KEYSIGHT TECHNOLOGIES (AGILENT HP)

33512B

The Keysight Technologies (formerly Agilent) 33512B is a 2-channel, 20 MHz Waveform Generator featuring Trueform signal generation technology. Trueform technology combines the advantages of Direct Digital Synthesis (DDS) and point-by-point architectures to offer lower jitter, lower harmonic distortion, and cleaner signals compared to traditional DDS instruments. This model has a high-resolution 4.3" color TFT display, provides 16-bit vertical resolution, a 160 MSa/s sampling rate, and 1 MSa/channel standard memory which can be expanded to 16 MSa. Additionally, it offers comprehensive modulation, sweep, and burst capabilities, alongside advanced dual-channel coupling and waveform summing features.

SPECIFICATIONS

General

Interfaces	USB 2.0 (USB-TMC488 protocol), LAN (10/100Base-T Ethernet, LXI-C compliant), GPIB/IEEE-488.1, IEEE-488.2
Display	4.3" Color TFT WQVGA (480x272) with LED backlight
Warm-up Time	1 hour
Calibration Cycle	1 year or 2 years

Physical

Power Supply	100 V to 240 V (±10%) at 50/60 Hz, 100 V to 120 V (±10%) at 400 Hz; < 45 W typical (< 75 VA)
Operating Temperature	0 °C to 55 °C °C
Dimensions (W×H×D)	261.2 mm × 103.8 mm × 303.2 mm (with bumpers and handle) mm
Weight	3.4 kg kg

Waveform and Output Channels

Number of Channels	2
Bandwidth	20 MHz
Standard Waveforms	Sine, square, ramp, pulse, triangle, Gaussian noise, PRBS (Pseudorandom Binary Sequence), DC
Built-in Arbitrary Waveforms	Cardiac, exponential fall, exponential rise, Gaussian pulse, Haversine, Lorentz, D-Lorentz, negative ramp, sinc
User-defined Arbitrary Waveforms	Up to 1 MSa (16 MSa with Option MEM) with multi-segment sequencing
Channel Isolation	Connector shells for channel output(s), Sync, and Mod In are isolated from the instrument's chassis; max ±42 Vpk

Frequency Characteristics

Pulse Frequency Range	Up to 20 MHz
Arbitrary Waveform Sample Rate	160 MSa/s

Amplitude and Voltage Characteristics

Amplitude Range (into 50 Ohms)	1 mVpp to 10 Vpp
Amplitude Range (into Open Circuit)	2 mVpp to 20 Vpp

Waveform Purity and Distortion

Sine Total Harmonic Distortion (THD)	< 0.04%
Pulse Rise/Fall Time	8.4 ns

Arbitrary Waveform Characteristics

Arbitrary Waveform Length	8 Sa to 1 MSa per channel (16 MSa with Option MEM) in increments of 1 sample
Vertical Resolution	16 bits
Arbitrary Waveform Filter-Off Bandwidth (-3 dB, nom)	40 MHz
Arbitrary Waveform Normal-Filter-On Bandwidth (-3 dB, nom)	0.27 x (Sample Rate)
Arbitrary Waveform Step-Filter-On Bandwidth (-3 dB, nom)	0.13 x (Sample Rate)
Arbitrary Waveform Rise/Fall Time (Filter On)	0.35 / Bandwidth (8 ns min) with "Normal" or "Step" filter On

Waveform Sequencing

Waveform Sequencing Preload Capacity	Up to 32 sequences totaling up to 1,024 segments in volatile memory
Sequence Segment Length	8 Sa to 1 MSa per channel (16 MSa with Option MEM) in increments of 1 sample
Sequence Steps	1 to 512 steps
Sequence Segment Repeat Count	1 to 1,000,000, or infinite

Modulation, Sweep, and Burst

Operating Modes	Continuous, modulate, frequency sweep, burst, output gate
Modulation Types	AM, FM, PM, FSK, BPSK, PWM, Sum (carrier + modulation)
Modulation Input Connector	Rear-panel BNC, isolated
Modulation Input Assignment	Channel 1, Channel 2, or both
Modulation Input Voltage Level	±5 V full-scale
Modulation Input Impedance (nom)	5 kΩ
Modulation Input Bandwidth (-3 dB, typ)	0 Hz to 100 kHz

Trigger and Synchronization

Sync/Marker Connector	Front-panel BNC, isolated from chassis
Sync/Marker Functions	Sync, sweep marker, burst marker, or arbitrary waveform marker
Sync/Marker Assignment	Channel 1 or Channel 2
Sync/Marker Polarity	Normal or inverted
Sync/Marker Voltage Level (nom)	3 Vpp into open circuit, 1.5 Vpp into 50 Ω
Sync/Marker Output Impedance (nom)	50 Ω
Sync/Marker Minimum Pulse Width (nom)	16 ns
External Trigger Connector	Rear-panel BNC, chassis-referenced
External Trigger Function	Input or output
External Trigger Assignment (as Input)	Channel 1, channel 2, or both
External Trigger Assignment (as Output)	Channel 1 or channel 2
External Trigger Polarity	Positive or negative slope
External Trigger Input Level (nom)	0 V to 0.4 V for low, >2.3 V for high, 3.5 V maximum
External Trigger Output Level (nom)	3 Vpp into open circuit, 1.5 Vpp into 50 Ω
External Trigger Input Impedance (nom)	10 kΩ, DC-coupled
External Trigger Output Impedance (nom)	50 Ω
External Trigger Fanout	≤4 Agilent 33500B Series waveform generators

System, Connectivity, and Control

Programming Language	SCPI-1999, IEEE-488.2; Agilent 33210A / 33220A compatible
Web Browser Control	Remote operation and monitoring via Web user interface
Real-Time Clock/Calendar battery	CR-2032 coin-type, replaceable, >5 year life (typ)

Unique Instrument Features

Waveform Summing and Combining	Add noise to signals using a single channel. Sum/combine up to 4 signals on 2-channel models
Variable-Bandwidth Noise	Adjustable bandwidth of the built-in noise generator
Dual-Channel Coupling	Frequency/amplitude coupling, equal/inverted, configurable start phase and phase shift

Frequency

Sine Frequency Range	1 µHz to 20 MHz
Square Frequency Range	1 µHz to 20 MHz
Ramp Frequency Range	1 µHz to 200 kHz
Triangle Frequency Range	1 µHz to 200 kHz
Frequency Resolution	1 µHz
Frequency Stability (Standard)	±1 ppm of setting ±15 pHz (0 °C to 55 °C)
Frequency Stability (Option OCX)	±0.1 ppm of setting ±15 pHz (0 °C to 55 °C)
Frequency Aging (Standard)	±1 ppm per year
Frequency Aging (Option OCX)	±0.1 ppm per year

Amplitude & Offset

Amplitude Accuracy	±(1% of setting + 1 mVpp) at 1 kHz, into 50 Ω
Offset Range (into 50 Ω)	±5 V
Offset Range (into Open Circuit)	±10 V
Output Impedance	50 Ω (nominal)

Square & Pulse

Square Jitter	< 40 ps
Square Duty Cycle	0.01% to 99.99% (limitations apply)
Pulse Jitter	< 40 ps

Environmental & Standards

Storage Temperature	-30 °C to 70 °C
Operating Altitude	Up to 3,000 m (9,840 ft)
Safety Compliance	EN 61010-1, UL 61010-1, CSA C22.2 No. 61010-1
EMC Compliance	EN 61326-1, ICES-001, AS/NZS CISPR 11

Dual-Channel Characteristics

Channel-to-Channel Phase Offset Range	-360° to +360°
Channel-to-Channel Phase Offset Resolution	0.001°

Amplitude

Amplitude Flatness (< 5 MHz)	±0.1 dB (relative to 1 kHz, 50 Ω load)
Amplitude Flatness (5 MHz to 20 MHz)	±0.15 dB (relative to 1 kHz, 50 Ω load)

Pulse

Pulse Width Range	16 ns to 1,000,000 s
Pulse Duty Cycle Range	0.01% to 99.99% (subject to width limits)

Outputs

Maximum Floating Voltage	±42 Vpk to earth

Interfaces

LXI Compliance	LXI Core 2011 Device

TECHNOLOGY

Trueform Signal Generation Technology

APPLICATIONS

Electronic testing, waveform generation, circuit characterization, and differential signaling

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