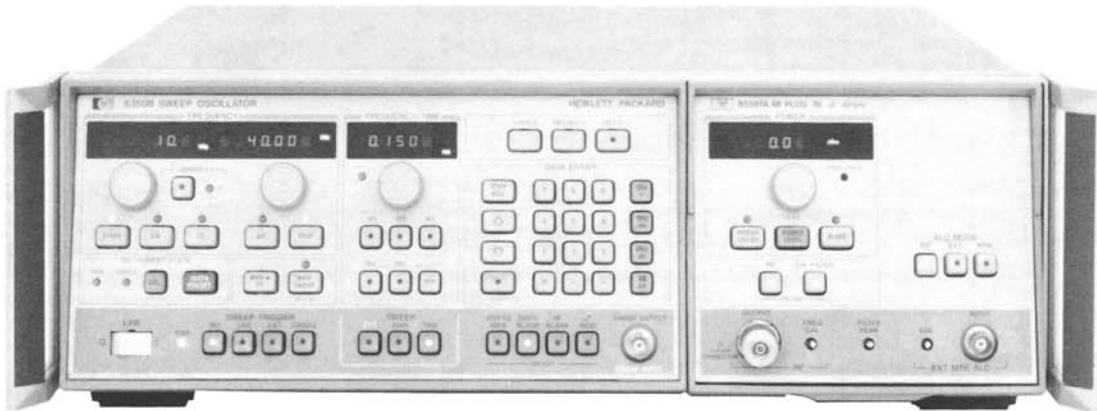


SWEEP OSCILLATORS

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 8350B



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 frequency difference 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.

The HP 8350 provides full compatibility with the HP 8510 Network Analyzer and the HP 8757 Scalar Network Analyzers for convenient vector and scalar measurements. 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 1.5 to 20 GHz and -40 dBc from 20 to 40 GHz. The HP 83595A/C, operate from 10 MHz to 26.5 GHz without sacrificing frequency accuracy (± 12 MHz at 26.5 GHz). The HP 83595C also provides -50 dBc harmonics and subharmonics from 1.5 to 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), 40 to 60 GHz (HP 83556A), 50 to 75 GHz (HP 83557A), and 75 to 110 GHz (HP 83558A) bands by effectively extending the characteristics of an 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 83572C) are also capable of power meter leveling with the HP 432A/B/C, 436A, and 438A power meters.

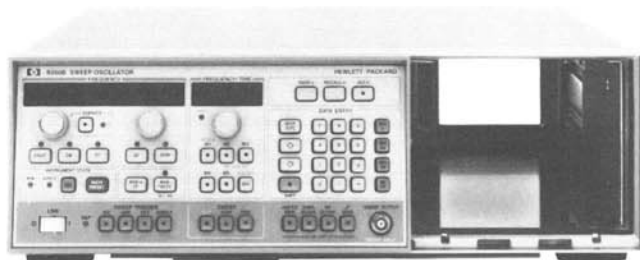
All HP 83500 series front panel functions are HP-IB programmable including power level. This means your automatic test systems can now characterize a device both as a function of frequency and input power level.

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 30 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 Δ 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 8757 scalar network analyzers. 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 Δ , 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 8757 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/ Δ F Sweep: sweeps symmetrically upward, centered on CF.

Δ 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).

Δ F Resolution: 0.1% of full band (1024 points across band), 0.012% of band for $\frac{1}{8}$ of band or less, 0.0015% of band for $\frac{1}{64}$ 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.

Alt 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 plug-in specifications.

Internal AM: Selectable to 27.8 kHz or 1 kHz. On/off ratio, refer to RF plug-in specifications.

External FM: refer to RF plug-in 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/ Δ 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, E1.

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 375 volt-amperes including RF plug-in.

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: Extended Repair Service. See page 725.

W32: Calibration Service. See page 725.

Price

\$4,900

add \$60

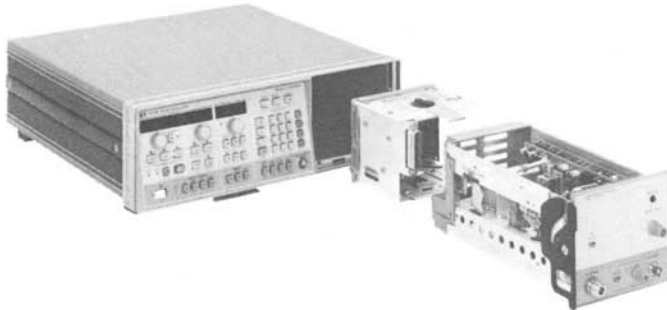
add \$80

add \$125

add \$360

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 407 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 ^{1,2}	HP 86240A/B/C	HP 86250A ¹ /B ¹ /C/D ²
HP 86222A/B	HP 86241A ¹	HP 86251A ³
HP 86230B ^{1,2}	HP 86242A ¹ /C/D ²	HP 86260A ¹ /B ^{1,3} /C ^{1,3}
HP 86235A	HP 86245A	HP 86290A ² /B/C

Ordering Information

HP 11869A Adapter

Price

\$750

Options

004: Extension Cables for Plug-ins with Rear Panel RF Output add \$200

006: Type N Aux Out Interface Connector for HP 86251A and 86290A²/B/C add \$200

W30: Two Additional Years Return to HP Support add \$50

¹ Not compatible with 27.8 kHz square wave modulation.

² Models HP 86220A, 86230B, 86290A, 86250A/B/C, and 86242A/C are obsolete. However, existing models can interface to HP 8350B mainframe via the HP 11869A adapter.

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

RF Plug-in Summary

	HP Model number	Frequency range (GHz)	Leveled power output	CW Frequency accuracy (MHz)	Complete specifications on page
Broad-band Plug-ins	83597A	0.01-40	1 mW	±20	403
	83596A	2.4-40	1 mW	±20	403
	83595A	0.01-26.5	2.5 mW	±12	401
	83595C	0.01-26.5	10 mW/20mW ¹	±12	401
	83594A	2-26.5	2.5 mW	±12	401
	83592A/B	0.01-20	10 mW/20 mW ¹	±10	401
	83592C	0.01-20	2.5 mW/4 mW ²	±10	401
	83590A	2-20	10 mW	±10	401
	83525A/B	0.01-8.4	20 mW/10 mW	±15/12	404
	83522A	0.01-2.4	20 mW	±5	404
	86222A/B	0.01-2.4	20 mW	±10	407
	86290B	2-18.6	10 mW	±30	407
86290C	2-18.6	20 mW	±30	407	
Straddle-band Plug-ins	83540A/B	2-8.4	40 mW/20 mW	±12	404
	86240A	2-8.4	40 mW	±25	407
	86240B	2-8.4	20 mW	±25	407
	86240C	3.6-8.6	40 mW	±25	407
	86251A	7.5-18.6	10 mW	±20 ³	407
	83550A	8.0-20.0	100 mW/63 mW ⁴	±20	404
Single-band Plug-ins	86235A	1.7-4.3	40 mW	±20	407
	86241A	3.2-6.5	5 mW	±30	407
	86242D	5.9-9	10 mW	±35	407
	83545A	5.9-12.4	50 mW	±20	404
	86245A	5.9-12.4	50 mW	±40	407
	86250D	8.0-12.4	10 mW	±40	407
	86260B	10-15.5	10 mW	±50	407
	86260A	12.4-18	10 mW	±50	407
	86260C	17-22	10 mW	±50	407
	83570A	18-26.5	10 mW	±30	404
	83572A	26.5-40	1.6 mW (Opt 001)	±100	404
	83572B	26.5-40	4 mW (Opt 001)	±100	404

NOTE: The HP 11869A Adapter is required to interface HP 86200 series plug-ins with the HP 8350B mainframe.

¹ 20 mW to 18 GHz (HP 83592B) and 20mW to 20 GHz (HP 83595C).

² HP 83592C: 4 mW to 18.6 GHz.

³ When installed in HP 8350 with HP 11869A Adapter.

⁴ HP 83550A: 100 mW to 18.6 GHz.

SIGNAL SOURCES

Model 8350 Series: RF, Plug-Ins

HP 83500 Series

HP 83500 Series Plug-Ins: Specifications Summary	Broadband			Straddle-band		Single-band
	HP 83522A ¹	HP 83525A ¹	HP 83525B ¹	HP 83540A	HP 83550A	HP 83545A
Frequency characteristics						
Range (GHz)	0.01 to 2.4	0.01 to 8.4	0.01 to 8.4	2 to 8.4	8 to 20	5.9 to 12.4
Accuracy (MHz, 25° C)						
CW mode	±5	±12 ²	±12 ²	±12	±20	±20
All sweep modes (sweep time > 100 ms)	±15	±20 ²	±20 ²	±20	±50	±35
Residual FM (kHz peak, 10 Hz to 10 kHz bandwidth)	<5	<7 ⁴	<7 ⁴	<7	<25 ⁶	<15
Output characteristics						
Maximum leveled power (dBm, 25° C)	>13	>13	>10	>16	>20 ³	>17
Power level accuracy (dB)						
Internally leveled	±1	±1.5	±1.5	±1.5	±1.5	±1
Power variation (dB, at max specified power)						
Internally leveled	±0.25	±1	±1	±1	±1.25	±0.6
Externally leveled, typical (excluding coupler/detector variations)	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
Spurious signals (dBc, at max specified power)						
Harmonically related	< -25	< -20	< -45 ²	< -20	< -20 ⁵	< -30 ⁶
Non-harmonics	< -25	< -60 ⁴	< -60 ⁴	< -60	< -50	< -60
Source SWR, typical (50 Ω nominal, internally leveled)	<1.5	<1.6 ⁴	<1.6 ⁴	<1.6	<2.5	<1.6
Modulation characteristics						
External pulse, typical						
Rise/fall time (ns)	n/a	20 ²	20 ²	20	25	15
Minimum RF pulse width						
Leveled (μs)	n/a	1 ²	1 ²	1	1	1
Unleveled (ns)	n/a	100 ²	100 ²	100	100	100
External FM						
Maximum deviation (MHz)						
dc to 100 Hz rates	±75	±75	±75	±75	±75	±75
100 Hz to 200 kHz rates	±7	±7	±7	±7	±12	±7
200 kHz to 1 MHz rates	±7	±7	±7	±7	±12	±7
1 to 2 MHz rates	±5	±5	±5	±5	±12	±5
2 to 6 MHz rates	±1	±1	±1	±1	±12	±1
6 to 10 MHz rates	±1	±1	±1	±1	n/a	±1
Sensitivity (MHz/volt), typical	-20/-6	-20/-6	-20/-6	-20/-6	-20/-6	-20/-6
External AM						
Frequency response (kHz), typical	100	100	100	100	100	100
Range (dB), typical	>15	>15	>15	>15	>20	>15
Sensitivity (dB/volts)	+1	+1	+1	+1	+1	+1
Internal AM (1 kHz/27.8 kHz square wave)						
On/off ratio (dB)	>30	>30	>30	>30	>30	>40
Prices						
Plug-in	\$8,870	\$15,050	\$16,500	\$11,600	\$20,600	\$12,600
With Opt 001 (calibrated external leveling)	n/a	n/a	n/a	n/a	n/a	n/a
With Opt 002 (70 dB attenuator)	+\$1,025	+\$1,125	+\$1,140	+\$1,140	+\$1,345 ⁷	+\$1,140
With Opt 004 (rear panel RF output)	+\$204	+\$204	+\$206	+\$206	+\$206	+\$206
With Opt 006 (Int. sq. wave mod. and ext. pulse mod.)	n/a	n/a	n/a	n/a	n/a	n/a
With Opt W30 (two years extended service)	+\$194	+\$290	+\$291	+\$220	+\$388	+\$255
With Opt W32						+\$326
Calibration service (see page 588)	+\$827	+\$704	+\$827	+\$679	+\$1,097	+\$704

¹ Enhanced frequency accuracy is provided by internal crystal markers of 10 MHz and 50 MHz (over full range for HP 83522A, and below 2 GHz for HP 83525A/B). 1 MHz harmonic markers are available below 1 GHz.

² Specifications apply from 2 to 8.4 GHz only. 0.01 to 2 GHz specifications are the same as for the HP 83522A plug-in.

³ 18 dBm from 18.6 to 20 GHz

⁴ Specifications apply only from 2 to 8.4 GHz; below 2 GHz non-harmonics are < -30 dBc and SWR is < 2.0.

⁵ -15 dBc from 8 to 11 GHz

⁶ -17 dBc from 5.9 to 7 GHz

⁷ 50 dB step attenuator

⁸ 20 Hz to 15 kHz bandwidth