

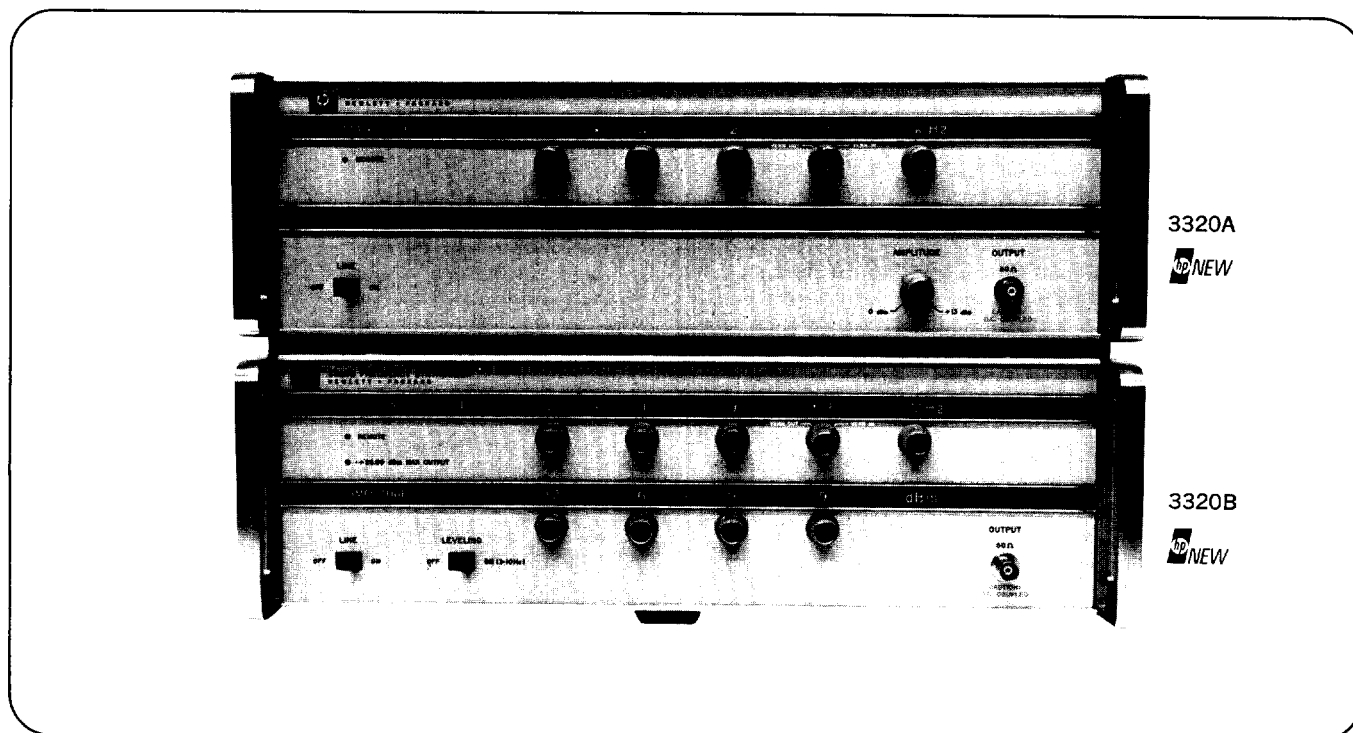
SIGNAL SOURCES



FREQUENCY SYNTHESIZER

0.01 Hz to 13 MHz

Models 3320A, 3320B



Description

The 3320A/B Frequency Synthesizer has the frequency accuracy, stability, and resolution demanded by many of today's exacting applications. The ease and flexibility of adding greater stability means the 3320A/B can be tailored to your needs as they emerge. Spectral purity and low signal-to-phase noise complement the frequency qualities of the 3320A/B.

The capability of the 3320A means you can add synthesizer quality to your design and production effort, yet the price allows you to avoid cutting deeply into your instrumentation budget.

The 3320B is more than a synthesizer. It offers precise level control, superior frequency response, low harmonic distortion and high power output which are features normally not found on frequency synthesizers. This makes the 3320B a precision bench signal source where neither frequency nor amplitude quality is sacrificed.

However, the 3320B is even more. It is a quality programmable signal source. Two choices of digital remote control afford great flexibility for today's system applications. High precision in both frequency and amplitude means that expensive system monitoring is unnecessary.

Features-frequency

The 3320A/B Frequency Synthesizer has a broad frequency range of 0.01 Hz to 13 MHz in seven frequency ranges (the two lower ranges, 100 Hz and 10 Hz, are optional).

Three digits plus a ten-turn two-digit continuous vernier plus 30% overrange capability gives the 3320A/B 1 part in 10^6 frequency resolution across its total frequency range. The standard instrument utilizes an ambient temperature crystal reference which reduces drift to less than ± 10 parts in 10^6 per

year. The ability to phase lock to an external frequency standard or to add an optional reference crystal oven provide a range of frequency stabilities covering most applications.

The 3320A/B is a synthesizer with ranges. This means the signal-to-phase noise is reduced as the instrument is down-ranged. The low spurious content of >60 dB down and low harmonic distortion, which ranges from -60 to -40 dB depending on frequency, contribute to a high quality spectral output.

Features-amplitude

The 3320A has a maximum 1 volt rms into 50 Ω output (+13 dBm) with a continuous +13 dBm to 0 dBm amplitude vernier. The 3320A is therefore recommended for applications where level control is not a critical parameter.

In applications where a high quality output amplitude is needed or it is desired to digitally control the output amplitude, the 3320B is recommended. The 3320B features a four-digit leveling loop with a 0.01 dB level resolution of a calibrated output from +26.99 dBm to -69.99 dBm (-73.00 dBm under remote control). This is a maximum of a full half watt of output power (5 volts rms into 50 ohms or 10 volts rms into an open circuit).

Frequency response of ± 0.05 dB over the range of 10 Hz to 13 MHz and level accuracy of ± 0.05 dBm absolute at 10 kHz complement the level capability of the 3320B.

Programmability/remote control

The 3320A/B is a programmable signal source. Digital remote control capability may be purchased installed in the instrument or may be added later if the need arises.

The 3320A with its Option 003 allows parallel BCD remote control of frequency only. The first digit of the frequency

vernier and the frequency range may be controlled digitally as well as the main frequency digits.

The 3320B has two remote control options. Both options allow full control of all functions except the last vernier digit and the line switch. Option 004 is parallel BCD remote control capability. Option 005 is a unique bit-parallel/word-serial ASCII programming option. This option is advantageous where several 3320B's need to be controlled since only one programming device is needed. The ASCII programming option has eight input lines thus allowing direct interface to the HP 3260A Marked Card Programmer, photo reader, or any other 8-bit controller. This buss line programming means a saving of computer interface slots and a simplification of software.

3320A/B Specifications

Frequency range: 0.01 Hz to 13 MHz in 7 ranges.

Frequency ranges: 10 MHz, 1000 kHz, 100 kHz, 10 kHz, 1000 Hz, 100 Hz and 10 Hz (optional). 30% overrange on all ranges.

Frequency resolution:

Range	Vernier Out (local or remote)	Vernier In (local)	Vernier In (remote)
10 MHz	10 kHz	10 Hz	1 kHz
1000 kHz	1 kHz	1 Hz	100 Hz
100 kHz	100 Hz	0.1 Hz	10 Hz
10 kHz	10 Hz	0.01 Hz	1 Hz
1000 Hz	1 Hz	1 mHz	0.1 Hz
100 Hz	0.1 Hz	0.1 mHz	0.01 Hz
10 Hz	0.01 Hz	0.01 mHz	0.001 Hz

Frequency accuracy

Vernier out: $\pm 0.001\%$ of setting for 6 mo, 0°C to 55°C.

Vernier in: $\pm 0.01\%$ of range for 6 mo, 0°C to 55°C.

Frequency stability

Long term: ± 10 parts in 10^6 of setting per year (vernier out) with ambient temperature reference. Optional high stability crystal reference oven available (Option 002).

Signal-to-phase noise (integrated): > 40 dB down in 30 kHz band, excluding ± 1 Hz, centered on carrier. 10 MHz range, vernier out. Improves on lower frequency ranges.

Harmonic distortion: with output frequencies $> 0.1\%$ of range at full output amplitude, any harmonically related signal will be less than the following specified levels.

—60 dB with output from 5 Hz to 100 kHz.

—50 dB with output from 100 kHz to 1 MHz.

—40 dB with output from 1 MHz to 13 MHz.

Spurious: > 60 dB down.

Internal frequency standard: 20 MHz ambient temperature crystal. Optional 5 MHz reference crystal oven available Opt. 002.

Phase locking: the 3320A/B may be phase locked with a 200 mV to 2 V rms signal that is any subharmonic of 20 MHz from 1 MHz through 10 MHz (e.g., 1 MHz, 2 MHz, 2.5 MHz, 5 MHz, 10 MHz). BNC female connector.

Rear panel output: front or rear panel output is available. Can be easily changed by routing internal cable to front or rear female BNC connectors. No degradation of performance for rear panel output.

Auxiliary outputs

Tracking output: 20 MHz to 33 MHz offset signal. Tracks main output with 20 MHz offset. Rear panel female BNC, > 100 mV rms/50 Ω .

1 MHz reference output: sine wave, rear panel female BNC, 220 mV rms/50 Ω (> 0 dBm/50 Ω).

Low level output: same frequency as main output but remains between 50 mV rms and 158 mV rms (into 50 Ω) depending on main output level setting. May be used as counter output if wanted. Rear panel female BNC, sine wave.

3320A amplitude section

Amplitude: maximum 2 V rms $\pm 10\%$ open circuit.
maximum 1 V rms $\pm 10\%$ into 50 Ω .

Amplitude range: 0 dBm to +13 dBm range through $\frac{3}{4}$ turn front panel control (not programmable).

Frequency response: ± 2 dB over total range.

Output impedance: 50 Ω (75 Ω , Option 001).

3320B amplitude section

Amplitude range: +26.99 dBm ($\frac{1}{2}$ watt) to -69.99 dBm (-73.00 dBm under remote control) into 50 Ω . (+26.99 dBm = 5 V rms into 50 Ω).

Amplitude resolution: 0.01 dB.

Frequency response (10 kHz reference):

dc	10 Hz	13 MHz
± 0.5 dB	± 0.05 dB	+26.00 dBm
	± 0.1 dB	-3.00 dBm
	± 0.25 dB	-23.00 dBm
		-73.00 dBm

Amplitude accuracy (absolute): ± 0.05 dB at 10 kHz and +26.99 dBm (20°C to 30°C).

Output impedance: 50 Ω (75 Ω , Option 001).

Options

75 Ohm output impedance

Option 001 (3320A/B)

Attenuation and output referenced to 75 Ω .

Amplitude range (3320B only): +24.99 dBm to -69.99 dBm (-75.00 dBm under remote control) into 75 Ω .

Reference crystal oven*

Option 002 (3320A/B)

5 MHz crystal in temperature stabilized oven.

Long term stability: ± 1 part in 10^8 /day; ± 1 part in 10^7 /mo.

Frequency accuracy: ± 1 part in 10^7 of setting per mo. For field installation order accessory kit HP 11237A.

Parallel BCD remote control*

Option 003 (3320A only)

Allows digital remote control of frequency only on 3320A. Digital control of output level is not available on 3320A. The most significant digit of the vernier may be programmed thus giving four digits, plus 30% overrange, control of frequency in seven ranges (two are optional).

Frequency switching and settling time: $\pm 0.01\%$ of range, 15 ms; $\pm 0.001\%$ of range, 60 ms.

For field installation order accessory kit HP 11238A.

Parallel BCD remote control*

Option 004 (3320B only)

Allows full digital remote control of frequency and amplitude. **Four digits of frequency, overrange, frequency range, Vernier In/Out, four digits of amplitude, and leveling loop response times are all controlled digitally. All front panel controls, except line switch, are disabled in remote.

Frequency switching and settling time: $\pm 0.01\%$ of range, 15 ms; $\pm 0.001\%$ of range, 60 ms.

Amplitude switching and settling time: < 1.5 s to rated accuracy.

ASCII remote control**Option 005* (3320B only)**

Allows bit-parallel word-serial digital remote control of all functions. **A 3320B with this option will recognize an address and then accept instructions in a serial fashion. Instructions are in a 7-bit parallel ASCII code. Due to the addressing feature, up to ten 3320B's (with this option) may be programmed from one programmer. The HP 3260A Marked Card Programmer may be used as a programmer for this option.

This option requires 8 digital input lines for full control. **Seven of the eight are programming input lines and one is a data command line.

Full digital isolation is standard with this option.

Logic Level Requirements for All Digital Remote Control Options.

State	Requirements
"Low" (logical "1")	0 V to 0.4 V (5 mA max.) or contact closure to ground through <80 ohms.
"High" (logical "0")	+2.4 V to +5 V or removal of contact closure to ground.

100 Hz and 10 Hz ranges***Option 006 (3320A/B)**

Adds two lower frequency ranges, 100.0 Hz and 10.00 Hz, yielding greater resolution for low frequency outputs (see resolution section of specifications). These two ranges are fully programmable if digital remote options are installed.

For field installation order accessory kit HP 11240A.

General 3320A/B

Operating temperature: 0°C to 55°C.

Storage temperature: -40°C to +70°C.

Power requirements: 115 V or 230 V $\pm 10\%$, 48 Hz to 63 Hz, 110 VA max, (400 Hz operation on special basis).

Weight

3320A: 45 lbs (20,4 kg). Shipping: 59 lbs (26,7 kg).

3320B: 47 lbs (21,3 kg). Shipping: 61 lbs (27,5 kg).

Dimensions: 16 3/4" wide, 19 3/8" deep, 5 7/32" high (425 x 491,5 x 132,6 mm).

Accessories furnished: rack mounting kit.

Prices: 3320A, \$1900: Option 001, 75 Ω output, add \$25; Option 002, crystal oven, add \$290; Option 003, BCD remote control, add \$300; Option 006, 100 Hz/10 Hz ranges, add \$200. 3320B, \$2400: Option 001 75 Ω output, add \$25; Option 002, crystal oven, add \$290; Option 004, BCD remote control, add \$400; Option 005, ASCII remote control, add \$595; Option 006, 100 Hz/10 Hz ranges, add \$200.

Kit for interfacing to Hewlett-Packard 2100 Series computers. HP 11232A for interfacing 3320B Option 005.

Useful accessories

HP 11048C, 50 Ω feedthrough, \$15; HP 11094B, 75 Ω feedthrough, \$15; HP 3260A Marked Card Programmer allows the 3320B with ASCII remote to be easily programmed by a punched or marked card.

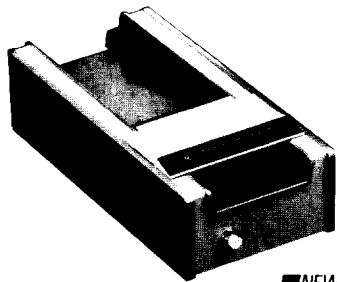
* Field installable.

** Except last vernier digit and line switch.

MARKED CARD PROGRAMMER

Reads marked & punched cards

Model 3260A



3260A

Description

The Hewlett-Packard Model 3260A is an eight channel optical mark sense card reader. The HP 3260A Marked Card Programmer detects pencil marks on hand-fed cards and gives a voltage output corresponding to the presence of marks in the eight columns. Punched holes are sensed the same as pencil marks. The TTL logic level output is "1" state low. The 3260A has its own internal power supply and card drive motor for maximum versatility. Cards are stacked in the output tray from the bottom so that the original card order is always retained.

Application

The 3260A offers a convenient and inexpensive method of programming devices or entering data into devices which accept eight-bit-parallel/word-serial instructions or data. Rapid and error free tests become easier to obtain since a 32 word card is typically read in 1.5 seconds and each test is performed exactly as the card instructs. This insures consistency for redundant tests by reducing operator errors. Extensive operator

training on complicated or delicate instrument controls becomes unnecessary when using the Marked Card Programmer.

General

Weight: net 6 lb (13,5 kg). Shipping 7.5 lb (16,5 kg).

Power: 120 V or 240 V +5% -10%, 48 Hz to 440 Hz, <8 VA when idle, <9 VA when reading a card.

Dimensions: 5 1/3" wide, 3 1/2" high, 11 1/4" deep (134,5 x 88,9 x 285,8 mm).

Temperature: operating range, 0° - 55°C.

Cable: 5 ft detachable cable supplied with 36 pin (2 x 18) connector. Connector is in stackable housing for parallel connection to multiple devices.

Cards

Furnished: 100 program cards (HP Part Number 9320-2886). Dimensions are 7 3/8" x 3 1/4" (187,2 x 82,6 mm).

Available: package of 2000, \$15; package of 10,000, \$60. Output tray extends for use with 11 inch cards.

Price: HP 3260A, \$750.