TEKTRONIX

AFG2021

The Tektronix AFG2021 is a 20 MHz Arbitrary / Function Generator designed to provide high-performance signal generation in an affordable and compact package. Featuring a 250 MS/s sample rate, 14-bit vertical resolution, and 1 MS waveform memory, it enables the creation of highly precise standard and complex arbitrary waveforms.

SPECIFICATIONS

General

Interfaces	USB Host (front), USB Device (rear, USBTMC), LAN (10/100 Base-T, LXI Class C)
Display	3.5-inch TFT Color LCD, 320 × 240 resolution
Setup Memory Capacity	10 setups
Warm-up Time	20 minutes

Physical

Power Supply	100 V to 240 V AC (50/60 Hz), 115 V AC (400 Hz), < 120 W power consumption
Operating Temperature	0 to +50 °C °C
Dimensions (W×H×D)	242.4 mm × 104.2 mm × 374.2 mm mm
Weight	3.1 kg

Channel Characteristics

Number of Channels	1
Operating Modes	Continuous, Modulation, Sweep, Burst

Waveform Generation

Standard Waveforms	Sine, Square, Pulse, Ramp, Noise, DC, Sin(x)/x, Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine
Sampling Rate	250 MS/s
Vertical Resolution	14 bits
Minimum Arbitrary Waveform Length	2 points
Maximum Arbitrary Waveform Length	1,000,000 points (1 MS)
Non-Volatile Memory Capacity	4 waveforms (each up to 1M points)

Frequency Specifications

Sine Frequency Range	1 µHz to 20 MHz
Square Frequency Range	1 µHz to 10 MHz
Pulse Frequency Range	1 mHz to 10 MHz
Ramp/Triangle Frequency Range	1 µHz to 200 kHz
Noise Bandwidth	20 MHz (-3 dB)
Arbitrary Waveform Frequency Range	1 mHz to 10 MHz
Frequency Resolution	1 µHz
Frequency Accuracy	±1 ppm (0 °C to 50 °C)
Aging Rate	±1 ppm per year

Sine Wave Distortion and Purity

Harmonic Distortion (10 Hz to 20 kHz)	< -70 dBc (at 1 Vp-p)
Harmonic Distortion (20 kHz to 1 MHz)	< -60 dBc (at 1 Vp-p)
Harmonic Distortion (1 MHz to 5 MHz)	< -50 dBc (at 1 Vp-p)
Harmonic Distortion (5 MHz to 20 MHz)	< -40 dBc (at 1 Vp-p)
Total Harmonic Distortion (THD)	< 0.2% (10 Hz to 20 kHz, 1 Vp-p)
Spurious Noise (Non-Harmonic)	< -50 dBc (1 Vp-p, DC to 20 MHz)
Phase Noise	< -110 dBc/Hz at 10 kHz offset (10 MHz, 0 dBm)
Sine Wave Jitter (RMS)	< 100 ps (typical)

Pulse & Square Wave Characteristics

Rise/Fall Time	≤ 18 ns
Overshoot	< 5%
Pulse Duty Cycle Range	0.1% to 99.9% (subject to width limits)
Pulse Width Range	30.00 ns to 999.9 s
Pulse Width Resolution	10 ps or 5 digits
Pulse Jitter (RMS)	< 500 ps (typical)

Amplitude and Output Characteristics

Amplitude Range (into 50 Ω, ≤10 MHz)	10 mVp-p to 10 Vp-p
Amplitude Range (into 50 Ω, >10 MHz to 20 MHz)	10 mVp-p to 5 Vp-p
Amplitude Range (Open Circuit, ≤10 MHz)	20 mVp-p to 20 Vp-p
Amplitude Range (Open Circuit, >10 MHz to 20 MHz)	20 mVp-p to 10 Vp-p
Amplitude Accuracy	±(1% of setting + 1 mVp-p) at 1 kHz, 50 Ω load
Amplitude Resolution	0.1 mVp-p, 0.1 mVrms, 1 mV, 1 µV, or 4 digits
Amplitude Units	Vp-p, Vrms, dBm
DC Offset Range (into 50 Ω)	±5 Vpk (limit: |Voffset| + Vp-p/2 ≤ 5 V)
DC Offset Range (Open Circuit)	±10 Vpk (limit: |Voffset| + Vp-p/2 ≤ 10 V)
DC Offset Accuracy	±(1% of |setting| + 5 mV + 0.5% of amplitude)
Output Impedance	50 Ω
Output Protection	Short-circuit protected
Main Output Connector Type	BNC (front panel)

Modulation, Sweep, and Burst

Modulation Types	AM, FM, PM, FSK, PWM
Internal Modulation Sources	Sine, Square, Ramp, Noise, Arbitrary
AM Modulation Depth	0.0% to 120.0%
FM Deviation Range	1 µHz to 10 MHz
PM Phase Deviation Range	0.0° to 180.0°
FSK Keying Rate	2 mHz to 1 MHz
PWM Duty Cycle Deviation	0.0% to 50.0% of pulse period
Sweep Type	Linear, Logarithmic
Sweep Time Range	1 ms to 300 s
Burst Type	Triggered, Gated
Burst Count Range	1 to 1,000,000 cycles, or Infinite

Clock, Trigger, and Synchronization

External Reference Input Frequency Range	10 MHz ± 10 kHz
External Reference Input Level	100 mVp-p to 5 Vp-p
External Reference Output Frequency	10 MHz
External Reference Output Level	1.2 Vp-p (typical into 50 Ω)
Trigger Input Voltage Level	TTL compatible (Min high 2.0 V, Max low 0.8 V)
Trigger Output Voltage Level	TTL compatible (into ≥ 10 kΩ)
Sync Output Level	TTL compatible (into 50 Ω)
Sync Output Impedance	50 Ω

Connectivity and Programming

Programming Command Language	SCPI
External Modulation Input Connector	BNC (rear panel)

Physical and Environmental

Display Type and Size	3.5-inch TFT Color LCD
Display Resolution	320 × 240 pixels
Power Consumption	Less than 120 W (typical 30 W)
Storage Temperature Range	-30 °C to +70 °C
Operating Humidity Range	< 80% R.H. (0 °C to +40 °C), < 60% R.H. (+40 °C to +50 °C)

Compliance and Standards

Calibration Interval	1 year (recommended)

Performance

Sine Wave Flatness (< 5 MHz)	±0.15 dB (into 50 Ω, 1 Vp-p, relative to 1 kHz)
Sine Wave Flatness (5 MHz to 20 MHz)	±0.3 dB (into 50 Ω, 1 Vp-p, relative to 1 kHz)

Modulation

Internal Modulation Frequency (AM, FM, PM, PWM)	2 mHz to 50 kHz
Internal FSK Rate	2 mHz to 1 MHz

Inputs & Outputs

External Modulation Input Impedance	10 kΩ
External Modulation Input Range	±1.0 V full scale
External Modulation Bandwidth	DC to 25 kHz
Trigger Input Impedance	10 kΩ
Trigger Input Minimum Pulse Width	100 ns
Reference Clock Input Impedance	1 kΩ, AC coupled
Reference Clock Output Impedance	50 Ω, AC coupled

Environmental

Operating Altitude	Up to 3,000 m (10,000 ft)

Compliance

Safety Compliance	UL 61010-1, CAN/CSA-C22.2 No. 61010-1, EN 61010-1, IEC 61010-1
EMC Compliance	EN 61326-1:2006, Class A

Frequency

Phase Range	-180.00° to +180.00°
Phase Resolution	0.01°

Waveform Characteristics

Ramp Linearity	≤0.1% of peak output (at 1 kHz, 100% amplitude, 10% to 90% symmetry)
Ramp Symmetry Range	0.0% to 100.0%
Ramp Symmetry Resolution	0.1%
Square Wave Duty Cycle	50% (fixed)

Sweep

Sweep Trigger Sources	Internal, External, Manual

Burst

Burst Trigger Sources	Internal, External, Manual

Interfaces

LXI Compliance	LXI Class C, Version 1.3

TECHNOLOGY

Direct Digital Synthesis (DDS)

APPLICATIONS

Electronic Test and Measurement