

# SWEEP OSCILLATORS

## Model 8620 Series: 10 MHz to 22 GHz

Model 8620 Series



- Single-band, straddle-band and broadband plug-ins
- External phase-lock capability
- > 10 mW to 22 GHz



HP 8620C with HP 86222B, 86290B



### HP 8620 System

The Hewlett-Packard HP 8620 solid state sweeper system offers the flexibility of the HP 8620C mainframe in addition to a choice of singleband, multiband, straddle-band, and broadband plug-ins. The HP 8620 system also offers high output with solid state reliability—greater than 10 mW leveled to 22 GHz.

The fundamental oscillators used in the plug-ins and modules are YIG tuned transistor or bulk effect circuits. YIG tuning results in exceptional tuning linearity, low noise, and low spurious content; it also allows frequency modulation at high rates and wide deviations with low distortion.

### HP 8620C Sweeper Mainframe

The HP 8620C has many features which are highly useful in stringent applications. With convenient functionally grouped controls and lighted pushbutton indicators the mainframe offers extreme ease of operation and flexibility. In addition, it can be a completely HP-IB programmable source, an indispensable feature for automatic systems and signal simulation applications.

### HP 86222A/B and 86290B/C Broadband Plug-Ins

Now the 10 MHz to 18.6 GHz frequency range can be covered with just two plug-ins—the HP 86222A/B and 86290B/C. Besides their broad frequency range these plug-ins offer many special features including unique crystal markers in the HP 86222B and better than  $\pm 30$  MHz frequency accuracy in a HP 86290B/C even at 18 GHz.

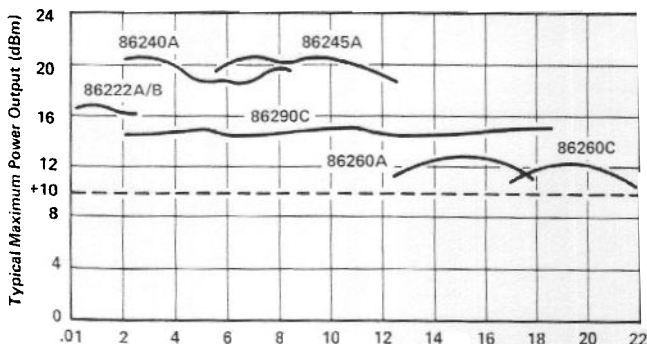
### HP 86240A/B/C and 86251A Straddle-Band Plug-Ins

Covering more than an octave of frequencies the HP 86240A/B span 2 to 8.4 GHz and the HP 86251A spans from 7.5 to 18.6 GHz with major advances in power output and signal purity. The HP 86240A offers more than 40 mW while the HP 86251A provides over 10 mW of leveled output across the full band. All three plug-ins deliver a high quality test signal of low harmonic content with the HP 86240B providing harmonics of >45 dBc. This can be very important when making measurements across more than one octave.

### HP 86200 Series Single-Band Plug-Ins

The HP 86200 series of plug-ins covers both ends of the frequency spectrum from 10 MHz to 22 GHz with a choice of nine plug-ins.

TYPICAL UNLEVELED POWER OUTPUT



### Compatibility



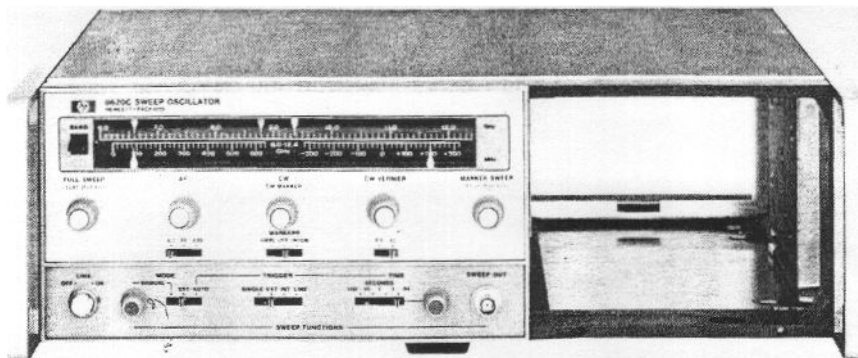
# SWEEP OSCILLATORS

## Model 8620 Series: Mainframe

### Model 8620C

- Optional BCD or HP-IB programming
- 3 markers

- 100%  $\Delta F$  capability, fully calibrated



HP 8620C

The HP 8620C offers many features as standard equipment. For example, up to four separate bands and their respective frequency scales can be selected with a band select lever to the left of the dial scale. Pushbuttons, concentrically located in the frequency control knobs, light when actuated to indicate the sweep function in use. The sweep functions available are: FULL SWEEP, MARKER SWEEP, CW/ $\Delta F$  and CW. Three markers are available, controlled by the START MARKER, STOP MARKER, and CW MARKER knobs.

The HP 8620C is fully and continuously calibrated for any  $\Delta F$  sweep width. The sweep is symmetrical about the CW MARKER setting and three continuously variable  $\Delta F$  ranges are available by using the range switch below the  $\Delta F$  knob. This allows calibrated sweep widths of up to 1%, 10% or 100% of full band.

When in CW/ $\Delta F$  or CW modes, the CW VERNIER knob allows for excellent frequency resolution. In terms of improved frequency resolution the vernier increases the effective length of the dial scale to 7.5 metres (300 inches).

Another feature is the capability to fully program the sweeper. The standard HP 8620C includes inputs for band selection, sweep function selection, and analog frequency control. In addition to this, a more flexible digital frequency programming option is available to control the HP 8620C via the HP-IB (Option 011).

## 8620C Specifications

### Frequency

**Frequency range accuracy and linearity:** determined by band select lever and RF plug-in installed.

### Sweep Functions

**FULL SWEEP:** sweeps the full band as determined by the plug-in and the band select lever.

**MARKER SWEEP:** sweeps from START MARKER to STOP MARKER frequency settings: up to the full range of the plug-in can be set to sweep either up or down in frequency.

**$\Delta F$  Sweep:** sweeps symmetrically upward in frequency, centered on CW setting, CW vernier can be activated for fine control of center frequency.

**Width:** continuously adjustable and calibrated from zero to 1%, zero to 10%, or zero to 100% of frequency band.

**CW operations:** single-frequency RF output controlled by CW MARKER knob selected by depressing pushbutton in CW MARKER control.

**CW vernier:** calibrated directly in MHz about CW setting. CW vernier activated by pushbutton in CW vernier control. Zero to  $\pm 0.5\%$  or zero to  $\pm 5\%$  of full bandwidth, selectable with front panel switch.

**Frequency markers:** three constant width frequency markers are fully calibrated and independently adjustable over the entire range in FULL SWEEP function, controlled by START MARKER, STOP MARKER, and CW MARKER controls. In  $\Delta F$  sweep START and STOP MARKERS are available, and in MARKER SWEEP the CW MARKER is available. Front panel switch provides for the selection of either amplitude or intensity markers (amplitude modulating the RF output or Z-axis modulating the CRT display).

**Marker output:** rectangular pulse, typically  $-5$  volts peak available from Z-axis BNC connector on rear panel. Source impedance, approximately 1000 ohms.

### Sweep Modes: auto, manual and external

**Sweep time:** continuously adjustable from 0.01 to 100 seconds.

**Sweep triggers:** line, internal, external and single.

**Sweep output:** direct-coupled sawtooth, zero to approximately +10 volts, at front panel BNC connector, concurrent with swept RF output.

### Modulation

External AM, FM and phase-lock capability; internal square wave AM modulation available.

### Remote Control

**Remote band select:** frequency range can be controlled remotely by three binary contact closure lines available at rear panel connector.

### Remote Frequency Programming, Opt 011 (HP-IB) Functions

**Band:** manual enable or remote control of up to four bands.

**Mode:** seven modes are selectable, including digital control in three modes with a resolution of 10,000 points.

### HP-IB interface functions

SH0, AH1, T0, L2, SR0, RL2, PP0, DC0, DT0, C0, E1.

### General

#### Blanking

**RF:** with blanking switch enabled, RF automatically turns off during retrace, and remains off until start of next sweep.

**Display (Z-AXIS/MKR/PEN LIFT output):** direct-coupled rectangular pulse approximately +5.0 volts coincident in time with RF blanking is on rear panel.

**Negative (negative blanking output):** direct-coupled rectangular pulse approximately  $-5.0$  volts coincident in time with RF blanking.

**Pen lift:** for use with X-Y recorders having positive power supplies. Transistor-switch signal is available on Z-AXIS/MKR/PEN LIFT connector. This signal is also available on the programming connector.

**Furnished:** 2.29 m (7½-foot) power cable with NEMA plug and calibration scale. With Option 011, an HP-IB connector/adaptor are included.

**Power:** 100, 120, 220, or 240 volts  $+5 - 10\%$ , 50 to 400 Hz. Approximately 140 watts.

**Weight:** (not including RF unit): Net, 11.1 kg (24 lb). Shipping 13.4 kg (30 lb).

**Size:** 132.6 mm H x 425 mm W x 337 mm D (5.29" x 16.75" x 13.25").

### Ordering Information

HP 8620C Sweep Oscillator Mainframe

Opt 011: HP-IB Frequency Programming

Opt 007: Rear Sweep Out

Opt 820: 8410C Interface Cable

Opt 908: Rack Flange Kit

# SWEEP OSCILLATORS

## Model 8620 Series: Broadband RF Plug-Ins

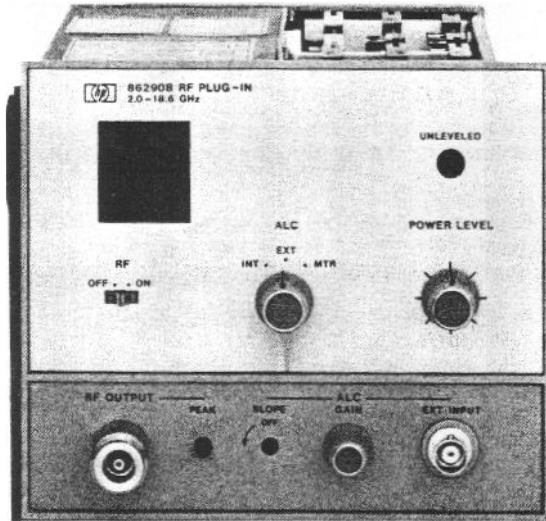
Models 86290B and 86290C

515



- +13 dBm 2 to 18.6 GHz with HP 86290C
- $\pm 30$  MHz frequency accuracy at 18.6 GHz

- Compatible with HP 8350 mainframe via HP 11869A adapter



HP 86290B

The HP 86290B/C broadband plug-ins offer a continuous sweep from 2 to 18.6 GHz for broadband swept testing. In addition, higher frequency resolution is achieved by covering the 2 to 18.6 GHz range in three individual bands of 2 to 6.2, 6 to 12.4, 12 to 18.6. The HP 86290C offers outstanding electrical performance, producing  $>20$  mW swept output over the 2 to 18.6 GHz range along with excellent linearity and low spurious and harmonic content. For scalar measurements in the AC detection mode, the 27.8 kHz square wave modulation from the HP 8756 or the HP 8757 Scalar Network Analyzers is accepted directly through the EXTERNAL AM input. When performing phase/amplitude network analysis the interfacing between the sweeper and the HP 8410C Network Analyzer permits the HP 8410C to automatically phase lock over multi-octave sweeps for continuous swept 2 to 18.6 GHz phase and amplitude measurements.

### Output Characteristics

#### Maximum Levelled Power (25°C)

**HP 86290B:** +10 dBm, (Opt. 004: +9.5 dBm)  
**HP 86290C:** +13 dBm, (Opt. 004: +12.5 dBm)

**Power level control range:**  $>10$  dB

	Band 1	Band 2	Band 3	Band 4
<b>Power Variation (Max Rated Pwr)</b>				
Internally levelled: (dB)	$\pm 0.7$	$\pm 0.7$	$\pm 0.8$	$\pm 0.9$
Externally levelled (excluding coupler and detector variation)				
Crystal detector: $-20$ to $-250$ mV for specified leveling at rated output: (dB)	$\pm 0.15$	$\pm 0.15$	$\pm 0.15$	$\pm 0.15$
Power meter: internal leveling amplifier with compensation for HP models 432A/B/C provided: (dB)	$\pm 0.15$	$\pm 0.15$	$\pm 0.15$	$\pm 0.15$
With temperature, typically (dB/°C)	$\pm 0.1$	$\pm 0.1$	$\pm 0.1$	$\pm 0.1$

**Residual AM in 100 kHz BW:**  $<-55$  dBc.

#### Spurious Signals

**Harmonically related signals:**  $<-25$  dBc.

**Non-harmonics:**  $<-50$  dBc.

**Impedance:** 50 $\Omega$  nominal.

**SWR:**  $<1.9$  internally levelled.

**RF output connector:** type N female.

### Modulation Characteristics

#### External AM

**Input impedance:** approximately 10k $\Omega$ .

**Frequency response:** typically 100 kHz levelled.

#### Square Wave Response

**On/Off ratio:**  $>30$  dB.

**Symmetry:** 40/60.

**Attenuation for +5V input:**  $>30$  dB.

#### Internal AM (1000 Hz)

**Square-wave on/off ratio:**  $>25$  dB.

**RF blanking on/off ratio:**  $>30$  dB.

#### External FM

##### Maximum Deviations for Modulation Frequencies

DC to 100 Hz:  $\pm 75$  MHz.

100 Hz to 2 MHz:  $\pm 5$  MHz.

## Specifications

### with Plug-In Installed in an HP 8620C Mainframe

#### Frequency Characteristics

	Band 1	Band 2	Band 3	Band 4
<b>Range:</b> (GHz) HP 86290B/C	2-6.2	6-12.4	12-18.6	2-18.6
<b>Accuracy (25°C)</b>				
CW mode (or $>100$ ms sweep time): (MHz)	$\pm 20$	$\pm 30$	$\pm 30$	$\pm 100$
Remote programming: (typ.)	$\pm 2.5$	$\pm 2.5$	$\pm 3.5$	—
All sweep modes: (MHz)	$\pm 30$	$\pm 40$	$\pm 40$	$\pm 80$
Marker: (MHz)	$\pm 30$	$\pm 30$	$\pm 30$	$\pm 80$
Linearity (MHz) typ.:	$\pm 8$	$\pm 8$	$\pm 8$	$\pm 30$
<b>Frequency Stability</b>				
With temperature: (MHz/°C)	$\pm 0.5$	$\pm 1.0$	$\pm 1.5$	$\pm 2.0$
With 10% line voltage change: (kHz)	$\pm 100$	$\pm 100$	$\pm 100$	$\pm 100$
With 10 dB power level change: (MHz)	$\pm 0.6$	$\pm 1.2$	$\pm 1.8$	$\pm 1.8$
With 3:1 load VSWR, all phases: (kHz)	$\pm 100$	$\pm 200$	$\pm 300$	$\pm 300$
With time (in 10 minute period after 30 minute warmup): typically (kHz)	$\pm 300$	$\pm 600$	$\pm 900$	$\pm 900$
Residual FM (20 Hz $-15$ kHz bandwidth CW mode): (kHz peak)	$<10$	$<20$	$<30$	$<30$

### General

**Sweep time (min):** 10 ms single bands, 60 ms on 2 to 18.6 GHz band.

**Auxiliary output:** rear panel 2 to 6.2 GHz fundamental oscillator output, nominally  $-10$  dBm.

**Slope control:** front panel control allowing compensation for frequency dependent test setup losses.

**Peak control:** front panel control for peaking power over desired frequency range.

**Frequency reference output:** nom. 1 V/GHz (2–18.6 volts)  $\pm 35$  mV rear panel BNC output.

**Weight:** net, 4.4 kg (9.6 lb); shipping, 5.9 kg (13 lb).

### Ordering Information

**HP 86290B** 2 to 18.6 GHz +10 dBm (10 mW) plug-in (internal leveling standard)

**HP 86290C** 2 to 18.6 GHz +13 dBm (20 mW) plug-in (internal leveling standard)

**Opt 004:** rear panel RF output

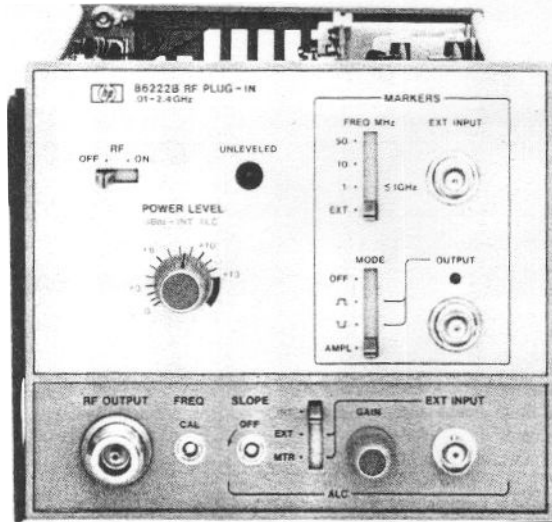


# SWEEP OSCILLATORS

## Model 8620 Series: Broadband RF Plug-Ins (cont.)

### Models 86222A and 86222B

- 10 MHz to 2.4 GHz in one, continuous sweep
- Internally leveled flatness  $\pm 0.25$  dB over full range



HP 86222B

The HP 86222A and 86222B RF plug-ins can provide CW or continuous swept 10 MHz to 2.4 GHz frequency coverage. Power output is calibrated from 0 to +13 dBm in 1 dB increments with  $\pm 0.25$  dB flatness and excellent linearity (2 MHz) over the entire 0.01 to 2.4 GHz range. For applications demanding precise frequency identification, the HP 86222B offers a crystal marker system which provides a comb of markers at 1, 10 or 50 MHz. Markers may be displayed as intensified spots on a CRT or as amplitude dips on the RF output (often useful for XY 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 for independent CW frequency calibration (75 kHz accuracy at 1 GHz). For scalar measurements in the AC detection mode, the 27.8 kHz square wave modulation from the HP 8756A or the HP 8757A Scalar Network Analyzer is accepted directly through the external AM input. For phase/magnitude network analysis the interfacing between the sweeper and the HP 8410C Network Analyzer permits the HP 8410C to automatically phase-lock over multi-octave sweeps.

### Specifications with Plug-in Installed in an HP 8620C Mainframe

#### Frequency Characteristics

**Range:** 10 MHz to 2.4 GHz.

#### Accuracy (25°C)

**CW mode:**  $\pm 10$  MHz.

**Remote programming:** typically  $\pm 1.5$  MHz.

**All sweep modes:**  $\pm 15$  MHz (>100 ms sweep time). Accuracy of HP 86222B may be enhanced to better than  $\pm 200$  kHz through use of crystal markers.

**Linearity:** typically  $\pm 2$  MHz.

#### Stability

**With temperature:**  $\pm 500$  kHz/°C.

**With 10% line voltage change:**  $\pm 20$  kHz.

**With 10 dB power level change:**  $\pm 100$  kHz.

**With 3:1 load SWR, all phases:**  $\pm 10$  kHz.

**With time (after 1-hour warm-up):** typically  $\pm 100$  kHz/10 min.

**Residual FM:** (20 Hz – 15 kHz bandwidth; FM switch in NORM; CW Mode): <5 kHz peak.

#### Output Characteristics

**Maximum leveled power (25°C):** >20 mW (+13 dBm); typically >+15 dBm.

**Power level accuracy (internal leveling only):**  $\pm 1$  dB.

**Attenuator Opt 002:** add  $\pm 0.2$  dB/10 dB step.

#### Power Variation (at max. rated power)

#### Internally Leveled

**0.01 to 2.4 GHz:**  $\pm 0.25$  dB.

**Stability with temperature:** typically  $\pm 0.02$  dB/°C.

- 1, 10, and 50 MHz crystal marker combs with HP 86222B
- Compatible with HP 8350 mainframe via HP 11869A adapter

#### Externally Leveled (excluding coupler and detector variation)

**Crystal detector:** (–10 to –100 mV at rated output):  $\pm 0.1$  dB.

**Power meter (with HP 432A/B/C series power meters):**  $\pm 0.1$  dB.

**Residual AM in 100 kHz BW:** <–50 dBc.

#### Spurious Signals (below fundamental)

**Harmonics:** <–25 dBc at +13 dBm; typically <–30 dBc at +10 dBm.

#### Non-Harmonics

**0.01 to 2.3 GHz:** <–30 dBc at +13 dBm; typically <–40 dBc at +10 dBm.

**2.3 to 2.4 GHz:** <–25 dBc at +13 dBm; typically <–35 dBc at +10 dBm.

**Broadband noise in 100 kHz bandwidth:** typically <–70 dBm.

**Impedance:** 50  $\Omega$  nominal.

**SWR:** <1.5 internally leveled.

**Slope control:** allows variable compensation for frequency dependent losses in test set-up.

**RF output connector:** type N female.

### Modulation Characteristics

#### External AM

**Input impedance:** approximately 10 k $\Omega$ .

**Frequency response:** typically 150 kHz.

#### Square Wave Response

**On/Off ratio:** >30 dB.

**Symmetry:** 40/60, for > 10 dBm output power.

**Attenuation for +6 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:**  $\pm 75$  MHz.

**100 Hz to 1 MHz:**  $\pm 5$  MHz.

**1 MHz to 2 MHz:**  $\pm 2$  MHz.

#### Sensitivity (typically)

**FM mode:** –20 MHz/V.

**Phase-lock mode:** –6 MHz/V.

### Crystal Marker Capabilities (HP 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:**  $\pm 75$  kHz.

**10 MHz markers:**  $\pm 200$  kHz.

**50 MHz markers:**  $\pm 300$  kHz.

**Temperature stability:** typically  $\pm 2 \times 10^{-6}$ /°C.

#### Marker output

**Pos. intensity mode:** nominally >3 V.

**Neg. intensity mode:** nominally –3 to –8 V, internally adjustable.

**Amplitude mode:** typically 0.5 dB, internally adjustable.

### General

**Weight:** net, 2.5 kg (5.5 lb); shipping, 4 kg (9 lb).

### Ordering Information

**HP 86222A** 0.01–2.4 GHz RF Plug-In (internal leveling standard)

**HP 86222B** 0.01–2.4 GHz RF Plug-In with Crystal and External Markers (internal leveling standard)

**Opt 002:** 70 dB Step Attenuator (10 dB steps)

**Opt 004:** Rear Panel RF Output

# SWEEP OSCILLATORS

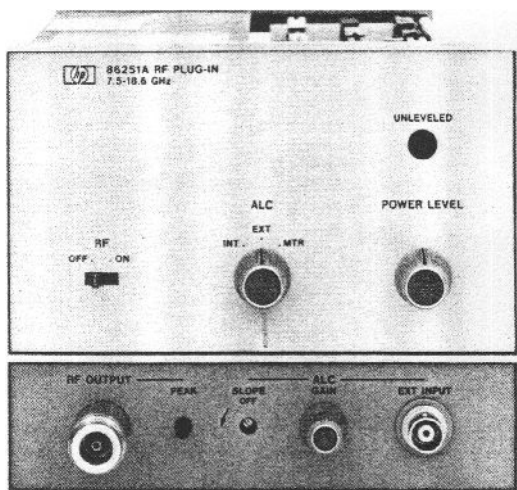
## Model 8620 Series: Straddle Band RF Plug-Ins

### Models 86240A, 86240B, 86240C and 86251A



- 7.5–18.6 continuous sweep with HP 86251A
- < -45 dBc harmonics with HP 86240B
- Up to 40 mW output power with HP 86240A

- MLA compatibility with HP 86240C
- Usable in HP 8350 mainframe with HP 11869A plug-in adapter



HP 86251A

#### HP 86251A: 7.5–18.6 GHz

The HP 86251A excels in meeting the most stringent of swept or CW source requirements for precise Radar and ECM component measurements. Covering the essential frequency bands with one continuous sweep, the HP 86251A is ideal for testing active devices like multioctave TWTs or RF memories as well as passive devices like filters or isolators.

#### HP 86240A/B: 2–8.4 GHz

The HP 86240A/B are designed for high power and superior performance with the HP 86240A delivering 40 mW of RF output power and the HP 86240B offering 45 dBc harmonics (typically < -50 dBc). For precise RF power level control, internal leveling and slope control are also available.

#### HP 86240C RF Distortion Analysis of MW Links: 3.6-8.6 GHz

The HP 86240C can be used for MLA Upconverter Simulation as well as a general purpose sweeper. It is optimized for group delay of

less than 1 ns peak-to-peak over 30 MHz, linearity better than 0.5% and power output up to 40 mW. It has 10 MHz FM bandwidth, flat to  $\pm 1.5$  dB for noise loading applications, power control and internal leveling. For further information on MLA Upconverter Simulation refer to the Telecommunications Test Equipment section on page 391.

### Specifications with Plug-In Installed in an HP 8620C Mainframe

#### Frequency Characteristics

**Linearity:** typically  $\pm 0.1\%$ .

**Residual FM** (in 20 Hz -15 kHz bandwidth, FM switch in NORM, CW Mode): <9 kHz peak, <30 kHz peak for HP 86251A.

**Reference output:** dc-coupled voltage proportional to RF frequency, voltage approximately 1 V/GHz.

#### Output Characteristics

**Internal Leveling:** selected by front panel switch; refer to RF plug-in specifications.

**Source SWR:** 50 $\Omega$  nominal impedance.

**Internally leveled:** <1.6 SWR for HP 86240. <1.9 SWR for HP 86251A.

**Unleveled:** typically 3 SWR.

**RF output connector:** type N female.

#### HP 86240C Modulation Characteristics

**External FM** (maximum deviation for modulation frequencies)

**DC to 100 Hz:**  $\pm 100$  MHz

**90 kHz to 10 MHz:**  $\pm 1.5$  MHz

**Frequencies response, dc to 10 MHz:**  $\pm 1.5$  dB

**Nominal Sensitivity**

**FM mode:** +20 MHz/volt

**Upconverter mode:** +20 MHz/volt

#### General

**Weight:** Net, 2.3 kg (5 lb); shipping, 3.2 kg (7 lb) for HP 86240A/B/C. Net, 4.4 kg (9.6 lb); shipping, 5.9 kg (13 lb) for HP 86251A.

#### Options

**002:** 70 dB Step Attenuator (HP 86240A/B/C only)

**004:** Rear Panel RF Output

	HP 86240A	HP 86240B	HP 86240C	HP 86251A
<b>FREQUENCY</b>				
Frequency Range (GHz):	2.0-8.4	2.0-8.4	3.6-8.6	7.5-18.6
Frequency Accuracy: (25°C)				
CW Mode (MHz):	$\pm 25$	$\pm 25$	$\pm 25$	$\pm 60^1$
CW Remote Programming typically (MHz):	$\pm 3.5$	$\pm 3.5$	$\pm 3.5$	
All Sweep Modes (for sweep time >100 ms) (MHz):	$\pm 40$	$\pm 50$	$\pm 35$	$\pm 60$
<b>POWER OUTPUT</b>				
Maximum Leveled Power (25°C) (mW):	>40	>20	>40	>10
With Option 002 (mW):	>40	>20	>40	
<b>Power Variation:</b> (At Max Rated Power)				
Unleveled (Typically) (dB):	< $\pm 6$	< $\pm 6$	< $\pm 6$	< $\pm 5$
Internally Leveled:	< $\pm 2$	< $\pm 2$	< $\pm 2$	$\pm 0.8$
Externally Leveled (Excluding Coupler and Detector Variation) Crystal Detector and Power Meter (dB):	< $\pm 0.1$	< $\pm 0.1$	< $\pm 0.1$	$\pm 0.15$
<b>Spurious Signals:</b> (dB below fundamental at specified maximum power)				
Harmonics:	< -20 (@20 mW) < -16 (@40 mW) < -60	< -45 (Typ < -50) < -60	< -20 (@20 mW) < -16 (@40 mW) < -60	< -35 < -50
Nonharmonics:				
Plug-in:				

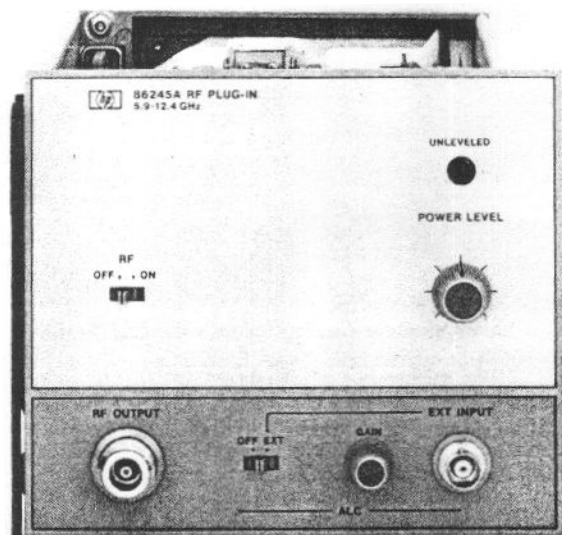
<sup>1</sup>CW mode installed in HP 8350 mainframe or remote programming in HP 8620C:  $\pm 20$  MHz.

# SWEEP OSCILLATORS

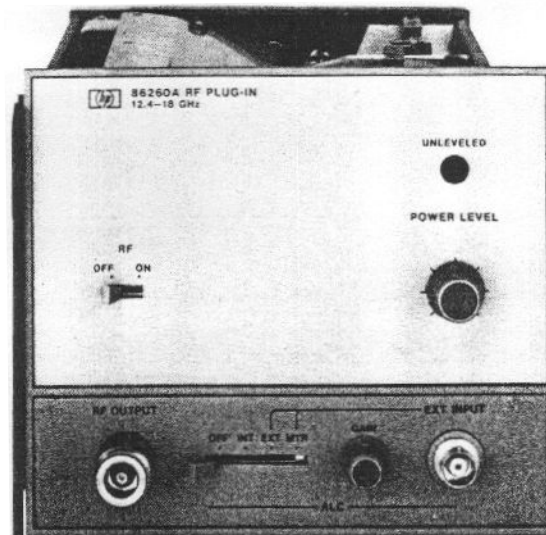
## Model 8620 Series: Single Band RF Plug-Ins

### Model 86200 Series and 11869A Adapter

- 10 MHz to 22 GHz coverage
- >50 mW from 5.9 to 12.4 GHz
- Compatible with HP 8350 mainframe via HP 11869A adapter



HP 86245A



HP 86260A

### HP 86200 Series

The HP 86200 series plug-ins feature a wide choice of bandwidths and power specifications for covering the 10 MHz to 22 GHz frequency range. The HP 86222A/B 10 MHz to 2.4 GHz plug-ins, the HP 86240A/B/C 2 GHz to 8.6 GHz plug-ins, and the HP 86290B/C 2 GHz to 18.6 GHz plug-ins cover multi-octave frequency ranges with exceptional frequency precision and RF output characteristics. See preceding pages for specifications on these plug-ins. For octave band applications, smaller range plug-ins covering, for instance, 5.9 GHz to 12.4 GHz are available with optional capability to operate as up-converters for MLA measurements. Internal leveling is standard on all HP 86200 series plug-ins.

### HP 11869A Adapter

The HP 86200 series can be used in the HP 8350 Sweep Oscillator mainframe with the addition of the HP 11869A Adapter. The HP 11869A provides the electrical and mechanical interface between the HP 86200 plug-in and the HP 8350 so that digital control of the plug-in is possible. All of the performance and features of the HP 8350 Sweep Oscillator mainframe are available when using the HP 86200 plug-ins and HP 11869A Adapter. For more information on the HP 11869A see page 501.

### Specifications

#### With Plug-In Installed in an HP 8620C Mainframe

**Frequency linearity:** typically  $\pm 1\%$ .

**Frequency reference output:** typically 1 V/GHz dc-coupled voltage is available for referencing or phase-locking external equipment to the plug-in or for multi-octave operation with an HP 8410C.

**RF power leveling:** internal dc-coupled leveling amplifier and PIN modulator provided.

**Internal, standard:** selected by front panel switch; refer to RF plug-in specifications.

### External

**Crystal input:** approximately  $-20$  to 250 mV for specified leveling at rated output; for use with negative polarity detectors such as HP 780 Series Directional Detectors, HP 423A/B and 8470 Series Crystal Detectors.

**Power meter input:** leveling amplifier with compensation for HP 432A power meter included internally in all plug-ins except the HP 86241A.

**Indicator:** front panel indicator lights when RF power level is set too high to permit leveling over entire selected sweep range or when operating in unlevelled mode.

**Residual AM in 100 kHz bandwidth:**  $< -50$  dBc.

### External AM

**Frequency response:** typically dc to 100 kHz unlevelled, dc to 50 kHz leveled (at maximum leveled power).

**Input impedance:** approximately 5000 ohms.

**RF output connector:** type N Female.

**HP 8350 Compatibility:** the HP 11869A Adapter provides the electrical and mechanical interface so that the HP 86200 series plug-ins can be used in the HP 8350 Sweep Oscillator mainframe. For more information see the section on HP 11869A Adapter page 501.

**Weight:** net, 2.3 kg (5 lb); shipping, 3.2 kg (7 lb).

### Options

**002:** 70 dB attenuator in 10 dB steps

**004:** rear panel RF output

**Upconverter simulation options:** options are available which guarantee compatibility with the HP Microwave Link Analyzer. For further information on these plug-ins refer to the Telecommunications Test Equipment Section beginning on page 391.

## Single Band Plug-Ins

Refer also to Broadband Models 86222A/B (0.01-2.4 GHz), 86240A/B/C (2-8.4 GHz), 86251A (7.5-18.6 GHz), and 86290B/C (2-18.6 GHz)

Specifications with plug-in installed in HP 8620C	HP 86220A	HP 86235A	HP 86241A	HP 86242D	HP 86245A	HP 86250D	HP 86260B	HP 86260A	HP 86260C
<b>Frequency range<sup>1</sup> (GHz):</b>	0.01-1.3	1.7-4.3	3.2-6.5	5.9-9.0	5.9-12.4	8.0-12.4	10.0-15.5	12.4-18.0	17.0-22.0
<b>Frequency accuracy</b> CW mode (MHz):	±10	±20	±30	±35	±40	±40	±50	±50	±50
Remote programming typically (MHz):	±6.0	±2.5	±10.5	±5.0	±20	±20	±25	±25	±25
All sweep modes (sweep time >100 ms) (MHz):	±15	±30	±33	±40	±50	±50	±70	±70	±70
<b>Stability:</b> With Temperature:	±600 kHz/°C	±500 kHz/°C	±650 kHz/°C	±750 kHz/°C	±1.2 MHz/°C	±1.2 MHz/°C	±5.4 MHz/°C	±5.4 MHz/°C	±5.4 MHz/°C
With 10% Line Voltage Change:	±20 kHz	±40 kHz	±30 kHz	±40 kHz	±40 kHz	±40 kHz	±180 kHz	±180 kHz	±180 kHz
With 10 dB Power Level Change:	±20 kHz	±1 MHz	±1 MHz	±1.5 MHz	±1.5 MHz	±1.5 MHz	±6 MHz	±6 MHz	±6 MHz
With 3:1 Load SWR Change, all Phases:		±250 kHz		±250 kHz	±250 kHz	±250 kHz			
With Time (after warm-up): Typ/10 min.	± 200 kHz	± 200 kHz	± 200 kHz	± 600 kHz	± 600 kHz	± 600 kHz		± 450 kHz	
<b>Residual FM</b> (20 Hz -15 kHz BW, FM switch in NORM) CW mode (kHz peak):	<5	<7	<7	<15	<15	<15	<25	<25	<25
<b>Maximum leveled power<sup>1</sup> (mW):</b>	10	>40	>6.3(3.2-6 GHz) >5(6-6.5 GHz)	>10	>50	>10	>10	>10	>10
<b>Power variation</b> Internally leveled (dB):	<±0.5	<±2	<±0.8	<±0.5	<±0.6	<±0.5	<±0.7	<±0.7	<±0.7
Externally leveled (dB) (excluding coupler & detector variation):	N/A	<±0.1	<±0.1	<±0.1	<±0.1	<±0.1	<±0.1	<±0.1	<±0.1
<b>Spurious signals:</b> (dB below fundamental, at specified max power) Harmonics:	<-25(10-750 MHz) <-30(750-1300 MHz)	<-20	<-16(3.2-3.8 GHz) <-20(3.8-6.5 GHz)	<-30	<-17(5.9-7 GHz) <-30(7-12.4 GHz)	<-30	<-25	<-25	<-25
Nonharmonics:	<-40	<-60	<-60	<-60	<-60	<-60	<-50	<-50	<-50
<b>Source SWR:</b> (50 Ω nom, Internally leveled)	<1.3	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
<b>External FM:</b> Max deviations (MHz) for modulation frequencies: DC-100 Hz:	±15	±75	±25	±150	±150	±150	±150	±75	±75
DC-1 MHz:	±0.5	±5	±2	±7	±7	±7	(DC-200 kHz) ±5(200 Hz-200 kHz)	(DC-200 kHz) ±5(200 Hz-200 kHz)	(DC-200 kHz) ±5(200 Hz-200 kHz)
Sensitivity (nom, MHz/V):	+3.5	-20/-6	-6	-20/-6	-20/-6	-20/-6	-20/-6	-20/-6	-20/-6
<b>AM:</b> Internal 1 kHz Square wave On/Off ratio & EXT AM sensitivity To -10 V (dB):	>35	>40	>25	>40	>40	>40	>25	>25	>25
EXT AM Response compatible with 8756A/8757A Mod drive signal:	No	Yes	No	Yes	Yes	Yes	No	No	No
<b>Plug-in:</b> Opt 002 (70 dB Atten.)			N/A	N/A	N/A	N/A	N/A	N/A	N/A

<sup>1</sup> Special frequency band and high power outputs available on request.