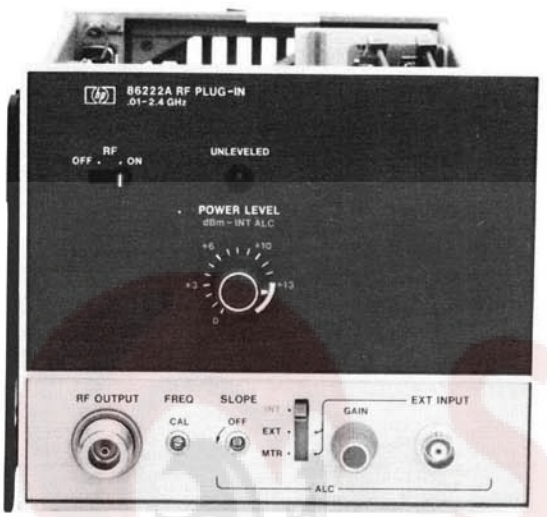
SWEEP OSCILLATORS

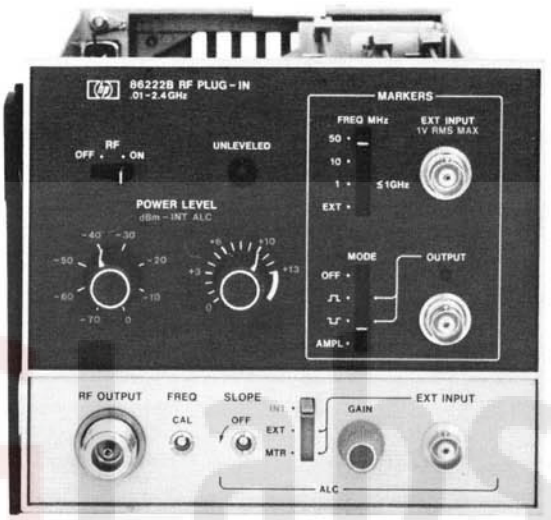
8620 Family: 10 MHz to 2.4 GHz plug-ins

Models 86222A and 86222B

- 10 MHz to 2.4 GHz in ONE, CONTINUOUS sweep
- Internally leveled FLATNESS ±0.25 dB over full range
- 1, 10, and 50 MHz crystal marker combs with 86222B
- Marker accuracy even in CW with 86222B



86222A



86222B

Description

The HP 86222A/B plug-ins provide uncompromising 10 MHz to 2.4 GHz frequency coverage. The entire range can be swept continuously—no need to break up your measurement into two or more sweeps. Yet narrowband resolution is not sacrificed. This precision is complemented by the 86222's good stability and frequency accuracy to make narrowband measurements truly practical. Both narrowband and wideband linearity is excellent (2 MHz over full band). The RF output characteristics of the 86222 feature similar high performance. Power output is calibrated 0 to +13 dBm in 1 dB increments. The output is internally leveled to ±0.25 dB flatness over the entire 0.01 to 2.4 GHz range!

For applications demanding precise frequency identification, the 86222B offers an advanced digitally processed birdie marker system which provides the accuracy associated with standard birdie markers without their normal liabilities. The 86222B marker system internally generates a typical birdie marker, then processes it to produce a digital pulse. This pulse can then be used to produce an intensity dot on the CRT which corresponds to a precise frequency. This opens the applications of 86222B "birdie" markers to a wide variety of network analyzers and displays, such as the 8410B and 8755, where previously it was impossible to inject them on either the detected dc or RF signals. Alternately, an amplitude marker, derived from the birdie, can be selected which produces a dip in RF power at each marker frequency. This type of marker is useful for X-Y recordings. In addition, when the output frequency is coincident with a 50, 10, or 1 MHz comb of the internal crystal oscillator, a front-panel LED lights. Thus, independent of the display, an operator can accurately identify a CW frequency of the 86222B—within 75 kHz at 1 GHz! Provision is also made for injection of an external marker for identification of specific frequencies between 1 MHz markers.

Continuous multi-octave vector measurements to 2.4 GHz are now possible using the HP 86222 together with the HP 8410B Network Analyzer. Previously, measurements could be made only one octave at a time because manual range switching of the HP 8410 was necessary. Now, the HP 86222/8620C combination automatically range switches the network analyzer for one continuous display, even from 0.1 to 2.4 GHz. In addition, with the 86222B crystal marker system the important third dimension, frequency, can be added to the polar display of the HP 8410B.

Increased dynamic range scalar measurements can be made using the HP 86222A/B together with the HP 8755 Swept Frequency Response Test Set. Heterodyne plug-ins in the range of 0.01–2 GHz will typically have a broadband noise output only 45 to 50 dB below the fundamental output signal. This noise is due to the high gain output amplifier used in heterodyne approaches. The noise level will be higher than most broadband detectors' noise level and significantly higher than the noise of the Schottky diode used in the HP 8755. This will limit the dynamic range of measurements such as the transmission loss of high pass, low pass, and notch filters, or return loss of bandpass filters when broadband detectors are used. The HP 8755, which is a 27.8 kHz receiver does not exhibit this problem when used with the HP 86222A/B. By designing an integral modulator in the sweeper, and an ALC loop which will handle the 27.8 kHz, the fundamental oscillator output can be modulated at 27.8 kHz without modulating the noise of the output amplifier. The HP 8755 will therefore not respond to the noise. The typical result is a 10 to 15 dB dynamic range improvement over other heterodyne sweepers and dc diode detection.

Specifications with Plug-in Installed in an 8620C Mainframe

Frequency Characteristics

Range: 10 MHz to 2.4 GHz.
Accuracy (25°C)
CW mode: ±10 MHz.
Remote programming: typically ±1.5 MHz.
All sweep modes: ±15 MHz (<0.1 sec sweeptime). Accuracy of 86222B may be enhanced to better than ±200 kHz through use of crystal markers.
Linearity (correlation between frequency and SWEEP OUT Voltage): typically ±2 MHz.
Frequency reference output: nominally 1 V/GHz ±0.01 V.
Frequency cal control: permits fine frequency calibration with marker indicator light.
Stability
With temperature: ±500 kHz/°C.
With 10% line voltage change: ±20 kHz.
With 3:1 load SWR, all phases: ±10 kHz.
With 10 dB power level change: ±20 kHz.
With time (after 1-hour warm-up): typically ±100 kHz/10 min.
Residual FM: (10 kHz bandwidth; FM switch in NORM; CW Mode): <5 kHz peak.

Output Characteristics

Maximum leveled power (25°C): >+13 dBm (20 mW); typically >+15 dBm.
Power level accuracy (internal leveling only): ±1 dB (includes frequency response).
Attenuator Opt 002: add ±0.2 dB/10 dB step.
Power Variation
Internally leveled
0.01 to 2.4 GHz: ±0.25 dB.
Across any 50 MHz (0.03 to 2.3 GHz): typically ±0.05 dB.
Stability with temperature: typically ±0.02 dB/°C.
Externally leveled (excluding coupler and detector variation)
Crystal detector: (−10 to −100 mV at rated output): ±0.1 dB.
Power meter (with HP 432A/B/C Series power meters): ±0.1 dB.
Unleveled indicator: lights when RF power level is set too high to permit leveling over sweep range selected or when operating in unleveled mode.
Residual AM in 100 kHz BW: >50 dB below carrier at maximum power.
Spurious signals: (below fundamental)
Harmonics: >25 dB at +13 dBm; typically >30 dB at +10 dBm.
Non-Harmonics
0.01 to 2.3 GHz: >30 dB at +13 dBm; typically >40 dB at +10 dBm.
2.3 to 2.4 GHz: >25 dB at +13 dBm; typically >35 dB at +10 dBm.
Broadband noise in 100 kHz bandwidth: typically <−70 dBm.
Impedance: 50Ω nominal.
SWR: <1.5.
Slope control: allows variable compensation for frequency dependent losses in test set-up.
Ouput connector: type N female.

Modulation Characteristics

External FM
Input impedance: approximately 10 kΩ.
Frequency response: typically 150 kHz.
External AM
Square wave response: guarantees HP 8755 Frequency Response Test Set operation with 8755 Modulator Drive connected to 8620 EXT AM input.
On/Off ratio: >30 dB.
Symmetry: 40/60 at ≥10 dBm output power.
Attenuation for +5 V input: >30 dB.
Internal AM
1 kHz square-wave On/Off ratio: >30 dB.
RF blanking On/Off ratio: >30 dB.
External FM
Maximum deviations for modulation frequencies
DC to 100 Hz: ±75 MHz
100 Hz to 1 MHz: ±5 MHz.
1 MHz to 2 MHz: ±2 MHz.
Sensitivity (typically)
FM mode: −20 MHz/V.
Phase-lock mode: −6 MHz/V.

Crystal Marker Capabilities (86222B Only)

Internal crystal markers: harmonic markers of 10 and 50 MHz usable over full 0.01 to 2.4 GHz range and 1 MHz markers usable 0.01 to 1 GHz. Positive (⎍) or negative (⎎) voltage output pulses can be selected to Z-axis intensify a scope trace; or RF amplitude pips can be selected (at maximum sweep speed pulse width optimized for approximately 10 markers/sweep).
Accuracy of center frequencies (25°C): $\pm 5 \times 10^{-6}$.
Typical marker width around center frequency
1 MHz markers: ±75 kHz.
10 MHz markers: ±200 kHz.
50 MHz markers: ±300 kHz.
Temperature stability: typically $\pm 2 \times 10^{-6}$/°C.
Marker output ⎍ mode: nominally >3 V.
⎎ mode: nominally −4 to −9 V, internally adjustable.
Amplitude mode: typically 0.5 dB, internally adjustable.
External marker input: generates amplitude or Z-axis marker when sweep frequency equals external input frequency.
Frequency range: 0.01 to 2.4 GHz.
Marker width: typically ±300 kHz.
Marker indicator light: green LED lights coincident with crystal or external marker for accurate CW calibration.

General

Weight: net, 2.5 kg (5.5 lb). Shipping 4 kg (9 lb).

Improved Network Measurements Capability

8410B Network Analyzer: interfacing through 8620C rear panel connector allows the 8410B to maintain phase lock over multi-octave sweeps at all sweep speeds.
8755 Frequency Response Test Set: direct connection of 8755 mod drive signal to External AM input of the 8620C eliminates the need for an external modulator.

Ordering Information

	Price
86222A 0.01–2.4 GHz RF Plug-In (internal leveling standard)	$4100
86222B 0.01–2.4 GHz RF Plug-In with Crystal and External Markers (internal leveling standard)	$4800
Opt 002: 70 dB Step Attenuator (10 dB steps)	add $350
Opt 004: Rear Panel RF Output	add $80