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Arbitrary/Function Generator Enables Engineers To Generate Test Signals Easily

Tektronix's AFG31000 series is said to redefine the arbitrary/function generator (AFG) by offering many key firsts among its features including the industry's largest touchscreen and a new user interface that will aid engineers who need to generate increasingly complex test cases for debugging, troubleshooting, characterizing and validating devices under test.

Despite their importance in electronics test and wide adoption, AFGs have lagged behind other test instrumentation in terms of usability, making do with small displays and other shortcomings that make them hard to learn and operate. Moreover, traditional AFGs lack the deep memory and programming capability needed to compose a series of test cases with complex timing—critical for optimum test efficiency. By addressing these issues, the AFG31000 represents the first of the next generation of AFGs with features and capabilities simply not available elsewhere in the market today, according to the vendor.

The AFG31000 series features a 9-inch capacitive touchscreen, said to be the largest available on an AFG, that allows users to see all related settings and parameters on a single screen within a shallow menu tree. Similar to the modern touch-enabled smart devices, users can tap or swipe to easily select, browse, locate and change settings. The intuitive user interface saves users time in both learning and operating the instrument (Fig. 1).

Traditional AFGs assume they are driving a 50-Ω impedance. However, most devices under test (DUTs) do not have a 50-Ω impedance. This mismatch results in an inconsistency between the waveform as seen on the AFG and the signal at the DUT. The new patented InstaView feature addresses this problem by monitoring and displaying the waveform at the DUT without the need for additional cables or instruments. The waveform shown on the display instantly responds to changes in frequency, amplitude, and waveform shape as well as the DUT's impedance (Fig. 2).

In addition to traditional AFG operation modes, the AFG31000 series offers an Advanced or waveform sequencer mode (Fig. 3). In the Advanced mode, the instrument's up-to 128 Mpts of waveform memory can be segmented into up to 256 entries, and users can drag and drop long waveforms, or multiple waveforms in the sequencer and define how they are output. Compared to arbitrary waveform generators, the AFG31000 series reduces instrument costs by as much as 90%, giving users who need long, non-repeating waveforms, or multiple waveforms with complex timing an affordable alternative.

Taking advantage of the large capacitive touch screen, the new ArbBuilder tool built in the AFG31000 series enables users to create and edit arbitrary waveforms directly on the instrument without needing to create the waveforms on a PC and transferring them to the instrument. ArbBuilder improves test efficiency especially for arbitrary waveforms that need to change frequently. For users who want to replicate waveforms captured by an oscilloscope, they can save waveforms as .csv files and use ArbBuilder to load them directly into the AFG31000.

AFG31000 series instruments are available in 1- or 2-channel configurations and deliver 14-bit vertical resolution along with a sample rate of 250 MSa/s, 1 GSa/s or 2 GSa/s. Additionally, in traditional AFG mode, users can change frequency without worrying about waveform length and sample rate. Output amplitude range is 1 mV_{P-P} to 10 V_{P-P} into 50-Ω loads.

The AFG31000 series arbitrary/function generator models with 25-, 50- or 100-MHz bandwidth are available now globally. Models with 150- or 250-MHz bandwidth are scheduled for release in November. Prices start at $2,210. See Tables 1 and 2 for additional electrical specifications and pricing.

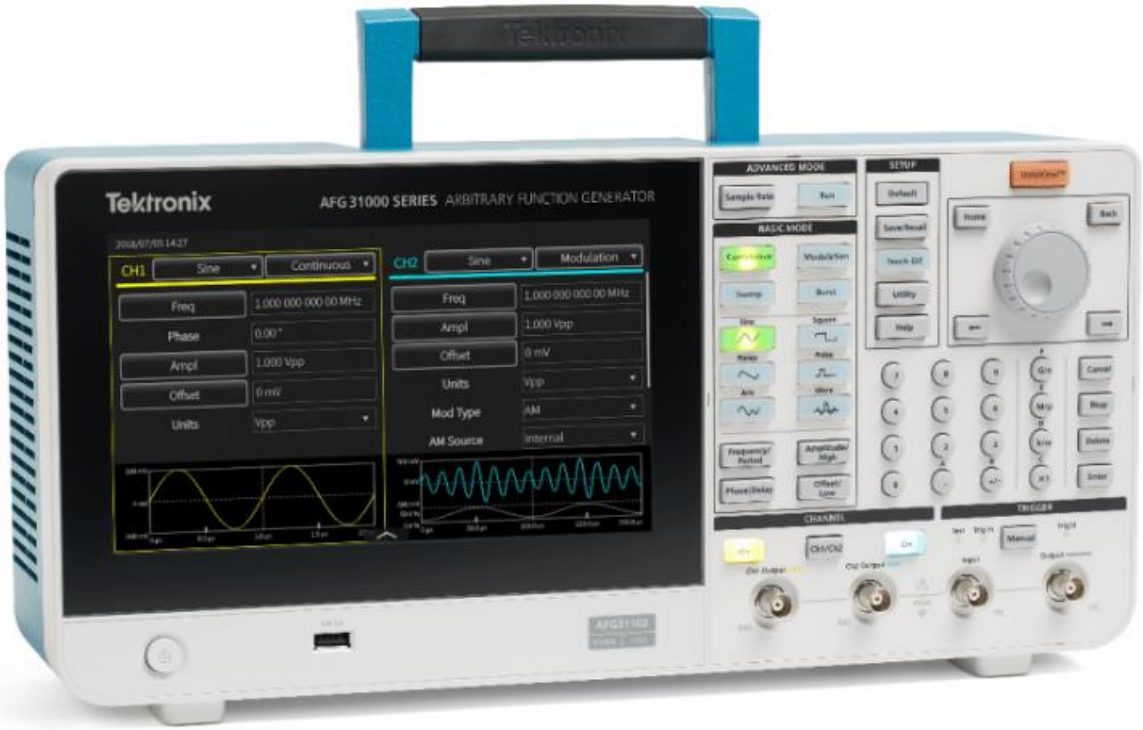

Fig. 1. The AFG31000 arbitrary/function generator is said to offer four industry firsts. These include a 9-inch capacitive display, a monitor waveform added at the device under test in real time, programmable waveform sequencing and built-in waveform creation capabilities.

Fig. 2. InstaView realtime waveform monitoring. Due to impedance mismatches between the AFG and the DUT, the output waveform from the AFG can be different from what is observed at the DUT. So typically an oscilloscope is need to check the signal at the DUT. However, the AFG uses the reflected signal to recreate the waveform seen at the DUT, eliminating the need for the external scope.

Fig. 3. An integrated waveform sequencer reduces the cost of generating complex waveforms with complex timing. Like an MP3 player, the AFG31000 can output waveforms in a user defined sequence.

Tables 1 and 2. Key electrical specifications and pricing for the AFG31000.

		AFG31021 / AFG31022	AFG31051 / AFG31052	AFG31101 / AFG31102	AFG31151 / AFG31152	AFG31251/ AFG31252
Basic (AFG) Mode	Vertical resolution	14-bit				
	Sine frequency range	1 µHz to 25 MHz	1 µHz to 50 MHz	1 µHz to 100 MHz	1 µHz to 150 MHz	1 µHz to 250 MHz
	Square/Pulse frequency range	1 µHz to 20 MHz	1 µHz to 40 MHz	1 µHz to 80 MHz	1 µHz to 120 MHz	1 µHz to 160 MHz
	Amplitude (into 50 ohm)	≤ 60 MHz: **1 mVpp** to 10 Vpp > 60 MHz to ≤ 80 MHz: **1 mVpp** to 8 Vpp > 80 MHz to ≤ 100 MHz: **1 mVpp** to 6 Vpp			≤ 200 MHz: **1 mVpp** to 5 Vpp > 200 MHz to ≤ 250 MHz: **1 mVpp** to 4 Vpp*	
	Arb Waveform length	2 to 128kpts				
	Sample rate	250 MSa/s	1 GSa/s (wfm length>16kpts: 250 MSa/s)		2 GSa/s (wfm length>16kpts: 250 MSa/s)	
	Jitter (typ)	**2.5ps**				
Advanced (Waveform Sequencer) Mode	Waveform length	**16 Mpts, 128 Mpts optional**				
	Number of entries	1 (continuous, gated, triggered), 1 - 256 (sequence mode)				
	Variable sample rate	1 µSa/s to 250 MSa/s	1 µSa/s to 500 MSa/s	1 µSa/s to 1 GSa/s	1 µSa/s to 2 GSa/s	

Model	Main Specs					Master Price
	Bandwidth	Max Sample Rate	Memory Depth	Channels	Output	
AFG31021	25 MHz	250 MS/s	16 MSa/ch	1	10 V_{p-p}	$2,210
AFG31022	25 MHz	250 MS/s	16 MSa/ch	2	10 V_{p-p}	$3,340
AFG31051	50 MHz	500 MS/s	16 MSa/ch	1	10 V_{p-p}	$2,440
AFG31052	50 MHz	500 MS/s	16 MSa/ch	2	10 V_{p-p}	$3,680
AFG31101	100 MHz	1 GS/s	16 MSa/ch	1	10 V_{p-p}	$4,270
AFG31102	100 MHz	1 GS/s	16 MSa/ch	2	10 V_{p-p}	$6,090
AFG31151	150 MHz	2 GS/s	16 MSa/ch	1	5 V_{p-p}	$5,020
AFG31152	150 MHz	2 GS/s	16 MSa/ch	2	5 V_{p-p}	$7,150
AFG31251	250 MHz	2 GS/s	16 MSa/ch	1	5 V_{p-p}	$9,600
AFG31252	250 MHz	2 GS/s	16 MSa/ch	2	5 V_{p-p}	$14,100