Arbitrary Waveform Generator

AWG7000B Series (AWG7122B • AWG7121B • AWG7062B • AWG7061B)

The AWG7000B Series of Arbitrary Waveform Generators Delivers the Industry's Best Mixed Signal Stimulus Solution for Ever-increasing Measurement Challenges

The AWG7000B Series Arbitrary Waveform Generator delivers a unique combination of superior signal stimulus, unrivaled sample rate, bandwidth 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.

The direct synthesis signal generation enables a variety of signal outputs including multi-level, Pre/de-emphasis, Jitter (Rj, Pj, ISI, DCD), SSC and wander elements.

With sample rates from 6 Gsample/sec to 24 Gsample/sec (with up to 10-Bit resolution), together with one or two output channels, the toughest signal generation challenges in the high-speed serial communication and wideband RF applications can easily be solved. The open Windows (Windows XP) based instruments deliver ease of use and allow unparalleled connectivity with peripherals and compatibility with third-party software.

Application Examples

The need for performance arbitrary waveform generation is broad and spans over a wide array of applications. With the AWG7000B Series, Tektronix' industry leading Arbitrary Waveform Generators represent a cutting edge 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 AWG7000B Series.

Features & Benefits

12 GS/s (24 GS/s) and 6 GS/s models

9.6 GHz effective RF frequency output

1 or 2 arbitrary waveform outputs
- Accurate timing with only 20 ps_{p-p} total jitter (at 10^{-12} BER, typical)
- 35 ps TR/TF (20% to 80%)
- ±100 ps range (1 ps resolution) inter channel 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-Bit (no marker output) or 8-Bit (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

16,000 steps 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

High-speed serial communications

Wideband RF for communications and defense electronics

Disk drive (magnetic/optical) read/write:
- Up to 6 Gb/s data rate (2-point/cell) or 42 ps timing resolution

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

Playback of oscilloscope captured signals, including enhancements such as adding pre-distortion effects

Waveform vectors imported from third-party tools such as MathCAD, MATLAB, Excel and others

Tektronix®

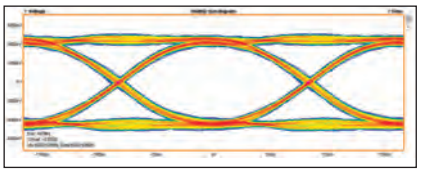


Figure 1: 24 GS/s, 6 Gb/s SATA Gen3 test signal, AWG7122B option 06.

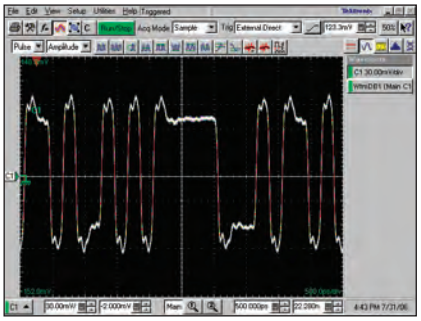


Figure 2: For 5 Gbps De-emphasis signal output by 20 GS/s.

High-speed Serial 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 bit of the same value, the first bit always has a higher voltage level than the following bit. By doing so, frequency characteristics of transmission lines can be compensated thus the signal fidelity at the receiver side increased.

The AWG7000B 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.

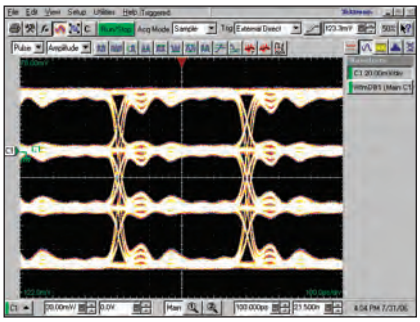


Figure 3: 20 Gb/s 4PAM signal (5 GS/s; AWG7121B).

The direct generation of such signals provides an increased signal quality and avoids cumbersome signal generation via multiple channels and power combiner. See Figure 1 and Figure 2.

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 multi-level signaling one can think of multi-level discrete amplitudes of a signal. This phenomenon is known as pulse-amplitude-modulation (PAM). A 4PAM signal, a signal with four 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. Multi-level memory chips, storing more than a single bit in an individual memory element, are being produced and multi-level coding of data for storage on optical disks is being considered as an efficient way to increase storage capacity.

The AWG7000B Series enables you to test your latest design by generating any kind of mixed or multi-level signal. See Figure 3.

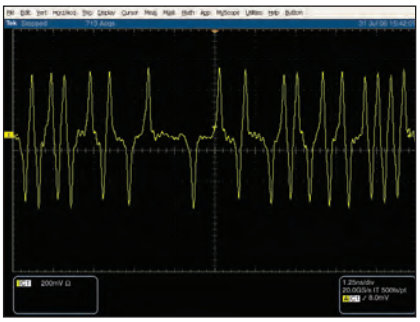


Figure 4: Hard disk read channel signal (5 Gb/s 2 points per cell); AWG7121B with 10 GS/s.

Signal Generation for Storage Device Testing

Increasing capacity requirements for storage devices leads to the development of newer and faster read-and-write strategies for both magnetic and optical mediums. Multi-level coding of data for storage on optical disks is also considered as an efficient way to increase storage capacity.

The AWG7000B Series with its ability to generate an accurate reproduction of the R/W signals, enables users to design, develop and test the latest storage devices. With sample rates up to 24 GS/s and the generation of up to six signals (two analog plus four Marker) with a clock timing resolution of 100 ps, the AWG7000B Series represents a new benchmark for the storage industry. See Figure 4.

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 re-create even the most complex RF behavior. The latest digital RF technologies often exceed the capabilities of current test instruments because of the need to generate the wide bandwidth and fast changing signals that are increasingly seen in many wireless applications such as UWB, radar and others.

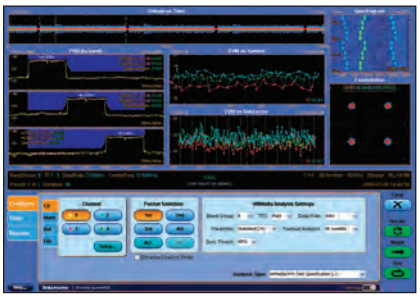


Figure 5: Direct WiMedia signals are easily created with RFXpress and the AWG7122B with Option 06 Interleaving.

The AWG7000B Series enables the direct generation of RF signals, via the D/A converter, up to an effective frequency of 9.6 GHz and with the capability to add real world signal anomalies. The direct generation of IF or RF signals avoids I/Q degradations and lengthy adjustments associated with traditional methods using I/Q modulators. See Figure 5.

Additional Software Application Tools Extending Waveform Generation

SerialXpress® (SDX100)

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

SSC also supports custom profiles and df/dt for stressing PLL designs. A programmatic interface enables easy integration of SerialXpress into test automation systems.

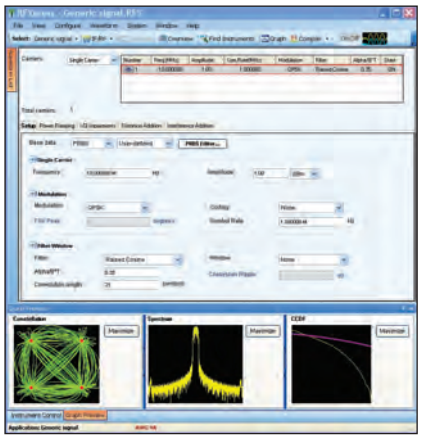
SerialXpress software.

RFXpress® (RFX100)

RFXpress® is a software package that synthesizes digitally modulated base band, 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 modulation formats, as well as the symbol map functions, the software allows users to define a wide variety of unique modulatation and frequency hopping schemes.

The RFXpress calibration feature predistorts the signal to provide flat frequency and linear phase response out of the AWG. Additionally you also have a provision to calibrate the image between fs/2 and fs thus providing a flat response for the under-sampled signals.

The UWB-WiMedia signal creation module for RFXpress (see Figure 4), has the capability to digitally synthesize and generate direct RF signals for all the Band Groups of the UWB spectrum. The latest WiMedia specification defines UWB signals that are communicated over a 1.5 GHz modulation bandwidth, includes complex preamble synchronization sequences and can operate in both hopping (TFI) and non-hopping (FFI) modes. All six band groups (BG1 to BG6) can be generated in a variety of ways including band hopping in either IQ, IF or direct RF generation. The conformance mode allows users to generate



RFXpress.®

signals that conform to WiMedia's specifications, while the custom mode enables users to add complex adjustments to the signals for stress and margin testing.

Radar signal creation, a software module for RFXpress gives you the ultimate flexibility in creating Pulsed Radar waveforms. It gives you the ability to build your own Radar pulse suite starting from a pulse to pulse trains to pulse groups. It Supports a variety of Modulation schemes including LFM, Barker and Poly phase Codes, User defined codes, Step FM, Non-Linear FM, User Defined FM and Custom modulation. It also has the ability to generate pulse trains with staggered PRI to resolve Range and Doppler ambiguity, Frequency hopping for Electronic Counter Counter Measures (ECCM) and Pulse to Pulse Amplitude variation to simulate Swerling target models.

Both RFXpress and SerialXpress are powerful, easy to use software packages to synthesize High-speed serial data and RF signals respectively for Arbitrary Waveform Generators (AWG). They run as an integral part of the AWG7000B Series arbitrary waveform generators or from an external PC.

For more details on RFXpress and SerialXpress visit www.tektronix.com.

Characteristics

Arbitrary Waveforms

	AWG7122B	AWG7121B	AWG7062B	AWG7061B
Arbitrary Waveform Output				
Digital to Analog Converter				
Resolution	10-Bit (no marker output) or 8-Bit (2 channel markers available, each channel selectable)			
Number of Outputs	2	1	2	1
Output Type	Differential			
Output Impedance	50 Ω			
Output Connector Type	SMA (front panel)			
Sampling Rate				
(Standard)(Option 06)	10 M to 12 Gsample/sec 12 G to 24 Gsample/sec	10 M to 12 Gsample/sec	10 M to 6 Gsample/sec	
Frequency Characteristics				
Effective RF Freq Out (Fmax)	Fmax determined as the lower of "Effective bandwidth (–6 dB)" or "Max sampling rate/2.5 points per cycle"			
Standard (typical)	3.5 GHz		2.4 GHz	
Option 02 (typical)	N/A	4.8 GHz	N/A	
Option 06 (typical)	9.6 GHz	N/A	N/A	
Effective Freq Switching Time	Minimum frequency switching time (from selected frequencies F_1 to F_2) is determined as "1/Fmax"			
Standard (typical)	170 ns		300 ns	
Option 02 (typical)	N/A	170 ns	N/A	
Option 06 (typical)	400 us	N/A	N/A	
Option 08 (typical)	286 ps		417 ps	
Option 02/08 (typical)	N/A	208 ps	N/A	
Option 06/08 (typical)	104 ps	N/A	N/A	
Amplitude Characteristics				
Rise Time Bandwidth (–3dB)	Bandwidth converted from rise time (0.35/Tr, as gaussian transition) characteristics through analog output and filtering circuitry			
Standard (typical)	Normal: 750 MHz Direct: 3.5 GHz			
Option 02 (typical)	N/A	7.5 GHz	N/A	
Option 06 (typical)	7.5 GHz	N/A	N/A	
Standard Output				
Low Pass Filter	Normal: 50 MHz, 200 MHz (Bessel type) Direct: N/A			
Amplitude				
Range	Normal: 50 mV to 2.0 V_{p-p} Direct: 50 mV to 1.0 V_{p-p}			
Resolution	1 mV			
Accuracy	± (3.0% of amplitude ± 2 mV) at offset = 0 V			

Arbitrary Waveforms (continued)

	AWG7122B	AWG7121B	AWG7062B	AWG7061B
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			
Distortion Characteristics				
	12 Gsample/s clock, 32 waveform points, 375 MHz signal frequency, 1.0 V amplitude		6 Gsample/s clock, 32 waveform points, 187.5 MHz signal frequency, 1.0 V amplitude	
Harmonic Distortion	Normal: ≤–35 dBc Direct: ≤–42 dBc		Normal: ≤–40 dBc Direct: ≤–45 dBc	
Non-harmonic Spurious	≤–50 dBc (DC to 6 GHz)		≤–50 dBc (DC to 3.0 GHz)	
Spurious Free Dynamic Range	12 Gsample/sec clock, amplitude: $1V_{p-p}$, offset: 0V 10-Bit DAC operational mode, DC to 6 GHz		6 Gsample/sec clock, amplitude: $1V_{p-p}$, offset: 0V 10-Bit DAC operational mode, DC to 3 GHz	
(Typical)	Normal: 45 dBc Direct: 45 dBc (at 375.0 MHz)		Normal: 51 dBc Direct: 51 dBc (at 187.5 MHz)	
Phase Noise	12 Gsample/sec clock, amplitude: $1V_{p-p}$, offset: 0 V carrier frequency 375.0 MHz		6 Gsample/sec clock, amplitude: 1 V_{p-p}, offset: 0 V carrier frequency 187.5 MHz	
(Typical)	–90 dBc/Hz at 10 kHz offset		≤–90 dBc/Hz at 10 kHz offset	
Random Jitter	1010 clock pattern			
rms (Typical)	Normal: 1.6 ps Direct: 0.9 ps			
Total Jitter	2^{15-1} PN data pattern (@10^{-12} BER)			
Peak-to-Peak ($_{p-p}$) (Typical)	Normal: 50 ps at 0.5 Gbps Direct: 30 ps at 6 Gbps			
Pulse Characteristics				
Pulse Response				
Rise/Fall Time (20 to 80%)	Normal: 350 ps (at 2.0 V_{p-p}) Direct: 75 ps (at 1.0 V_{p-p})			
Timing Skew (Typical)	Less than 20 ps (between each channel (+) Pos and (–) Neg output)			
Delay from Marker Output	Direct: 0.5 ns, Normal + 50 MHz: 9.7 ns, Normal + 200 MHz: 3.9 ns, Normal + Through: 2.1 ns			

Option: 02 and Option: 06

Output	AWG7122B		AWG7121B
	(Interleave mode)	(non- Interleave mode)	
Low Pass Filter		N/A	
Zeroing Control	On or Off	NA	
Amplitude			
Range	Zeroing On: 250 mV_{p-p} to 0.5 V_{p-p}, Zeroing Off: 500 mV_{p-p} to 1.0 V_{p-p}	500 mV to 1.0 V_{p-p}	
Resolution		1 mV	
Accuracy	Zeroing On: Within ±(40% of amplitude + 2 mV) Zeroing Off: Within ±(8% of amplitude + 2 mV)	± (2.0% of amplitude ±2 mV)	
Offset		NA	
Distortion Characteristics			
	24 Gsample/s clock, 32 waveform points, 750 MHz signal frequency	12 Gsample/s clock, 32 waveform points, 375 MHz signal frequency, 1.0 V_{p-p}	
Harmonic Distortion	Zeroing On: ≤–40 dBc (0.5V_{p-p}), Zeroing Off: ≤–40 dBc (1V_{p-p})	≤–42 dBc	
Non-harmonic Spurious	Zeroing On: ≤–45 dBc (0.5V_{p-p}), Zeroing Off: ≤–45 dBc (1V_{p-p}), DC to 6 GHz	≤–50 dBc, DC to 6 GHz	
Spurious Free Dynamic Range	24 Gsample/s clock, 10-Bit DAC operation mode, DC to 12 GHz	12 Gsample/sec clock, amplitude: 1V_{p-p}, 10-Bit DAC operational mode, DC to 6 GHz	
(Typical)	Zeroing On: 30 dB, Zeroing Off: 40 dB, (3.0 GHz)	44 dB (at 375 MHz), 48 dB (at 187.5 MHz)	
Phase Noise	24 Gsample/s clock, 750.0 MHz	12 Gsample/sec clock, amplitude: 1V_{p-p}, carrier frequency 375.0 MHz	
(Typical)	Zeroing On: ≤–85 dBc/Hz (0.5V_{p-p}), Zeroing Off: ≤–85 dBc/Hz (1V_{p-p}) at 10 kHz offset	≤–90 dBc/Hz at 10 kHz offset	
Random Jitter		1010 clock pattern	
rms (Typical)		0.9 ps	
Total Jitter		2^{15-1} PN data pattern (@10^{-12} BER)	
Peak-to-Peak ($_{p-p}$) (Typical)		20 ps at 2 G to 12 Gbps	
Pulse Characteristics			
Pulse Response			
Rise/Fall Time (20 to 80%)		35 ps (at 1.0 V_{p-p})	
Timing Skew (Typical)		Less than 12 ps (between each channel (+) Pos and (–) Neg output)	
Delay From Marker Output	0.9 ns	1.2 ns	0.2 ns
Interleave Skew/ Level Adjustment	Skew: +/– 180 degree against sample rate (e.g., 24 Gsample/s: 83 ps =360 degree) with 0.1 degree resolution, Amplitude: 1 mV resolution	NA	
Output Frequency Response		Refer to Figure 6	
	Amplitude relative to 100 MHz, Measured by harmonics of pulse waveform. Includes sin(x)/x roll-off, sample rate 24 Gsample/s	(Amplitude relative to 100 MHz, Measured by harmonics of pulse waveform Includes sin(x)/x roll-off), sample rate 12 Gsample/s	
	Zeroing On: 500 MHz: –0.5 dB, 1 GHz: –0.5 dB, 2 GHz: –1.0 dB, 3 GHz: –1.5 dB, 4 GHz: –1.9 dB, 5 GHz: –2.7 dB, 6GHz: –3.5 dB, 7 GHz: –4.0dB, 8 GHz: –4.5dB, 9 GHz: –5.7dB, 10 GHz: –6.8 dB, 11 GHz: –8.0 dB Zeroing Off: 500 MHz: –0.5 dB, 1 GHz: –0.5 dB, 2 GHz: –1.4 dB, 3 GHz: –1.9 dB, 4 GHz: –2.7 dB, 5 GHz: –4.8 dB, 6 GHz: –6.6 dB, 7 GHz: –8.2dB, 8 GHz: –10.4dB, 9 GHz: –14.0dB, 10 GHz: –18.0 dB, 11 GHz: –25.0 dB	500 MHz: –0.5 dB, 1 GHz: –0.5 dB, 2 GHz: –1.4 dB, 3 GHz: –1.9 dB, 4 GHz: –2.7 dB, 5 GHz: –4.8 dB, 6 GHz: –6.6 dB	
Level Flatness (Typical)	+/– 2 dB		+/– 2 dB

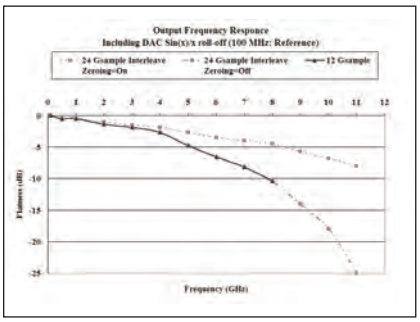


Figure 6: Output Frequency Response Curve.

	AWG7122B	AWG7121B	AWG7062B	AWG7061B
Waveform Length				
Waveform Length	2 to 32,400,000 points (or 2 to 64,800,000 points, option 01) in multiples of 4 Option 06: Interleave: 2 to 64,800,000 points (or 2 to 129,600,000 points, option 01) in multiples of 8	2 to 32,400,000 points (or 2 to 64,800,000 points, option 01) in multiples of 4		
Number of Waveform	1 to 16,000			
Sequence Length	1 to 16,000 steps			
Sequence Repeat Counter	1 to 65,536 or infinite			
Sequence Control	Repeat count, Wait for Trigger, Go-to-N and Jump. The standard model requires "Wait for Trigger ON" for all sequence step definition, the option 08 (fast sequence switching) selectable On or Off for each sequence step			
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			
Sampling Clock				
Resolution	8 digits			
Accuracy	Within ±(1 ppm + Aging), Aging: within ±1 ppm/year			
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

	AWG7122B	AWG7121B	AWG7062B	AWG7061B
Auxiliary Outputs				
Marker Output				
Number of Outputs	4 (2 per ch)	2	4 (2 per ch)	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	$0.5V_{p-p}$ to 1.4 V_{p-p}			
Resolution	10 mV			
External Termination	–2.8 V to +2.8 V			
Level Accuracy	± (10% of setting + 75 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	1010 clock pattern			
Rms: (Typical)	1 ps			
Total Jitter	2^{15-1} PN data pattern (@10^{-12} BER)			
Peak to Peak (p-p) : (Typical)	30 ps			
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 V to +5.0 V			
Resolution	10 mV			
Output Voltage Accuracy	± (3% of the setting + 120 mV)			
Max. Current	± 30 mA			
Connector	2 x 4 pin header on front panel			

	AWG7122B	AWG7121B	AWG7062B	AWG7061B
Auxiliary Inputs				
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)	0.7 ns at 10 GS/s, 0.8 ns at 9 GS/s, 1.0 ns at 6 GS/s			
Synchronize Between External Clock and Trigger Timing (Typical)	12 GS/s, x1 clock divider, synchronous trigger mode with specific timing: 50 ps_{p-p}, 10 ps_{rms}			
Synchronize Between External 10 MHz Reference and Trigger Timing (Typical)	12 GS/s setting, synchronous trigger mode with specific timing: 120 ps_{p-p}, 30 ps_{rms}			
Synchronize Between External Variable Reference and Trigger Timing (Typical)	2^N (N: integer) Clock setting of reference, synchronous trigger mode with specific timing: 50 ps_{p-p}, 10 ps_{rms}			
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	+7 to +11 dBm			
Impedance	50 Ω, AC coupled			
Frequency Range	6 GHz to 12 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 2400 (2 to 4800 @ interleave)	1 to 2400	1 to 1200	
Connector	BNC Rear			

AWG7000B Series Common Features

Waveform File Import Capability – Tektronix TDS5000/6000, TDS/CSA7000B, TDS/CSA/DSA8000, DPO7000B, DPO/DSA70000B (*.wfm). TDS3000, DPO4000 (*.ISF) AWG400s/500s/610/615/710/710B (*.wfm, *.pat, *.seq), AFG3000 (*.TFW), DTG5000s (*.DTG) Text data file (third-party software creation waveform data: MATLAB, MathCad, Excel).

Waveform File Export – Export waveform format by series of AWG400/500/600/700. (xxx.wfm or xxx.pat) and Text format.

S/W Driver for 3rd Party S/W – IVI-COM driver and MATLAB library.

Instrument Control/Data Transfer Ports

GPIB – 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) – Remote control and data transfer. (Conforms to IEEE 802.3). RJ-45.

TekLink – Proprietary bus for Tektronix product local communication.

Computer System and Peripherals – Windows XP Professional, 2 GB SDRAM, 80 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 10/100/1000 BASE-T, XGA out.

Display Characteristics – 10.4 inch, LCD color display with touch screen, 1024 (H) x 768 (V) (XGA).

Mechanical Cooling

Required Clearance –
Top and Bottom – 2 cm (0.8 inch).
Side – 15 cm (6 inch).
Rear – 7.5 cm (3 inch).

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.

Physical Characteristics

Dimension	mm	in.
Height	245	9.6
Width	465	18.0
Length	500	19.7

Weight (approx.)	kg	lbs.
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 Characteristics

	Operation	Non-operation
Temperature	+10 ºC to +40 ºC	-20 ºC to +60 ºC
Humidity	5% to 80% relative humidity (% RH) at up to +30 ºC, 5% to 45% RH above +30º C up to +50º C	5% to 90% relative humidity (% RH) 5% to 45% RH above +30º C up at up to +30 ºC, to +50º 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 msec duration, 3 drops in each direction of each axis	Half-sine mechanical shocks, 10 g peak amplitude 11 msec duration, 3 drops in each direction of each axis

	AWG7122B/AWG7121B/ AWG7062B/AWG7061B		AWG7121B	AWG7122B	
	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	35 ps	35 ps	35 ps
Output Bandwidth	750 MHz	3.5 GHz	7.5 GHz	7.5 GHz	7.5 GHz

Ordering Information

Arbitrary Waveform Generator

AWG7122B

12.0 GS/s (24 GS/s interleaved), 8/10-Bit, 32 M point, 2-channel arbitrary waveform generator.

AWG7121B

12.0 GS/s, 8/10-Bit, 32 M point, 1-channel arbitrary waveform generator.

AWG7062B

6.0 GS/s, 8/10-Bit, 32 M point, 2-channel arbitrary waveform generator.

AWG7061B

6.0 GS/s, 8/10-Bit, 32 M point, 1-channel arbitrary waveform generator.

All models Include: Accessory pouch, front cover, USB mouse, compact USB key board, lead set for DC output, stylus for touch screen (2 ea), AWG7000B Series product software CD and instructions, documentation CD with browser, Quick Start User Manual and registration card, Certificate of Calibration, power cable and 50 Ω SMA terminator (3 ea).

Note: Please specify power cord and language option at time of order.

Instrument Options

Product Options

AWG7122B, AWG7121B, AWG7062B, AWG7061B

Opt. 01 – Waveform record length expansion (from 32 Mpoint to 64 Mpoint).

Opt. 08 – Fast sequence switching (requires export control license), ECCN:3A002.

AWG7122B

Opt. 06 – Interleaved output at 24 Gsample/sec (includes Option 02 - High bandwidth output), (alternative for standard output).

AWG7121B

Opt. 02 – High bandwidth output (alternative for standard output).

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.

Opt. L7 – Simplified Chinese.

Opt. L8 – Traditional Chinese.

Opt. L10 – Russian.

Application Software

RFX100 – General-purpose IQ, IF and RF signal creation software package.

Opt. UWBCF – RFXpress plug-In for UWB-WiMedia IQ, IF and RF conformance signal creation (requires RFX100 as prerequisite).

Opt. UWBCT – RFXpress plug-In for UWB-WiMedia IQ, IF and RF custom and conformance signal creation (requires RFX100 as prerequisite and includes Option UWBCF).

Opt. RDR – RFXpress plug-In for RADAR signal creation (requires RFX100 as prerequisite).

SDX100 – Jitter generation software package (includes USB dongle).

Opt. ISI – S-Parameter and ISI creation (requires SDX100 as prerequisite).

Opt. SSC – Spread Spectrum Clock addition option (requires SDX100 as prerequisite).

Service Options

Service Option (for example, AWG7122B 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 Option C3).

Opt. D5 – Calibration Data Report 5 Years (with Option C5).

Opt. R3 – Repair Service 3 Years.

Opt. R5 – Repair Service 5 Years.

Service Post-sales Offering (for example, AWG7122B-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.

Arbitrary Waveform Generator

AWG7000B Series (AWG7122B • AWG7121B • AWG7062B • AWG7061B)

Product Upgrade

Product	Ordering Options		Description
AWG7122B	AWG70BUP	Opt. M12	Waveform Length Expansion 32 M point to 64 M point
AWG7062B	AWG70BUP	Opt. M02	
AWG7121B	AWG70BUP	Opt. M11	
AWG7061B	AWG70BUP	Opt. M01	
AWG7122B	AWG70BUP	Opt. S48	Upgrade from standard to Option 08 (fast sequence switching) requires export license
AWG7062B	AWG70BUP	Opt. S38	
AWG7121B	AWG70BUP	Opt. S28	
AWG7061B	AWG70BUP	Opt. S18	

Recommended Accessories

Item	Description	Parts Number
Pin Header		
SMA Cable	102 cm (40 inch)	012-1690-00
SMB Cable	51cm (20 inch)	012-1503-00
Rack Mount Kit	Rack Mount Kit with instruction	016-1983-01
Front Removable HDD Bay	Front Removable HDD Bay	016-1979-01
Replacement Hard Disk for AWG5000/7000 Series	SATA disk assembly (no software installation), Instruction sheet	065-0811-00
Quick Start User Manual	English	071-2481-00
	Japanese	071-2482-00
	Simplified Chinese	071-2483-00
	Traditional Chinese	071-2484-00
	Russian	071-2485-00
Service Manual	Service Manual, English	Visit Tektronix Web site

Warranty

One year parts and labor.

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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**

Product(s) are manufactured in ISO registered facilities.

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

08/08 HB/WOW 76W-22259-1