

# Arbitrary/Function Generators

► AFG3021 • AFG3022 • AFG3101 • AFG3102 • AFG3251 • AFG3252



## Product Description

Unmatched performance, versatility, intuitive operation and affordability make the AFG3000 Series of Function, Arbitrary Waveform and Pulse Generators the most useful instruments in the industry.

## Superior Performance and Versatility

Users can choose from 12 different standard waveforms. Arbitrary waveforms can be generated up to 128 K in length at high sampling rates. On pulse waveforms, leading and trailing edge time can be set independently. External signals can be connected and added to the output signal. Dual channel models can generate two identical or completely different signals. All instruments feature a highly stable time base with only  $\pm 1$  ppm drift per year.

## Intuitive User Interface Shows More Information at a Single Glance

A large screen shows all relevant waveform parameters and graphical waveshape at a single glance. This gives full confidence in the signal settings and lets you focus on the task at hand. Shortcut keys provide direct access to frequently used functions and parameters. Others can be selected conveniently through clearly structured menus. This reduces the time needed for learning and re-learning how to use the instrument. Look and feel are identical to the world's most popular TDS3000 Oscilloscopes.

## ArbExpress™ Software Included for Creating Waveforms with Ease

With this PC software waveforms can be seamlessly imported from any Tektronix oscilloscopes or defined by standard functions, equation editor and waveform math.

## ► Features & Benefits

25 MHz, 100 MHz or 240 MHz Sine Waveforms

14 bits, 250 MS/s, 1 GS/s or 2 GS/s Arbitrary Waveforms

5.6" Display for Full Confidence in Settings and Waveform Shape

Multi-language and Intuitive Operation Saves Set-up Time

Pulse Waveform with Variable Edge Times

AM, FM, PM, FSK, PWM

Sweep and Burst

Dual Channel Models Save Cost and Bench Space

USB Connector on Front Panel for Waveform Storage on Memory Device

USB, GPIB and LAN

## ► Applications

Electronic Test and Design

Sensor Simulation

Functional Test

Education and Training

## Arbitrary/Function Generators

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## ► Characteristics

### ► AFG3000 Series Characteristics

Model	AFG3021/AFG3022	AFG3101/AFG3102	AFG3251/AFG3252
Channels	1/2	1/2	1/2
Waveforms	Sine, Square, Pulse, Ramp, Triangle, Sin(x)/x, Exponential Rise and Decay, Gaussian, Lorentz, Haversine, DC, Noise		
Sine Wave	1 mHz to 25 MHz	1 mHz to 100 MHz	1 mHz to 240 MHz
Amplitude Flatness (1 V <sub>p-p</sub> )			
<5 MHz	±0.15 dB	±0.15 dB	±0.15 dB
5 MHz to 20 MHz	±0.3 dB	±0.3 dB	±0.3 dB
20 MHz to 25 MHz	±0.5 dB	±0.3 dB	±0.3 dB
25 MHz to 100 MHz	—	±0.5 dB	±0.5 dB
100 MHz to 200 MHz	—	—	±1.0 dB
Harmonic Distortion (1 V <sub>p-p</sub> )			
1 mHz to 20 kHz	<-70 dBc	<-60 dBc	<-60 dBc
20 kHz to 1 MHz	<-60 dBc	<-60 dBc	<-60 dBc
1 MHz to 5 MHz	<-50 dBc	<-50 dBc	<-50 dBc
5 MHz to 10 MHz	<-50 dBc	<-37 dBc	<-37 dBc
10 MHz to 25 MHz	<-40 dBc	<-37 dBc	<-37 dBc
>25 MHz	—	<-37 dBc	<-30 dBc
THD (DC – 20 kHz, 1 V <sub>p-p</sub> )		<0.2%	
Spurious (1 V <sub>p-p</sub> )			
1 mHz to 1 MHz	<-60 dBc	<-60 dBc	<-50 dBc
1 MHz to 25 MHz	<-50 dBc	<-50 dBc	<-47 dBc
>25 MHz	—	<-50 dBc + 6 dBc/octave	<-47 dBc + 6 dBc/octave
Square Wave	1 mHz to 12.5 MHz	1 mHz to 50 MHz	1 mHz to 120 MHz
Rise/Fall Time	≤18 ns	≤5 ns	≤2.5 ns
Pulse Wave	1 mHz to 12.5 MHz	1 mHz to 50 MHz	1 mHz to 120 MHz
Pulse Width	30 ns to 999 s	8 ns to 999 s	4 ns to 999 s
Edge Transition Time	18 ns to 625 s	5 ns to 625 s	2.5 ns to 625 s
Other Waveforms	1 mHz to 250 kHz	1 mHz to 1 MHz	1 mHz to 2.4 MHz
Noise Bandwidth (-3 dB)	25 MHz	100 MHz	240 MHz
DC (into 50 Ω)	-5 V to +5 V	-5 V to +5 V	-2.5 V to +2.5 V
Arbitrary Waveforms	1 mHz to 12.5 MHz	1 mHz to 50 MHz	1 mHz to 120 MHz
Non-volatile Memory	4 waveforms	4 waveforms	4 waveforms
Memory: Sample Rate	2 to 64 K: 250 MS/s	>16 K to 128 K: 250 MS/s 2 to 16 K: 1 GS/s	>16 K to 128 K: 250 MS/s 2 to 16 K: 2 GS/s
Vertical Resolution	14 bits	14 bits	14 bits
Amplitude into 50 Ω	10 mV <sub>p-p</sub> to 10 V <sub>p-p</sub>	20 mV <sub>p-p</sub> to 10 V <sub>p-p</sub>	≤200 MHz: 50 mV <sub>p-p</sub> to 5 V <sub>p-p</sub> >200 MHz: 50 mV <sub>p-p</sub> to 4 V <sub>p-p</sub>
Accuracy	±(1% of setting + 1 mV)	±(1% of setting + 1 mV)	±(1% of setting + 1 mV)
Offset	±5 V <sub>pk</sub> AC + DC	±5 V <sub>pk</sub> AC + DC	±2.5 V <sub>pk</sub> AC + DC
Remote Programming	USB 1.1	GPIO, LAN 10Base-T/100Base-TX, USB 1.1	

**Modulation**

**AM, FM, PM**

**Carrier Waveforms –**

All, except Pulse, Noise and DC.

**Source –** Internal/External.

**Internal Modulating Waveform –**

Sine, square, ramp, noise, ARB.

**Internal Modulating Frequency –**

2 mHz to 50.00 kHz.

**AM Modulation Depth –** 0.0% to +120.0%.

**Min FM Peak Deviation –** DC.

**Max FM Peak Deviation –** See chart, below.

**PM Phase Deviation –** 0.0° to +180.0°.

**Frequency Shift Keying**

**Carrier Waveforms –** All, except Pulse, Noise and DC.

**Source –** Internal/External.

**Internal Modulating Frequency –** 2 mHz to 1.000 MHz.

**Number of Keys –** 2.

**Pulse Width Modulation**

**Source –** Internal/External.

**Internal Modulating Waveform –**

Sine, square, ramp, noise, ARB.

**Internal Modulating Frequency –**

2 mHz to 50.00 kHz.

**Deviation –** 0% to 50.0% of pulse period.

**Sweep**

**Waveforms –** All, except Pulse, Noise and DC.

**Type –** Linear, logarithmic.

**Sweep Time/Hold/Return Time –** 10 ms to 100 s.

**Min Start/Stop Frequency –** 1 Hz.

**Max Start/Stop Frequency –** See chart, below.

**Burst**

**Waveforms –** All, except Noise and DC.

**Type –**

Triggered, gated (1 to 1,000,000 cycles or Infinite).

**Internal Trigger Rate –** 1.000 ms to 500.0 s.

**Gate and Trigger Sources –**

Internal, external, remote interface.

**Auxiliary Inputs**

**Modulation Input Channel 1, Channel 2 –**

DC to 25 kHz, ±1 V, 10 kΩ.

**External Triggered/Gated Burst Input –**

TTL, 10 kΩ.

**10 MHz Reference In –** -100 mV<sub>p-p</sub> to 5 V<sub>p-p</sub>, 1 kΩ.

**External Channel 1 Add Input –**

DC to 10 MHz, -1 V to +1 V (DC + peakAC), 50 Ω.

(AFG3101, AFG3102, AFG3251, AFG3252 only).

**Auxiliary Outputs**

**Channel 1 Trigger Output –** TTL, 50 Ω.

**10 MHz Reference Out –** 1.2 V<sub>p-p</sub>, 50 Ω

(AFG3101, AFG3102, AFG3251, AFG3252 only).

**Common Characteristics**

**Frequency Setting Resolution –**

1 μHz or 12 digits.

**Internal Noise Add –**

0% to 50% of amplitude setting.

**Main Output –** 50 Ω.

**Internal Frequency Reference –**

Stability: ±1 ppm, 0 °C to 50 °C.

Aging: ±1 ppm per year.

**Power Source –**

100 to 240 V, 47 to 63 Hz or 115 V, 360 to 440 Hz.

**Power Consumption –** 120 W.

**Display –**

AFG3021: 5.6" monochrome LCD.

All others: 5.6" color LCD.

**Physical Characteristics**

**Benchtop Configuration**

Dimensions	mm	in.
Height	156.3	6.2
Width	329.6	13.0
Depth	168.0	6.6
Weight	kg	lbs.
Net	4.5	9.9
Shipping	5.9	12.9

**Environmental and Safety Characteristics**

**Temperature –**

Operating: 0 °C to +50 °C.

Nonoperating: -30 °C to +70 °C.

► **Modulation: Max FM Peak Deviation**

	AFG3021/AFG3022	AFG3101/AFG3102	AFG3251/AFG3252
Sine	12.5 MHz	50 MHz	120 MHz
Square	6.25 MHz	25 MHz	60 MHz
ARB	5 MHz	25 MHz	60 MHz
Others	100 kHz	500 kHz	2.4 MHz

► **Sweep: Max Start/Stop Frequency**

	AFG3021/AFG3022	AFG3101/AFG3102	AFG3251/AFG3252
Sine	25 MHz	100 MHz	240 MHz
Square	12.5 MHz	50 MHz	120 MHz
ARB	12.5 MHz	50 MHz	120 MHz
Others	200 kHz	1 MHz	5 MHz

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## ▶ Ordering Information

### **AFG3021, AFG3022, AFG3101, AFG3102, AFG3251, AFG3252**

Arbitrary/Function Generator.

**Includes:** Quick-start user manual, power cord, CD-ROM with reference manual, service manual and ArbExpress™ software, NIST-traceable calibration certificate. Please specify power plug when ordering.

### **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. A99 – No power cord or AC adapter.

### **Manual Options**

(Includes front panel overlay.)

- Opt. L0 – English (071-1631-xx).
- Opt. L1 – French (071-1632-xx).
- Opt. L2 – Italian (071-1669-xx).
- Opt. L3 – German (071-1633-xx).
- Opt. L4 – Spanish (071-1670-xx).
- Opt. L5 – Japanese (071-1634-xx).
- Opt. L7 – Simple Chinese (071-1635-xx).
- Opt. L8 – Traditional Chinese (071-1636-xx).
- Opt. L9 – Korean (071-1637-xx).
- Opt. L10 – Russian (071-1638-xx).
- Opt. L99 – No manual.



▶ BNC Fuse Adapter and 0.125 A Fuse.

### **Service**

- 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 Option C5).
- Opt. R5 – Repair Service 5 Years.

### **Warranty**

Three year warranty on parts and labor.

### **Recommended Accessories**

- RM3100 – Rackmount Kit.
- 013-0345-00 – Fuse adapter, BNC-P to BNC-R.
- 159-0454-00 – Fuse set, 3 pcs, 0.125 A.

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Updated 15 June 2005

Our most up-to-date product information is available at:  
[www.tektronix.com](http://www.tektronix.com)



Product(s) are manufactured in ISO registered facilities.  
Product(s) complies with IEEE Standard 488.2-1987 with SCPI conformance.

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09/05 DV/WOW

76W-18656-1

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