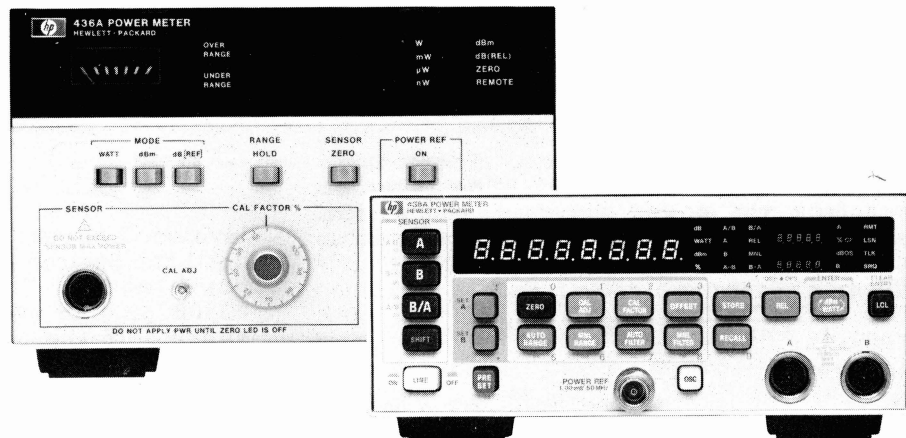
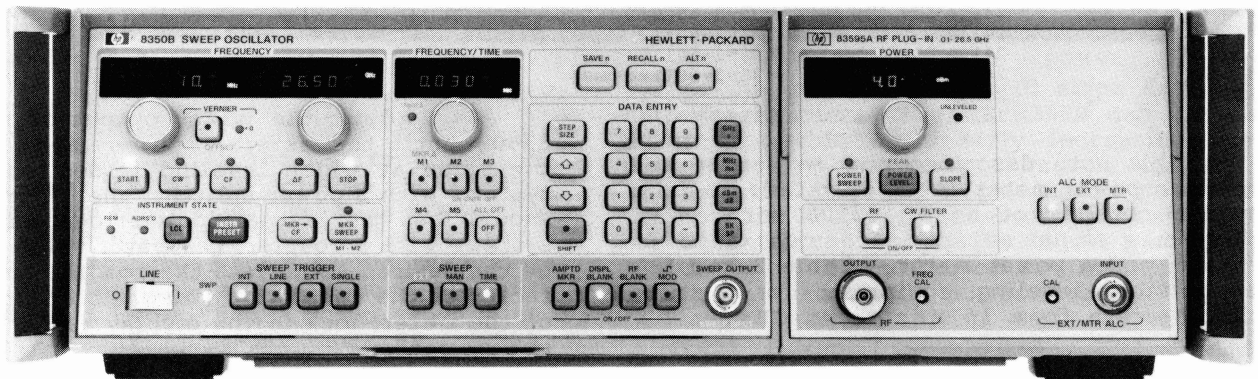


# LEVELING THE HP 8350B SWEEP OSCILLATOR WITH AN HP 430 SERIES POWER METER



## Introduction

The HP 8350B sweep oscillator with an HP 83500 series RF plug-in can now be externally leveled using an HP 436A or 438A power meter. A redesigned PC board in the HP 83500 series RF plug-ins has improved the ALC characteristics, expanding the list of power meters that can be used to level the HP 8350B from just the HP 432A power meter to the HP 432A, 436A, and 438A power meters\*. The new ALC board has been standard in the HP 83500 series plug-ins shipped since April 15, 1984. Table 1 contains serial number prefixes of the RF plug-ins with the new ALC board, and it also contains the part number of the retrofit kit for RF plug-ins without the new ALC board.

Table 1

HP 83500 series RF plug-ins with the new ALC board, and retrofit part numbers for those without.

RF plug-in	Lowest Serial Number Prefix with the new ALC Board	Retrofit Kit Part Number
83522A	2411A	83522-60023
83525A	2412A	83525-60086
83525B	2411A	83525-60087
83540A	2414A	83540-60024
83540B	2411A	83540-60025
83545A	2411A	83545-60070
83570A	2412A	83570-60083
83590A	2411A	83590-60081
83592A	2411A	83592-60112
83592B	2410A	83592-60112
83592C	2412A	83592-60112
83594A	2409A	83590-60081
83595A	2411A	83592-60112

This note describes how to set up and adjust a power meter-leveled system. Such a system consists of an HP 8350B with an RF plug-in, a signal separation device, a power sensor, and a power meter. Table 2 is a list of possible leveling equipment for systems that operate from 10 MHz to 40 GHz.

Table 2

	.01	.05	2	8	12	18	26.5	40
Thermistor Mount For HP 432A/B/C	HP 8478B (Type N)							
	(Waveguide) X486A P486A K486A R486A							
Thermocouple For HP 435A, 436A, 438A	HP 8481A (Type N or APC 7)							
	HP 8584 (APC 3.5)							
Power Splitters	HP 11667A (Type N)							
	HP 11667B (APC-3.5)							
Directional Couplers	HP 778D HP 11691D/92D (Type N)							
	(Waveguide) X752D P752D K752D R752D							

(GHz)

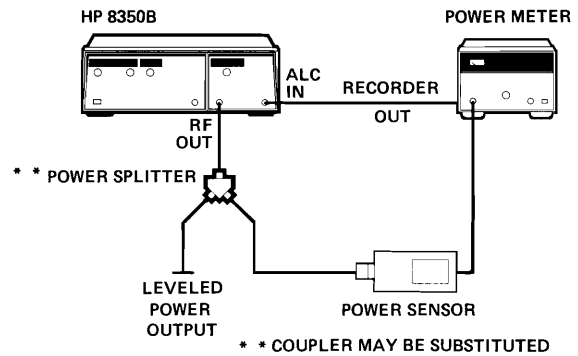
### Setting up leveled power

1) Set up the equipment. The configuration is shown in Figure 1. The recorder output from the power meter is used as the leveling feedback signal, and is connected to the ALC input on the RF plug-in. On the HP 8350B:

Press

\*Note: the HP 435A power meter can not be used to level the HP 8350B.

Figure 1



2) If using the HP 436A or 438A digital power meters: set the display range to the range containing the desired leveled power. In order to prevent these meters from switching display ranges and resetting their recorder output at large power deviations, they should be used in hold range mode. For best performance, the power level should be chosen so that the meter is not at the extreme of a range. The range is set as follows: put the HP 8350B in CW mode, at the center frequency of the band of interest:

Press

Key in center frequency

Adjust the power output of the HP 8350B until the external power meter reads the value at which leveling is desired. For systems with a power splitter, the meter value should be the actual power desired. For systems with a coupler, the meter value should be the desired value less the nominal coupling factor of the coupler. With the correct value on the meter, lock in the display range on the power meter:

Press

3) Set up the HP 8350B instrument state. Select CW or sweep mode, and enter the frequency or frequency range desired. To allow for the response time of the power sensors for the HP 430 series power meters, the HP 8350B sweep time should be set to greater than 50 seconds for a full band sweep:

Press

Key in sweep time

TIME

Engage meter leveling:

Press

MTR

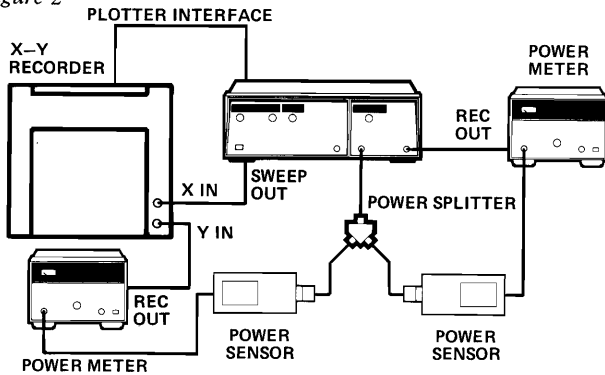
The system is now externally leveled. Adjust the HP 8350B power output until the desired power level is attained at the power meter. The unlevelled light on the HP 8350B plug-in should be off over the entire sweep. If the unlevelled light is on, and all connections are made properly, the system should be re-leveled at a lower power level.

### Verifying and Adjusting the Power Leveling

With a second power meter and an X-Y recorder, the power leveling can be verified and plotted, the power display on the HP 8350B can be calibrated, and the slope of the leveled power can be changed.

A. Plotting the leveled sweep. Place the second power meter sensor at the leveled power point, and connect the second power meter and the X-Y recorder as shown in Figure 2. The plotter interface between the HP 8350B and the X-Y recorder varies according to the capabilities of the recorder.

Figure 2



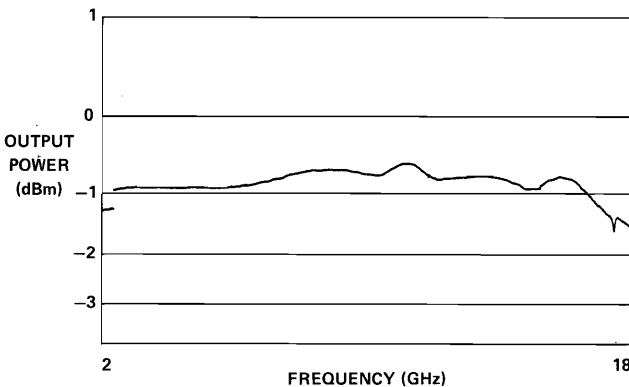
See the Appendix for the appropriate interface.

Place the source in single sweep mode:

Press **SINGLE**

Turn on the X-Y recorder and set the input limits: 10 volts on the X axis, and 2 volts on the Y axis. Pressing **SINGLE** on the HP 8350B will cause the plotter to trace the leveled output. Shown in Figure 3 is a typical leveling plot, made with two HP 436A power meters, two HP 8485A power sensors, an HP 83592B RF plug-in, an HP 7090A Measurement Plotting System, and a mute circuit as described in the Appendix. Note the 0.3 dB discontinuity at about 2.4 GHz. The HP 83592B RF plug-in has two independent internal leveling systems: one each above and below 2.4 GHz. The outputs of these loops are aligned during an internally leveled sweep, and when a single external ALC feedback is used, the differences in the ALC loops appear at the bandcrossing, thus causing a discontinuity at 2.4 GHz.

Figure 3



B. Calibrating the power level display on the HP 8350B. A calibration adjustment is provided on the RF plug-in so that the display can be calibrated for different leveling systems. Calibration is done in CW mode and the display is set to read the power at the leveled power point.

Put the HP 8350B in CW mode:

Press

Key in the desired leveled power:

Press

Key in level

Adjust the ALC cal control until the second power meter agrees with the HP 8350B level meter:

CAL INPUT  
   
 EXT/MTR ALC

The HP 8350B ALC cal control changes the actual output power, not the power displayed on the HP 8350B level meter.

C. Setting the power slope. Often, the leveled power will slope down at high frequencies. The HP 8350B can compensate for this by linearly increasing the power as the frequency is swept upwards. This function is called slope, and the power is added as dB/GHz. If the leveling plot shows a significant droop, simply divide the extent of the droop by the number of GHz in the sweep and enter that as the power slope:

Press

Key in slope

The plot in Figure 3 was made using 0.04 dB/GHz slope.

### Appendix

#### THE PLOTTER INTERFACE

The HP 8350B has to have two control lines to the X-Y recorder. One control line is penlift, to prevent the retrace from appearing. The other control line is mute, in order to prevent the spike at band crossings from appearing. These signals can be accessed through the programming connector on the HP 8350B, and penlift also appears at a BNC connector on the rear panel of the HP 8350B. See the HP 8350B operating guide for pin locations, and see the X-Y recorder operating guide for the location of the control lines, which are usually found on the auxiliary connector. For those recorders without a mute function, a simple penlift dwell circuit must be added to the HP 8350B to emulate the mute function. One such circuit is described in Product Note 8350-3 (5953-8859).



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