Agilent 33250A
Function/Arbitrary Waveform Generator
Data Sheet

- 80 MHz sine and square wave outputs
- Sine, square, ramp, noise and other waveforms
- 50 MHz pulse waveforms with variable rise/fall times
- 12-bit, 200 MSa/s, 64K-point deep arbitrary waveform

Color Graphical Display
The unique design of the 33250A combines a low-profile instrument with the benefits of a color graphical display. Now you can display multiple waveform parameters at the same time. The graphical interface also allows you to modify arbitrary waveforms quickly and easily.

Timebase Stability and Clock Reference
The 33250A TCXO timebase gives you frequency accuracy of 1 ppm for your most demanding applications. The external clock reference input/output lets you synchronize to an external 10 MHz clock, to another 33250A, or to an Agilent 33120A. Phase adjustments can be made from the front panel or via a computer interface, allowing precise phase calibration and adjustment.

3-year Warranty
The 33250A ships standard with operating and service manuals, a quick reference guide, test data, and a full three-year warranty - one of the best coverage plans in the industry.

Standard Waveforms
The Agilent Technologies 33250A Function/Arbitrary Waveform Generator uses direct digital-synthesis techniques to create a stable, accurate output on all waveforms, down to 1 µHz frequency resolution. The benefits are apparent in every signal you produce, from the sine wave frequency accuracy to the fast rise/fall times of square waves, to the ramp linearity.

Front-panel operation of the 33250A is straightforward and user friendly. The knob or numeric keypad can be used to adjust frequency, amplitude and offset. You can even enter voltage values directly in Vpp, Vrms, dBm, or high/low levels. Timing parameters can be entered in hertz (Hz) or seconds.

Custom Waveform Generation
Why settle for a basic function generator when you can get arbitrary waveforms at no extra cost? With the 33250A, you can generate arbitrary waveforms with 12-bit vertical resolution, 64K memory depth, and a sample rate of 200 MSa/s. You can also store up to four 64K-deep arbitrary waveforms in non-volatile memory with user-defined names to help you find the right waveform when you need it most.

Pulse Generation
The 33250A can generate simple pulses up to 50 MHz. With variable edge time, pulse width and voltage level, the 33250A is ideally suited to a wide variety of pulse applications.

Built-in Versatility
AM, FM and FSK capabilities make it easy to modulate waveforms with or without a separate source. Linear or logarithmic sweeps can be performed with a programmable frequency marker signal. Programmable burst count and gating allow you to further customize your signal.

For system applications, both GPIB and RS-232 interfaces are standard, and support full programmability using SCPI commands.
WAVEFORMS

Standard sine, square, pulse, ramp, noise, sin(x)/x, exponential rise, exponential fall, cardiac, DC volts

Arbitrary
Waveform length 1 to 64K points
Amplitude resolution 12 bits (including sign)
Repetition rate 1 µHz to 25 MHz
Sample rate 200 MSa/s
Filter bandwidth 50 MHz
Non-vol. memory Four (4) 64K waveforms

FREQUENCY CHARACTERISTICS

Sine 1 µHz to 80 MHz
Square 1 µHz to 80 MHz
Pulse 500 µHz to 50 MHz
Arb 1 µHz to 25 MHz
Ramp 1 µHz to 1 MHz
White noise 50 MHz bandwidth
Resolution 1 µHz; except pulse, 5 digits
Accuracy
Stability ± 0.3 ppm, 18°C to 28°C
± 1 ppm, 0°C to 50°C
Aging ± 1 ppm per 1 year

SINEWAVE SPECTRAL PURITY

Harmonic distortion
DC to 1 MHz -60 dBc
1 to 5 MHz -57 dBc
5 to 80 MHz -37 dBc
Total harmonic distortion
DC to 20 kHz < 0.2% + 0.1 mVrms
Spurious (non-harmonic)
DC to 1 MHz -60 dBc
1 to 20 MHz -50 dBc
20 MHz -50 dBc + 6 dBc/octave
Phase noise (30 kHz band)
10 MHz < -65 dBc (typical)
80 MHz < -47 dBc (typical)

SIGNAL CHARACTERISTICS

Squarewave
Rise/Fall time < 8 ns
Overshoot < 5%
Asymmetry 1% of period + 1 ns
Jitter (rms) < 2 MHz 0.01% + 525 ps
≥ 2 MHz 0.1% + 75 ps
Duty cycle ≤ 25 MHz 20.0% to 80.0%
≥ 25 to 50 MHz 40.0% to 60.0%
≥ 50 to 80 MHz 50.0% fixed

Pulse
Period 20.00 ns to 2000.0 s
Pulse width 8.0 ns to 1999.9 s
Variable edge time 5.00 ns to 1.00 ms
Overshoot < 5%
Jitter (rms) 100 ppm + 50 ps
Ramp
Linearity < 0.1% of peak output
Symmetry 0.0% - 100.0%
Arb
Min. edge time < 10 ns
Linearity < 0.1% of peak output
Settling time < 50 ns to 0.5% of final value
Jitter (rms) 30 ppm + 2.5 ns

OUTPUT CHARACTERISTICS

Amplitude (into 50Ω) 10 mVpp to 10 Vpp
Accuracy (at 1 kHz, >10 mVpp, Autorange) ± 1% of setting + 1 mVpp
Flatness (sinewave relative to 1 kHz, Autorange)
< 10 MHz ± 1% (0.1 dB)
10 to 50 MHz ± 2% (0.2 dB)
50 to 80 MHz ± 5% (0.4 dB)
Units Vpp, Vrms, dBm, high and low level
Resolution 0.1 mV or 4 digits
Offset (into 50Ω) ± 5 Vpk ac + dc
Accuracy 1% of setting + 2 mV + 0.5% of amplitude

Waveform Output
Impedance 50Ω typical (fixed)
>10 MΩ (output disabled)
Isolation 42 Vpk maximum to earth
Protection short-circuit protected; overload automatically disables main output

MODULATION

AM
Carrier waveforms sine, square, ramp, and arb
Mod. waveforms sine, square, ramp, noise, and arb
Mod. frequency 2 mHz to 20 kHz
Depth 0.0% to 120.0%
Source internal/external

FM
Carrier waveforms sine, square, ramp, and arb
Mod. waveforms sine, square, ramp, noise, and arb
Mod. frequency 2 mHz to 20 kHz
Deviation range DC to 80 MHz
Source internal/external

FSK
Carrier waveforms sine, square, ramp, and arb
Mod. waveform 50% duty cycle square
Internal rate 2 mHz to 1 MHz
Frequency range 1 µHz to 80 MHz
Source internal/external

External Modulation Input
Voltage range ± 5 % full scale
Input impedance 10 kΩ
Frequency DC to 20 kHz

BURST

Waves sine, square, ramp, pulse, arb, and noise
Frequency 1 µHz to 80 MHz
Burst count 1 to 1,000,000 cycles or infinite
Start/Stop phase -360.0° to +360.0°
Internal period 1 ms to 500 s
Gate source external trigger
Trigger source single manual trigger, internal, external trig
Trigger delay N-cycle, infinite
N cycles, 0.0 ns to 85.000 sec

SWEEP

Waves sine, square, ramp, and arb
Type linear and logarithmic
Direction up or down
Start F/Stop F 100 µHz to 80 MHz
Sweep time 1 ms to 500 s
Trigger single manual trigger, internal, external trig
Marker falling edge of sync signal (programmable)
SYSTEM CHARACTERISTICS

Configuration Times (typical)

<table>
<thead>
<tr>
<th>Function</th>
<th>Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>100 ms</td>
</tr>
<tr>
<td>Pulse</td>
<td>660 ms</td>
</tr>
<tr>
<td>Built-in arb</td>
<td>220 ms</td>
</tr>
</tbody>
</table>

Frequency change: 20 ms
Amplitude change: 50 ms
Offset change: 50 ms
Select user arb: < 900 ms for < 16K pts.
Modulation change: < 200 ms

Arb Download Times GPIB/RS-232 (115Kbps)

<table>
<thead>
<tr>
<th>Arb Length</th>
<th>Binary</th>
<th>ASCII Integer</th>
<th>ASCII Real</th>
</tr>
</thead>
<tbody>
<tr>
<td>64K points</td>
<td>48 sec</td>
<td>112 sec</td>
<td>186 sec</td>
</tr>
<tr>
<td>16K points</td>
<td>12 sec</td>
<td>28 sec</td>
<td>44 sec</td>
</tr>
<tr>
<td>8K points</td>
<td>6 sec</td>
<td>14 sec</td>
<td>22 sec</td>
</tr>
<tr>
<td>4K points</td>
<td>3 sec</td>
<td>7 sec</td>
<td>11 sec</td>
</tr>
<tr>
<td>2K points</td>
<td>1.5 sec</td>
<td>3.5 sec</td>
<td>5.5 sec</td>
</tr>
</tbody>
</table>

TRIGGER CHARACTERISTICS

Input level: TTL compatible
Slope: rising or falling, selectable
Pulse width: > 100 ns
Input impedance: 10 kΩ, DC coupled
Latency:
- Burst: < 100 ns (typical)
- Sweep: < 10 μs (typical)
Jitter (rms):
- Burst: 1 ns; except pulse, 300 ps
- Sweep: 2.5 μs

Trigger output

Level: TTL compatible into 50Ω
Pulse width: > 450 ns
Maximum rate: 1 MHz
Fanout: ≤ 4 Agilent 33250A's

CLOCK REFERENCE

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

External Reference Input
Lock range: 10 MHz ± 35 kHz
Level: 100 mVpp to 5 Vpp
Impedance: 1 kΩ nominal, ac coupled
Lock time: < 2 s

Internal Reference Output
Frequency: 10 MHz
Level: 632 mVpp (0 dbm), nominal
Impedance: 50 Ω nominal, ac coupled

SYNC OUTPUT

Level: TTL compatible into > 1 kΩ
Impedance: 50 Ω nominal

GENERAL

Power supply: 100-240 V, 50-60 Hz
100-127 V, 50-400 Hz
Power consumption: 140 VA
Operating temp.: 0°C to 55°C
Storage temp.: -30°C to 70°C
Stored states: 4 named user configurations
Power on state: default or last
Language: SCPI-1997, IEEE-488.2
Dimensions (WxHxD):
- Bench top: 254 x 104 x 374 mm
- Rackmount: 213 x 89 x 348 mm
Weight: 4.6 kg
Safety designed to EN61010-1, CSA1010.1, UL-311-1
EMC tested to EN55011, IEC-1326-1
Vibration and shock: MIL-T-28800E, Type III, Class 5
Acoustic noise: 40 dBA
Warm-up time: 1 hour
Calibration interval: 1 year
Warranty: 3 years standard

1 Harmonic distortion at low amplitudes is limited by a -70 dBm floor
2 Spurious noise at low amplitudes is limited by a -75 dBm floor
3 Sine and square waveforms above 25 MHz only with infinite burst count
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(fax) (81) 426 56 7840

**Latin America:**
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Latin American Region Headquarters
5200 Blue Lagoon Drive, Suite #950
Miami, Florida 33126 U.S.A.
(tel) (305) 267 4245
(fax) (305) 267 4286

**Australia/New Zealand:**
Agilent Technologies Australia Pty Ltd
347 Burwood Highway
Forest Hill, Victoria 3131
(tel) 1-800 629 485 (Australia)
(fax) (613) 9272 0749
(tel) 0 800 738 378 (New Zealand)
(fax) (64 4) 822 6881

**Asia Pacific:**
Agilent Technologies
24/F, Cityplaza One, 1111 King’s Road,
Taikoo Shing, Hong Kong, SAR
(tel) (852) 2599 7818
(fax) (852) 2506 9284

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### Agilent 33250A Function/Arbitrary Waveform Generator

**Accessories Included**

**Options**
- Opt. 1CM Rackmount kit* (Agilent 34190A)
- Opt. W50 Additional 2-year warranty (5-year total)

**Accessories**
- 10100C 50Ω feedthru
- 11094B 75Ω feedthru
- 11095A 600Ω feedthru
- 34131A Carrying case
- 34161A Accessory pouch
- 34190A Rackmount kit*
- 34811A BenchLink Arb software

*For racking two 33250As side-by-side, order the following items:
- Lock-link kit (p/n 5061-9694)
- Flange kit (p/n 5063-9212)

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Measurement Assistance Center
9-1, Takakura-Cho, Hachioji-Shi,
Tokyo 192-8510, Japan
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

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347 Burwood Highway
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