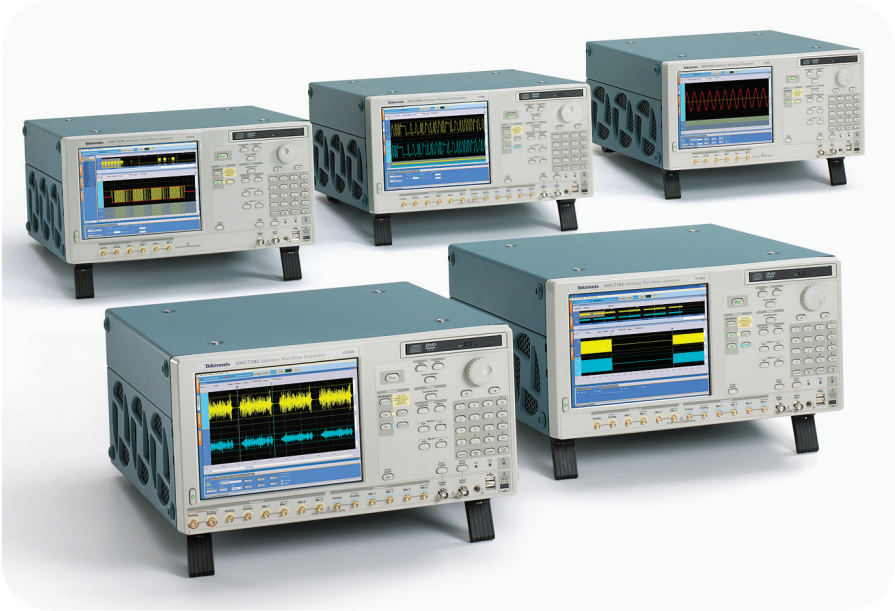
Arbitrary Waveform Generator

▶ AWG7000 Series (AWG7102 • AWG7101 • AWG7052 • AWG7051)



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.

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.

▶ 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) 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-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-point/cell) or 50 ps Timing Resolution

Telecom/Data Communications:
- Up to 10 Gb/s Data Rate (Binary, Pre-/De-emphasis and Multi-level 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

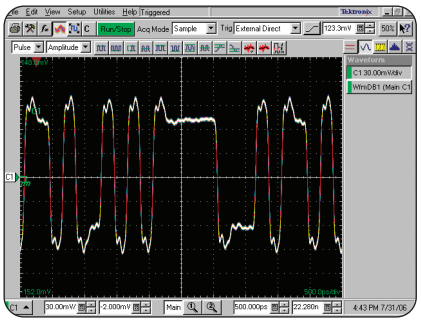
High-speed, Low-jitter Data/Pulse and Clock Source

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

Tektronix
Enabling Innovation



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

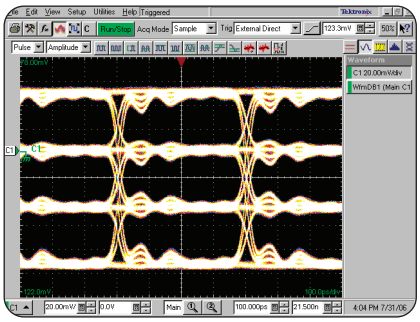
Pre/De-Emphasized Signal Generation

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 via multiple channels and power combiner. See Figure 1.



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

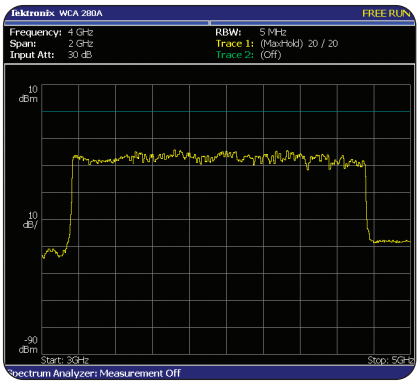
Multilevel Signal Generation

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

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



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

Signal Generation for Storage Device Testing

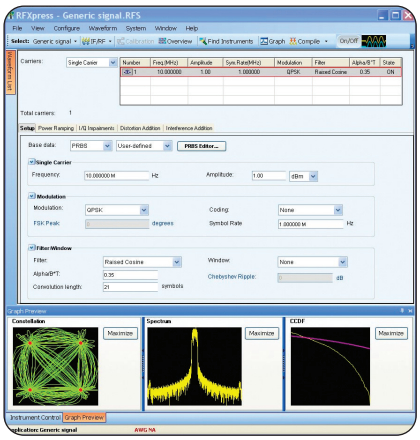
Increasing capacity requirements for storage devices leads to the development of new and faster read- and-write strategies for magnetic as well as optical storage devices. Multi-level coding of data for storage on optical disks is also being considered as an efficient way to increase storage capacity.

The AWG7000 Series with its ability to generate an accurate reproduction of the read-and-write 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 re-create 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.

The AWG7000 Series enables the direct generation of RF signals and their output via 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.

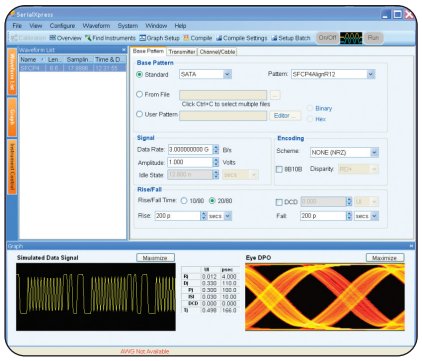


Additional Software Application Tools Extending Waveform Generation

RFXpress (RFX100)

RFXpress is a software package that synthesizes digitally modulated 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 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. SerialXpress in addition to supporting generation of Jitter (Random, Periodic (sinusoidal) , ISI and DCD) 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 package 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.

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

► Characteristics

► Arbitrary Waveforms

	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

	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				
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 Characteristics (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	
Non-harmonic 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 (@ 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 G to 6 Gb/s		30 ps at 1 G to 5 Gb/s	

► Option 02: High Bandwidth Output Option (Remove Standard Output)

	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 Characteristics (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	
Non-harmonic 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 (@ 10^{-12} BER)			
Peak-to-Peak	20 ps_{p-p}: at 2 G to 10 Gbp/s		20 ps_{p-p}: at 2 G to 5 Gb/s	

► Option 06: Interleaved High Bandwidth Output in Addition Option 02 (Remove Standard Output) Available for only AWG7102

	AWG7102
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)	5.8 GHz
Delay from Marker Output	1.0 ns
Sine Wave Characteristics (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}), Off: ≤–40 dBc (1 V_{p-p})
Non-harmonic Spurious	DC to 5 GHz, Zeroing On: ≤–45 dBc (0.5 V_{p-p}), 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, 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}), Off: ≤–85 dBc/Hz (1 V_{p-p})

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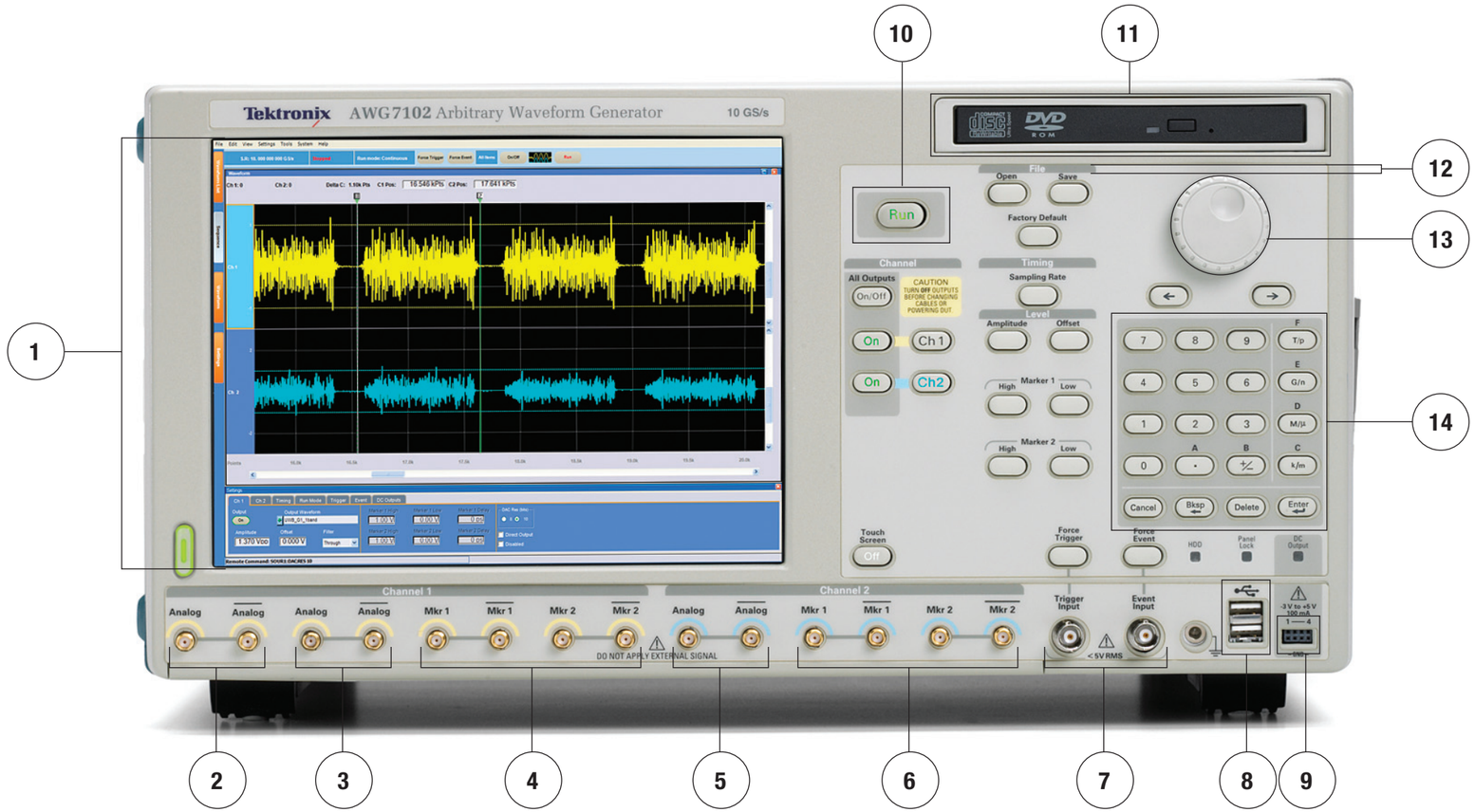

1	2	3	4	5	6	7	8	9	10	11	12	13	14
10.4-inch Touch Screen	CH 1 Analog (interleave)	CH 1 Analog	CH 1 Marker 1/2	CH 2 Analog	CH 2 Marker 1/2	Input: Trigger, Event	USB: For Memory, Mouse, Keyboard	4-channel DC Output	RUN Channel Selection	CD-RW, DVD-ROM Drive	File Manage Output Setting	Rotary Knob	Keypad

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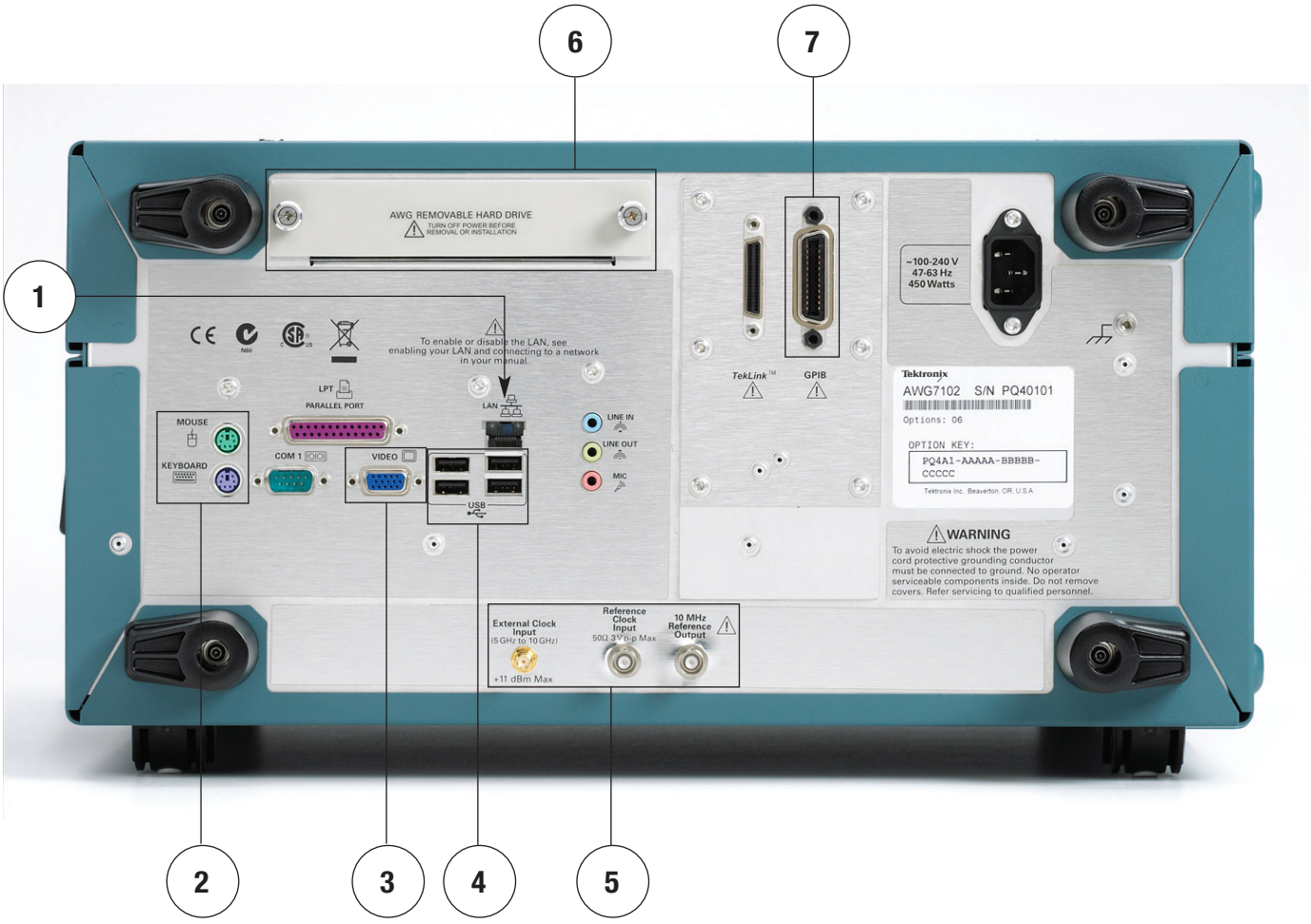

1	2	3	4	5	6	7
LAN (10/100Base-T)	PS/2 Keyboard/ Mouse	VGA Monitor Out	USB Port x 4	Reference Input (fixed and variable) Reference Output External Clock Input	3.5-inch Removable HDD	GPIB

► Auxiliary Outputs

	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 (@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	2x4-Pin header on front panel			

► Auxiliary Inputs

	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 ºC			
Synchronize Between External 10MHz 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 ºC			
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

Waveform File Import Capability	Tektronix DPO7000/TDS5000/6000/7000 (*.wfm), TDS3000 (*.ISF)
	AWG400s/500s/610/615/710/710B (*.wfm, *.pat, *.seq)
	Text data file (3rd 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 Characteristics	10.4 inch, LCD color display with touch screen, 1024 (H) x 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

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	**cm**	**in.**
Top and Bottom	2	0.8
Side	15	6
Rear	7.5	3

Environmental	**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 +30 ºC up to +50 ºC	5% to 90% relative humidity (% RH) at up to +30 ºC, 5% to 45% RH above +30 ºC up to +50 ºC
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	—

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

► Ordering Information

	AWG7102/AWG7101/ AWG7052/AWG7051		AWG7101/ AWG7052/AWG7051	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

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 touch screen (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) (015-1022-01).

Please specify power cord and language option when ordering.

Instrument Options

Product Options, AWG7102

Opt. 01 – Waveform Length Expansion (from 32 M to 64 M).

Opt. 06 – High Bandwidth output with 20 GS/s interleaved including Option 02 features (alternative for standard output).

Product Options, 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

International Power Plugs

Opt. A0 – North America power.
Opt. A1 – Universal EURO power.
Opt. A2 – United Kingdom power.
Opt. A3 – Australia power.
Opt. A5 – Switzerland power.
Opt. A6 – Japan power.
Opt. A10 – China power.
Opt. A11 – India power.
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).

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 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, 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, AWG7102
– AWG70UP Opt. M12. Waveform Length Expansion 32 M point to 64 M point.

Product Upgrade, AWG7052
– AWG70UP Opt. M02.

Product Upgrade, AWG7101
– AWG70UP Opt. M11.

Product Upgrade, AWG7051
– AWG70UP Opt. M01.

Recommended Accessories

Transition Time Converter –
150 ps (10% to 90%). Order 015-0710-00.
250 ps (10% to 90%). Order 015-0711-00.
500 ps (10% to 90%). Order 015-0712-00.
1000 ps (10% to 90%). Order 015-0713-00.
2000 ps (10% to 90%). Order 015-0714-00.

Pin Header SMA Cable – 102 cm (40 in.). Order 012-1690-00.

Pin Header SMA Cable – 51 cm (20 in.). Order 012-1503-00.

Rackmount Kit – Rackmount Kit with instruction. 016-1983-00.

Replacement Hard Disk – SATA disk assembly (no software installation). Order 065-0753-00.

Front Removable HDD Bay – Front removable HDD kit. Order 016-1979-01.

Documentation

Quick Start User Manual English – 071-1851-xx.

Quick Start User Manual Japanese – 071-1852-xx.

Service Manual: Service Manual, English. 071-1854-xx.

Warranty

One year parts and labor.

Arbitrary Waveform Generator

► AWG7000 Series (AWG7102 • AWG7101 • AWG7052 • AWG7051)

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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.

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