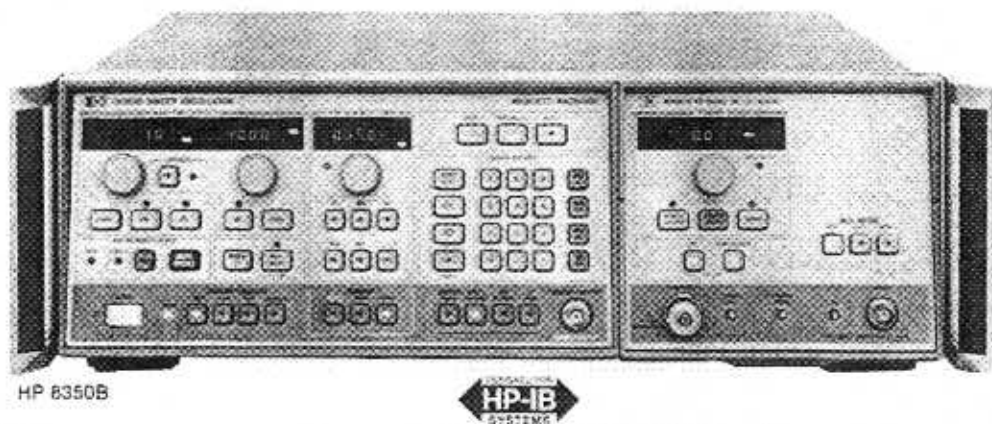


## SWEEP OSCILLATORS

Model 8350 Series: 10 MHz to 40 GHz

Model 8350 Series

- Versatile microprocessor-controlled mainframe
- Single-band, straddle-band and broad band plug-ins
- 10 MHz to 40 GHz from a single plug-in
- 10 mW output power to 26.5 GHz
- Total HP-IB programmability



### HP 8350 System

The HP 8350 is a powerful general-purpose source for swept microwave measurements, wideband CW signal generation and automatic testing. It incorporates the efficiency of microprocessor control with state-of-the-art YIG-tuned oscillators and GaAs FET amplifiers to produce a high performance sweep oscillator system ideally suited for either manual or automatic measurements.

You can easily configure a source to meet your application's frequency coverage and power requirements. Just combine the versatile HP 8350 mainframe with any of the 34 standard RF plug-ins (see table at right) and you are ready to make measurements. Both the advanced HP 83500 series plug-ins and the existing HP 86200 series plug-ins (via the HP 11869A adapter) are accepted by the HP 8350 mainframe.

### HP 8350 Mainframe

The HP 8350 has been designed to include many features that not only speed up and simplify measurements but also improve accuracy. In addition, it is compatible with HP network analyzers, counters, noise figure meters, power meters, and microwave link analyzers to provide complete solutions.

All function values (sweep limit frequencies, marker frequencies, etc.) are indicated on high resolution digital displays. Function values are easily modified using the appropriate knob, step keys, or data entry keyboard.

Five independent, continuously variable markers are available to note your measurement frequencies. The active marker frequency or the difference frequency between any two markers is read easily from a high resolution digital display. You can also use marker sweep to zoom in on a particular frequency span while retaining your original sweep limits.

Another particularly useful feature in making repetitive measurements is the HP 8350's Save/Recall Mode. Once the sweeper has been set for a particular measurement, all front panel settings (HP 8350 and HP 83500 series plug-in) can be *Saved* and later *Recalled* to repeat the measurement by accessing one of nine internal storage registers.

In the past, HP-IB programming of sweepers was limited to a series of CW frequencies. With the HP 8350 all front panel functions, e.g. sweeps, markers, sweep time, even output power (HP 83500 series plug-ins) can be programmed. This means there are no limitations in designing your own customized test systems. Utilizing the Learn Mode function, the HP 8350 becomes a "talker" as well as "listener" on the bus, transferring all manually entered front panel controls to the computer.

Full compatibility with both the HP 8510 Network Analyzer, the HP 8757A Scalar Network Analyzer are provided for convenient vector and scalar measurements with the HP 8350. The HP 5343A Counter can be combined with the HP 8350 to measure Start, Stop, or marker frequencies with up to 100 kHz accuracy while sweeping. Microwave noise figure measurements may be made using the HP 8350 with the HP 8970 Noise Figure Meter. In addition, the HP 8350B, with an appropriate plug-in driving the HP 8349B microwave amplifier, provides up to +20 dBm of output power across a 2 to 18.6 GHz range.

### HP 83500 Series Plug-Ins

Broadband frequency coverage from 10 MHz to 40 GHz with high output power is provided in the HP 83500 series RF plug-ins. One plug-in, the HP 83597A covers the entire 10 MHz to 40 GHz frequency range with -50 dBc harmonics from 2.4 to 20 GHz and -40 dBc from 20 to 40 GHz. The HP 83595A, operates from 10 MHz to 26.5 GHz without sacrificing frequency accuracy ( $\pm 12$  MHz at 26.5 GHz). The HP 83592C, 10 MHz to 20 GHz RF plug-in has -55 dBc harmonics and subharmonics from 2 to 20 GHz. The HP 83550A provides +20 dBm of output power from 8.0 to 18.6 GHz, +18 dBm from 18.6 to 20.0 GHz and also has a built-in source module interface to drive the HP 83550-series millimeter-wave source modules. The 18 GHz to 26.5 GHz band is filled by the HP 83570A RF plug-in and boasts a 10 mW power level (comparable to most BWOs). The millimeter-wave bands are covered by the HP 83550-series millimeter-wave source modules, frequency multipliers that provide coverage in the 26.5 to 40 GHz (HP 83554A), 33 to 50 GHz (HP 83555A), and 40 to 60 GHz (HP 83556A) bands by effectively extending the characteristics of a 11 to 20 GHz microwave source to the millimeter frequency range.

The HP 83500 series plug-ins offer output power level control previously unavailable on a swept source. Power level control is calibrated with 0.1 dB resolution and up to 80 dB range (with Opt 002 attenuator). Calibrated power sweeps are available for characterizing device performance as a function of power. Slope and internal leveling controls are standard on all units. The HP 83500 series plug-ins (except the HP 83572A/B) are also capable of power meter leveling with the HP 432A/B/C, 436A, and 438A power meters.

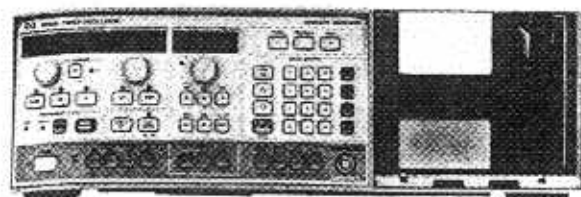
All HP 83500 series front panel functions are HP-IB programmable including power level. This means your automatic test systems can now characterize a device both as a function of frequency and input power level.

### HP 86200 Series Plug-Ins

Simply combining the HP 86200 series plug-in (including the one you may already own) with an HP 11869A Adapter makes all the convenient digital controls, markers, and HP-IB capability of the HP 8350 immediately available to you. The HP 86200 series are a particularly attractive plug-in choice when economical single-band operation is desired with the HP 8350 mainframe. For measurements with HP Microwave Link Analyzers, specially characterized HP 86200 series plug-ins can be used with the HP 8350 to create an upconverter for communications distortion measurements.

The HP 86290B/C plug-ins cover the 2-18 GHz frequency range with 10 mW and 20 mW of output power respectively. Frequency accuracy at 18 GHz is 20 MHz, exceeding that available on most single-band plug-ins. Both HP 83500 series and HP 86200 series plug-ins compatible with the HP 8350 mainframe are summarized in the table. Note that the HP 11869A Adapter is required with all HP 86200 series plug-ins.

- Accurate, high resolution, digital displays
- Five markers with marker  $\Delta$  and marker sweep
- Save/recall 9 complete front panel states



HP 8350B



### HP 8350B

Sweep Oscillator applications are greatly enhanced by the features of the HP 8350B. Along with the traditional swept and CW frequency functions, the HP 8350B adds extensive marker capabilities, versatile data entry and complete HP-IB programmability. Besides the popular HP 83500-series RF plug-ins, the HP 8350B also accepts the HP 86200-series plug-ins via the HP 11869A adapter. And the HP 8350B is directly compatible with such measurement systems as the HP 8510 vector network analyzer and the HP 8757A scalar network analyzer. Frequency accuracy is easily enhanced by using the HP 5343A counter to count the START, STOP, or ACTIVE MARKER frequencies.

The HP 8350B has three methods of changing function values: control knobs, keyboard entry, or step key entry.

Five markers are available with the HP 8350B. These markers, combined with the high resolution digital readout, make the accurate location of important frequency responses easy. A key marker feature, marker  $\Delta$ , computes the difference between any two markers. The markers can also modify the center frequency (marker  $\rightarrow$  CF) or the START/STOP frequency (Marker Sweep).

A necessity in making repetitive measurements or automatic tests is the Save/Recall feature. This feature supplies nine memory locations, each storing a complete front panel set-up. Nonvolatile memory is included so that all memories are retained even when line power is removed.

The HP 8350B makes "simultaneous" comparison of two separate frequency ranges or power levels easy via the alternate sweep mode. When the alternate sweep mode is activated, the HP 8350B alternates between the current front panel setting and any stored memory setting on successive sweeps. The output from this function may be processed through a network analyzer such as the HP 8757A and viewed on a two channel display.

All front panel controls (except the ac line switch) may be programmed or controlled via the HP-IB. The HP 8350B may interact as a listener or as a talker on the HP-IB.

A self test is performed at turn on or whenever the instrument preset function is activated. This function verifies that the HP 8350B is functioning properly. If there is a problem, error codes are displayed on the front panel to help locate the problem quickly to the board and component level.

### HP 8350B Specifications

#### Frequency Control Functions

Refer to RF plug-in for frequency range, linearity and accuracy specifications.

**START/STOP sweep:** sweeps up from the START frequency to the STOP frequency.

**CF/ $\Delta$ F Sweep:** sweeps symmetrically upward, centered on CF.

$\Delta$ F: frequency width of sweep continuously adjustable from zero to 100% of frequency range.

- Accepts all HP 83500 series plug-ins
- Total HP-IB programmability
- Compatible with HP Network Analyzers

**CF Resolution:** 0.00038% (262,144 points across band).

**$\Delta$ F Resolution:** 0.1% of full band (1024 points across band), 0.012% of band for  $\frac{1}{4}$  of band or less, 0.0015% of band for  $\frac{1}{8}$  of band or less.

**Display resolution:** 5 digits.

**CW operation:** single frequency RF output.

**CW resolution:** same as CF.

**Vernier:** adjusts CW frequency or swept center frequency up to 0.05% of RF plug-in band being swept.

**Vernier resolution:** 4 ppm (64 points between each CW point; 262,144 points across band).

**Offset:** allows the CW frequency or center frequency to be offset by any amount up to the full range of the plug-in.

**Frequency markers:** five frequency markers are independently adjustable and fully calibrated over the entire sweep range. Amplitude or intensity markers available.

**Resolution:** 0.4% of selected sweep width (256 points/sweep).

#### Sweep and Trigger Modes

**Internal:** sweep recurs automatically.

**Line:** sweep triggered by ac power line frequency.

**External trigger:** sweep is actuated by external trigger signal.

**Single:** selects mode and triggers a single sweep.

**Sweep time:** continuously adjustable from 10 ms to 100 seconds.

**Manual sweep:** continuous manual adjustment of frequency between end frequencies.

**External sweep:** sweep is controlled by external signal applied to SWP OUTPUT/SWP INPUT connector.

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

#### Instrument State Storage

**Save n/recall n:** 9 different front panel settings can be stored.

**All n:** causes the RF output to alternate on successive sweeps between the current front panel setting and a setting stored in memory.

#### Modulation

**External AM:** refer to RF unit specifications.

**Internal AM:** Selectable to 27.8 kHz or 1 kHz. On/off ratio, refer to RF unit specifications.

**External FM:** refer to RF unit specifications.

#### Remote Programming (HP-IB)

The HP 8350B has both input and output capability. All front panel controls except the ac line power switch are programmable.

**Frequency resolution:** same as CF/ $\Delta$ F plus vernier.

**Power resolution:** see HP 83500 Series Plug-ins.

**HP-IB interface functions:** SH1, AH1, T6, L4, SR1, RL1, PPO, DC1, DT1, CO, EI.

#### General Specifications

**Nonvolatile memory:** continuous memory that retains the contents of all instrument state storage registers, the HP-IB address, and current instrument state when ac line power is off.

**Operating temperature range:** 0°C to +55°C.

**Power:** 100, 120, 220 or 240 volts  $\pm$  10%, 50 to 60 Hz (Option 400, 60 to 400 Hz). Approximately 270 volt-amperes including RF unit.

**Weight (not including RF unit):** Net 16.5 kg (36.4 lb). Shipping 22.7 kg (50 lb).

**Dimensions:** 425 mm wide, 133.3 mm high, 422 mm deep (16.75" x 5.25" x 16.6").

#### Ordering Information

**HP 8350B Sweep Oscillator Mainframe**

##### Options

**803:** HP 5343A Interface Cables

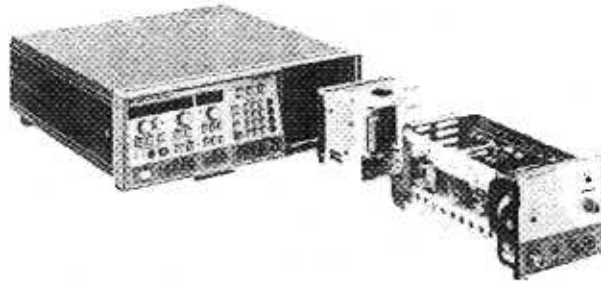
**910:** Extra Manual

**W30:** Two Years Extended Service

For transit cases see page 742

# SWEEP OSCILLATORS

## Model 8350 Series: RF Plug-Ins



### HP 11869A Adapter

The HP 11869A adapter provides the electrical and mechanical interface between the HP 8350 and 86200 series plug-ins. All of the HP 8350's standard operating features, including HP-IB remote programming, are available. However, specific plug-in functions (output power level, RF on/off, etc.) cannot be controlled or remotely programmed by the HP 8350 mainframe.

See page 405 for HP 86200 series plug-in specifications.

### Plug-ins Compatible With The HP 11869A Adapter

The HP 11869A adapter attaches to the back of the HP 86200 series plug-in and is equipped with a switch for setting the specific interface code for the plug-in being used.

The following plug-ins will operate in the HP 8350 by using the HP 11869A.

HP 86220A <sup>1,2</sup>	HP 86240A/B/C	HP 86250A <sup>1</sup> /B <sup>1</sup> /C/D <sup>2</sup>
HP 86222A/B	HP 86241A <sup>1</sup>	HP 86251A <sup>1</sup>
HP 86230B <sup>1,2</sup>	HP 86242A <sup>1</sup> /C/D <sup>2</sup>	HP 86260A <sup>1</sup> /B <sup>1</sup> /C <sup>2</sup>
HP 86235A	HP 86245A	HP 86290A <sup>2</sup> /B/C

### Ordering Information

#### HP 11869A Adapter

##### Options

**004:** Extension Cables for Plug-ins with Rear Panel RF Output

**006:** Type N Aux Out Interface Connector for HP 86251A and 86290A<sup>2</sup>/B/C

<sup>1</sup> Not compatible with 27.8 kHz square wave modulation.

<sup>2</sup> Models HP 86230B, 86290A, 86250A/B/C, and 86242A/C are obsolete. However, existing models can interface to HP 8350B mainframe via the HP 11869A adapter.

<sup>3</sup> Requires a special PROM for the HP 11869A, which is shipped with every HP 86251A, 86260B/C.

### RF Plug-in Summary

	HP Model number	Frequency range (GHz)	Leveled power output	Frequency accuracy (MHz)	Complete specifications on page
Broad-band Plug-ins	83597A	0.01-40	1 mW	±20	401
	83596A	2.4-40	1 mW	±20	401
	83595A	0.01-26.5	2.5 mW	±12	399
	83594A	2-26.5	2.5 mW	±12	399
	83592A/B	0.01-20	10 mW/20 mW*	±10	399
	83592C	0.01-20	4 mW	±10	399
	83590A	2-20	10 mW	±10	399
	83525A/B	0.01-8.4	20 mW/10 mW	±12	402
	83522A	0.01-2.4	20 mW	±5	402
	86222A/B	0.01-2.4	20 mW	±10	405
Straddle-band Plug-ins	86290B	2-18.6	10 mW	±30	405
	86290C	2-18.6	20 mW	±30	405
	83540A/B	2-8.4	40 mW/20 mW	±12	402
	86240A	2-8.4	40 mW	±20	405
	86240B	2-8.4	20 mW	±20	405
	86240C	3.6-8.6	40 mW	±20	405
	86251A	7.5-18.6	10 mW	±20	405
83550A	8.0-20.0	100 mW/63 mW**	±20	402	
Single-band Plug-ins	86235A	1.7-4.3	40 mW	±20	405
	86241A	3.2-6.5	5 mW	±30	405
	86242D	5.9-9	10 mW	±35	405
	83545A	5.9-12.4	50 mW	±20	402
	86245A	5.9-12.4	50 mW	±40	405
	86250D	8.0-12.4	10 mW	±40	405
	86260B	10-15.5	10 mW	±50	405
	86260A	12.4-18	10 mW	±50	405
	86260C	17-22	10 mW	±50	405
	83570A	18-26.5	10 mW	±30	402
	83572A	26.5-40	1.6 mW (Opt 001)	±100	402
	83572B	26.5-40	4 mW (Opt 001)	±100	402

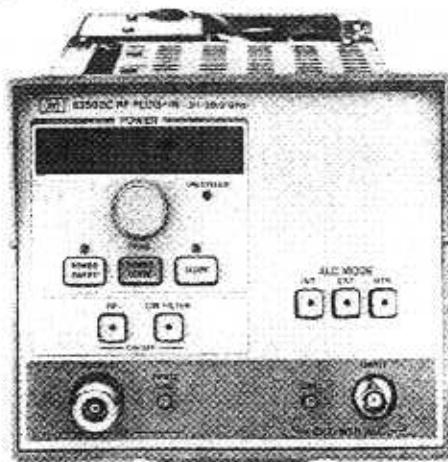
NOTE: The HP 11869A Adapter is HP 83592B: 20 mW to 18.6 GHz.

# SWEEP OSCILLATORS

## Model 8350 Series: Broadband RF Plug-Ins

### Models 83595A, 83592A/B/C, 83594A, 83590A

- Calibrated output power with 0.1 dB resolution
- +13 dBm from 0.01 to 18.6 GHz
- 12 MHz frequency accuracy at 26.5 GHz



HP 83592C



The HP 83590 series plug-ins feature wideband frequency coverage as exemplified by the HP 83595A which covers 0.01-26.5 GHz in a single sweep. While the HP 83590 series feature broadband sweeps, they still maintain narrowband precision. The frequency output exhibits excellent stability and accuracy. At 26.5 GHz the HP 83595A maintains an accuracy of  $\pm 12$  MHz. The HP 83592B does not sacrifice power for broadband high frequency coverage; the output power is internally leveled for a minimum +13 dBm (to 18.6 GHz) output with  $\pm 0.9$  dB flatness. The HP 83592C provides a clean test signal with  $-55$  dBc harmonic and subharmonic levels (3.5-20 GHz) to maximize dynamic range. Power output capabilities have been expanded to provide power sweep and slope control. In addition, the HP 83590 series plug-ins are completely HP-IB programmable.

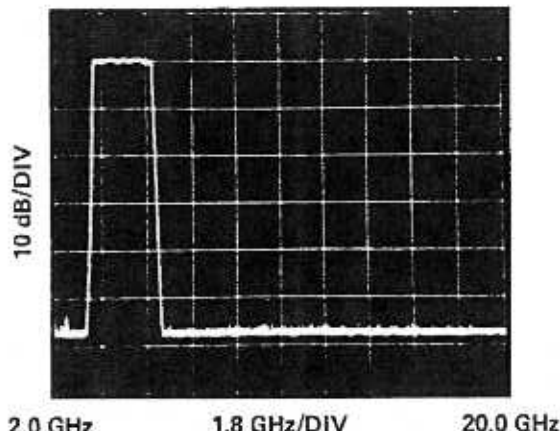
The most outstanding feature of the HP 83590 series plug-ins is their broad frequency range. Innovative technology is used to create this precision frequency range. The principle behind this technology is the Switched YIG Tuned Multiplier circuit (SYTM). The YTM circuit uses the output of a fundamental oscillator to drive a high-efficiency multiplier that has been integrated with a tracking YIG filter in order to create and select high order harmonics to be used as output frequencies.

A figure of merit for the HP 83590 series is their flat output power over the entire frequency range. The output power is internally leveled within 0.9 dB with a displayed resolution of 0.1 dB. The power level may be controlled to a minimum settable power level of  $-5$  dBm ( $-2$  dBm for the HP 83592B). This level may be extended to  $-75$  dBm on the HP 83592A and HP 83590A or to  $-72$  dBm on the HP 83592B with Option 002 (70 dB Step Attenuator), or to  $-60$  dBm on the HP 83592C, the HP 83595A and HP 83594A with Option 002 (55 dB Step Attenuator).

Since power parameters are critical to high frequency measurements, the HP 83590 Series (along with all HP 83500 series plug-ins) offer many modes of power output. In addition to a single power output, the HP 83590 Series offer a Power Sweep function. The Power Sweep function sweeps a power range for characterizing level sensitive devices like amplifiers and transistors. The Slope mode is supplied to provide compensation for cable or test set losses. In all these modes the power output is internally monitored and leveled. If preferred, the power may be externally leveled. The HP 83590 Series plug-ins are capable of power meter leveling with the HP 432A/B/C, 436A, and 438A power meters.

HP-IB programmability is an essential feature when one of the HP 83590 series is used in automatic test systems. For example, the automated tests of amplifiers for gain compression are possible. These plug-ins are completely programmable, which means the power mode may be selected and the power level may be set with .01 dB resolution.

- $-55$  dBc harmonics and subharmonics from 3.5 to 20 GHz
- Internal leveling and slope standard
- HP-IB



#### Output Characteristics

##### Output Power Resolution

**Displayed:** 0.1 dB  
**Programmable/Settable:** 0.01 dB

**Power Sweep** (with Option 002 Power Sweep cannot cross an attenuator step)

**Calibrated Range:**  $> 15$  dB ( $> 9$  dB)<sup>1</sup>  
**Accuracy** (including linearity), typical: 1.5 dB

**Power Slope** (with Option 002 Power Slope cannot cross an attenuator step)

**Calibrated Range:** Up to 5 dB/GHz; up to 15 dB (9 dB)<sup>1</sup> for full sweep  
**Linearity**, typical: 0.2 dB (0.3 dB)<sup>1</sup>

**Residual AM in 100 kHz Bandwidth**, typical:  $-50$  dBc

**Source Output VSWR** (50 ohm nominal):  $< 1.9$

#### Modulation Characteristics

##### External AM

**Frequency Response**, typical: 100 kHz  
**Range of Amplitude Control**, typical: 15 dB  
**Sensitivity**, typical: 1 dB/V

##### Internal Square Wave Modulation

1 kHz of 27.8 kHz square wave modulation selectable by internal jumper in HP 8350B. The 27.8 kHz modulation ensures operation with all Hewlett-Packard scalar network analyzers.

**On/Off Ratio:**  $> 30$  dB

**Symmetry:** 40/60

**External Pulse Modulation** (HP 83592A/B/C, 83595A specifications only)

**Pulse Input:** TTL compatible  
**Rise/Fall Time**, typical: 15 nsec (0.01-2.5 GHz)  
 10 nsec (2.5-20 GHz or 26.5 GHz)

##### Minimum RF Pulse Width:

**Internally Leveled**, typical: 1 nsec  
**Unleveled**, typical: 200 nsec (0.01-2.5 GHz)  
 100 nsec (2.5-20 GHz or 26.5 GHz)

##### External FM

##### Maximum Deviations for Modulation Frequencies:

DC to 100 Hz:  $\pm 75$  MHz  
 100 Hz to 1 MHz:  $\pm 7$  MHz  
 1 MHz to 2 MHz:  $\pm 5$  MHz  
 2 MHz to 10 MHz:  $\pm 1$  MHz

**Sensitivity** (switch selectable), typical

FM Mode:  $-20$  MHz/V  
 Phase-lock Mode: 6 MHz/V

# SWEEP OSCILLATORS

## Model 8350 Series: Broadband RF Plug-Ins (cont'd)

Models 83595A, 83592A/B/C, 83594A, 83590A

### General Specifications

#### Minimum Sweep Time

HP 83590A, 83592A/B/C: 10 msec for single band, 25 msec for full sweep

HP 83594A, 83595A: 10 msec for single band, 30 msec for full sweep

**Auxiliary Output** (rear panel fundamental oscillator output, nominally 0 dBm):

HP 83590A, 83594A: 2.0-7.0 GHz

HP 83592A/B/C, 83595A: 2.3-7.0 GHz

**Frequency Reference Output** (rear panel BNC output, switch selectable):

1 V/GHz (<18 GHz) or 0.5 V/GHz (<20 GHz or <26.5 GHz) ± 25 mV

#### RF Output Connector

HP 83590A, 83592A/B/C: Type N female

HP 83594A, 83595A: Type APC 3.5 male

#### Weight:

HP 83590A, 83594A: Net 5.7 kg (12.45 lb), Shipping 8.75 kg (19.25 lb)

HP 83592A/B/C, 83595A: Net 6.0 kg (13.2 lb), Shipping 9.2 kg (20 lb)

### Ordering Information

HP 83590A 2.0 to 20 GHz RF Plug-in

HP 83592A 0.01 to 20 GHz RF Plug-in

HP 83592B 0.01 to 20 GHz (high power) RF Plug-in

HP 83592C 0.01 to 20 GHz (low harmonics) RF

Plug-in

HP 83594A 2.0 to 26.5 GHz RF Plug-in

HP 83595A 0.01 to 26.5 GHz RF Plug-in

**Option 002** Rear Panel RF Output

**Option 004:** 70 dB Step Attenuator (HP 83590A, 83592A/B)

55 dB Step Attenuator (HP 83592C, 83594A, 83595A)

	Band 0	Band 1	Band 2	Band 3	Band 4	Full Band
<b>Frequency Characteristics</b>						
<b>Range</b>						
HP 83590A	-	2-7	7-13.5	13.5-20	-	2-20
HP 83592A/B/C	.01-2.4	2.4-7	7-13.5	13.5-20	-	.01-20
HP 83594A	-	2-7	7-13.5	13.5-20	20-26.5	2-26.5
HP 83595A	.01-2.4	2.4-7	7-13.5	13.5-20	20-26.5	.01-26.5
<b>Accuracy (MHz, 25°C)</b>						
CW Mode	±5	±5	±10	±10	±12	-
All Sweep Modes (sweep time >100 ms)	±15	±20	±25	±30	±35	±25 (±50 <sup>1</sup> )
<b>Linearity (MHz, typical)</b>						
	±2	±2	±4	±5	±10	±10 (±15 <sup>1</sup> )
<b>Stability, typical</b>						
With Temperature (MHz/°C)	±0.2	±0.2	±0.4	±0.6	±0.8	-
With 10 dB Power Change (kHz)	±200	±200	±400	±600	±800	-
With 3:1 Load SWR (MHz)	±100	±100	±200	±300	±400	-
With Time <sup>2</sup> (kHz)	±100	±100	±200	±300	±400	-
<b>Residual FM (kHz peak, 10 Hz-10 kHz bandwidth)</b>						
	<5	<5	<7	<9	<12	-
<b>Output Characteristics</b>						
<b>Maximum Leveled Power (mW, 25°C)</b>						
With Option 002	10 (20 <sup>3</sup> ) 10 (16 <sup>3</sup> )	10 (20 <sup>3</sup> , 4 <sup>3</sup> ) 7 (14 <sup>3</sup> , 3.2 <sup>3</sup> )	10 (20 <sup>3</sup> , 4 <sup>3</sup> ) 6.3 (12 <sup>3</sup> , 2.5 <sup>3</sup> )	10 (2.5 <sup>3</sup> ) 5 (1.4 <sup>3</sup> )	2.5 1.25	10 (2.5 <sup>3</sup> ) 5 (1.25 <sup>3</sup> , 1.4 <sup>3</sup> )
<b>Power Level Accuracy (dB)</b>						
Internally Leveled	±1.5	±1.3	±1.3	±1.4	±1.7	±1.5 (±1.8 <sup>4</sup> )
<b>Power Variation (dB, max specified power)</b>						
Internally Leveled	±0.9	±0.7	±0.7	±0.8	±0.9	±0.9 (±1.0 <sup>4</sup> )
Externally Leveled <sup>5</sup>	±0.2 (0.25 <sup>6</sup> )	±0.2 (0.25 <sup>6</sup> )	±0.2 (0.25 <sup>6</sup> )	±0.2 (0.25 <sup>6</sup> )	±0.2 (0.25 <sup>6</sup> )	-
<b>Minimum Settable Power (dBm)</b>						
With Option 002	-5 (-2 <sup>7</sup> ) -60 (-72 <sup>7</sup> -75 <sup>7</sup> )	-5 (-2 <sup>7</sup> ) -60 (-72 <sup>7</sup> -75 <sup>7</sup> )	-5 (-2 <sup>7</sup> ) -60 (-72 <sup>7</sup> -75 <sup>7</sup> )	-5 (-2 <sup>7</sup> ) -60 (-72 <sup>7</sup> -75 <sup>7</sup> )	-5 (-2 <sup>7</sup> ) -60 (-72 <sup>7</sup> -75 <sup>7</sup> )	-
<b>Spurious Signals (dBc, max specified power)</b>						
<b>Harmonically Related</b>						
	<-25 (-20 <sup>8</sup> , -45 <sup>8</sup> )	<-25 (-55 <sup>8</sup> )	<-25 (-55 <sup>8</sup> )	<-25 (-55 <sup>8</sup> )	<-20	-
<b>Non-harmonics</b>						
	<-25	<-50 (-55 <sup>8</sup> )	<-50 (-55 <sup>8</sup> )	<-50 (-55 <sup>8</sup> )	<-50	-

<sup>1</sup> HP 83594A, 83595A specifications only.

<sup>2</sup> 10 minute period after one hour warm-up at

<sup>3</sup> HP 83592B specifications only.

<sup>4</sup> HP 83592C specifications only.

<sup>5</sup> Negative crystal detector (sweep time > 100

<sup>6</sup> HP 83592A specifications only.

<sup>7</sup> HP 83592C only: <-25 dBc (0.1-1.4 GHz)

<-45 dBc (1.4-2.4 GHz)

<-50 dBc (2.4-3.5 GHz)

<-55 dBc (3.5-20 GHz)

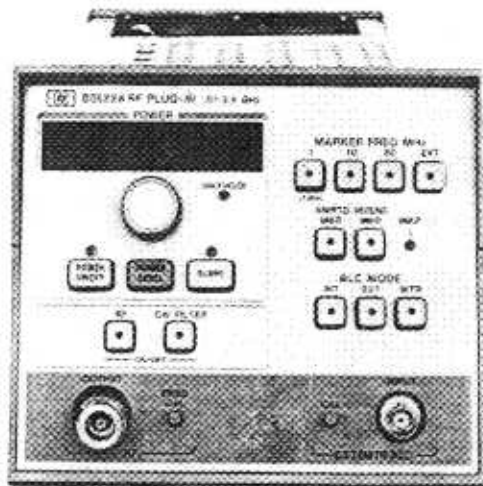
# SWEEP OSCILLATORS

## 8350 Family: Broadband Plug-ins (Cont.)

Models 83522A, 83525A and 83525B

- 10 MHz-2.4 GHz and 10 MHz-8.4 GHz in One Continuous Sweep
- Calibrated Output Power
- Power Sweep

- 1, 10, and 50 MHz Crystal Markers
- >45 dBc Harmonics 83525B from 2-8.4 GHz Output
- Complete HP-IB Programmability



83522A



83525B



Broadband frequency measurements may be made with the HP83522A (10 MHz to 2.4 GHz) plug-in and the HP 83525A/B (10 MHz to 8.4 GHz) plug-in. These plug-ins have similar functions as well as individual merits which are all described in the following article.

### 83522A

The 83522A uses a heterodyne circuit to provide high performance 10 MHz to 2.4 GHz frequency coverage. This frequency range is covered in one continuous sweep having excellent frequency characteristics. Frequency accuracy is maintained within 5 MHz and the linearity is within 2 MHz over the full band. The power output is internally leveled to  $\pm 0.25$  dB flatness over the entire 10 MHz to 2.4 GHz range while maintaining a power level  $\geq 13$  dBm.

### 83525A/B

The 83525A/B cover the unmatched frequency range of 10 MHz to 8.4 GHz with excellent frequency stability, accuracy, and output power. This wide frequency range is created by automatically switching two bands together with a PIN diode switch. The lower frequency band covers 0.01-2.1 GHz which results from a heterodyne circuit. The upper frequency band is produced by a 2-8.4 GHz YIG oscillator. This 0.1 GHz frequency overlap is provided to enable smooth, narrowband sweeps around the switch point. On a full band sweep (10 MHz to 8.4 GHz) the band discontinuity at the switchpoint will be typically  $< 8$  MHz. The 83525A/B maintain excellent frequency parameters with a lower band accuracy within  $\pm 5$  MHz and an upper band accuracy within 8 MHz. Full band frequency linearity is  $\pm 3$  MHz while the lower band maintains a linearity of  $\pm 2$  MHz.

The 83525A plug-in, with its extremely broad frequency range, does not sacrifice power. This plug-in provides at least +13 dBm of output power while being internally leveled to a flatness of  $\pm 1$  dBm.

The 83525B plug-in provides the same outstanding specifications as the 83525A plus 45 dBc harmonics for maximum dynamic range in RF component and system measurements.

### 83522/83525 Common Features Crystal Marker Capability

A powerful feature offered by the 83522A and the 83525A/B is Crystal Marker capability. This capability provides harmonic markers at 10 or 50 MHz intervals over the full range of the 83522A and below 2 GHz with the 83525A/B. In addition, 1 MHz harmonic markers are available below 1 GHz with all three plug-ins. These

markers may either be seen as intensity spots or amplitude dips. The x-axis intensity markers are compatible with the HP8755 Swept Frequency Response Test Set. These crystal markers simplify and speed up precision frequency measurements.

### Power Output

The 83522A and the 83525A/B plug-ins have a calibrated output power range of typically 15 dB that may be extended to  $> 80$  dB with Option 002 (70 dB attenuator). The output power level accuracy is within 1 dB on the 83522A and within 1.5 dB on the 83525A/B. The front panel digital resolution enables the power to be manually set to a 0.1 dB resolution. The power may be remotely HP-IB programmed to 0.02 dB resolution.

These plug-ins also offer a variety of power functions. An innovative feature offered on these plug-ins is Power Sweep, which sweeps the output power from one level to another. With this function, power response measurements may be made in a single test. Slope compensation is provided for situations that involve lossy cables or test set ups. This function slopes the power to compensate for high frequency losses via a "Slope" control.

### Programmability

The 83522A and the 83525A/B are completely programmable plug-ins. This infers that the power level, power mode (Power Sweep, Slope, etc.), crystal markers and other plug-in functions may be externally controlled via the HP-IB. Programmability is a key feature for automatic test systems or production environments requiring multiple, repetitive tests.

### Network Measurements

Increased dynamic range scalar measurements can be made using either the HP83522A or the 83525A with the HP8755 Swept Frequency Response Test Set. The dynamic range is increased by internally modulating the RF output with the required 27.8 KHz square wave (produced by the 8350A). This causes the output to be modulated before it is passed through the output amplifier, thereby avoiding modulation of the amplifier noise. The advantage of increased dynamic range is complemented by the simple interface between the sweep oscillator and the HP8755. In addition these plug-ins are directly compatible with the HP 8410B Network Analyzer for vector measurements, the HP 8970A Noise Figure Meter for level analysis and the HP 5344S Source Synchronizer for phase-lock applications.

# SWEEP OSCILLATORS

## Frequency Characteristics

Range	83522A		83525A/B	
	0.01-2.4 GHz		0.01-8.4 GHz	
Accuracy* (25°C ± 5°C)				
CW Mode	± 5 MHz	± 5 MHz	± 5 MHz	± 5 MHz
Typically	± 1.5 MHz	± 1.5 MHz	± 1.5 MHz	± 3.5 MHz
All Sweep Modes	± 15 MHz	± 15 MHz	± 15 MHz	± 20 MHz
Linearity Typically	± 2 MHz	± 2 MHz	± 2 MHz	± 3 MHz
Stability				
With Temperature: Typically	± 200 kHz/°C	± 200 kHz/°C	± 200 kHz/°C	± 200 kHz/°C
With 10% Line Voltage Change	± 20 kHz	± 20 kHz	± 20 kHz	± 20 kHz
With 10 dB Power Level Change	± 100 kHz	± 100 kHz	± 100 kHz	± 1 MHz
With 3:1 Load SWR	± 10 kHz	± 10 kHz	± 10 kHz	± 250 kHz
With 7 min in 10 minute period after one hour warmup at the same frequency setting. Typically Residual FM (10 Hz-10 KHz Bandwidth), peak	< ± 100 kHz	< ± 100 kHz	< ± 100 kHz	< ± 200 kHz
	< 5 kHz	< 5 kHz	< 5 kHz	< 7 kHz

## Output Characteristics

	83522A		83525A/B	
			0.1-2 GHz	2-8.4 GHz
Maximum Leveled Output Power (25°C ± 5°C)	+20 mW	+20 mW	+20 mW	+20 mW/10 mW
With Option 002	+20 mW	+20 mW	+20 mW	+16 mW/10 mW
Power Level Accuracy (Internally Leveled)	± 1 dB	± 1.5 dB	± 1.5 dB	± 1.5 dB
Calibrated Range	15 dB	15 dB	15 dB	15 dB
With Option 002	35 dB	35 dB	35 dB	35 dB
Attenuator Accuracy (per 1.0 dB step, typical)	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
Resolution (displayed)	0.1 dB	0.1 dB	0.1 dB	0.1 dB
Remote Programming (Settable)	± 0.02 dB	± 0.02 dB	± 0.02 dB	± 0.02 dB
Power Variation (Max. Rated Power) Internally Leveled	± 0.25 dB	± 1 dB	± 1 dB	± 1 dB
Externally Leveled (Excludes Coupler/Detector Variation) For Negative Crystal Detector and HP 432A/S/C Power Meter	< ± 0.1 dB	< ± 0.1 dB	< ± 0.1 dB	< ± 0.1 dB
With Temperature	± 0.02 dB/°C	± 0.02 dB/°C	± 0.02 dB/°C	± 0.02 dB/°C
Residual AM in 100 kHz Bandwidth	> 50 dBc	> 50 dBc	> 50 dBc	> 50 dBc
Spurious Signals				
Harmonics (for 10 mW output power) Typical	> 25 dBc	> 25 dBc**	> 25 dBc/45 dBc	> 30 dBc/50 dBc
Non-Harmonics Typical	> 25 dBc	> 30 dBc	> 30 dBc	> 60 dBc
Typical	> 30 dBc	> 35 dBc	> 35 dBc	> 60 dBc
Output VSWR (Internally leveled)	< 1.5	< 2.0	< 2.0	< 1.6

**Unleveled Indicator:** Lights when RF power level is set too high to permit leveling over sweep range selected.

**Impedance:** 50 Ω nominal

### Power Sweep

**Calibrated range:** 15 dB

**Accuracy (Including linearity):** < ± 1.5 dB Typical

**Resolution:** 0.1 dB

### Slope Compensation

**Calibrated range:** up to 5 dB/GHz (10 dB over full range, typically 15 dB)

**Linearity:** < 0.2 dB Typical

**Resolution:** 0.1 dB/GHz

### Modulation Characteristics

#### External AM

**Frequency response:** 100 kHz Typically

**Input impedance:** Approximately 10 kΩ

**Range of amplitude control:** 15 dB Typically

**Sensitivity:** 1 dB/V Typically

**Maximum input:** 15 V

**Pulse modulation:** (83525A/B, 2-8.4 GHz)

**Rise/fall time:** 20 nsec Typically

**Minimum pulse width:** Leveled: 1 μsec Typically

Unleveled: 100 nsec Typically

\* When calibrated using internal crystal markers and FREQ CAL adjustment.

\*\* 83525A harmonics > 20 dBc for 20 mW output power.

### Internal AM

Selectable (by Internal Jumper in 8350A) to 1 kHz or 27.8 kHz square wave modulation. 27.8 kHz Modulation guarantees operation with HP 8755 Frequency Response Test Set.

### External FM

Maximum Deviations for Modulation Frequencies

DC to 100 Hz: ± 75 MHz

100 Hz to 1 MHz: ± 7 MHz

1 MHz to 2 MHz: ± 5 MHz

2 MHz to 10 MHz: ± 1 MHz

### Sensitivity

**FM Mode:** -20 MHz/V Typical

**Phase-lock mode:** -6 MHz/V Typical

**Input impedance:** 2 kΩ nominal

**Frequency response (DC to 2 MHz):** ± 3 dB

### Crystal Marker Capability

**Internal crystal markers:** Harmonic markers of 10 and 50 MHz are available over the full range of the 83522A and below 2 GHz with 83525A/B. 1 MHz harmonic markers are available below 1 GHz with the 83522A and 83525A/B. Markers are output as intensity spots through the POS Z BLANK connector on the 8350A, or as amplitude dips on the RF output.

**Accuracy of center frequencies (25°C):** ± 5 × 10<sup>-7</sup>

**Typical Marker Width Around Center Frequency**

**1 MHz Markers:** ± 100 kHz

**10 MHz Markers:** ± 200 kHz

**50 MHz Markers:** ± 300 kHz

**Temperature stability:** ± 2 × 10<sup>-4</sup>/°C Typical

**External marker input:** Generates amplitude or Z-axis marker when sweep frequency equals external input frequency.

**Frequency range:** .01 to 2.4 GHz (2.0 GHz for 83525A/B)

**Marker width:** ± 300 kHz

**Marker indicator light:** LED lights when coincident with crystal or external marker for accurate CW calibration.

### General Specifications

**Sweep Time (minimum over full band)**

**83522A (.01-2.4 GHz):** 10 ms

**83525A/B (.01-8.4 GHz):** 17 ms

**Switch points (83525A/B Only):** Low Band 0.1-2.1 GHz, High Band 2.0-8.4 GHz. Internal band switch point at 2.0-2.1 GHz

**Frequency reference output:** Nominal 1 V/GHz (over full sweep range) ± 10 mV rear panel BNC output.

**RF Output connector:** Type N female

**Weight:** Net 4.5 kg. (10 lb.). Shipping 7.7 kg. (17 lb.)

### Improved Network Measurement Capabilities

The 83522A and 83525A/B are compatible with the:

8410 Network Analyzer

8755 Scalar Network Analyzer

8970A Noise Figure Meter (Frequencies > 2 GHz)

8709A Phase-lock Synchronizer

5344S Source Synchronizer

### Ordering Information

**83522A** +13 dBm, 0.1-2.4 GHz RF Plug-in

#### Options:

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

**004:** Rear Panel RF Output

**83525A** +13 dBm, 0.1-8.4 GHz RF Plug-in

**83525B** +10 dBm, .01-8.4 GHz RF Plug-in

#### Options:

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

**004:** Rear Panel RF Output