AFG-2100/2000 Series Arbitrary Function Generator

New Product Announcement

The AFG-2100/2000 Series Arbitrary Function Generator

The AFG-2100/2000 Series Arbitrary Function Generator is a DDS (Direct Digital Synthesized) based signal generator designed to accommodate the Educational and Basic Industrial requirements for an accurate and affordable signal source covering the output of Sine, Square (Pulse), Ramp (Triangle), Noise and Arbitrary waveforms. The 20M Sa/s sampling rate, 10 bit vertical resolution and 4k point memory of the AFG-2100/2000 Series provide user with a flexible environment for creating the specific waveform output as needed. The 0.1Hz resolution of Sine, Square and Triangle waveforms and the 1% ~ 99% adjustable duty cycle of Square (Pulse) waveform are the remarkable features to greatly extend its application range in various fields.

The AFG-2100/2000 Series includes 6 models in three frequency bands of 5MHz, 12MHz and 25MHz. Besides the basic features of the whole AFG2100/2000 Series, AFG-2100 also carries additional features of AM/FM/FSK Modulation, Sweep, and Frequency Counter.

The friendly human interface of AFG-2100/2000 Series allows user to set waveform parameters, including waveform type, frequency, amplitude, DC offset, modulation type, and duty cycle, through keypad entry and/or the knob selection, and display the set parameters on the 3.5" LCD screen. The AFG-2100/2000 Series is equipped with a USB Device interface for remote control and waveform editing through a PC. A waveform editing software is provided to facilitate the waveform creation on the PC. After the waveform editing is done, the user is able to download the waveform data from PC to the AFG-2100/2000 Series for signal output.

Product Description

AFG-2125, 25MHz Arbitrary Function Generator with Frequency Counter, Sweep, & AM, FM, FSK Modulation

AFG-2025, 25MHz Arbitrary Function Generator

AFG-2112, 12MHz Arbitrary Function Generator with Frequency Counter, Sweep, & AM, FM, FSK Modulation

AFG-2012, 12MHz Arbitrary Function Generator

AFG-2105, 5MHz Arbitrary Function Generator with Frequency Counter, Sweep, & AM, FM, FSK Modulation

AFG-2005, 5MHz Arbitrary Function Generator

Selection Guide

FREQUENCY RANGE	5MHz		12MHz		25MHz	
M O DEL	AFG- 2005	AFG- 2105	AFG- 2012	AFG- 2112	AFG- 2025	AFG- 2125
ARBITRARY WAVEFORM	V	V	V	V	V	V
DUTY	V	V	V	V	V	V
T TL	V	V	V	V	V	V
DC O FFSET	V	V	V	V	V	V
USB INTERFACE	V	V	V	V	V	V
LIN/LOG SWEEP		V		V		V
AM/FM/FSK MODULATION		V		V		V
EXT COUNTER		V		V		V

Key Features

- 20MSa/s sampling, 10 bit vertical resolution and 4k point memory for Arbitrary Waveform
- 1% ~ 99% adjustable duty cycle for Square Waveform.
- Waveform parameter setting through numeric keypad entry & knob selection.
- Amplitude, DC Offset and other key setting information shown on the 3.5" LCD screen Simultaneously.
- AM/FM/FSK Modulation, Sweep, and Frequency Counter functions (AFG-2100 only).
- USB Device interface for remote control and waveform editing.

Arbitrary Waveform Function

Other than the high accuracy and high stability DDS Function Waveforms-Sine, Square and Triangle, the AFG-2100/2000 Series also provides the feature to generate Arbitrary Waveforms as what user wants. The 20MS/sa sampling rate, 10 bit vertical resolution and 4k point waveform memory allow user to create the needed waveform point by point through keypad entry on the front panel, or to do waveform editing on the PC and download the waveform data to the AFG-2100/2000 Series, for arbitrary waveform output. A C

software is available to facilitate the editing of complicated and irregular waveforms, which fulfill the requirements of various applications in the real life scenarios.

Adjustable Duty Cycle

The adjustable duty cycle of square waveform is a commonly used feature of a Function Generator. For a conventional Function Generator, however, the adjustable duty cycle mostly falls in a limited 20% ~ 80% range, which may not fit the demands of specific applications. The AFG-2100/2000 Series is able to provide a 1% ~ 99% variable duty cycle for its square waveform output. This feature allows the AFG-2100/2000 Series to be used as a Pulse Generator to create pulse waveform simulating a spike signal or a transient signal in most of the generic applications.
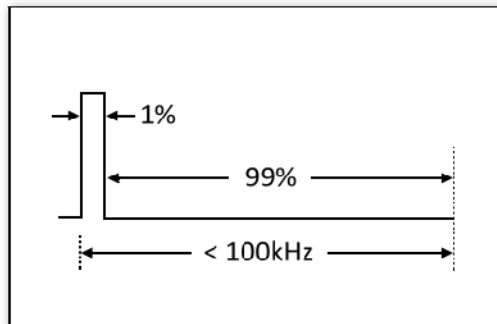
Parameter Setting

The keypad entry and/or knob selection for waveform parameter setting is a unique feature of the AFG-2100/2000 Series. The conventional analog knob, which is commonly adopted in the AFG design, is not accurate enough for precision setting of waveform parameters, and may generate noise to interfere the system operation. The keypad entry design of AFG-2100/2000 Series improves the setting uncertainty of conventional Function Generator and therefore significantly increases the accuracy of its

waveform output. Besides keypad entry, the AFG-2100/2000 Series also offers the knob selection convenience with a digital knob design, which allows user to see the parameter value change in detail on the 3.5" LCD screen when the adjustment is in progress.

Waveform Amplitude & DC Offset

Besides output waveform frequency, the AFG-2100/2000 Series is able to show output waveform amplitude, DC offset and other key setting information on the LCD screen simultaneously. This provides the convenience for user to know what signal is being sent out at the output terminal without the need to check the waveform through an oscilloscope. Further more, the waveform amplitude value can be shown in one of the three units, including Vpp, Vrms and dBm, depending on user's selection. This saves time for tedious math conversion among various units of waveform amplitude.

AM/FM/FSK Modulation, Sweep & Frequency Counter

All AFG-2100 models are equipped with additional AM/FM/FSK Modulation, Sweep & Frequency Counter functions. The AM/FM modulated signal provides a means for basic modulation circuit tests and experiments. Whereas, the FSK modulated signal is offered as a convenient source for the performance evaluation of digital modulation circuits. The Sweep function, with accurate frequency sweep range & sweep time, adequately fits a lot of basic applications in the market, such as sweep-tone test of the speaker in a 20Hz ~ 20kHz sweep range. The built-in frequency counter of AFG-2100 is able to measure the frequency of an external signal up to 150MHz. This add-on value saves for user an additional cost of purchasing a standalone frequency counter.

USB Interface

The AFG-2100/2000 Series provides a USB Device Interface, which allows the programming of remote control or ATE of the product. An arbitrary waveform editing software is available to facilitate the   waveform

creation task. After the waveform editing is completed on the PC, the waveform data can be downloaded through USB Interface to the AFG-2100/200 for arbitrary waveform output.

Arbitrary Waveform Editing PC Software

The arbitrary waveform editing software contains not only waveform drawing tools but also a wide variety of waveform editing functions. 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. Besides, this software can import CVI format file as waveform data which is created by the other tools. The editing software will stretch AFG2100/2000 to more applications.

Key Dates for Product Announcement

1. Order queue open (Oct. 5th, 2011)

2. Distributor Announcement (Oct. 5th, 2011)

3. Global Market Announcement (Oct. 5th, 2011)

4. Demo Units Shipped to Distributors (Beginning of November, 2011)

5. Mass quantity order fulfillment (Mid-November, 2011)

Applications:

- Audio products frequency characteristics measurement. (by sweep function)
- Pulse signal as trigger or synchronization signal for electronic product testing.   (by small duty cycle square wave)
- Pulse noise simulation. (by small duty cycle square wave)
- Reference clock signal of electronic device (usually 10MHz for "reference in", like PLL design)
- Vibration signal simulation (by low but stable frequency, says 0.1Hz)
- Noise simulation for communication system (by noise in arbitrary waveform editing)
- Educational lab.

Product Position

1. AFG-2100/2000 Series is the clear price leader in the low cost Arbitrary Function Generator market today. There are many low cost function generators, either analog or digital function generators, available in the market, however, only AFG-2100/2000 Series has the "Arbitrary Waveform" feature in this price range.

2. The numeric keypad operation, the all-parameters display on LCD panel, the USB Interface, and the waveform editing software support make AFG-2100/2000 the highest value product in the low cost AFG market.

3. The AFG-2100/2000 Series is not only suitable for Educational applications. With good features of Arbitrary Waveform, 1% ~ 99% adjustable duty cycle for Square Waveform, and the programmability through USB Interface, the AFG-2100/2000 Series is also suitable for the basic Industrial applications.

4. The AFG-2100/2000 Series, with far better features and same price level as SFG-2100/2000, will fully replace the existing SFG-2100/2000 Series in the future.

Market Strategy

1. Position the AFG-2100/2000 Series as the price leader of all Arbitrary Function Generators available in the market today.

2. Aim at educational market and basic industrial application market by promoting the value of Arbitrary Waveform, numeric keypad, LCD display and USB features of the AFG-2100/2000.

3. Look for the opportunities to replace high-price Arbitrary Waveform Generators with the affordable AFG-2100/2000 Series in the industrial market.

4. Use existing SFG-2100/2000 customer base to expand AFG-2100/2000 market share.

Existing GW Products Replacement

The AFG-2100/2000 Series will replace the existing SFG-2100/2000 Series in the future. The SFG-2100/2000 Series will be phased out once its order rate declines to a low level. A last-buy announcement will be released 3 months before this series is completely phased out.

Service Policy

1. **One (1) year warranty.**

2. **Service Support.** The service instructions in the Service Manual will help distributors repair defective units promptly. Should the board replacement is necessary to fix the defective unit, the board swapping service support is provided by Good Will Instrument to facilitate the repair jobs done at the distributor's site.

3. http://www.gwinstek.com.tw for free download .

![GW INSTEK logo] **Gw INSTEK**
Made to Measure

Specifications

The specifications apply when the function generator is powered on for

at least 30 minutes under +20°C~+30°C.

Models		AFG-2000 series			AFG-2100 Series		
		2005	2012	2025	2105	2112	2125
Waveforms							
		Sine, Square, Ramp(Triangle)					
Arbitrary Waveform							
	Sample Rate	20 MSa/s					
	Repetition Rate	10MHz					
	Waveform Length	4k points					
	Amplitude Resolution	10 bit					
	Non-Volatile Memory	4k points					
	User-defined Output Section	4k points					
	User-defined Mark Output	4k points					
Frequency Characteristics							
Range	Sine, Square	0.1Hz | 5MHz	0.1Hz | 12MHz	0.1Hz | 25MHz	0.1Hz | 5MHz	0.1Hz | 12MHz	0.1Hz | 25MHz
	Ramp	0.1Hz ~ 1MHz					
Resolution	Sine, Square, Ramp	0.1Hz					
Accuracy	Stability	±20 ppm					
	Aging	±1 ppm, per 1 year					
	Tolerance	1 mHz					
Output Characteristics							
Amplitude	Range	1 mVpp to 10 Vpp(into 50Ω), 0.1Hz 20MHz 2 mVpp to 20 Vpp(open-circuit) , 0.1Hz 20MHz 1 mVpp to 5 Vpp(into 50), 20MHz 25MHz 2 mVpp to 10 Vpp(open-circuit), 20MHz 25MHz					
	Accuracy	± 1% of setting ±1 mVpp (at 1 kHz,>10 mVpp)					
	Resolution	1 mV or 3 digits					
	Flatness	± 1% (0.1dB) 100kHz ± 3% (0.3 dB) 5MHz ± 5% (0.4 dB) 20MHz ± 5% (0.4 dB) 25MHz (sine wave relative to 1 kHz)					
	Units	Vpp, Vrms, dBm,					
Offset	Range	±5 Vpk ac +dc (into 50Ω) ±10Vpk ac +dc (Open circuit)					
	Accuracy	1% of setting + 5 mV+ 0.5% of amplitude					
Output	Impedance	50Ω typical (fixed)> 10MΩ (output disabled)					
	Protection (main output)	Short-circuit protected by overload relay automatically disables output					
SYNC Output	Level	TTL-compatible into>1kΩ					
	Impedance	50Ω nominal					
	Rise or Fall Time	25ns					
Sine wave Characteristics	Harmonic Distortion	–55 dBc DC 1 MHz, Ampl 1 Vpp –45 dBc 1MHz 5 MHz, Ampl 1 Vpp –30 dBc 5MHz 25 MHz, Ampl 1 Vpp					
Square wave Characteristics	Rise/Fall Time	25ns at maximum output (into 50Ωload)					
	Overshoot	< 5%					
	Asymmetry	1% of period+1 ns					
	Variable Duty Cycle	1.0% to 99.0% 100kHz 20.0% to 80.0% 5 MHz 40.0% to 60.0% 10MHz 50% 25MHz					
Ramp Characteristics	Linearity	0.1% of peak output					
	Variable Symmetry	0% to 100%(0.1% Resolution)					

10/5/2011

AM Modulation			
	Carrier Waveforms		Sine, Square, Ramp, ARB
	Modulating Waveforms		Sine, Square, Triangle
	Modulating Frequency		2 mHz to 20 kHz (Int) DC to 20KHz (Ext)
	Depth		0% to 120.0%
	Source		Internal / External
	Carrier BW		100Hz to Max Frequency (-3dB)
	External Modulating Sensitivity		10Vp-p for setting depth
FM Modulation			
	Carrier Waveforms		Sine, Square, Ramp, ARB
	Modulating Waveforms		Sine, Square, Triangle
	Modulating Frequency		2 mHz to 20 kHz (Int) DC to 20KHz (Ext)
	Deviation		DC to Max Frequency
	Source		Internal / External
	External Modulating Sensitivity		10Vp-p for setting deviation
SWEEP			
	Waveforms		Sine, Square, Ramp, ARB
	Type		Linear or Logarithmic
	Start F / Stop F		0.1Hz to Max Frequency
	Sweep Time		1 ms to 500 s
	Source		Internal / External
FSK			
	Carrier Waveforms		Sine, Square, Ramp, ARB
	Modulating Waveforms		50% duty cycle square
	Internal Rate		2 mHz to 100 kHz
	Frequency Range		0.1Hz to Max Frequency
	Source		Internal / External
Frequency Counter			
	Range		5Hz to 150MHz
	Accuracy		Time Base accuracy±1count
	Time base		±20ppm (23 ± 5) after 30 minutes warm up
	Resolution		100nHz for 1Hz, 0.1Hz for 100MHz.
	Input Impedance		1MΩ/150pf
	Sensitivity		35mVrms(5Hz to 100MHz) 45mVrms(100MHz to 150MHz)
System Characteristics			
	Store/Recall	10 Groups of Setting Memories	
	Interface	USB(Device)	
	Display	3.5", 3 color LCD	
General Specifications			
	Power Source	AC100 240V , 50 60Hz	
	Power Consumption	15 VA	
	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	
	Operating Altitude	2000 meters	
	Storage Temperature	-10 ~ 70 C, Humidity: ≤70%	
	Dimensions (WxHxD)	266(W)×107(H)×293(D) mm	
	Weight	Approx. 2.5 kg	
	Accessories	User' Manual CD ×1, Quick Start Guide x1, Power cord×1	
		GTL-110× 1	GTL-110× 2

Ordering Information

AFG-2005, 5MHz Arbitrary DDS Function Generator

AFG-2105, 5MHz Arbitrary DDS Function Generator with Counter, Sweep, AM, FM and FSK Modulation

AFG-2012, 12MHz Arbitrary DDS Function Generator

AFG-2112, 12MHz Arbitrary DDS Function Generator with Counter, Sweep, AM, FM and FSK Modulation

AFG-2025, 25MHz Arbitrary DDS Function Generator

AFG-2125, 25MHz Arbitrary DDS Function Generator with Counter, Sweep, AM, FM and FSK Modulation

Accessories:

User manual CD x 1

Quick Start Guide x 1

Power Cord x 1

GTL-101 test lead x 1 (AFG-2000 series)

GTL-101 test lead x 2 (AFG-2100 series)

Optional Accessories:

GTL-246 USB Cable, USB2.0 A-B Type Cable

Free Download:

PC Software, FreeWave software