Uncompromising performance for functions and waveforms

The Agilent Technologies 33220A Function/Arbitrary Waveform Generator uses direct digital synthesis (DDS) techniques to create a stable, accurate output signal for clean, low distortion sine waves. It also gives you square waves with fast rise and fall times up to 20 MHz and linear ramp waves up to 200 kHz.

Pulse Generation

The 33220A can generate variable-edge-time pulses up to 5 MHz. With variable period, pulse width, and amplitude the 33220A is ideally suited to a wide variety of applications requiring a flexible pulse signal.

Custom waveform generation

Use the 33220A to generate complex custom waveforms. With 14-bit resolution, and a sampling rate of 50 MSa/s, the 33220A gives you the flexibility to create the waveforms you need. It also lets you store up to four waveforms in nonvolatile memory.

The Agilent IntuiLink Arbitrary Waveform software allows you to easily create, edit, and download complex waveforms using the waveform editor. Or you can capture a waveform using IntuiLink for Oscilloscope and send it to the 33220A for output. To find out more about IntuiLink, visit www.agilent.com/find/intuilink.

Easy-to-use functionality

Front-panel operation of the 33220A is straightforward and user friendly. You can access all major functions with a single key or two. The knob or numeric keypad can be used to adjust frequency, amplitude, offset, and other parameters. You can even enter voltage values directly in $V_{pp}$, $V_{rms}$, dBm, or as high and low levels. Timing parameters can be entered in Hertz (Hz) or seconds.

Internal AM, FM, PM, FSK, and PWM modulation make it easy to modulate waveforms without the need for a separate modulation source. Linear and logarithmic sweeps are also built in, with sweep rates selectable from 1 ms to 500 s. Burst mode operation allows for a user-selected number of cycles per period of time. GPIB, LAN, and USB interfaces are all standard, plus you get full programmability using SCPI commands.

External Frequency Reference (Option 001)

The 33220A external frequency reference lets you synchronize to an external 10 MHz clock, to another 33220A, or to an Agilent 33250A. Phase adjustments can be made from the front panel or via a computer interface, allowing precise phase calibration and adjustment.

3-Year Warranty

With your 33220A, you get operating and service manuals, a quick reference guide, test data, and a full 3-year warranty, all for one low price.
WAVEFORMS

Standard
- Sine, Square, Ramp, Triangle, Pulse, Noise, DC

Built-in arbitrary
- Exponential rise, Exponential fall, Negative ramp, Sin(x)/x, Cardiac

WAVEFORM CHARACTERISTICS

Sine
- Frequency Range: 1 μHz to 20 MHz
- Amplitude Flatness
  - (relative to 1 kHz)
  - < 100 kHz: 0.1 dB
  - 100 kHz to 5 MHz: 0.15 dB
  - 5 MHz to 20 MHz: 0.3 dB
- Harmonic distortion
  - DC to 20 kHz: < 1 V_{pp}
  - 20 kHz to 100 kHz: -65 dBc
  - 100 kHz to 1 MHz: -45 dBc
  - 1 MHz to 10 MHz: -40 dBc
- Total harmonic distortion (DC to 20 kHz): 0.04%

Square
- Frequency range: 1 μHz to 20 MHz
- Rise/Fall time: < 13 ns
- Overshoot: < 2%

Ramp, Triangle
- Frequency range: 1 μHz to 200 kHz
- Linearity: < 0.1% of peak output
- Variable Symmetry: 0.0% to 100.0%

Pulse
- Frequency range: 0.5 μHz to 5 MHz
- Pulse width (period ≤ 10s): 10 ns resolution
- Variable edge time: < 13 ns to 100 ns
- Overshoot: < 2%

Noise
- Bandwidth: 10 MHz typical

Arbitrary
- Frequency range: 1 μHz to 6 MHz
- Waveform length: 2 to 64 K points
- Amplitude resolution: 14 bits (including sign)
- Sample rate: 50 MSa/s
- Min. Rise/Fall Time: 35 ns typical
- Linearity: < 0.1% of peak output
- Settling Time: < 250 ns to 0.5% of final value
- Jitter (RMS): 6 ns + 30 ppm
- Non-volatile memory: four waveforms

COMMON CHARACTERISTICS

Amplitude
- Range: 10 mV_{pp} to 10 V_{pp} into 50Ω
- 20 mV_{pp} to 20 V_{pp} into open circuit
- Accuracy (at 1 kHz): ± 1% of setting ± 1 mV_{pp}
- Units: V_{pp}, V_{rms}, dBm
- Resolution: 4 digits

DC Offset
- Range (peak AC + DC): ± 5 V into 50Ω
- ± 10 V into open circuit
- Accuracy: ± 2% of offset setting
- ± 0.5% of amplitude ± 2 mV
- Resolution: 4 digits

Main Output
- Impedance: 50 Ω typical
- Isolation: 42 Vpk maximum to earth
- Protection: Short-circuit protected, overload automatically disables main output

Internal Frequency Reference
- Accuracy: ± 10 ppm in 90 days
- ± 20 ppm in 1 year

External Frequency Reference (Option 001)
- Rear Panel Input
  - Lock Range: 10 MHz ± 500 Hz
  - Level: 100 mV_{pp} to 5 V_{pp}
  - Impedance: 1 kΩ typical, AC coupled
  - Lock Time: < 2 seconds

Rear Panel Output
- Frequency: 10 MHz
- Level: 632 mV_{pp} (0 dBm), typical
- Impedance: 50 Ω typical, AC coupled

Phase Offset
- Range: + 360° to - 360°
- Resolution: 0.001°
- Accuracy: 20 ns

MODULATION

AM
- Carrier waveforms: Sine, Square, Ramp, Arb
- Source: Internal/External
- Internal modulation: Sine, Square, Ramp, Triangle, Noise, Arb (2 mHz to 20 kHz)
- Depth: 0.0% to 120.0%

FM
- Carrier waveforms: Sine, Square, Ramp, Arb
- Source: Internal/External
- Internal modulation: Sine, Square, Ramp, Triangle, Noise, Arb (2 mHz to 20 kHz)
- Deviation: DC to 10 MHz

PM
- Carrier waveforms: Sine, Square, Ramp, Arb
- Source: Internal/External
- Internal modulation: Sine, Square, Ramp, Triangle, Noise, Arb (2 mHz to 20 kHz)
- Deviation: 0.0 to 360.0 degrees
PWM
Carrier waveform Pulse
Source Internal/External
Internal modulation Sine, Square, Ramp, Triangle, Noise, Arb (2 mHz to 20 kHz)
Deviation 0% to 100% of pulse width

FSK
Carrier waveforms Sine, Square, Ramp, Arb
Source Internal/External
Internal modulation 50% duty cycle square (2 mHz to 100 kHz)

External Modulation Input (for AM, FM, PM, PWM)
Voltage range ± 5 V full scale
Input impedance 5 kΩ typical
Bandwidth DC to 20 kHz

SWEEP
Waveforms Sine, Square, Ramp, Arb
Type Linear or Logarithmic
Direction Up or Down
Sweep time 1 ms to 500 s
Trigger Single, External, or Internal
Marker falling edge of sync signal (programmable frequency)

BURST
Waveforms Sine, Square, Ramp, Triangle, Pulse, Noise, Arb
Type Counted (1 to 50,000 cycles), Infinite, Gated
Start/Stop Phase -360° to +360°
Internal Period 1 µs to 500 s
Gate Source External trigger
Trigger source Single, External or Internal

TRIGGER CHARACTERISTICS
Trigger input
Input level TTL compatible
Slope Rising or Falling, selectable
Pulse width > 100 ns
Input impedance >10 kΩ, DC coupled
Latency < 500 ns
Jitter (rms) 6 ns (3.5 ns for pulse)
Trigger output
Level TTL compatible into ≥ 1 kΩ
Pulse width > 400 ns
Output Impedance 50 Ω, typical
Maximum rate 1 MHz

PROGRAMMING TIMES (typical)
Configuration times USB LAN GPIB
Function Change 99 ms 100 ms 99 ms
Frequency Change 3 ms 5 ms 2 ms
Amplitude Change 36 ms 36 ms 36 ms
Select User Arb 111 ms 112 ms 109 ms
Arb Download Times (binary transfer)
   USB LAN GPIB
   64K points 101 ms 250 ms 356 ms
   16K points 26 ms 62 ms 87 ms
   4K points 8 ms 20 ms 22 ms

GENERAL
Power Supply CAT II
100 - 240V @ 50/60Hz (-5%, +10%)
100 - 120V @ 400Hz (±10%)
Power Consumption 50 VA max
Operating Environment IEC 61010
   Pollution Degree 2
   Indoor Location
Operating Temperature 0°C to 55°C
Operating Humidity 5% to 80% RH, non-condensing
Operating Altitude Up to 3000 meters
Storage Temperature -30°C to 70°C
State Storage Memory Power off state automatically saved.
   Four user-configurable stored states
Interface USB, GPIB, and LAN standard
Language SCPI - 1993, IEEE-488.2
Dimensions (W x H x D)
   Bench top 261.1mm x 103.8mm x 303.2mm
   Rack mount 212.8mm x 88.3mm x 272.3mm
Weight 3.4 kg (7.5 lbs)
Safety Designed to UL-1244, CSA 1010, EN61010
EMC Tested to MIL-461C, EN55011, EN50082-1
Vibration and Shock MIL-T-28800, Type III, Class 5
Acoustic Noise 30 dBA
Warm-up Time 1 hour
Warranty 3 years standard

Footnotes
[1] add 1/10th of output amplitude and offset spec per °C for operation outside the range of 18°C to 28°C
[2] Autorange enabled
[3] DC offset set to 0 V
[4] spurious noise at low amplitude is limited by −75 dBm typical
[5] add 10 ppm for operation outside the range of 18°C to 28°C
[6] FSK uses trigger input (1 MHz maximum)
[7] Sine and square waveforms above 6 MHz are allowed only with an “infinite” burst count
Agilent Technologies’ Test and Measurement Support, Services, and Assistance
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Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

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