Arbitrary Waveform Generator

AWG7102 • AWG7101 • AWG7052 • AWG7051 Data Sheet

Features & Benefits

- 10 GS/s (20 GS/s) and 5 GS/s Models
- 1 or 2 Arbitrary Waveform Outputs
  - Accurate Timing with only 20 ps_{p-p} Total Jitter (at 10^{-12} BER, Typical)
  - 45 ps Tr/Tf (20% to 80%)
  - ±100 ps Range (1 ps Resolution) Interchannel Skew Control
- 2 or 4 Variable-level Marker Outputs
  - Accurate Timing with only 30 ps_{p-p} Total Jitter (at 10^{-12} BER, Typical)
  - 45 ps Tr/Tf (20% to 80%)
  - Up to 300 ps Range (1 ps Resolution) Delay Control
- Vertical Resolution up to 10 bit Available: 10 bits (No Marker Output) or 8 bits (with Two Marker Outputs)
- Up to 64 M (64,800,000) Point Record Length Provides Longer Data Streams
- Down to 100 fs Resolution Edge Timing Shift Control
- Sequencing Creates Infinite Waveform Loops, Jumps, and Conditional Branches
- Real-time Sequencing Creates Infinite Waveform Loops, Jumps, and Conditional Branches
- Intuitive User Interface Shortens Test Time
- Integrated PC Supports Network Integration and Provides a Built-in DVD, Removable Hard Drive, LAN, and USB Ports

Applications

- Disk Drive (Magnetic/Optical) Read/Write:
  - Up to 5 Gb/s Data Rate (2 Points/Cell) or 50 ps Timing Resolution
- Telecom/Data Communications:
  - Up to 10 Gb/s Data Rate (Binary, Pre/De-emphasis, and Multilevel Logic)
- Wireless Communications:
  - Up to 5 GHz (4 Waveform Points/Cycle) Arbitrary RF/IF and Wide-bandwidth Modulation I and Q Baseband Signals
- Mixed-signal Design and Test:
  - 2-channel Analog plus 4-channel Marker Outputs
- High-speed, Low-jitter Data/Pulse and Clock Source
- Real-world, Ideal, or Distorted Signal Generation – Including All the Glitches, Anomalies, and Impairments
- Enhanced/Corrupted Playback of DSO Captured Signals
- Waveform Vectors Imported from Third-party Tools such as MATLAB, MathCAD, Excel, and Others

The AWG7000 Series of Arbitrary Waveform Generators Delivers the Industry's Best Mixed-signal Stimulus Solution for Ever-increasing Measurement Challenges

The AWG7000 Series Arbitrary Waveform Generator delivers a unique combination of superior signal stimulus, unrivaled sample rate, bandwidth and signal fidelity, and uncompromised usability.

This family offers the industry's best solution to the challenging signal stimulus issues faced by designers verifying, characterizing, and debugging sophisticated electronic designs.

With sample rates from 5 GS/s to 20 GS/s (10 bits), together with 1 to 2 output channels, the toughest measurement challenges in the disk drive, communications, digital consumer, and semiconductor design/test industries can be easily solved.

The open Windows (Windows XP)-based instruments deliver ease of use and allow connectivity with peripherals and compatibility with third-party software.

Tektronix®

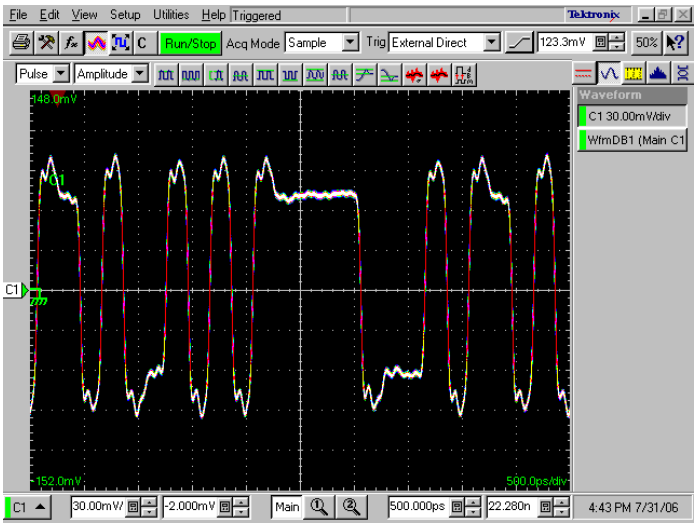


Figure 1: 5 Gb/s Pre/De-emphasized signal.

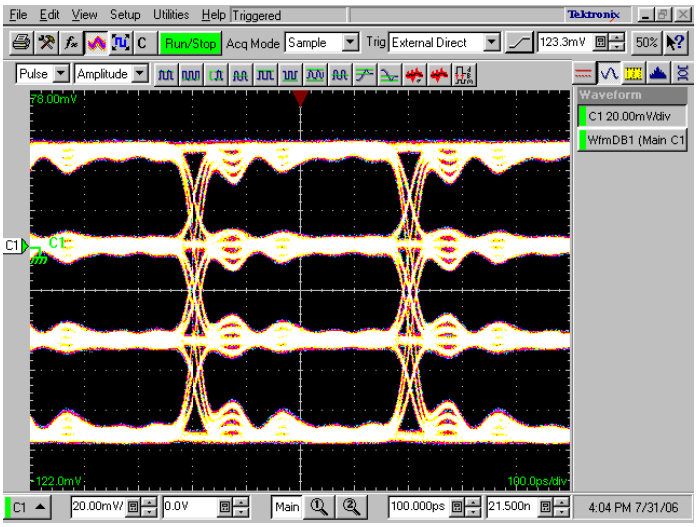


Figure 2: 20 Gb/s 4PAM signal (5 GS/s; AWG7101).

Application Examples

The need for performance arbitrary waveform generation is broad and spans over a wide array of applications. With the AWG7000 Series, Tektronix' 3rd generation of industry-leading Arbitrary Waveform Generators represent a new benchmark in performance, sample rate, signal fidelity, and timing resolution.

The ability to create, generate, or replicate either ideal, distorted, or "real-life" signals is essential in the design and testing process. Signal generation with controllable rise and fall times, noise or jitter; pre-emphasis, multilevel, and mixed signals; wideband RF, and fast-changing signals are just some of the capabilities of the AWG7000 Series.

Pre/De-Emphasized Signal Generation

With increasing transmission speeds and to compensate for frequency characteristics of "lossy" media, the technique of pre/de-emphasis is increasingly applied. Serial data standards such as PCI Express and others have also included pre/de-emphasis tests as a requirement to meet the respective compliance test specification.

The basic theory of pre-emphasis is that for any series of bits of the same value, the first bit always has a higher voltage level than the following bits. By doing so, frequency characteristics of transmission lines can be compensated thus the signal fidelity at the receiver side increased.

The AWG7000 Series, with its performance and analog output, enables users to directly generate pre/de-emphasized signals for next-generation serial data standards. It also enables users to generate 3-level signals as required for SATA Out-of-Band (OOB) testing.

The direct generation of such signals provides an increased signal quality and avoids cumbersome signal generation using multiple channels and a power combiner. See Figure 1.

Multilevel Signal Generation

The requirements for serial interfaces are continuously increasing. Higher and higher data rates are required, and the performance of cables and circuits is moving closer to their theoretical limits. One technique to increase the data rate without increasing the transition rate is by applying multilevel signals, wherein a signal can assume more than the standard binary 2 levels.

In multilevel signaling one can think of multilevel discrete amplitudes of a signal. This phenomenon is known as Pulse Amplitude Modulation or PAM. A 4PAM signal, a signal with 4 different amplitudes, increases the data rate by four without increasing the transition rate of the signal. Multilevel signals are not only applied for data transmission. Multilevel memory chips, storing more than a single bit in an individual memory element, are being produced and multilevel coding of data for storage on optical disks is being considered as an efficient way to increase storage capacity.

The AWG7000 Series enables you to test your latest design by generating any kind of mixed or multilevel signal. See Figure 2.

Figure 3: Hard disk read channel signal (5 Gb/s 2 points per cell); AWG7101 with 10 GS/s.

Signal Generation for Storage Device Testing

Increasing capacity requirements for storage devices leads to the development of new and faster read-and-write strategies for magnetic as well as optical storage devices. Multilevel coding of data for storage on optical disks is also being considered as an efficient way to increase storage capacity.

The AWG7000 Series, with its ability to generate an accurate reproduction of the readandwrite signals, enables users to design, develop, and test the latest storage devices. With sample rates up to 20 GS/s, and the generation of up to 6 signals (2 analog plus 4 marker) with a clock timing resolution of 100 ps, the AWG7000 Series represents a new benchmark in the industry. See Figure 3.

Wideband RF-signal Generation

In the RF world, technologies ranging from a wireless mouse to a satellite image require test equipment that can provide enough sample rate and resolution to recreate even the most complex RF behavior. The latest digital RF technologies often exceed the capabilities of current test equipment to generate wide-bandwidth and fast-changing signals that are increasingly seen in many wireless applications such as radar, UWB, and others.

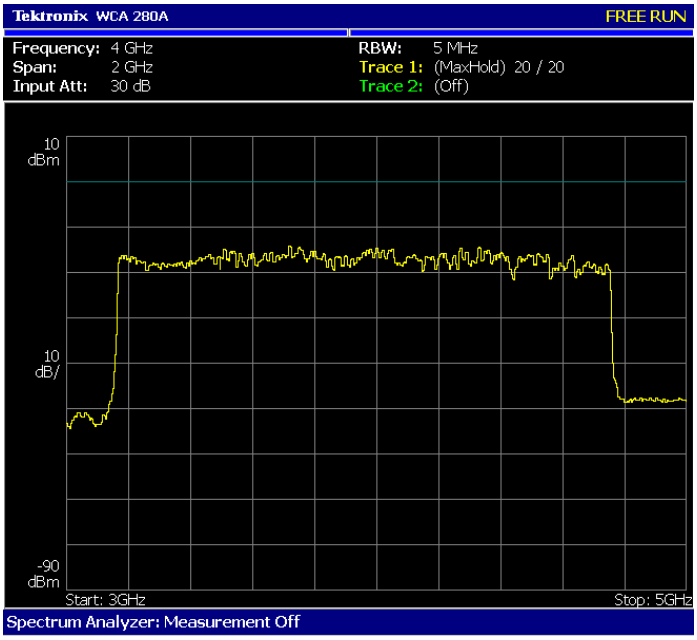
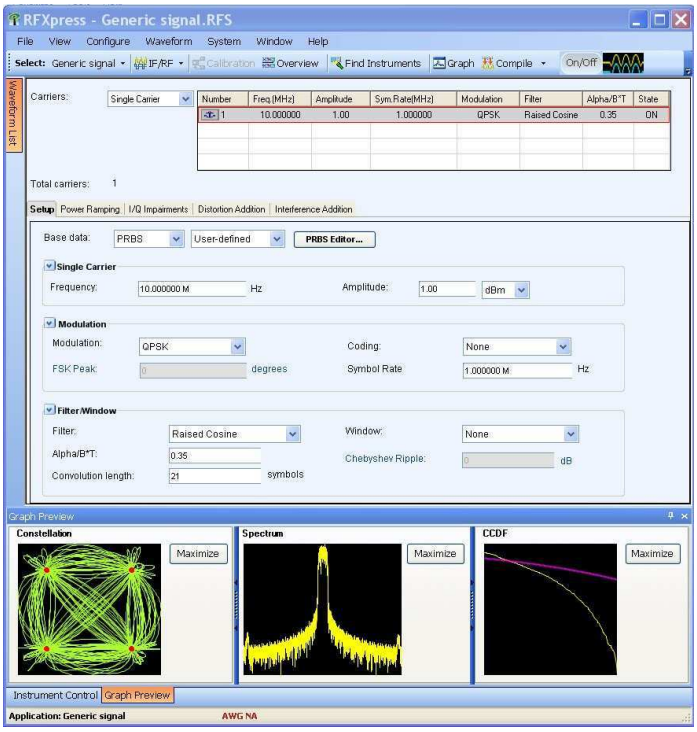
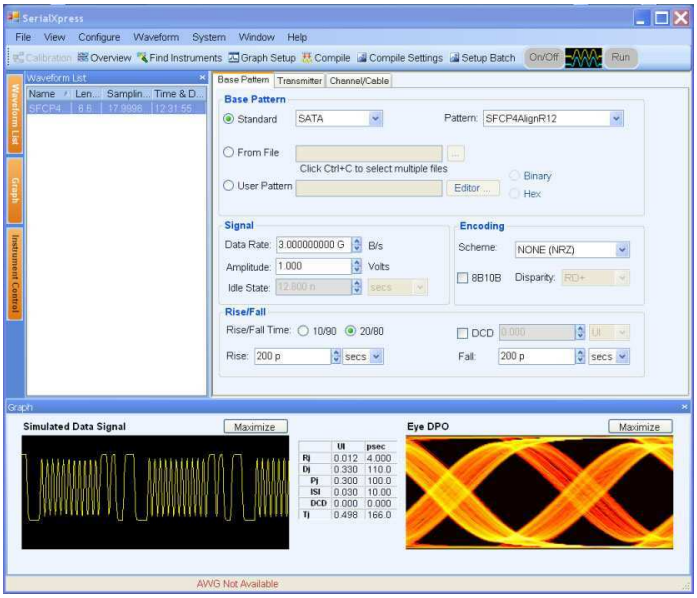


Figure 4: UWB (MBOA) three band (480 Mb/s 1795 MAC bytes 96 symbol payload); 3.168 GHz-4.752 GHz; AWG7102; Interleave at 15.84 GS/s; 0.5 V_{p-p}.

The AWG7000 Series enables the direct generation of RF signals and their output through the D/A converter for signals up to a carrier frequency of 5 GHz and a bandwidth of 5.8 GHz. The direct generation of IF or RF signals avoids I/Q degradations and lengthy adjustments associated with traditional generation using I/Q modulators. The AWG7000 Series with its maximum sample rate of 20 GS/s is the sole solution that allows a direct RF signal generation for up to 5 GHz. See Figure 4.





Additional Software Application Tools Extending Waveform Generation

RFXpress (RFX100)

RFXpress is a software package that synthesizes digitally modulated baseband, IF, and RF signals. It takes IQ, IF, and RF signal generation to the next level and fully exploits the wideband signal generation capabilities of Arbitrary Waveform Generators (AWGs). Supporting a wide range of modulations, as well as the symbol map functions, the software allows you to define your own modulation.

UWB-WiMedia signal creation, a software module for RFXpress, has the capability to digitally synthesize and generate RF signals in Band Groups 1 and 2 of the UWB spectrum. As per the latest WiMedia specification, signals will band hop in real-time over 1.5 GHz modulation bandwidth including all the different preamble synchronization sequences, cover sequences, TFCs, and band groups. All six band groups (BG1 to BG6) can be generated with band hopping in either IQ or IF. The conformance mode enables you to generate all signals that conform to WiMedia's specifications, while the custom mode allows you to adjust the signals for stress and margin testing.

SerialXpress® (SDX100)

SerialXpress enables creation of exact waveforms required for thorough and repeatable design validation, margin/characterization, and conformance testing of high-speed serial data receivers. It considerably simplifies the signal creation and Jitter simulations, thus reducing overall development and test time. In addition to supporting generation of Jitter (Random, Periodic (sinusoidal), ISI, and DCD) SerialXpress also supports SSC, pre-emphasis, and noise addition. This allows the user to create a combination of various impairments simultaneously to stress the receiver.

Both RFXpress and SerialXpress are powerful easy-to-use software packages to synthesize RF and high-speed serial data signals respectively for arbitrary waveform generators (AWG). It runs as an integral part of the AWG7000 Series arbitrary waveform generators or from an external PC.

Characteristics

Arbitrary Waveforms

Characteristic	AWG7102	AWG7101	AWG7052	AWG7051
Waveform Length	2 to 32,400,000 points (or 2 to 64,800,000 points, Option 01) in multiples of 64 Interleave: 2 to 64,800,000 points (or 2 to 129,600,000 points, Option 01) in multiples of 128	2 to 32,400,000 points (or 2 to 64,800,000 points, Option 01) in multiples of 64		
Number of Waveforms	1 to 16,000			
Sequence Length	1 to 4,000 steps			
Sequence Repeat Counter	1 to 65,536 or infinite			
Sequence Control	Repeat count, Wait for Trigger, Go-to-N, and Jump			
Jump Mode	Synchronous and Asynchronous			
Run Modes				
Continuous	Waveform is iteratively output. If a sequence is defined, the sequence order and repeat functions are applied			
Triggered	Waveform is output only once when an external, internal, GPIB, LAN, or manual trigger is received			
Gated	Waveform begins output when gate is true and resets to beginning when false			
Sequence	Waveform is output as defined by the sequence			
Interleave operation	Up to 20 GS/s sample rate (Option 06)	N/A		
Clock Generator				
Sampling frequency	10 MS/s to 10 GS/s (10 GS/s to 20 GS/s at interleave)	10 MS/s to 10 GS/s	10 MS/s to 5 GS/s	
Resolution	8 digits			
Internal Clock				
Accuracy	Within ±(1 ppm + Aging) Aging: within ±1 ppm/year			
Clock phase noise	< -90 dBc/Hz at 100 kHz offset			
Internal Trigger Generator				
Internal Trigger Rate				
Range	1.0 µs to 10.0 s			
Resolution	3 digits, 0.1 µs minimum			
Skew Control Between Outputs				
Range	-100 ps to +100 ps	N/A	-100 ps to +100 ps	N/A
Resolution	1 ps	N/A	1 ps	N/A
Skew accuracy	±(10% of setting +10 ps)	N/A	±(10% of setting +10 ps)	N/A

Main Arbitrary Waveform Output

Characteristic	AWG7102	AWG7101	AWG7052	AWG7051
Digital to Analog Converter				
Resolution	10 bit (no marker output) or 8 bit (2 ch markets available): each channel selectable			
Standard Output (into 50 Ω)				
Number of arb outputs	2	1	2	1
Output style	Differential			
Output impedance	50 Ω			
Connector	SMA Front			
Amplitude				
Amplitude				
Normal	50 mV_{p-p} to 2.0 V_{p-p}			
Direct	50 mV to 1.0 V_{p-p}			
Resolution	1 mV			
DC accuracy	±(3.0% of Amplitude + 2 mV) at offset = 0 V			
Offset				
Range				
Normal	-0.5 V to +0.5 V			
Direct	N/A			
Resolution	1 mV			
Accuracy	±(2% of offset ±10 mV) at minimum amplitude			
Pulse response	(-1 and 1 waveform data, 0 V offset, through filter at 1 V_{p-p})			
Rise/Fall Time (20 to 80%)				
Normal	350 ps (at 2 0 V_{p-p})			
Direct	75 ps (at 1.0 V_{p-p})			
Overshoot	Less than 10% (at 1.0 V_{p-p} amplitude)			
Bandwidth (-3 dB) (typical)				
Normal	750 MHz			
Direct	3.5 GHz			
Timing skew	Less than 20 ps (Direct output; between each channel (+) Pos and (–) Neg output)			
Low-pass filter				
Normal	50 MHz, 200 MHz (Bessel type)			
Direct	N/A			
Delay from marker output	Normal: 50 MHz (9.7 ns), 200 MHz (3.9 ns), Through (2.1 ns), Direct (0.5 ns)			
Sine wave (up to 5th harmonic)	(10 GS/s clock, 32 waveform points, 312.5 MHz signal frequency, 1.0 V amplitude)		(5 GS/s clock, 32 waveform points, 156.25 MHz signal frequency, 1.0 V amplitude)	
Harmonic distortion (typical)				
Normal	≤ -35 dBc		≤ -40 dBc	
Direct	≤ -42 dBc		≤ -45 dBc	
Nonharmonic spurious (typical)				
Normal	≤ -50 dBc (DC to 5 GHz)		≤ -50 dBc (DC to 2.5 GHz)	
SFDR (typical)	(10 GS/s clock, Amplitude: 1 V_{p-p}, Offset: 0 V, filter: "through," 10 bit DAC operation mode, DC to 5 GHz)		(5 GS/s clock, Amplitude: 1 V_{p-p}, Offset: 0 V, filter: "through," 10 bit DAC operation mode, DC to 2.5 GHz)	
Normal	45 dB		51 dB	
Direct	45 dB (at 312.5 MHz)		51 dB (at 156 MHz)	
Phase noise	(10 GS/s clock, Amplitude: 1 V_{p-p}, Offset: 0 V, 312.5 MHz) ≤ -90 dBc/Hz at 10 kHz offset		(5 GS/s clock, Amplitude: 1 V_{p-p}, Offset: 0 V, 156 MHz) ≤ -90 dBc/Hz at 10 kHz offset	
Random Jitter (typical)	1010 clock pattern			
RMS				
Normal	1.6 ps		1.6 ps	
Direct	0.9 ps		0.9 ps	
Total Jitter (typical)	2^{15}-1 PN data pattern (at 10-12 BER)			
Peak-to-Peak				
Normal	50 ps at 0.5 Gb/s		50 ps at 0.5 Gb/s	
Direct	30 ps at 1 to 6 Gb/s		30 ps at 1 to 5 Gb/s	

Option 02: High-bandwidth Output Option (Remove Standard Output)

Characteristic	AWG7102	AWG7101	AWG7052	AWG7051
Output Style	Differential			
Output Impedance	50 Ω			
Connector	SMA Front			
Amplitude (into 50 Ω)				
Amplitude	500 mV_{p-p} to 1.0 V_{p-p}			
Resolution	1 mV			
DC accuracy	±(2.0% of Amplitude + 2 mV)			
Offset	N/A			
Pulse Response	(-1 and 1 waveform data, 1 V_{p-p})			
Rise/Fall Time: (20 to 80%)	45 ps			
Overshoot	Less than 3% (at 1.0 V_{p-p} amplitude)			
Bandwidth (-3 dB) (typical)	5.8 GHz			
Timing Skew	Less than 20 ps (between each channel (+) Pos and (–) Neg output)			
Delay from Marker Output	0.2 ns			
Sine Wave (up to 5th harmonic)	(10 GS/s clock, 32 waveform points, 312.5 MHz signal frequency, 1.0 V amplitude)		(5 GS/s clock, 32 waveform points, 156.25 MHz signal frequency, 1.0 V amplitude)	
Harmonic Distortion (typical)	≤ -42 dBc		≤ -45 dBc	
Nonharmonic Spurious (typical)	≤ -50 dBc, DC to 5 GHz		≤ -50 dBc, DC to 2.5 GHz	
SFDR (typical)	(10 GS/s clock, Amplitude: 1 V_{p-p}, 10 bit DAC operation mode, DC to 5 GHz) 44 dB (at 312.5 MHz)		(5 GS/s clock, Amplitude: 1 V_{p-p}, 10 bit DAC operation mode, DC to 2.5 GHz) 48 dB (at 156 MHz)	
Phase Noise	(10 GS/s clock, Amplitude: 1 V_{p-p}, 312.5 MHz) ≤ -90 dBc/Hz at 10 kHz offset		(5 GS/s clock, Amplitude: 1 V_{p-p}, 156 MHz) ≤ -90 dBc/Hz at 10 kHz offset	
Random Jitter (typical)	1010 clock pattern			
RMS	0.9 ps		0.9 ps	
Total Jitter (typical)	2^{15}-1 PN data pattern (at 10-12 BER)			
Peak-to-Peak	20 ps_{p-p}: at 2 to 10 Gb/s		20 ps_{p-p}: at 2 to 5 Gb/s	

Option 06: Interleaved High-bandwidth Output in Addition to Option 02 (Remove Standard Output)
Available for only AWG7102

Characteristic	Description
Output Style	Differential
Output Impedance	50 Ω
Connector	SMA Front
Zeroing Control	On or Off
Amplitude (into 50 Ω)	
Amplitude	Zeroing On: 250 mV_{p-p} to 0.5 V_{p-p} Zeroing Off: 500 mV_{p-p} to 1.0 V_{p-p}
Resolution	1 mV
DC accuracy (typical)	±(8.0% of Amplitude + 2 mV) at offset = 0 V
Offset	N/A
Pulse Response	
Rise/Fall time: (20 to 80%)	45 ps
Overshoot	Less than 10% (at 1.0 V_{p-p} amplitude)
Bandwidth (-3 dB) (typical)	5.8 GHz
Delay from Marker Output	1.0 ns
Sine Wave (up to 5th harmonic)	(20 GS/s clock, 32 waveform points, 625 MHz signal frequency)
Harmonics Distortion	Zeroing On: ≤ -40 dBc (0.5 V_{p-p}) Zeroing Off: ≤ -40 dBc (1 V_{p-p})
Nonharmonic Spurious	DC to 5 GHz Zeroing On: ≤ -45 dBc (0.5 V_{p-p}) Zeroing Off: ≤ -45 dBc (1 V_{p-p})
SFDR (typical)	(20 GS/s clock, 10 bit DAC operation mode, DC to 10 GHz) 2.5 GHz – Zeroing On: 30 dB Zeroing Off: 40 dB
Phase Noise	(20 GS/s clock, 625 MHz) At 10 kHz offset – Zeroing On: ≤ -85 dBc/Hz (0.5 V_{p-p}) Zeroing Off: ≤ -85 dBc/Hz (1 V_{p-p})

Auxiliary Outputs

Characteristic	AWG7102	AWG7101	AWG7052	AWG7051
Marker Output				
Number of outputs	4 (2 per channel)	2	4 (2 per channel)	2
Output style	Differential			
Output impedance	50 Ω			
Connector	SMA Front			
Level (into 50 Ω) (Twice for Hi_Z Input)				
Output window	-1.4 V to +1.4 V			
Amplitude	0.5 V_{p-p} to 1.4 V_{p-p}			
Resolution	10 mV			
External termination	-2.8 V to +2.8 V			
Level accuracy	±(10% of setting + 50 mV)			
Rise/Fall time (20% to 80%)	45 ps (1.0 V_{p-p}, Hi +1.0 V, Lo 0 V)			
Marker Timing Skew				
Intra Skew	<13 ps (between each channel (+) Pos and (–) Neg output) (typical)			
In same channel	<30 ps (between Marker 1 and Marker 2 output) (typical)			
Delay Control Between Markers				
Range	0 to 300 ps			
Resolution	1 ps			
Accuracy	±(5% of setting + 50 ps)			
Random Jitter (typical)	1010 clock pattern			
RMS	1 ps		1 ps	
Total Jitter (typical)	2^{15}-1 PN data pattern (at 10-12 BER)			
Peak-to-Peak	30 ps_{p-p}		30 ps_{p-p}	
10 MHz Reference Out				
Amplitude	1.2 V_{p-p} into 50 Ω. Max 2.5 V_{p-p} open			
Impedance	50 Ω, AC coupling			
Connector	BNC Rear			
DC Outputs				
Number of outputs	4: Independently controlled outputs			
Range	-3.0 to +5.0 V			
Resolution	10 mV			
Max. current	±30 mA			
Connector	2×4 Pin Header on front panel			

Auxiliary Inputs

Characteristic	AWG7102	AWG7101	AWG7052	AWG7051
Trigger/Gate In				
Impedance		1 kΩ or 50 Ω		
Polarity		POS or NEG		
Connector		BNC Front		
Input Voltage Range		1 kΩ: ±10 V 50 Ω: ±5 V		
Threshold				
Level		-5.0 V to 5.0 V		
Resolution		0.1 V		
Trigger to output uncertainly				
Asynchronies between internal/external clock and trigger timing (typical)		2.2 ns at 10 GS/s, 2.6 ns at 7 GS/s, 3.4 ns at 5 GS/s		
Synchronize between external clock and trigger timing (typical)		10 GS/s x1 clock divider: 8 clock + 50 ps_{p-p} 10 GS/s x1 clock divider with specific timing: 50 ps_{p-p}, 10 ps_{RMS} The ambient temperature variant allows only ±5 °C		
Synchronize between external 10 MHz reference and trigger timing (typical)		10 GS/s setting: 8 clock + 150 ps_{p-p} 10 GS/s setting with specific timing: 150 ps_{p-p}, 30 ps_{RMS} The ambient temperature variant allows only ±5 °C		
Trigger Mode				
Minimum pulse width		20 ns		
Trigger hold-off		832 × sampling_period - 100 ns		
Delay to analog out		128 × sampling_period + 250 ns		
Gated Mode				
Minimum pulse width		1024 × sampling_period + 10 ns		
Delay to analog out		640 × sampling_period + 260 ns		
Event Input				
Impedance		1 kΩ or 50 Ω		
Polarity		POS or NEG		
Connector		BNC Front		
Input voltage range		1 kΩ: ±10 V 50 Ω: ±5 V		
Threshold level		-5.0 V to 5.0 V		
Resolution		0.1 V		
Sequence Mode				
Minimum pulse width		20 ns		
Event hold-off		900 × sampling_period + 150 ns		
Delay to analog out		1024 × sampling_period + 280 ns (Jump timing: Asynchronous jump)		
External Clock IN				
Input voltage swing		+5 to +11 dBm		
Impedance		50 Ω, AC coupled		
Frequency range		5 GHz to 10 GHz: (acceptable frequency drift is ±0.5%)		
Clock divider	1/1, 1/2, 1/4……1/256			1/2, 1/4……1/256
Connector		SMA Rear		
Fixed Reference Clock IN				
Input voltage range		0.2 V_{p-p} to 3.0 V_{p-p}		
Impedance		50 Ω, AC coupled		
Frequency range		10 MHz, 20 MHz, 100 MHz (with ±0.1%)		
Connector		BNC Rear		
Variable Reference Clock IN				
Input ranges		5 MHz to 800 MHz (acceptable frequency drift is ±0.1%)		
Input voltage range		0.2 V_{p-p} to 3 V_{p-p}		
Impedance		50 Ω, AC coupled		
Multiplier rate	1 to 2000 (2 to 4000 at interleave)	1 to 2000		1 to 1000
Connector		BNC Rear		

AWG7000 Series Common Features

Characteristic	Description
Waveform File Import Capability	Tektronix DPO7000/TDS5000/6000/7000 (*.wfm), TDS3000 (*.ISF)
	AWG400s/500s/610/615/710/710B (*.wfm, *.pat, *.seq)
	Text data file (third-party software creation waveform data: MATLAB, MathCad, Excel)
S/W Driver for Third-party S/W	IVI-COM driver
Instrument Control / Data Transfer Ports	
GPIB*1	Remote control and data transfer. (Conforms to IEEE-Std 488.1, compatible with IEEE 488.2 and SCPI-1999.0)
Ethernet (10/100/1000Base-T)*1	Remote control and data transfer. (Conforms to IEEE 802.3). RJ-45
Computer system and peripherals	Windows XP Professional, 512 MB SDRAM, 20 GB removable Hard Drive at rear (available front mount kit), CD-RW/DVD drive at front, included USB compact keyboard and mouse
PC I/O ports	USB 2.0 compliant ports (6 total, 2 front, 4 rear), PS/2 mouse and keyboard connectors (rear panel), RJ-45 Ethernet connector (rear panel) supports 10/100/1000Base-T, XGA out
Display	10.4 inch, LCD color display with touchscreen, 1024 (H) × 768 (V) (XGA)
Power Supply	100 to 240 VAC, 47 to 63 Hz
Power consumption	450 W
Safety	UL61010-1,CAN/CSA-22.2, No.61010-1-04, EN61010-1, IEC61010-1
Emissions	EN 55011 (Class A), IEC61000-3-2, IEC61000-3-3
Immunity	IEC61326, IEC61000-4-2/3/4/5/6/8/11
Regional Certifications	
Europe	EN61326
Australia / New Zealand	AS/NZS 2064

*1 Supported by MATLAB software through MATLAB Instrument Control Toolbox.

Physical Characteristics

Dimension	mm	in.
Height	245	9.6
Width	465	18.0
Length	500	19.7
Weight (approx.)	**kg**	**lb.**
Net	19	41.9
Net with Package	28	61.7
Mechanical Cooling Required Clearance		
Top and Bottom	2 cm	0.8 in.
Side	15 cm	6 in.
Rear	7.5 cm	3 in.

Environmental

Characteristic	Operation	Nonoperation
Temperature	+10 °C to +40 °C	-20 °C to +60 °C
Humidity	5% to 80% relative humidity (% RH) at up to +30 °C 5% to 45% RH above +30 °C up to +50 °C	5% to 90% relative humidity (% RH) at up to +30 °C 5% to 45% RH above +30 °C up to +50 °C
Altitude	Up to 3,048 meters (10,000 feet)	Up to 12,192 meters (40,000 feet)
Random Vibration	0.27 G_{RMS}, 5 to 500 Hz, 10 minutes per axis	2.28 G_{RMS}, 5 to 500 Hz, 10 minutes per axis
Sine Vibration	0.33 mm_{p-p} (0.013 $in._{p-p}$) constant displacement, 5 to 55 Hz	—
Mechanical Shock	Half-sine mechanical shocks, 30 g peak amplitude 11 ms duration, 3 drops in each direction of each axis	—

Characteristic	AWG7101 AWG7102 AWG7052 AWG7051		AWG7101 AWG7051 AWG7052	AWG7102	
	Standard		Option 02	Option 06 (Including Option 02)	
	Normal Out	Direct Out	High Bandwidth	High Bandwidth without Interleave	High Bandwidth with Interleave, Zeroing Off, (Zeroing On)
Maximum Amplitude	2 V_{p-p}	1 V_{p-p}	1 V_{p-p}	1 V_{p-p}	1 V_{p-p} (0.5 V_{p-p})
Minimum Amplitude	50 mV_{p-p}	50 mV_{p-p}	500 mV_{p-p}	500 mV_{p-p}	500 mV_{p-p} (250 mV_{p-p})
Offset	±500 mV	N/A	N/A	N/A	N/A
Tr/Tf (20 to 80%)	350 ps	75 ps	45 ps	45 ps	45 ps
Output Bandwidth	750 MHz	3.5 GHz	5.8 GHz	5.8 GHz	5.8 GHz

Ordering Information

Arbitrary Waveform Generator Mainframe

AWG7102
10.0 GS/s (20 GS/s interleaved), 8/10 bit, 32 M point, 2-channel arbitrary waveform generator.

AWG7101
10.0 GS/s, 8/10 bit, 32 M point, 1-channel arbitrary waveform generator.

AWG7052
5.0 GS/s, 8/10 bit, 32 M point, 2-channel arbitrary waveform generator.

AWG7051
5.0 GS/s, 8/10 bit, 32 M point, 1-channel arbitrary waveform generator.

All Models Include: Accessory pouch, front cover, USB mouse, compact USB keyboard, lead set for DC Output, stylus for touchscreen (2 each), Windows XP operating system restore DVD and instructions, AWG7000 Series product software CD and instructions, Document CD with Browser, Quick Start User Manual, registration card, Certificate of Calibration, power cable, 50 Ω SMA Terminator (3 each) (015-1022-xx).
Please specify power cord and language option when ordering.

Instrument Options

Product Options

Option	Description
AWG7102	
Opt. 01	Waveform Length Expansion (from 32 M to 64 M)
Opt. 06	High-bandwidth output with 20 GS/s interleaved including Opt. 02 features (alternative for standard output)
AWG7101, AWG7052, AWG7051	
Opt. 01	Waveform Length Expansion (from 32 M to 64 M)
Opt. 02	High-bandwidth output (alternative for standard output)

Common Options

Option	Description
International Power Plugs	
Opt. A0	North America
Opt. A1	Universal EURO
Opt. A2	United Kingdom
Opt. A3	Australia
Opt. A5	Switzerland
Opt. A6	Japan
Opt. A10	China
Opt. A11	India
Opt. A99	No power cord or AC adapter
Language Options	
Opt. L0	English
Opt. L5	Japanese

Service

The following service options and programs are available for AWG7000s (AWG7102, AWG7101, AWG7052, AWG7051).

Option	Description
Service Option: (for example, AWG7102 Opt. C3)	
Opt. CA1	A single calibration event
Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. R3	Repair Service 3 Years
Opt. R5	Repair Service 5 Years
Service Post-sales Offering: (for example, AWG7102-CA1).	
CA1	A single calibration event
R3DW	Repair service coverage 3 years
R5DW	Repair service coverage 5 years
R2PW	Repair service coverage 2 years post warranty
R1PW	Repair service coverage 1 year post warranty

Product Upgrade

Product	Ordering Options		Description
AWG7102	AWG70UP	Opt. M12	Waveform Length Expansion 32 M point to 64 M point.
AWG7052	AWG70UP	Opt. M02	
AWG7101	AWG70UP	Opt. M11	
AWG7051	AWG70UP	Opt. M01	

Recommended Accessories

Accessory	Order
Transition Time Converter	
150 ps (10% to 90%)	015-0710-xx
250 ps (10% to 90%)	015-0711-xx
500 ps (10% to 90%)	015-0712-xx
1000 ps (10% to 90%)	015-0713-xx
2000 ps (10% to 90%)	015-0714-xx
Pin Header SMA Cable	
102 cm (40 in.)	012-1690-xx
51 cm (20 in.)	012-1503-xx
Rackmount Kit: Rackmount Kit with instruction	016-1983-xx
Front Removable HDD Bay: Front removable HDD kit	016-1979-xx
Replacement Hard Disk: SATA disk assembly (no software installation)	065-0753-xx
Documentation	
Quick Start User Manual	
English	071-1851-xx
Japanese	071-1852-xx
Service Manual: English	071-1854-xx

Warranty
One-year parts and labor.

CE

ISO 9001

Product(s) are manufactured in ISO registered facilities.

GPIB IEEE-488

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit **www.tektronix.com**

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