Specifications describe the instrument’s warranted performance over the 0° to 55°C temperature range unless otherwise noted. Supplemental Characteristics are intended to provide information useful in estimating instrument capability in your application by describing typical, but not warranted, performance. Note: Supplemental characteristics are indicated by italic type.
**Frequency**

**Range:**
- Synthesized CW generators
  - 83711B, 1.0 to 20 GHz
  - 83712B, 10 MHz to 20 GHz
- Synthesized signal generators
  - 83731B, 1.0 to 20 GHz
  - 83732B, 10 MHz to 20 GHz

**Resolution:** 1 kHz (1 Hz with Option 1E8)

**Stability** (with high-stability timebase, Option 1E5)
- **Aging rate:**
  - $<1.5 \times 10^{-9}$/day after 24-hour warm up
- **Temperature effects:**
  - $<1 \times 10^{-7}$ over 0 to 55°C, nominally $<1.4 \times 10^{-9}$/°C
- **Line voltage effects:**
  - $<5 \times 10^{-14}$ for 10% change in line voltage

**Stability** (without high-stability timebase)
- **Aging rate:**
  - $<1.0 \times 10^{-8}$/day after 72 hours at 25°C ± 10°C
- **Temperature effects:**
  - $<5 \times 10^{-4}$ over 0 to 55°C referenced to 25°C

**Stability** (with external 10 MHz reference):
Same as external reference.

**Frequency switching time**
- $<50$ ms to within 1 kHz for any frequency step
- $<35$ ms to within 1 kHz for $<1$ GHz steps not across the 10 GHz band switch point

**RF Output**

**Maximum leveled output power:**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Standard</th>
<th>with Option 1E1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 to 1 GHz</td>
<td>+13 dBm</td>
<td>+13 dBm</td>
</tr>
<tr>
<td>1 to 18 GHz</td>
<td>+11 dBm</td>
<td>+10 dBm</td>
</tr>
<tr>
<td>18 to 20 GHz</td>
<td>+10 dBm</td>
<td>+8 dBm</td>
</tr>
</tbody>
</table>

**Typical maximum available output power from 1 to 20 GHz, at 25°C with output step attenuator (Option 1E1) installed**

---

1. $-10$ dBm (linear AM)
2. The use of type-N RF connectors above 18.0 GHz degrades specification typically by 0.2 dB.
User Flatness (Level) Correction
Number of points: 2 to 401 points/table
Number of tables: up to 4
Entry modes: power meter, GPIB

Spectral Purity
SSB phase noise (dBc/Hz, CW mode):

<table>
<thead>
<tr>
<th>Carrier Freq.</th>
<th>100 Hz</th>
<th>1 kHz</th>
<th>10 kHz</th>
<th>100 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 to &lt;1 GHz</td>
<td>-78</td>
<td>-92</td>
<td>-103</td>
<td>-115</td>
</tr>
<tr>
<td>1 to &lt;2 GHz</td>
<td>-73</td>
<td>-83</td>
<td>-92</td>
<td>-107</td>
</tr>
<tr>
<td>2 to &lt;5 GHz</td>
<td>-70</td>
<td>-78</td>
<td>-83</td>
<td>-100</td>
</tr>
<tr>
<td>5 to &lt;10 GHz</td>
<td>-68</td>
<td>-78</td>
<td>-82</td>
<td>-100</td>
</tr>
<tr>
<td>10 to 20 GHz</td>
<td>-65</td>
<td>-73</td>
<td>-76</td>
<td>-100</td>
</tr>
</tbody>
</table>

Phase noise decreases 6 dB/octave below 500 MHz and reaches a floor of <-140 dBc/Hz.

Nonharmonic spurious (≥3 kHz): <-60 dBc (includes power supply and frequency synthesis spurious)
Nonharmonic spurious (<3 kHz): <-50 dBc
Subharmonics: none
Residual FM:
At 1 GHz, in 50 Hz to 15 kHz bandwidth: < 15 Hz Residual FM decreases 6 dB per octave below 1 GHz.

Harmonics:
83711B/83712B, <-50 dBc (at levels < +6 dBm)
83731B/83732B, <-55 dBc (at levels < +6 dBm)

Typical single-sideband phase noise at 50 MHz, 1 GHz, 10 GHz, and 20 GHz, 25° C, CW mode. Offsets less than 100 Hz require the high-stability timebase, Option 1E5.

Typical residual FM measured in 50 Hz to 15 kHz bandwidth, CW mode, with high-stability timebase, Option 1E5

AM noise floor (at 0 dBm and offsets greater than 5 MHz from carrier):
0.01 to 1 GHz, <-140 dBm/Hz
1 to 20 GHz, <-150 dBm/Hz
Agilent 83731B and 83732B
Modulation Specifications
Pulse Modulation1

<table>
<thead>
<tr>
<th>Carrier Frequency</th>
<th>MHz</th>
<th>GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25 to 500</td>
<td>&lt;25</td>
<td>&lt;1</td>
</tr>
<tr>
<td>&lt;25 to 1000</td>
<td>&lt;25</td>
<td>&lt;1</td>
</tr>
<tr>
<td>&lt;1 to 20</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum Pulse width</th>
<th>MHz</th>
<th>GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 µs</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>&lt;100 ns</td>
<td>&lt;10</td>
<td>&lt;1</td>
</tr>
<tr>
<td>&lt;25 ns</td>
<td>&lt;2</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rise/Fall Time</th>
<th>MHz</th>
<th>GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;500 ns</td>
<td>&lt;500</td>
<td>&lt;500</td>
</tr>
<tr>
<td>&lt;350 ns</td>
<td>&lt;350</td>
<td>&lt;350</td>
</tr>
<tr>
<td>&lt;50 ns</td>
<td>&lt;50</td>
<td>&lt;50</td>
</tr>
<tr>
<td>&lt;35 ns</td>
<td>&lt;35</td>
<td>&lt;35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Video Feedthrough</th>
<th>MHz</th>
<th>GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2 mV peak-to-peak at 0 dBm</td>
<td>&lt;2 mV peak-to-peak at 0 dBm</td>
<td></td>
</tr>
<tr>
<td>&lt;20 mV peak-to-peak at 0 dBm</td>
<td>&lt;20 mV peak-to-peak at 0 dBm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulse Width Compression</th>
<th>MHz</th>
<th>GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>±150 ns</td>
<td>±150</td>
<td>±150</td>
</tr>
<tr>
<td>±15 ns</td>
<td>±15</td>
<td>±15</td>
</tr>
<tr>
<td>±5 ns</td>
<td>±5</td>
<td>±5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulse Delay (Video out to RF out)</th>
<th>MHz</th>
<th>GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 µsec</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>&lt;200 ns</td>
<td>&lt;200</td>
<td>&lt;200</td>
</tr>
<tr>
<td>&lt;125 ns</td>
<td>&lt;125</td>
<td>&lt;125</td>
</tr>
</tbody>
</table>

On/off ratio: >80 dB

Typical pulse modulation on/off ratio at +8 dBm

Maximum pulse repetition frequency: >3 MHz
Minimum pulse duty cycle: no restrictions on duty cycle
Pulse level accuracy: ±1.0 dB (relative to CW)
Pulse overshoot: <10 %
Input impedance: 50 Ω nominal; TTL drive levels
Maximum leveled output power in pulse mode: −0.5 dB (relative to CW)

Typical pulse modulation envelope illustrates the fast rise and fall times, excellent flatness, and pulse fidelity of the 83731B/83732B.

Internal Pulse Source
Pulse source modes: free-run, triggered with delay, doublet, and gated. Triggered with delay, doublet, and gated require external trigger source.
Pulse repetition frequency: 3 Hz to >3 MHz
Pulse repetition interval (PRI): 300 ns to 419 ms
Pulse width (Tw): 25 ns to 419 ms
Variable pulse delay
  Free-run mode (Td): ±419 ms
  Triggered with delay and doublet modes (Td): 225 ns to 419 ms with ±25 ns jitter
Pulse width/delay/PRI resolution: 25 ns
Pulse delay (video to RF, Trf):
  1 to 20 GHz, <20 ns nominal

All pulse modulation specifications and supplemental characteristics apply during use of internal pulse source.
### Frequency Modulation

**Rates:** 1 kHz to 1 MHz  
**Flatness:** ±2 dB

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Maximum Deviation</th>
<th>Modulation Index</th>
<th>Frequency Maximum Deviation</th>
<th>Modulation Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 to 20 GHz</td>
<td>10 MHz peak</td>
<td>&gt;300</td>
<td>256 MHz to &lt;500 MHz</td>
<td>1.25 MHz peak</td>
</tr>
<tr>
<td>1 to &lt;2 GHz</td>
<td>5 MHz peak</td>
<td>&gt;150</td>
<td>500 MHz to &lt;1 GHz</td>
<td>2.5 MHz peak</td>
</tr>
<tr>
<td>500 MHz to &lt;1 GHz</td>
<td></td>
<td></td>
<td>256 MHz to &lt;500 MHz</td>
<td>1.25 MHz peak</td>
</tr>
</tbody>
</table>

*The modulation index and maximum deviation decrease by a factor of 2 for each octave below 256 MHz.*

**FM sensitivity:**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Seven ranges, selectable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 20 GHz</td>
<td>10, 5, 3, 1, 0.3, 0.1, 0.03 MHz/V pk</td>
</tr>
<tr>
<td>256 MHz to &lt;1 GHz</td>
<td>2500, 1250, 750, 250, 75, 25, 7.5 kHz/V pk</td>
</tr>
<tr>
<td>64 to &lt;256 MHz</td>
<td>625, 312, 187, 62.5, 18.7, 6.25, 1.87 kHz/V pk</td>
</tr>
<tr>
<td>16 to &lt;64 MHz</td>
<td>156, 78.1, 46.8, 15.6, 6.81, 3.12 kHz/V pk</td>
</tr>
<tr>
<td>10 to &lt;16 MHz</td>
<td>78.1, 39.0, 23.4, 7.81, 3.9 kHz/V pk</td>
</tr>
</tbody>
</table>

**Flatness:** DC to 100 kHz: ±1 dB  
**Bandwidth:** >1 MHz (3 dB) usable to 1 MHz at low deviations

**Incidental AM:** <5%  
**FM input impedance:** 600Ω nominal  
**Harmonic distortion:** <1% (1 MHz peak deviation at 100 kHz rate)

### Logarithmic Amplitude Modulation (Scan Modulation)

**Maximum depth:** > 60 dB  
**Sensitivity:** –10 dB/V; (0 to +6V for 0 to –60 dBc)  
**Step response:** (50 dB change in level)  
< 1 GHz, < 10 µs rise time, < 20 µs fall time  
1 to 20 GHz, < 5 µs rise and fall times  
**Input impedance:** 5000Ω nominal  
**Maximum leveled output power in log AM mode (relative to CW):**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 GHz</td>
<td>0 dB</td>
<td>–4.5 dB</td>
</tr>
</tbody>
</table>

**Typical log AM error (deviation from desired depth) at 25°C for carrier frequencies between 1.0 and 20 GHz**

### Simultaneous Modulations

Full AM bandwidth and depth is available at any pulse rate or width. FM/ΦM is completely independent of AM and pulse modulation.
Option 1E2: Internal Modulation Generator
Available in 83731B and 83732B models only. Specifications for internal modulation are same as base instrument, unless noted below.

Waveforms
- Sine wave: 0.5 Hz to 1 MHz rates
- Ramp, square, triangle: 0.5 Hz to 100 kHz rates
- Uniform noise, Gaussian noise

**Rate accuracy:** $< \pm 0.01\%$

Internal scan modulation
- Rate: 0.5 Hz to 20 kHz
- Rate Resolution: 0.5 Hz (3 digits displayed)
- Depth resolution: 0.01 dB

Internal linear AM
- Rate: 0.5 Hz to 100 kHz
- Rate Resolution: 0.5 Hz (3 digits displayed)
- Depth resolution: 0.1\%

Internal FM
- Rate: 1 kHz to 1 MHz
- Rate Resolution: 0.5 Hz (3 digits displayed)
- Deviation resolution: 0.01 Hz
- Flatness: $\pm 2$ dB (1 to 500 kHz)

Internal phase modulation (with Option 800 only)
- Rate: 0.5 Hz to 1 MHz
- Rate Resolution: 0.5 Hz (3 digits displayed)
- Deviation resolution: 0.01 rad
- **Bandwidth:** 700 kHz (3 dB) on low range

General

**Noise figure meter compatibility**
Agilent 8370 sources are fully compatible with and can be controlled by the 8970B noise figure meter through Special Function 41.5.

**Programming**
These instruments are fully compatible with the Standard Commands for Programmable Instruments (SCPI). SCPI complies with IEEE 488.2-1987.

In addition, these instruments will emulate most applicable Agilent 8673 commands, providing general compatibility with ATE systems which include 8673 series signal generators.

**Environmental**

**Operating temperature range:** 0° to 55°C
- **EMC:** complies with CISPR Pub. 11/1990, Class A, and Mil-Std-461C, Part 2, Methods CE03, CS01, CS02, RE02, RS03

**Power requirements**
- **Power:** 90 to 132V, 48 to 440 Hz: 198 to 264V, 48 to 66 Hz: 260 VA maximum

**Physical dimensions**
- **Net weight:** <16 kg (35 lb) Shipping: <23 kg (49 lb)
- **Size:** 498 mm D x 426 mm W x 133 mm H
  (19.6in x 16.8in x 5.2in)

Transit case available by ordering Agilent part number 9211-2655.

**Front Panel Connectors**

83731B/83732B front panel

**RF output**
Type-N precision, or 3.5 mm precision (Option 1E9). Nominal impedance is 50 ohms.

**ALC in**
Used for external leveling with either a power meter or a positive- or negative-polarity diode detector.

**AM in (83731B/83732B only)**
Accepts input signal for external linear AM or log AM. Nominal impedance is 5k ohms.

**FM/PHM in (83731B/83732B only)**
Accepts input signal for external FM or phase modulation (Option 800 only). Nominal impedance is 600 ohms.

**Pulse/trigger gate in (83731B/83732B only)**
Accepts input signal for external pulse modulation. Also accepts external trigger pulse input for internal pulse modulation. TTL-level compatible, nominal impedance is 50 ohms.

**Pulse video out (83731B/83732B only)**
Outputs a signal that follows the RF output in all pulse modes. TTL-level compatible, nominal source impedance is 50 ohms.

**Pulse sync out (83731B/83732B only)**
Outputs a synchronizing pulse, nominally 50 ns width, during internal and triggered pulse modulation. TTL-level compatible, nominal source impedance is 50 ohms.
Rear Panel Connectors

83731B/83732B rear panel

10 MHz input
Accepts a 10 MHz ±100 Hz, 0 to 10 dBm, external reference signal for operation from an external high stability timebase. Nominal input impedance is 50Ω.

10 MHz output
Outputs the 10 MHz reference signal, nominally +3 dBm, for use as an external reference signal. Nominal source impedance is 50Ω.

0.5V/GHz output
Supplies a voltage proportional to output frequency for use with mm-wave frequency multipliers, including the Agilent 83550 Series Millimeter Wave Source Modules.

AM output (Option 1E2 only)
Provides a sample of the modulating signal from the internal AM generator or external AM input.

FM/ΦFM output (Option 1E2 only)
Provides a sample of the modulating signal from the internal FM/ΦFM generator or external FM/ΦFM input.

Ordering Information

83711B 1 to 20 GHz synthesized CW generator
83712B 0.01 to 20 GHz synthesized CW generator
83731B 1 to 20 GHz synthesized signal generator
83732B 0.01 to 20 GHz synthesized signal generator
Option 1E1 Adds 110 dB output step attenuator
Option 1E2 Adds internal modulation generator (83731B/32B only)
Option 1E5 Adds high-stability timebase
Option 1E8 1 Hz frequency resolution
Option 1E9 3.5 mm RF output connector
Option 800 analog phase modulation (83731B/32B only)
Option 0B2 Extra operating manual
Option 0BV Service documentation, component level
Option 0BW Service documentation, assembly level
Option 1CM Rack mount kit (Part number 5062-3977)
Option 1CP Rack mount and handle kit (Part number 5062-3983)
Option 1CR Rack slide kit (Part number 1494-0059)
Option W30 Two additional years return to-Agilent-service
Option W32 Three-year return-to-Agilent calibration service
Option W34 Three-year Mil-Std calibration service

Longer term warranty and calibration services are available.
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(fax) (81) 426 56 7840
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New Zealand:
(tel) 0 800 738 378
(fax) (64 4) 495 8950
Asia Pacific:
(tel) (852) 3197 7777
(fax) (852) 2506 9284

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