

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 ± 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

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

► 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 _{p-p})			
<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 _{p-p})			
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 _{p-p})		<0.2%	
Spurious (1 V _{p-p})			
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 _{p-p} to 10 V _{p-p}	20 mV _{p-p} to 10 V _{p-p}	≤200 MHz: 50 mV _{p-p} to 5 V _{p-p} >200 MHz: 50 mV _{p-p} to 4 V _{p-p}
Accuracy	±(1% of setting + 1 mV)	±(1% of setting + 1 mV)	±(1% of setting + 1 mV)
Offset	±5 V _{pk} AC + DC	±5 V _{pk} AC + DC	±2.5 V _{pk} 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_{p-p} to 5 V_{p-p}, 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_{p-p}, 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

Arbitrary/Function Generators

▶ AFG3021 • AFG3022 • AFG3101 • AFG3102 • AFG3251 • AFG3252

▶ 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.

Contact Tektronix:

ASEAN / Australasia / Pakistan (65) 6356 3900

Austria +41 52 675 3777

Balkan, Israel, South Africa and other ISE Countries +41 52 675 3777

Belgium 07 81 60166

Brazil & South America 55 (11) 3741-8360

Canada 1 (800) 661-5625

Central East Europe, Ukraine and the Baltics +41 52 675 3777

Central Europe & Greece +41 52 675 3777

Denmark +45 80 88 1401

Finland +41 52 675 3777

France & North Africa +33 (0) 1 69 86 81 81

Germany +49 (221) 94 77 400

Hong Kong (852) 2585-6688

India (91) 80-22275577

Italy +39 (02) 25086 1

Japan 81 (3) 6714-3010

Luxembourg +44 (0) 1344 392400

Mexico, Central America & Caribbean 52 (55) 5666-333

Middle East, Asia and North Africa +41 52 675 3777

The Netherlands 090 02 021797

Norway 800 16098

People's Republic of China 86 (10) 6235 1230

Poland +41 52 675 3777

Portugal 80 08 12370

Republic of Korea 82 (2) 528-5299

Russia & CIS 7 095 775 1064

South Africa +27 11 254 8360

Spain (+34) 901 988 054

Sweden 020 08 80371

Switzerland +41 52 675 3777

Taiwan 886 (2) 2722-9622

United Kingdom & Eire +44 (0) 1344 392400

USA 1 (800) 426-2200

For other areas contact Tektronix, Inc. at: 1 (503) 627-7111

Updated 15 June 2005

Our most up-to-date product information is available at:
www.tektronix.com



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

Copyright © 2005, Tektronix, Inc. All rights reserved. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specification and price change privileges reserved. TEKTRONIX and TEK are registered trademarks of Tektronix, Inc. All other trade names referenced are the service marks, trademarks or registered trademarks of their respective companies.

07/05 HB/WWW

76W-18656-0

Tektronix
Enabling Innovation