AD INSTRUMENTS

AD8660 Fully Numerical Control

Dual Channel Function/Arbitrary Waveform Generator

AD8660 Dual-channel Function / Arbitrary waveform generator is a set of Function Signal Generator, Arbitrary Waveform Generator, Pulse Generator, Analog / Digital modulator, VCO, Sweep, Counters and Frequency Meter and other functions in a high Performance, cost-effective, multi-function signal generator. Abundant shortcut keys and graphical user interface simplifies every operation. Users do not have to spend a lot of time to learn and familiar with the operation of the instrument, you can be skilled use. For education, research and development, production, testing, maintenance and other industries to provide a new choice.

The instrument adopt the Direct Digital Synthesizer (DDS) technology and provide stable, precise, pure and low distortion signals. Surface mounting technology improves interference immunity and operational life span. Can output up to 97 groups of functions / arbitrary waveform, contains 33 groups of preset waveforms and 64 groups of user-defined waveforms. Preset waveforms: Sine, Square, Rectangle (Duty Cycle adjustable), Pulse (Pulse width and cycle time can be set accurately), Triangle/Ramp, CMOS(0~12V), Four channels TTL, Exponential Rise, Exponential Fall, Noise, ECG, DC etc.

Main Features:

- Adopt the Direct Digital Synthesizer (DDS) technology and provide stable, precise, pure and low distortion signals.
- 2.4 inch TFT Color LCD with 320×240 resolution, displaying parameters and graphics of the two channels at the same time.
- The instrument uses 14-bit high-speed D/A converter chip (5Vpp output quantization error is less than 1mV), 250MSa/s sample rate, 14bits vertical resolution.
- Can output up to 97 groups of functions / arbitrary waveform, contains 33 groups of preset waveforms and 64 groups of user-defined waveforms. Preset waveforms: Sine, Square (Duty Cycle adjustable), Pulse (Pulse width and cycle time can be set accurately), Triangle/Ramp, CMOS(0~12V), Four channels TTL, Exponential Rise, Exponential Fall, Noise, ECG, DC etc.
- Enable to store 64 arbitrary waveform data files, each one of waveform storage depth 8192 points * 14bits;
- Various modulation types: AM, FM, PM, ASK, FSK and PSK modulations.
- Sweep Function: It can sweep 4 properties of signals including frequency, amplitude, offset and duty cycle; It has Linear and Logarithm two sweep types; 0.01S~999.99S sweep time; Up, Down and roundtrip sweep directions.
- VCO Function (Voltage Control Output): Can be achieved by an external input signal: voltage controlling frequency, voltage controlling amplitude, voltage controlling offset, voltage controlling duty cycle and PWM modulations.
- Burst Output Function: There has Manual Trigger, internal CH2 Trigger, and External Trigger for your options. It can output 1~1048575 pulse trains.
- 100M Frequency meter function: It can measure frequency, period, pulse width and duty cycle. Max. frequency workable is 100MHz and Min. frequency workable is 0.01 Hz.
- Counter Function: It has 2 coupling measure modes including DC coupling and AC coupling. This design can solve inaccuracy problem of AC coupling.
- Standard dual full functional channels which are equivalent to two independent generators.
- Channel SYNC Function: Support waveform copy and state copy between channels.
- Support two or more signal generators connected to achieve multi-channel output, the maximum support 16-channel synchronous output, the phase between each channel can be adjusted.
- Precisely adjust the phases of the two channels, Precision can be 0.01°.
- Minimum amplitude resolution can be up to 1 mV. Amplitude range is 0~20Vpp.
- Duty-cycle of each channel can be adjusted independently0.01%-99.99%, the adjusting resolution is 0.01%.

- -12V~+12V DC Offset function. Resolution 0.001V.
- Save function: It can save 20 sets user-set parameters and can be loaded at any time.
- Communicating function: All functions can be controlled by PC program and the communication protocol is open for secondary development.
- Output short-circuit protection: All channels can work more than 60 seconds when the load is short-circuited.
- Provide powerful waveform editing PC software. Users can download arbitrary waveform to this instrument after edit through PC program which is included in user CD.
- Adopt ABS plastic shell with table type design. Use 100-240V (AC) wide range voltage power supply.

Technical Specification

Unless specified, all specifications can be guaranteed if the following two conditions are met.

- □ The generator has passed self-inspection.
- □ The generator has been working continuously for at least 30 minutes under the specified temperature (18℃~28℃).

□ All the specifications are guaranteed unless those marked with “typical”

Frequency		
Model	**AD8660**	
Sine	0~60MHz	
Square	0~25MHz	
Ramp, Triangle	0~10MHz	
Pulse	0~10MHz	
TTL/CMOS	0~10MHz	
Arbitrary Waveform	0~10MHz	
Minimum pulse width	20ns(All models of pulse wave minimum width can reach 20ns)	
Min. Resolution on all frequency range	1μHz (Min. resolution can reach 1μHz on all frequency range to ensure adjusting accuracy under high frequency. For example, it can output 10.000000000001MHz signal).	
Accuracy	±20ppm	
Stability	±1ppm/ 3hours	
Waveform Characteristics		
Waveforms	Sine, Square, Rectangle (Duty Cycle adjustable), Pulse (Pulse width and cycle time can be set accurately), Triangle/Ramp, Sawtooth Wave, CMOS, Four channels TTL, DC, Half wave, Full wave, Positive Step, Inverse Step, Positive Exponent, Inverse Exponent, Lorenz Pulse, Multitone, Noise, ECG, Trapezoidal Pulse, Sinc Pulse, Narrow Pulse, Gauss White Noise, AM, FM, and other 64 sets customer-defined waveform.	
Non-Volatile Storage	Can store 64 user-defined arbitrary waveforms, (8K 14bits) * 64	
Waveform Length	8192 points * 14bits	
Sampling Rate	250MSa/s	
Vertical Resolution	14 bits	
Sine	Harmonic Suppression	≥50dBc(<1MHz); ≥45dBc(1MHz~20MHz);
	Total Harmonic Distortion	<0.5% (20Hz~20kHz,0dBm)
Rectangle	Rise/Fall Time	≤7ns (VPP<5V)
	Overshoot	≤5%

	Duty Cycle	0.01%~99.99% (Resolution 0.01%)		
Sawtooth wave	Linearity	>99% (0.01Hz~10kHz)		
Output characteristics				
Amplitude（VPP）	Frequency≤5MHz: 1mVpp~24Vpp; 5MHz<Frequency≤10MHz: 1mVpp~20Vpp; 10MHz<Frequency≤20MHz: 1mVpp~10Vpp; Frequency>20MHz: 1mVpp~5Vpp;			
Resolution	1mV			
Amplitude Stability	±0.5%/ 5 Hours			
Amplitude flatness	±2.5%(<10MHz);±5%(>10MHz);			
Waveform Output				
Impedance	50Ω±10%（Typical）			
Protection	All channels can work more than 60 seconds when the load is short-circuited.			
DC Offset				
Offset Range	Frequency≤20MHz: ±12V; Frequency>20MHz: ±2.5V;			
Offset Resolution	1mV			
Phase Feature				
Phase range	0~359.99°			
Phase resolution	0.01°			
TTL Output				
TTL Level Amplitude	>3Vpp			
Fan-out	>8 TTL LOAD			
Rise/Fall Time	≤10ns			
CMOS Output				
Low Electric Level	<0.3V			
High Electric Level	1V~12V			
Rise/Fall Time	≤18ns			
External Measurement				
Function	Frequency, Period, Positive/Negative Pulse Width, Duty Cycle			
Input Voltage Range	1Vpp~20Vpp			
Frequency Meter	Resolution	0.01Hz (Gate Time = 100S)		
	Range	0.01Hz~100MHz		
	Sensitivity	Gate Time 3 grades (1S, 10S, 100S) adjustable		
Counter	Range	0-4294967295		
	Coupling	DC, AC		
	Working Mode	Manual		
Period	Measurement Range		5ns ~ 20s	DC coupling

Pulse Width	Measurement Range	0ns ~ 20s	measurement
	Resolution	5ns	
Duty Cycle	Range (Display)	0% ~ 100%	

Sweep

Carrier Waveform	Sine, Square, Ramp, Arbitrary (except DC)
Sweep Type	Linear or Logarithm
Sweep Direction	Up, Down and roundtrip sweep directions;
Sweep Objects	Frequency, Amplitude, Offset, Duty Cycle
Sweep Time	0.01S~999.99S/Step
Setting range	Starting position and Finishing position can be set arbitrarily.
Sweep Range	Decided by Parameters setting.

VCO (Voltage Control Output)

Modulation signal range to input	0~5V
VCO signal frequency range	0-2000Hz
VCO control object	voltage controlling frequency (VCF), voltage controlling amplitude (VCA), voltage controlling offset, voltage controlling duty cycle.
VCO special function	Can Amplitude Modulate (AM) or Frequency Modulate (FM) by external analog signal.

Modulation

Modulation Type	AM, FM, PM, ASK, FSK, PSK
Carrier Waveform	Sine, Square, Triangle, Ramp, Arbitrary waveform (Except DC)
AM	
Source	Internal (CH2) / External (VCO IN Port)
Modulating Waveform	Sine, Square, Triangle, Ramp, Arbitrary waveform
Depth	0% to 120%
Modulating Frequency	Internal : 1μHz~1MHz; External: 1μHz~2KHz;
FM	
Source	Internal (CH2) / External (VCO IN Port)
Modulating Waveform	Sine, Square, Triangle, Ramp, Arbitrary waveform
Modulating Frequency	Internal : 1μHz~1MHz; External: 1μHz~2KHz;
PM	
Source	Internal (CH2) / External (VCO IN Port)
Modulating Waveform	Sine, Square, Triangle, Ramp, Arbitrary waveform
Phase Deviation	0° to 360°
Modulating Frequency	Internal : 1μHz~1MHz; External: 1μHz~2KHz;
ASK	
Source	Internal (CH2), External (ASK IN Port), Manual
Modulating Waveform	Square with 50% duty cycle.

Key Frequency	1μHz~10MHz
FSK	
Source	Internal (CH2), External (FSK IN Port), Manual
Modulating Waveform	Square with 50% duty cycle.
Key Frequency	1μHz~10MHz
PSK	
Source	Internal (CH2), External (PSK IN Port), Manual
Modulating Waveform	Square with 50% duty cycle.
Key Frequency	1μHz~10MHz
Burst Function	
Carrier Waveform	Sine, Square, Ramp, Arbitrary (except DC)
Burst Count	1~1048575
Trigger Source	Manual, Internal, External (AC/DC)
General Specifications	

Display	Type	2.4 inch, TFT Color Display.	
Save & Load	Amount	20	
	Position	01 to 20 (01 for start default value)	
Interface	Type	USB to Serial interface	
	Protocol	Command line mode, providing communication protocols.	
	Communicating Speed		9600bps (Industrial standard)
Power	Voltage Range	AC100V~240V	
Technic	SMD, LSI, Reliable and durable		
Buzzer	Can be turned on/off by setting.		
Operation	Buttons and knob continuously.		
Environment	Temp.: 0~40℃, Humidity: ﹤80%		
Size	200mm * 190mm * 90mm (L * W * H)		
Weight	850g		
Package Size	25cm * 21cm * 10cm (L * W * H)		
Package Weight	0.98kg(Main engine, accessories and packing materials)		