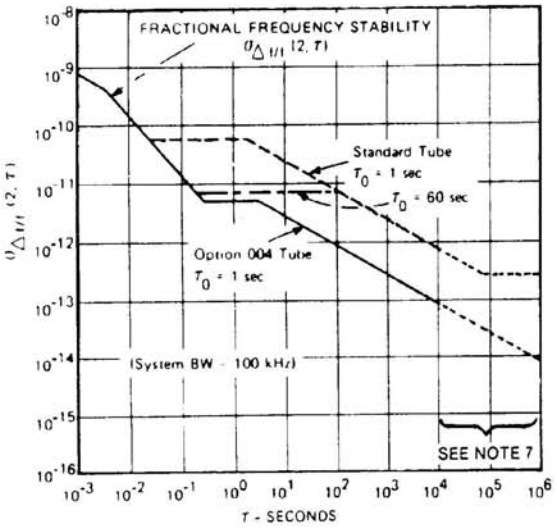
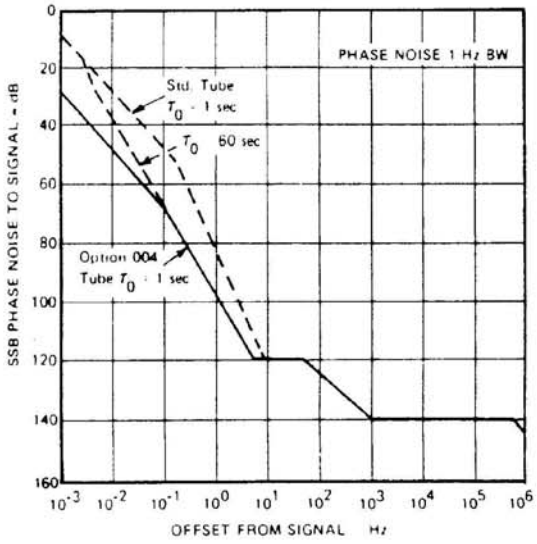
Table 1-1. Specifications

	Standard Beam Tube	Option 004 High Performance Beam Tube
Accuracy(1): Maintained over a temperature range of 0 to 50°C and magnetic fields up to 0.2 millitesla (2 gauss) or any combination thereof.	$\pm 1 \times 10^{-11}$	$\pm 7 \times 10^{-12}$
Accuracy - Limited Temp. Range (5)	$\pm 6 \times 10^{-12}$	$\pm 4 \times 10^{-12}$
Reproducibility(1) (2)	$\pm 5 \times 10^{-12}$	$\pm 3 \times 10^{-12}$(3)
Retrace (1)	$\pm 6 \times 10^{-12}$	$\pm 1 \times 10^{-12}$(6)
Settability (Frequency)(1)	$\pm 7 \times 10^{-13}$	$\pm 1 \times 10^{-13}$(3)
Long-term stability (for life of cesium beam tube)	$\pm 3 \times 10^{-12}$	$\pm 2 \times 10^{-12}$
DC Magnetic Field Stability, frequency change, any orientation in a 2 gauss field.	$\pm 2 \times 10^{-12}$	$\pm 2 \times 10^{-13}$
Time Constant, quartz oscillator control loop (τ_0)	1 and 60 s(4)	1 s
Warm-up time at 25°C	45 min.	30 min.
Beam Tube Warranty	3 years	12 months

FREQUENCY STABILITY(1), 5 MHz



PHASE NOISE, 5 MHz



Notes:
(1) See definitions, page 1-5
(2) See Figure 1-2
(3) With 10638A Degausser
(4) Use 60 second time constant for increased short-term stability in controlled environments.
(5) Over any ±2.5°C Range at any temperature between 15 and 35°C
(6) With degaussing — Retrace is less than $\pm 2 \times 10^{-12}$ without degaussing
(7) For values of $\tau(s) > 10^4$ seconds, instruments are not subjected to frequency stability testing on a regular basis. This portion of the curve (i.e., $\tau(s) > 10^4$ seconds) provides information useful in formulating applications for the HP 5061A.

	FREQUENCY STABILITY*,	
τ (s)	Standard Tube	Option 004 Tube
10^{-3}	8.2×10^{-10}	8.2×10^{-10}
10^{-2}	1.5×10^{-10}	1.5×10^{-10}
10^{0}	5.6×10^{-11}	5×10^{-12}
10^{1}	2.5×10^{-11}	2.7×10^{-12}
10^{2}	8×10^{-12}	8.5×10^{-13}
10^{3}	2.5×10^{-12}	2.7×10^{-13}
10^{4}	8×10^{-13}	8.5×10^{-14}

*These measurements are made with a servo loop time constant of 1 sec. (τ_0 = 1 second)

	PHASE NOISE,* (dB Below the Carrier)	
Δf	Standard Tube	Option 004 Tube
10^{-3}	-8	-28
10^{-2}	-28	-48
10^{0}	-82	-96
10^{1}	-120	-120
10^{2}	-125	-125
10^{3}	-140	-140
10^{6}	-146	-146

*These measurements are made with a servo loop time constant of 1 sec. (τ_0 = 1 second)

Table 1-1. Specifications (Continued)

SINUSOIDAL OUTPUTS

5 MHz, 1 MHz, and 100 kHz, front and rear panel BNC.

Output Voltage: >1 Vrms into 50 ohms.

Harmonic Distortion: Down more than 40 dB from rated output.

Non-Harmonically Related Output: Down more than 80 dB from rated output.

CESIUM BEAM TUBES

Length: 16 inches.

Operating Life: 5 years typical.

Shelf Life: 2 years in temperature up to 35°C for new tube with full operating life expectancy remaining, if storage is according to recommended procedures.

QUARTZ OSCILLATOR

The high quality internal oscillator may be used without turning on the cesium beam tube.

Aging Rate: $<5 \times 10^{-10}$ per 24 hours.

Frequency Adjustments:

Fine: 5×10^{-8} range, with dial reading parts in 10^{10} (nominal).

Coarse: 1×10^{-6} range, screwdriver adjustment at front panel.

Stability:

As a function of ambient temperature: $<5 \times 10^{-9}$ total from 0 to +50°C.

As a function of load: $<\pm 2 \times 10^{-11}$ for open circuit to short, and 50Ω R, L, C load change.

ENVIRONMENTAL:

Temperature: Operating, 0 to 50°C. Stability for high performance (Option 004) beam tubes, $<\pm 5 \times 10^{-12}$ change over 0 to 50°C range. For the standard tube, $<\pm 5 \times 10^{-12}$ change from 25°C reference. Non-operating, <-40 to +75°C (+50°C with Options 001 and 002).

Production units have passed type testing as follows:

Humidity: Operating, to 95% at 40°C.

Altitude: $<2 \times 10^{-12}$ change up to 12.2 km (40,000 ft.) operating.

AC Magnetic Field: Less than 2×10^{-12} for 0.2 millitesla (2 gauss) peak for 50, 60 or 400 Hz (±10%) fields.

Shock: MIL-T-21200, Class 1 (30 G's, 11 ms)

POWER: 115V ±10%, 48 to 440 Hz, 230V ±10%, 48 to 66 Hz, or 22 to 30V dc.

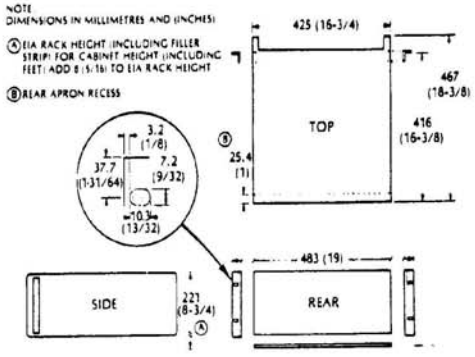
Approximate power required:

	DC	AC
5061A and 5061A with Option 004	27W	43W
Option 001	Add 7.5W	10W
Option 002	Add 4.5W	22W
Option 003	Add 12W	32W

NET WEIGHT: 30.5 kg (67 lbs); Option 001, add 0.9 kg (2 lbs.); Option 002, add 2.3 kg (5 lbs.); Option 004, add 1.4 kg (3 lbs.). Add 5.5 kg (12 lbs.) for shipping weight.

ACCESSORIES FURNISHED: Power Cord, 180 cm (6 ft.), detachable. Accessory Kit, HP 05061-6070, includes two extender boards, test cables, maintenance tools, and a mating connector 1251-0126 for EXT DC input.

DIMENSIONS:



ACCESSORIES AVAILABLE: EXT DC cable connects 5061A to 5089A Standby Supply, 05089-60101. 10638A Degausser for use with Option 004 High Performance Tube. See page 1-6 for details. Rack Mounting Kit, Opt. 908.

MATING CONNECTORS:

EXT DC Input: 1251-0126 (5-contact), Cannon MS 3106E-14S-5S (Series ME) furnished.

AC line: 1251-2457, Cannon MS3106A-18-22SW.

Degausser: 1251-2797, Bendix PT06A-14-18P1005).

WARRANTY: Instrument, 1 year; optional battery, 1 year (see page 1-3 for beam tube warranty).

OPTION 001 TIME STANDARD

CLOCK DISPLAY: 24 hour LED readout in hours, minutes and seconds driven by Clock Pulse. Normally lighted. Push-to-read button for readout when on standby battery or external dc.

Rate: 1 pulse-per-second.

Amplitude: +10V ±10% peak.

Width: 20μs min.

Rise Time: <50 ns.

Fall Time: <50 ns.

Jitter: <1 ns rms pulse-to-pulse and pulse-to-5 MHz.

Output: Buffered front and rear BNC connectors. All specs are with 50Ω load.

SYNCHRONIZATION (REAR BNC): Automatic, 100 ns (±100 ns) delayed from reference input pulse. Manual adj. to <±50 ns. Reference pulse must be >+5V, with a rise time of <50 ns.

OPTION 002 STANDBY POWER SUPPLY

CAPACITY (WITH OPTION 001 CLOCK): 30 minutes minimum at 25°C at full charge from sealed nickel-cadmium batteries.

CHARGE CONTROL: Automatic when ac power is connected.

INDICATOR: A front panel light flashes when ac power is interrupted and battery is being used.

OPTION 003 (COMBINES OPTION 001 and 002)

OPTION 004
HIGH PERFORMANCE CESIUM BEAM TUBE

Replaces standard beam tube and may be installed with any of the above options. See page 1-3 for specifications and warranty. For optimum performance the 10638A Degausser should be ordered.

Table 1-1. Specifications (Continued)

DEFINITION OF TERMS

Accuracy

The degree to which an oscillator frequency corresponds to that of an accepted definition. The currently accepted definition is that of the 13th General Conference of Weights and Measures. In practice, this involves comparison with some generally accepted physical embodiment of this definition such as the NBS Frequency Standard. The specified accuracy of the 5061A Cesium Beam Frequency Standard is intrinsic to it and is achieved without calibration.

Reproducibility

The degree to which an oscillator will produce the same frequency from one occasion to another after proper alignment. This does not include calibration.

Retrace

The degree to which a cesium standard will produce the same frequency from one occasion to another after cessation of power for periods up to one month without a re-alignment. This does not include calibration.

Intrinsic Reproducibility

Intrinsic reproducibility of the 5061A (see Figure 1-2) is a measure of the repeatability from one independently aligned unit to another. The small spread indicates that any HP 5061A with a standard beam tube will produce a frequency within $\pm 5 \times 10^{-12}$ without calibration. The data was acquired from over 150 units by continuous phase comparison for an interval of 48 hours or more against the Hewlett-Packard House Standard.

Settability

The degree to which the frequency of an oscillator may be adjusted to correspond with a reference. This is also termed calibration.

Stability

A. Long-Term frequency stability is defined as the absolute value (magnitude) of the fractional frequency change with time. An observation time sufficiently long to reduce the effects of random noise to an insignificant value is implied. Frequency changes due to environmental effects must be considered separately.

B. Short-term stability is defined as the standard deviation of fractional frequency fluctuations due to random noise in the cesium standard. It may also be expressed as standard deviation of phase. This specification must include the number of samples, the averaging time, the repetition time, and the system bandwidth.

See "Statistics of Atomic Frequency Standards" by David W. Allan, Proceedings of IEEE, Feb. 1966. P. 221, and HP Application Note 116 for measurement details.

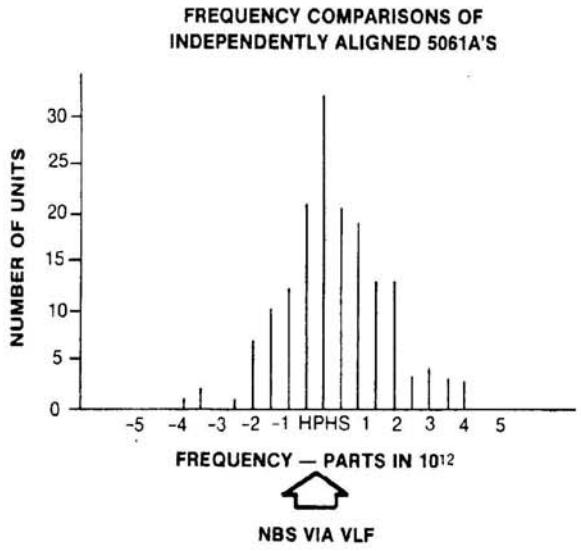


Figure 1-2. Frequency of Independently Aligned 5061A Cesium Beam Standards with Standard Beam Tube

1-16. ACCESSORIES

1-17. *Table 1-2* lists equipment supplied and *Table 1-3* lists accessories available for the HP Model 5061A.

Table 1-2. Equipment Supplied

Equipment	Description	HP Part No.
AC Power Cable	Three-conductor with ground pin	05061-6091*
Accessory Kit:		05061-6070
Adapter	Micon, male-to-male	1250-0813
Connector	Plug (female)	1251-0126
Screwdriver	Ceramic	8710-0033
Wrench	Key, 4 Spline	8710-0055
Screwdriver	Offset	8730-0007
Wrench	1/8 inch open-end	8710-1111
Board Extender	22 pin	5060-7202
Cable Assembly	Test Micon-to-BNC (2 supplied)	05060-6116
Extender, 90° bend	12 pin	05061-6073

*This part number will vary depending on country of destination. See *Figure 2-1* for additional power cable part numbers that are available.

Table 1-3. Accessories Available

Accessory	Description	HP Part No.
Standby Power Supply	22 to 28Vdc, 2-amp supply with 15 amp-hours standby capacity (at 25°C)	5089A
Cable	Connects 5061A to the 5089A dc output	05089-60101
Extension Slides and Slide Adapter	Permits sliding instrument out and tilting from rack-mounted position	1490-0718 1490-0721
Degausser	For degaussing Option 004 High Performance Cesium Beam Tube	10638A
Rack Mounting Kit	Provides conversion from bench to rack	5060-8742
Distribution Amplifier	Amplifies and allows 5061A output RF signal distribution to remote locations	5087A