Accuracy	Stability	±1 ppm 0 ~ 50℃	
		Aging	±1 ppm, per 1 year	
		Tolerance	≤1μHz	
OUTPUT CHARACTERISTICS *2	Amplitude		Range 10 mVpp to 10 Vpp(into 50Ω); 20 mVpp to 20 Vpp(open-circuit) Accuracy ±1% of setting ±1 mVpp (at 1 kHz,>10 mVpp) (into 50Ω) Resolution 0.1 mV or 4 digits Flatness ±1%(0.1dB)<10MHz;±2%(0.2dB)10MHz~50MHz;±10%(0.9 dB)50MHz~70MHz;±20%(1.9dB)70MHz~80MHz (sinewave relative to 1kHz) Units Vpp, Vrms, dBm	
	Offset		Range ±5 Vpk ac +dc (into 50Ω); ±10Vpk ac +dc (Open circuit) Accuracy 1% of setting + 2 mV+ 0.5% of amplitude	
	Waveform Output		Impedance 50Ω typical (fixed); >10MΩ (output disabled) Protection Short-circuit protected;overload relay auto-matically disables main output	
	SYNC Output		Level TTL-compatible into>1kΩ Impedance 50Ω nominal	
SINEWAVE CHARACTERISTICS	Harmonic Distortion *5		-60dBc DC~1MHz,Ampl<3Vpp;-55dBc DC~1MHz,Ampl>3Vpp;-45dBc 1MHz~5MHz,Ampl>3Vpp;-30dBc 5MHz~80MHz,Ampl>3Vpp	
	Total Harmonic Distortion		<0.2%+0.1mVrms DC ~ 20 kHz	
	Spurious (non-harmonic)*5		–60dBc DC~1MHz; –50dBc 1MHz~20MHz; –50dBc + 6dBc/octave 1MHz~80MHz	
	Phase Noise		＜-65dBc typical 10MHz, 30kHz band; ＜-47dBc typical 80MHz, 30kHz band	

SPECIFICATIONS

		AFG-3081	AFG-3051
SQUARE WAVE CHARACTERISTICS	Rise/Fall Time	<8ns *3	
	Duty Cycle	20%~80%	
	Overshoot	< 5%	
	Asymmetry	1% of period+1ns	
	Variable Duty Cycle	20.0%~80.0% ≤ 25MHz; 40.0%~60.0%, 25~50MHz; 50.0%(Fixed), 50~80MHz	
	Jitter	0.01% + 525ps < 2MHz; 0.1% + 75ps > 2MHz	
RAMP CHARACTERISTICS	Linearity	< 0.1% of peak output	
	Variable Symmetry	0%~100%	
PULSE CHARACTERISTICS	Period	20ns ~ 2000s	
	Pulse Width	8ns ~ 1999.9s; Minimum Pulse Width: 8ns when FREQ≤50MHz; 5% of setting period when FREQ≤6.5MHz ; Resolution: 1ns when FREQ≤50MHz; 1% of setting period when FREQ≤6.5MHz	
	Overshoot	<5%	
	Jitter	100 ppm +50 ps	
AM MODULATION	Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse, Arb	
	Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
	Modulating Frequency	2mHz ~ 20kHz	
	Depth	0% ~ 120.0%	
	Source	Internal/External	
FM MODULATION	Carrier Waveforms	Sine, Square, Triangle, Ramp	
	Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
	Modulating Frequency	2mHz ~ 20kHz	
	Peak Deviation	DC ~ 80MHz	DC ~ 50MHz
	Source	Internal/External	
PWM	Carrier Waveforms	Square	
	Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
	Modulating Frequency	2mHz ~ 20kHz	
	Deviation	0% ~ 100.0% of pulse width	
	Source	Internal/External	
FSK	Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse	
	Modulating Waveforms	50% duty cycle square	
	Internal Rate	2 mHz ~ 100 kHz	
	Frequency Range	DC ~ 80MHz	DC ~ 50MHz
	Source	Internal/External	
SWEEP	Waveforms	Sine, Square, Triangle	
	Type	Linear or Logarithmic	
	Source	Internal/External	
	Start/Stop FREQ	100μHz ~ 80 MHz	100μHz ~ 50MHz
	Sweep Time	1ms ~ 500s	
	Trigger	Single, External, Internal	
	Marker	Falling edge of Mark signal (Programmable frequency)	
	Source	Internal/External	
BURST	Waveforms	Sine, Square, Triangle, Ramp	
	Frequency	1μHz ~ 80MHz *4	1μHz ~ 50 MHz *4
	Burst Count	1 ~ 1000000 cycles or Infinite	
	Start/Stop Phase	-360.0 ~ +360.0°	
	Internal Period	1ms ~ 500s	
	Gate Source	External Trigger	
	Trigger Source	Single, External or Internal Rate	
	Trigger Delay	N-Cycle, Infinite : 0s ~ 85s	
EXTERNAL MODULATION INPUT	Type	for AM, FM, Sweep, PWM	
	Voltage Range	± 5V full scale	
	Input Impedance	10kΩ	
	Frequency	DC ~ 20 kHz	
EXTERNAL TRIGGER INPUT	Type	for FSK, Burst, Sweep	
	Input Level	TTL Compatible	
	Slope	Rising or falling(selectable)	
	Pulse Width	> 100 ns	
	Input Impedance	10kΩ,DC coupled	
	Latency	Sweep: <10us(typical); Burst: <100ns(typical)	
	Jitter	Sweep: 2.5us; Burst: 1ns; except pulse, 300ps	
MODULATION OUTPUT	Type	for AM, FM, Sweep, PWM	
	Amplitude	Range:≥1Vpp; Impedance: >10kΩ typical(fixed)	
TRIGGER OUTPUT	Type	for Burst, Sweep	
	Level	TTL Compatible into 50Ω	
	Pulse Width	> 450 ns	
	Maximum Rate	1 MHz	
	Fan-out	≥4 TTL load	
	Impedance	50Ω typical	
MARKER OUTPUT	Type	for ARB, Sweep	
	Level	TTL Compatible into 50Ω	
	Fan-out	≥4 TTL load	
	Impedance	50Ω typical	
Store/Recall		10 Groups of Setting Memories	
Interface		GPIB, RS-232C, USB Host/Device	
Display		4.3 inch TFT LCD; 480 × 3(RGB) × 272	
SYSTEM CHARACTERISTICS	Configuration Times(typical)	Function Change: Standard>102ms,Pulse>660ms,Built-In Arb>240ms Frequency Change: 24ms; Amplitude Change: 50ms;Offset Change: 50ms Select User Arb: < 2s for 1M points; Modulation Change: < 200ms	
	Arb Download Times(typical)	Binary Code: GPIB/RS-232C (115 Kbps), USB(Device); ASCII Code: USB(Host)*6	
GENERAL SPECIFICATIONS	Power Consumption	65VA	
	Operating Environment	Temperature to satisfy the specification: 18 ~ 28° C; Operating temperature: 0 ~ 40°C Relative Humidity: ≤80%, 0 ~ 40°C, ≤70%, 35 ~ 40°C; Installation category: CAT II	
	Operating Altitude	2000 meters	
	Pollution Degree	IEC 61010 Degree 2, Indoor Use	
	Storage Temperature	-10 ~ 70°C, Humidity: ≤70%	
POWER SOURCE	AC100 ~ 240V , 50 ~ 60Hz		
POWER CONSUMPTION	65VA		
DIMENSIONS & WEIGHT	265 (W) x 107 (H) x 374 (D)mm, Approx. 4kg		

Specifications subject to change without notice. FG-308151GD4BH

ORDERING INFORMATION

AFG-3081 80MHz Arbitrary Function Generator
AFG-3051 50MHz Arbitrary Function Generator

ACCESSORIES

CD(User manual+Software)×1,Quick Start Guide×1, Power Cord×1, GTL-110 Test Lead×1

OPTIONAL ASSESSORIES

GTL-232 RS-232C Cable
GTL-248 GPIB Cable (2.0m)
GRA-432 Rack Adapter Kit
GTL-250 GPIB Cable, Double Shielded, 600mm
GTL-246 USB Cable, USB 2.0 A-B Type Cable, 4P

FREE DOWNLOAD

PC Software Arbitrary Waveform Editing Software

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GW INSTEK
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