

# Arbitrary Waveform Generators

## AWG70000A Series Datasheet

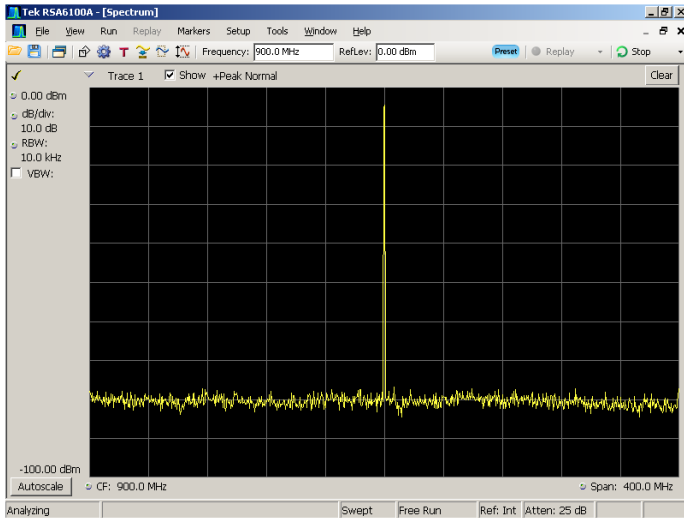


### Features & Benefits

- Leading edge AWG performance
    - Sample Rates up to 50 GS/s
    - -80 dBc Spurious Free Dynamic Range
    - 10 bits vertical resolution
    - 16 GSample waveform memory
  - Complete solution for wideband RF signal generation in a single box
    - Direct generation of wideband signals with carriers up to 20 GHz, removing the need for external RF conversion
  - Simulate real-world analog effects on high speed digital data streams
    - Model signal impairments up to speeds of 12.5 GBs
  - Generate high precision RF signals
    - Spurious Free Dynamic Range performance better than -80 dBc
  - Create high speed baseband signals for optical transmission with the vertical resolution to handle higher order complex modulation
    - 10 bits of vertical resolution at a sample rate of 50 GS/s
- Create long waveform scenarios without building complex sequences
    - Up to 16 GSamples of Waveform Memory plays 320 ms of data at 50 GS/s
  - Synchronize multiple units to achieve a multi-channel high speed AWG system
  - Fully operational without external PC
    - Built-in display and buttons make it possible to quickly select, edit and play waveforms directly from the front panel of the AWG
  - Simulate real-world environments by playing back captured signals
    - Waveforms captured with Oscilloscopes or Real-Time Spectrum Analyzers can be played back, edited or re-sampled on the AWG
  - Smooth transition from simulation to the real-world testing environment
    - Waveform vectors imported from third-party tools such as MATLAB, Excel, and others

### Applications

- Wideband RF/MW for Communications and Defense Electronics
  - Output wideband RF signals up to 20 GHz
- Validation and compliance testing of High Speed Silicon & Communications Devices
  - Easily stress test receivers with a wide array of signal impairments
- Coherent Optical Research
  - Generation of high Baud rate baseband signals with higher order, complex modulation
- Leading edge research in electronics, physics & chemistry
  - High speed, low jitter signal source generates uniquely specified analog signals, fast pulses, data streams and clocks



The AWG70000A offers outstanding Spurious Free Dynamic Range performance

## Unparalleled Performance

The need for high-performance arbitrary waveform generation is broad and spans a wide array of applications. The industry-leading AWG70000A Series arbitrary waveform generator (AWG) represents the cutting edge in performance, sample rate, signal fidelity, and waveform memory. The ability to create, generate, or replicate either ideal, distorted, or “real-life” signals is essential in design, testing and operations of some of the world’s most complex data communications systems. The AWG70000A Series of AWGs, with up to 50 GS/s and 10-bit vertical resolution, delivers the industry’s best signal stimulus solution for ever-increasing measurement challenges. This allows for easy generation of very complex signals and complete control over signal characteristics.

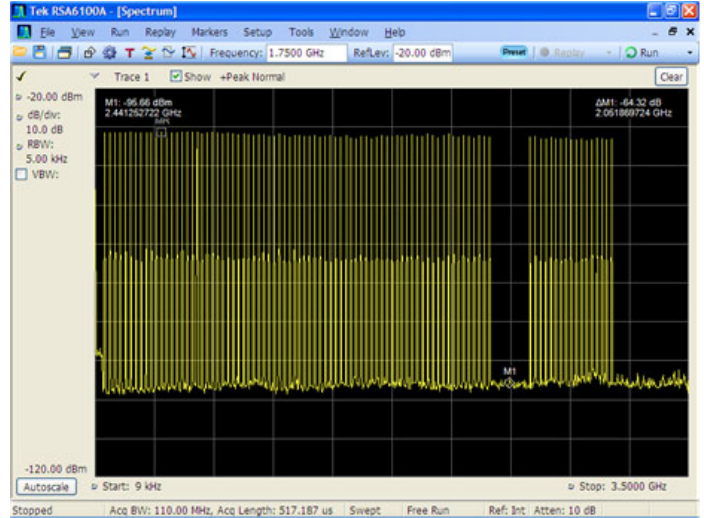
## Seamless transition from simulation to generation

If a waveform can be defined or captured, then the AWG70000A can generate the signal. The creation of the waveform can happen in many ways. Application software like RFXpress and SerialXpress, which are optimized to work specifically the Tektronix AWG family, provide specific waveform creation capabilities, while 3rd party solutions like MATLAB, Excel, or others, have the flexibility to create any waveform you desire. Waveforms created in any of these packages can be imported and played back in the AWG70000A, seamlessly transitioning from the simulation world to the real world.

Additionally, any signals captured on Tektronix oscilloscopes or Real-Time Spectrum analyzers can be loaded into the AWG70000A and played back. With the use of the RFXpress software, the captured signal can also be modified or changed to meet any specific requirements that may exist.

## Wideband RF Signal Generation

Creating RF signals is becoming more and more complex, making it difficult for RF engineers to accurately create the signals required for conformance and margin testing. When combined with RFXpress, the AWG70000A Series can address these tough design challenges. RFXpress is a software package that digitally synthesizes modulated baseband, IF, and RF signals taking signal generation to new levels by fully exploiting the wideband



3 GHz wide multi-carrier signal generated on the AWG70000A with over 60 dBC SFDR



AWG radar pulses created with AWG70000A and RFXpress.

signal generation capabilities of the AWG70000A Series arbitrary waveform generators (AWGs). Together, the AWG70000A and RFXpress provide engineers with “bandwidth on demand”, which is the ability to generate wideband modulated signals anywhere within the 20 GHz frequency range.

The latest digital RF technologies often exceed the capabilities of other test instruments because of the need to generate the wide-bandwidth and fast-changing signals that are increasingly seen in many RF applications such as radar, RF comms, OFDM, and UWB. When used in conjunction with RFXpress, the AWG70000A Series supports a wide range of modulation formats and simplifies the task of creating complex RF waveforms. The AWG70000A Series instruments provide customers with ways to generate fully modulated baseband, intermediate frequency (IF) signals, or directly generated RF waveforms up to 20 GHz.

## Radar Signal Creation

Generating advanced radar signals often demands exceptional performance from an AWG in terms of sample rate, dynamic range, and memory. The Tektronix AWG70000A Series sets a new industry standard

## Environment Signal Generation

The mission-critical nature of many radar signals requires that they coexist with standards-based commercial signals sharing the same spectrum without performance degradation. To meet this expectation, a radar designer has to thoroughly test all the corner cases at the design/debug stage. The AWG70000A and RFXpress (with optional Environment plug-in) offers extreme flexibility to define and create these worst-case scenarios.

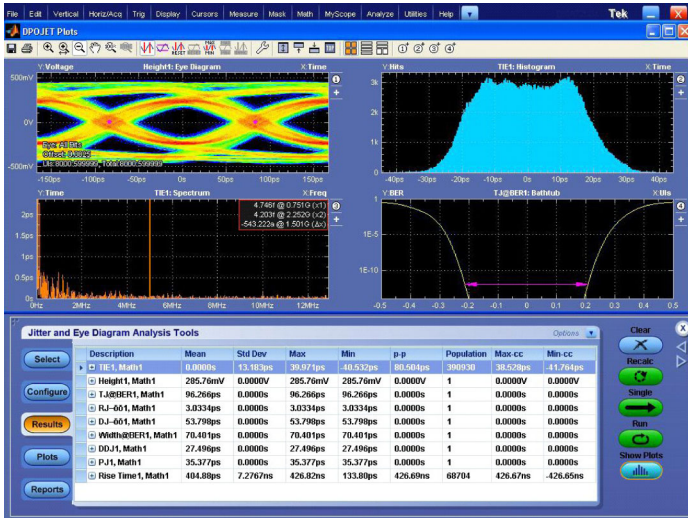
You can specify up to 25 signals to define your environment, including WiMAX, WiFi, GSM, GSM-EDGE, EGPRS 2A, EGPRS2B, CDMA, W-CDMA, DVB-T, Noise, and CW Radar. This plug-in also allows you to seamlessly import signals from other RFXpress plug-ins (including Radar, Generic Signal, etc.), as well as from Matlab® and from Tektronix spectrum analyzers and oscilloscopes, into your environment. You can also configure PHY parameters of your standard-specific signals. You can define the carrier frequency, power, start time, and duration for all the signals in your environment, so you have full control over the way these signals interact/interfere with each other.

## Generic OFDM Creation

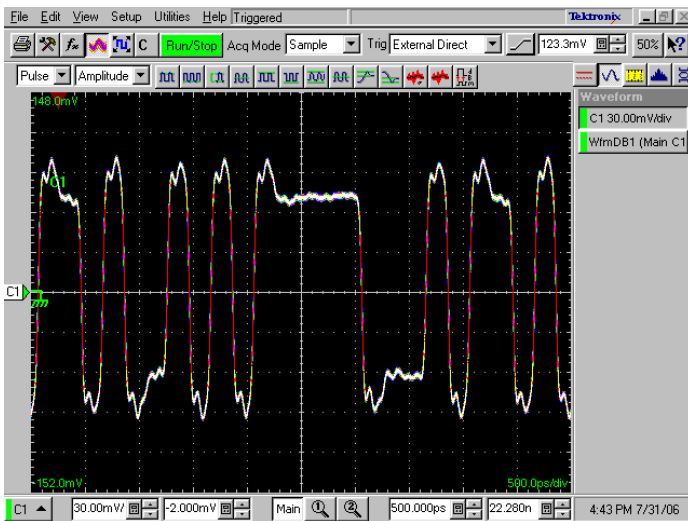
In today's wireless world, OFDM is becoming the modulation method of choice for transmitting large amounts of digital data over short and medium distances. The need for wide bandwidths and multiple carriers create challenges for engineers who need to create OFDM signals to test their RF receivers. The AWG70000A Series, when coupled with RFXpress, allows users to configure every part of the OFDM signal definition. Engineers can build signals symbol-by-symbol to create a complete OFDM frame or let the RFXpress software choose default values for some signal aspects. The combined AWG/RFXpress solution supports a variety of data coding formats that include Reed Solomon, Convolution, and Scrambling. Users also have the ability to define each subcarrier in the symbol which can be configured independently for type, modulation, and base data. The RFXpress software gives visibility into all aspects of the OFDM signal by providing a symbol table that gives a summary of all the carriers in the selected symbol. OFDM packets/frames can be built by specifying the spacing between the symbols/frames and parts of the OFDM packets can be stressed by adding gated noise.

## High-speed Serial Signal Generation

Serial signals are made up entirely of binary data— simple ones and zeros. As clock rates have increased these simple ones and zeros have begun to look more like analog waveforms because analog events are embedded in the digital data. The zero rise time and the perfectly flat tops of textbook digital signals no longer represent reality. Electronic environments have noise, jitter, crosstalk, distributed reactances, power supply variations, and other shortcomings. Each takes its toll on the signal. A real-world digital “square wave” rarely resembles its theoretical counterpart. Since the AWG70000A Series is an analog waveform source, it is the perfect single-box solution that is used to create digital data streams and mimic the analog imperfections that occur in real-world environments. The AWG70000A Series uses direct synthesis techniques to allow engineers to create signals that simulate the effects of propagation through a transmission line. Rise times, pulse shapes, delays, and aberrations can all be controlled with the AWG70000A Series instruments. When used in



Easily create digital data impairments with the AWG70000A and SerialXpress.



Digital data with de-emphasis added using the AWG70000A and SerialXpress.

for advanced radar signal generation, by delivering wide modulation bandwidths up to 20 GHz. With a sample rate of up to 50 GS/s the AWG70000A Series can directly generate RF signals never before possible from an AWG. In instances where IQ generation is desired, the AWG70000A offers the ability to oversample the signal, thereby improving signal quality with its outstanding SFDR performance

The AWG70000A and RFXpress are the perfect solution for creating complex radar signals. Users get the ultimate flexibility in creating custom radar pulse suites. Modulation types such as LFM, Barker and Polyphase Codes, Step FM, and Nonlinear FM are easily created using the AWG, and the flexibility of RFXpress enables the creation of waveforms requiring customer-defined modulation. The combination AWG and RFXpress solution 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 including antenna scan patterns, clutter, and multipath effects.

conjunction with the SerialXpress software package, engineers are provided control over every aspect of their digital signals reaching speeds of up to 12.5 Gb/s. This is exactly what is needed for rigorous receiver testing requirements.

SerialXpress enables AWG70000A Series instruments to create a variety of digital data impairments such as jitter (Random, Periodic, Sinusoidal), noise, pre/de-emphasis, duty cycle distortion, Inter-symbol Interference (ISI), Duty Cycle Distortion (DCD), and Spread Spectrum Clocking (SSC). The transmission environments of both board and cables can be emulated using touchstone files uploaded into SerialXpress. The AWG70000A and SerialXpress solution also provides base pattern waveforms for many of today's high-speed serial applications such as SATA, Display Port, SAS, PCI-E, USB, and Fibre Channel.

For high-speed serial applications the AWG70000A Series offers the industry's best solution for addressing challenging signal stimulus issues faced by digital designers who need to verify, characterize, and debug

complex digital designs. The file-based architecture uses direct synthesis to create complex data streams and provides users with the simplicity, repeatability, and flexibility required to solve the toughest signal generation challenges in high-speed serial communication applications.

### **LXI Class C**

Using the LXI Web Interface, you can connect to the AWG70000A Series through a standard web browser by simply entering the AWG's IP address in the address bar of the browser. The web interface enables viewing of instrument status and configuration, as well as status and modification of network settings. All web interaction conforms to the LXI Class C specification.

### **Performance You Can Count On**

Depend on Tektronix to provide you with performance you can count on. In addition to industry-leading service and support, this product comes backed by a standard one-year warranty.

## Characteristics

### Definitions

**Specifications** (not noted) – Product characteristics described in terms of specified performance with tolerance limits which are warranted/guaranteed to the customer. Specifications are checked in the manufacturing process and in the Performance Verification section of the product manual with a direct measurement of the parameter.

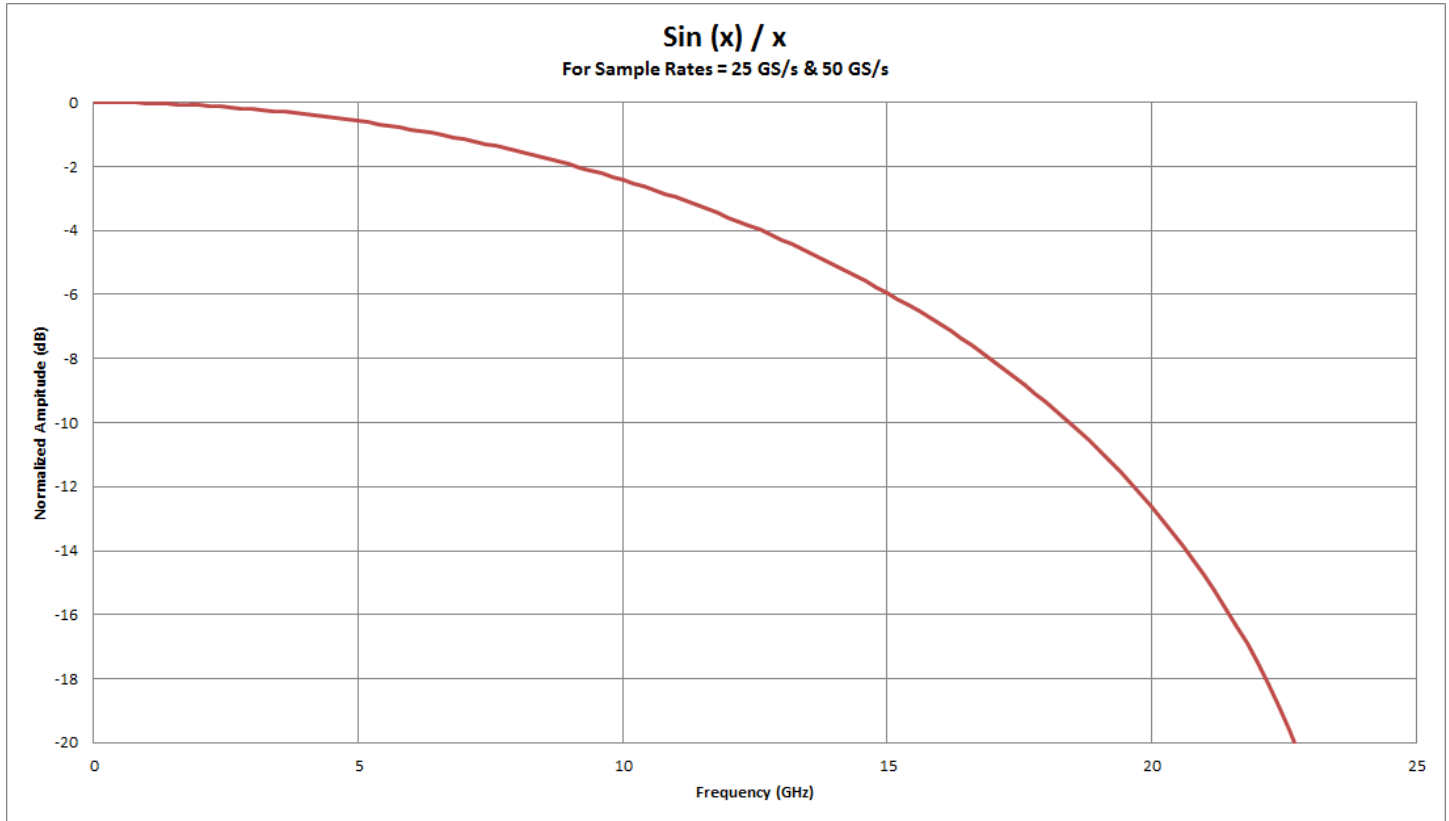
**Typical** (noted) – Product characteristics described in terms of typical performance, but not guaranteed performance. The values given are never warranted, but most units will perform to the level indicated. Typical characteristics are not tested in the manufacturing process or the Performance Verification section of the product manual.

**Nominal** (noted) – Product characteristics described in terms of being guaranteed by design. Nominal characteristics are non-warranted, so they are not checked in the manufacturing process or the Performance Verification section of the product manual.

### AWG70000A Series Specifications

#### General Characteristics

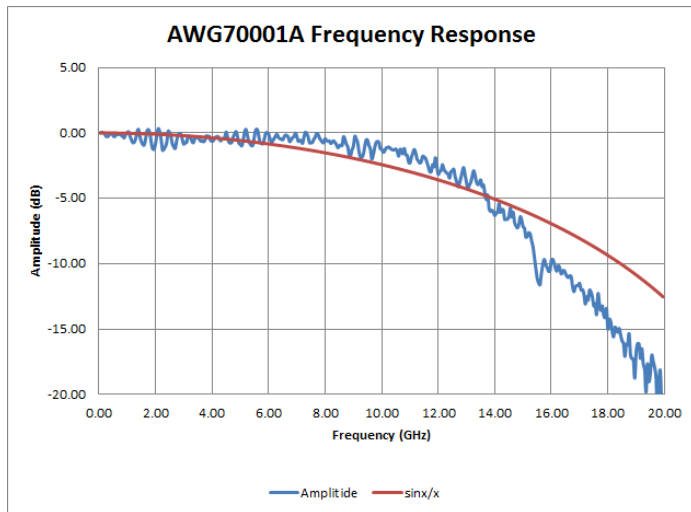
Characteristic	AWG70001A	AWG70002A
Digital to Analog Converter		
Sample rate (nominal)	1.5 KS/s - 50 GS/s	1.5 KS/s - 25 GS/s
Resolution (nominal)	10 bit (no markers selected) or 8 bit (markers selected)	
Sin (x)/x Roll-off		
Sin (x)/x (-3 dB)	11.1 GHz	



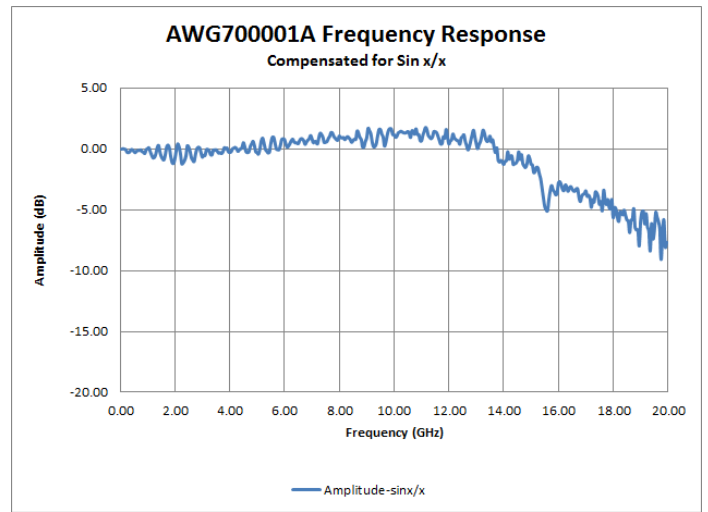
Sin x/x rolloff at 25 GS/s or 50 GS/s

**Frequency Domain Characteristics**

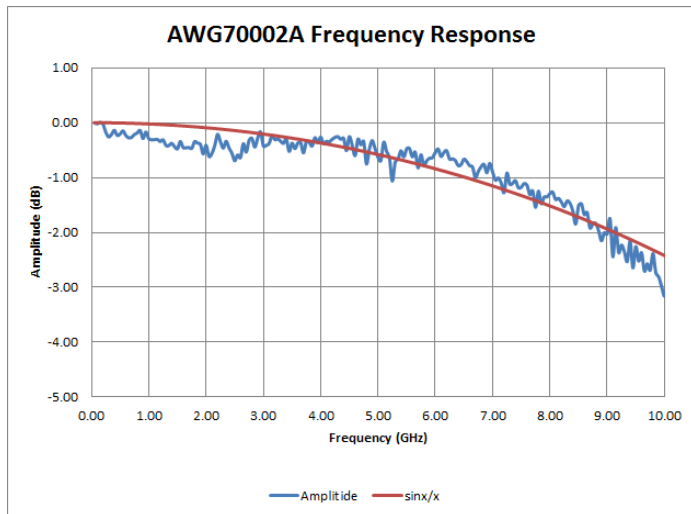
Characteristic	AWG70001A	AWG70002A
<b>Output Frequency Characteristics</b>		
Effective Frequency Output	Fmaximum (specified) is determined as "sample rate / oversampling rate" or "SR / 2.5"	
Fmaximum	20 GHz	10 GHz
<b>Output Amplitude Characteristics</b>		
Amplitude	Amplitude levels are measured as single-ended outputs Amplitude level will be 3 dBm higher when using differential (both) outputs	
Range (typical)	-8 dBm to -2 dBm	
Resolution (typical)	0.35 dB	
Accuracy (typical)	0.17 dB	
Output Flatness	Mathematically corrected for characteristic Sin (x)/x roll-off, uncorrected by external calibration methods	
Flatness (typical)	±1.8 dB to 10 GHz +1.8 dB, -3 dB 10 GHz to 15 GHz	+0.8 dB, -1.5 dB to 10 GHz
Analog Bandwidth	15 GHz	13.5 GHz
Output Match		
SWR (typical)	DC to 5 GHz = 1.32:1 5 GHz to 10 GHz = 1.52:1 10 GHz to 20 GHz = 1.73:1	DC to 5 GHz = 1.61:1 5 GHz to 10 GHz = 1.61:1



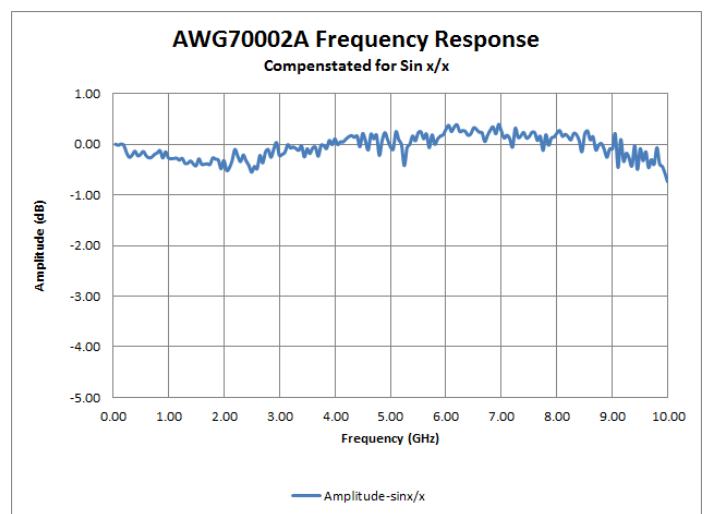
AWG70001A frequency response including Sin x/x



AWG70001A frequency response compensated for Sin x/x



AWG70002A frequency response including Sin x/x



AWG70002A frequency response compensated for Sin x/x

**Time Domain Characteristics**

Characteristic	AWG70001A	AWG70002A
<b>Data Rate Characteristics</b>		
Data rate	Bit rate determined as "sample rate / 4 points per cycle", allowing full impairment generation	
Bit rate (nominal)	12.5 Gb/s	6.25 Gb/s
<b>Rise/Fall Time Characteristics</b>		
Rise/Fall time	Rise/Fall time measured at 20% to 80% levels, related by a factor of 0.75 to the industry standard of 10% to 90% levels	
Tr/Tf (typical)	Sampling rate $\leq$ 25 GS/s: < 23 ps < 27 ps at 50 GS/s	< 22 ps
<b>Output Amplitude Characteristics</b>		
Amplitude	Amplitude levels are measured between differential outputs (+) to (-) For single-ended output the amplitude level will be one-half the voltage levels below	
Range	500 mV <sub>p-p</sub> to 1 V <sub>p-p</sub>	
Resolution	1.0 mV	
Accuracy	$\pm$ (2% of amplitude + 1 mV)	

**Spurious Free Dynamic Range (SFDR) Characteristics\* 1, 2**

Characteristic	AWG70001A			
Frequency Output of AWG	In Band Performance		Adjacent Band Performance	
	Measured across	Specification (typical)	Measured across	Specification (typical)
100 MHz	DC - 1 GHz	-80 dBc	DC - 10 GHz	-72 dBc
DC - 500 MHz	DC - 500 MHz	-70 dBc	DC - 1.5 GHz	-66 dBc
DC - 1 GHz	DC - 1 GHz	-63 dBc	DC - 3 GHz	-63 dBc
DC - 2 GHz	DC - 2 GHz	-62 dBc	DC - 6 GHz	-60 dBc
DC - 3 GHz	DC - 3 GHz	-60 dBc	DC - 6 GHz	-52 dBc
DC - 5 GHz	DC - 5 GHz	-52 dBc	DC - 6 GHz	-52 dBc
5 GHz - 6 GHz	5 GHz - 6 GHz	-52 dBc	3 GHz - 9 GHz	-40 dBc
6 GHz - 7 GHz	6 GHz - 7 GHz	-42 dBc	4 GHz - 10 GHz	-42 dBc
7 GHz - 8 GHz	7 GHz - 8 GHz	-60 dBc	6 GHz - 12.5 GHz	-52 dBc
8 GHz - 10 GHz	8 GHz - 10 GHz	-50 dBc	6 GHz - 12.5 GHz	-52 dBc
10 GHz - 12 GHz	10 GHz - 12 GHz	-53 dBc	6 GHz - 12.5 GHz	-50 dBc
12 GHz - 13 GHz	12 GHz - 13 GHz	-22 dBc	10 GHz - 15 GHz	-22 dBc
13 GHz - 14 GHz	13 GHz - 14 GHz	-54 dBc	11 GHz - 16 GHz	-20 dBc
14 GHz - 16 GHz	14 GHz - 16 GHz	-46 dBc	13 GHz - 18 GHz	-38 dBc
16 GHz - 18.5 GHz	16 GHz - 18.5 GHz	-42 dBc	14 GHz - 20 GHz	-30 dBc
18.5 GHz - 20 GHz	18.5 GHz - 20 GHz	-28 dBc	16 GHz - 20 GHz	-24 dBc

	AWG70002A			
	In Band Performance		Adjacent Band Performance	
	Measured across	Specification (typical)	Measured across	Specification (typical)
100 MHz	DC - 1 GHz	-80 dBc	DC - 10 GHz	-72 dBc
0 - 500 MHz	DC - 500 MHz	-70 dBc	DC - 1.5 GHz	-66 dBc
DC - 1 GHz	DC - 1 GHz	-63 dBc	DC - 3 GHz	-63 dBc
DC - 2 GHz	DC - 2 GHz	-62 dBc	DC - 6 GHz	-60 dBc
DC - 3 GHz	DC - 3 GHz	-60 dBc	DC - 6 GHz	-52 dBc
DC - 5 GHz	DC - 5 GHz	-52 dBc	DC - 6 GHz	-52 dBc
5 GHz - 6 GHz	5 GHz - 6 GHz	-52 dBc	3 GHz - 9 GHz	-40 dBc
6 GHz - 7 GHz	6 GHz - 7 GHz	-42 dBc	4 GHz - 10 GHz	-42 dBc
7 GHz - 8 GHz	7 GHz - 8 GHz	-55 dBc	6 GHz - 12.5 GHz	-50 dBc
8 GHz - 10 GHz	8 GHz - 10 GHz	-50 dBc	6 GHz - 12.5 GHz	-50 dBc

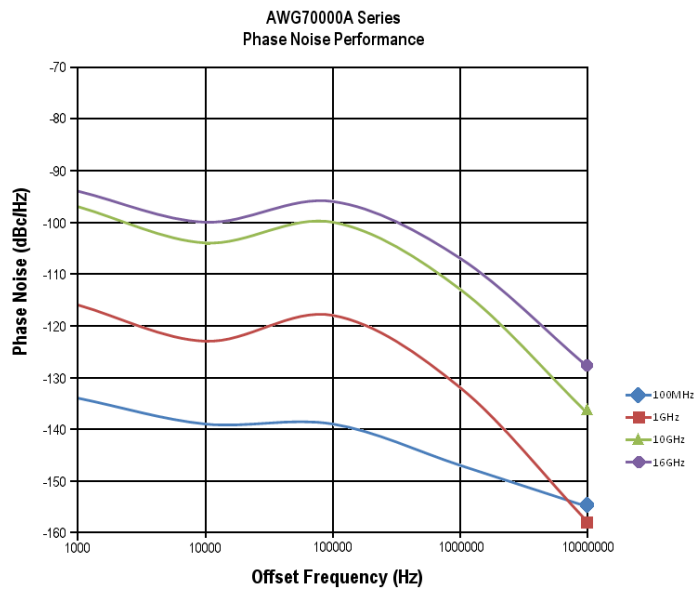
\*1 Measured with Balun at maximum sample rate.

\*2 SFDR is determined as a function of the directly generated carrier frequency. Harmonics not included.

**Output Distortion Characteristics**

Characteristic	AWG70001A	AWG70002A
<b>Output Distortion Characteristics</b>		
Harmonic Distortion* <sup>3</sup>	Sample rate = 25 GS/s	
Output Frequency: 2nd Harmonic	< 2 GHz: < -60 dBc 2 GHz - 6 GHz: < -50 dBc > 6 GHz: < -42 dBc	
Output Frequency: 3rd Harmonic	< 1 GHz: < -60 dBc 1 GHz - 2 GHz: < -50 dBc > 2 GHz: < -40 dBc	
Effective Number of Bits (ENOB)	4.6 bits	5.6 bits
Phase Noise	See Phase noise chart below.	
Jitter		
Random jitter (typical)	250 fs RMS	
Total jitter (typical)	10 ps <sub>p-p</sub> at 12.5 Gb/s	

\*<sup>3</sup> Measured with Balun at maximum sample rate.



Phase noise in reduced jitter mode

**Channel timing Characteristics**

Characteristic	AWG70001A	AWG70002A
Channel to channel skew	NA	±5 ps
Output skew control		
Range	NA	-100 to 100 ps
Resolution	NA	500 fs
Accuracy	NA	±5 ps
Intra-channel skew	NA	<5 ps



**AWG70000A Series Features****Hardware Characteristics**

Characteristic	AWG70001A	AWG70002A
Number of analog outputs	1 channel	2 channels
Output connector	Differential, SMA (front panel)	
Output impedance (nominal)	50 $\Omega$	
Waveform length	Standard – to 2 GSamples Extended memory – to 16 GSamples	Standard – to 2 GSamples Extended memory – to 8 GSamples per channel
Run Modes		
Continuous	Waveform is continuously repeated	
Triggered	Waveform is output only once after a trigger is received	
Triggered Continuous	Waveform is continuously repeated after a trigger is received	
Sampling Clock		
Resolution	up to 8 digits	
Accuracy	Within $\pm(1 \text{ ppm} + \text{Aging})$ , Aging: $\pm 1 \text{ ppm}$ per year	

**Computer Characteristics**

Characteristic	AWG70001A	AWG70002A
Operating System / Peripherals / IO	Windows 7 4 GB memory 500 GB Solid State Drive Included USB compact keyboard and mouse USB 2.0 compliant ports (6 total – 2 front, 4 rear) RJ-45 Ethernet connector (rear panel) supports 10/100/1000BASE-T VGA Video (rear panel) for external monitor eSATA (rear panel)	
Display characteristics	LED backlit touch screen display, 165 mm (6.5 in.) diagonal, 1024 × 768 XGA	
Waveform file import capability	Import waveform format by series: *.AWGX file created by Tektronix AWG70000A Series *.AWG file created by Tektronix AWG5000 or AWG7000 Series *.PAT and *.WFM file formats created by Tektronix AWG400/500/600/700 Series *.IQT file format created by Tektronix RSA3000 Series *.TIQ file format created by Tektronix RSA6000/5000 Series or MDO4000 Series *.WFM or *.ISF file formats created by Tektronix TDS/DPO/MSO/DSA Series *.TXT file format *.MAT Matlab file format	
Waveform file export capability	Tektronix AWG70000A Series *.WFMX file format *.TXT file format	
Software driver for third-party applications	IVI-COM driver	
Instrument control / Data transfer		
GPIB through USB B device port, requires external adapter TEK-USB-488	Remote control and data transfer (conforms to IEEE-Std 488.1, compatible with IEEE-Std 488.2 and SCPI-1999.0)	
Ethernet	Remote control and data transfer (conforms to IEEE-Std 802.3)	
LAN eXtensions for Instrumentation (LXI)	Class LXI Class C Version 1.4	

**Auxiliary Outputs**

Characteristic	AWG70001A	AWG70002A
<b>Markers</b>		
Number	Total: 2	Total: 4 (2 per channel)
Style	Differential	
Connector	SMA (front panel)	
Impedance	50 Ω	
Level (into 50 Ω)	Single-ended	
Window	-1.4 V to 1.4 V	
Amplitude	0.5 V <sub>p-p</sub> to 1.4 V <sub>p-p</sub>	
Resolution	10 mV	
Accuracy	±(10% of setting + 50 mV) into 50 Ω	
Rise/Fall time (20% to 80%)	<35 ps (High: 1.0 V, Low: 0 V)	
<b>Timing skew</b>		
Intra-channel (typical)	<12 ps (between each channel (+) Pos and (-) Neg output)	
Inter-channel (typical)	<15 ps (between Marker 1 and Marker 2 outputs)	
<b>Delay control</b>		
Delay from analog output (typical)	180 ps ±25 ps	755 ps ±25 ps
Range	0 to 100 ps	
Resolution	1 ps	
Accuracy	±15 ps	
<b>Jitter</b>		
Random RMS (typical)	0.4 ps <sub>RMS</sub>	
Total p-p (typical)	20 ps <sub>p-p</sub> (Using PRBS15 pattern)	
<b>10 MHz Reference Out</b>		
Amplitude	+4 dBm ±2 dBm	
Connector	SMA (rear panel)	
Impedance	50 Ω, AC coupled	
<b>Synchronization Clock Output</b>		
Frequency	1/80 of the clock output	
Amplitude	1.0 V ±100 mV <sub>p-p</sub> into 50 Ω	
Connector	SMA (rear panel)	
Impedance	50 Ω, AC coupled	

**Auxiliary Inputs**

Characteristic	AWG70001A	AWG70002A
Trigger		
Number	2 (A and B)	
Polarity	Pos or Neg	
Impedance	50 $\Omega$ , 1 k $\Omega$	
Range	50 $\Omega$ : <5 V <sub>rms</sub> , 1 k $\Omega$ : $\pm$ 10 V	
Connector	SMA (rear panel)	
Threshold		
Range	-5.0 V to 5.0 V	
Resolution	0.1 V	
Accuracy	$\pm$ (5% +100 mV)	
Trigger to output uncertainty		
Asynchronous (typical)	$\pm$ 40 ps at maximum sample rate	
Synchronous (typical)	External variable reference and synchronous trigger timing: 500 fs <sub>rms</sub> , 7 ps <sub>p-p</sub> at BER 10 <sup>-12</sup>	
Synchronous (typical)	External 10 MHz reference and synchronous trigger timing: 5 ps <sub>rms</sub> , 70 ps <sub>p-p</sub> at BER 10 <sup>-12</sup>	
Trigger		
Minimum pulse width	20 ns	
Trigger hold-off	>1.4 $\mu$ s	
Reference In		
Input amplitude	-5 dBm to +5 dBm	
Fixed frequency range	10 MHz, $\pm$ 10 ppm	
Variable frequency range	35 MHz to 250 MHz	
Connector	SMA (rear panel)	
Impedance	50 $\Omega$ , AC coupled	

**Physical Characteristics**

<b>Dimension</b>	<b>mm</b>	<b>in.</b>
Height	153.67	6.05
Width	460.5	18.13
Depth	603.5	23.76
<b>Weight</b>	<b>kg</b>	<b>lb.</b>
Net (instrument)	16.78	37
Net (with packaging)	22.41	49.4
<b>Mechanical Cooling</b>		
<b>Clearance</b>	<b>cm</b>	<b>in.</b>
Top/Bottom	0	0
Side	5.08	2
Rear	0	0
<b>Power Supply</b>		
Rating	100 to 240 V AC, 50/60 Hz	
Consumption	500 Watts	

**Environmental Characteristics**

<b>Characteristic</b>	<b>Description</b>
<b>Temperature</b>	
Operational	0 °C to 50 °C
Nonoperational	-20 °C to 60 °C
<b>Humidity</b>	
Operational	5% to 90% relative humidity (% RH) at up to 30 °C 5% to 45% relative humidity above 30 °C up to 50 °C
Nonoperational	5% to 90% relative humidity (% RH) at up to 30 °C 5% to 45% relative humidity above 30 °C up to 60 °C
<b>Altitude</b>	
Operational	Up to 3,000 m (9,842 ft.)
Nonoperational	Up to 12,000 m (39,370 ft.)
<b>Vibration</b>	
<b>Sine</b>	
Operational	0.33 mm p-p (0.013 in p-p) constant displacement, 5 to 55 Hz
<b>Random</b>	
Operational	0.27 g RMS, 5 to 500 Hz, 10 minutes per axis
Nonoperational	2.28 g RMS, 5 to 500 Hz, 10 minutes per axis
<b>Mechanical Shock</b>	
Operational	Half-sine mechanical shocks, 30 g peak, 11 ms duration, 3 drops in each direction of each axis
<b>Regulatory</b>	
Safety	UL61010-1, CAN/CSA-22.2, No.61010-1-04, EN61010-1, IEC61010-1
Emissions	EN55011 (Class A), IEC61000-3-2, IEC61000-3-3
Immunity	IEC61326, IEC61000-4-2/3/4/5/6/8/11
<b>Regional certifications</b>	
Europe	EN61326
Australia / New Zealand	AS/NZS 2064

## Ordering Information

### Arbitrary Waveform Generator

#### AWG70001A

10 bit, 2 GSamples record length, 1-channel arbitrary waveform generator.

- Option 150: 1.5 kS/s to 50 GS/s

#### AWG70002A

10 bit, 2 GSamples record length, 2-channel arbitrary waveform generator.

- Option 225: 1.5 kS/s to 25 GS/s

**All Models Include:** USB mouse, compact USB keyboard, Touch Screen Stylus, Safety and Installation Manual and registration card, Certificate of Calibration, power cable, and one 50  $\Omega$  SMA terminator per channel, one-year warranty.

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

## Instrument Options

### Product Options

Option	Description
Opt. 01	Waveform record length expansion AWG70001A – (from 2 GSamples to 16 GSamples) AWG70002A – (from 2 GSamples to 8 GSamples on both channels)
Opt. RFX	Adds RFXpress (RFX100) software to the AWG
Opt. RDR	Adds Radar Signal Generation to RFXpress (requires Opt. RFX)
Opt. SPARA	Adds S-parameter Emulation to RFXpress (requires Opt. RFX)
Opt. OFDM	Adds OFDM Signal Generation to RFXpress (requires Opt. RFX)
Opt. ENV	Adds Environment Signal Generation to RFXpress (requires Opt. RFX)
Opt. ENV01	Bundling Option – Opt. ENV + Opt. RDR (requires Opt. RFX)
Opt. ENV02	Bundling Option – Opt. ENV + Opt. RDR + Opt. OFDM (requires Opt. RFX)
Opt. ENV03	Bundling Option – Opt. ENV + Opt. RDR + Opt. OFDM + Opt. SPARA (requires Opt. RFX)
Opt. ENV04	Bundling Option – Opt. ENV + Opt. RDR + Opt. OFDM + Opt. SPARA + Opt. UWBCF (requires Opt. RFX)
Opt. UWBCF	Adds UWB-WiMedia Conformance Signal Generation to RFXpress (requires Opt. RFX)
Opt. UWBCF	Adds UWB-WiMedia Custom and Conformance Signal Generation to RFXpress (requires Opt. RFX, includes Opt. UWBCF)

### International Power Plugs

Option	Description
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. A12	Brazil
Opt. A99	No power cord or AC adapter

### Language Options

Option	Description
Opt. L0	English manual
Opt. L5	Japanese manual
Opt. L7	Simplified Chinese manual
Opt. L8	Traditional Chinese manual
Opt. L10	Russian manual

### Application Software

Product	Description
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)

### Rack Mount Kit

Product	Description
AWGRACK	Rack Mount Kit for AWG70000A Series

### Service Options

Option	Description
Opt. CA1	Single Calibration or Functional Verification
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

### Product Upgrades

Ordering Options	Description
AWG70001A	
AWG701AUP Opt. 01	Upgrade to add waveform record length, 2G samples to 16G samples
AWG701AUP Opt. SSD	Replacement/additional Solid State Disc Drive
AWG70002A	
AWG702AUP Opt. 01	Upgrade to add waveform record length, 2G samples to 8G samples each channel
AWG702AUP Opt. SSD	Replacement/additional Solid State Disc Drive

**Note:** To add any RFXpress software as an upgrade, please refer to the RFX100 data sheet.

### Post Sales Service Options

Option	Description
CA1	Single Calibration or Functional Verification
R5DW	Repair Service Coverage 5 Years
R2PW	Repair Service Coverage 2 Years Post Warranty
R1PW	Repair Service Coverage 1 Year Post Warranty

**Recommended Accessories**

Item	Description	Part Number
Programmer Manual	Programming Commands, English	Visit Tektronix website
Service Manual	Service Manual, English	Visit Tektronix website
GPIB to USB Adapter	Enables GPIB Control through USB B port	TEK-USB-488

**Warranty**

One-year parts and labor.



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.



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](http://www.tektronix.com)



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