

**83545A**  
**RF PLUG-IN**  
**(Including Options 002 and 004)**

**SERIAL NUMBERS**

This manual applies directly to HP Model 83545A  
RF Plug-in having serial number prefix 2101A.

For additional information about serial numbers,  
refer to INSTRUMENTS COVERED BY  
MANUAL in Section I.

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BP21.2

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## SAFETY CONSIDERATIONS

### GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been designed and tested in accordance with international standards.

### SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).



Indicates hazardous voltages.



Indicates earth (ground) terminal.

**WARNING**

The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.

**CAUTION**

The **CAUTION** sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a **CAUTION** sign until the indicated conditions are fully understood and met.

### SERVICING

**WARNING**

*Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.*

*Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.*

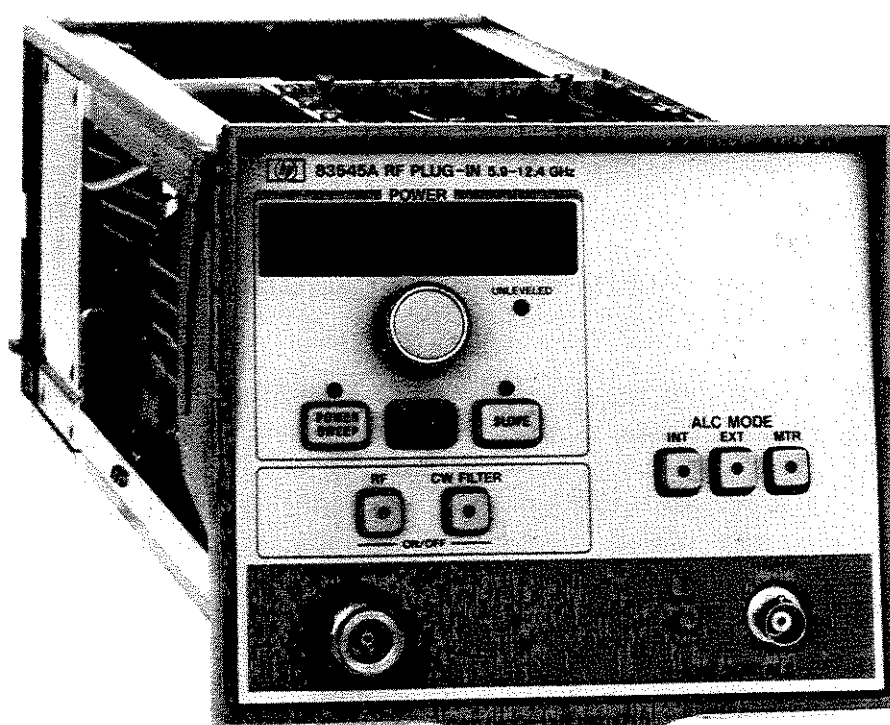


Figure 1-1. Model 83545A RF Plug-in



## SECTION I GENERAL INFORMATION

### 1-1. INTRODUCTION

1-2. This Operating and Service Manual contains information required to install, operate, test, adjust, and service the Hewlett-Packard Model 83545A RF Plug-in. Figure 1-1 shows the Model 83545A.

1-3. This manual is divided into eight major sections which provide the following information:

- a. **SECTION I, GENERAL INFORMATION**, includes a brief description of the instrument, safety considerations, specifications, supplemental characteristics, instrument identification, options available, accessories available, and a list of recommended test equipment.
- b. **SECTION II, INSTALLATION**, provides information for initial inspection, preparation for use, storage, and shipment.
- c. **SECTION III, OPERATION**, explains the frequency resolution characteristics of the RF plug-in in CW and swept frequency modes. Operating instructions include FM switch parameter settings, and crystal and power meter leveling instructions. A description of front and rear panel features and plug-in error codes is also given.
- d. **SECTION IV, PERFORMANCE TESTS**, presents procedures required to verify that performance of the RF Plug-in is in accordance with published specifications.
- e. **SECTION V, ADJUSTMENTS**, presents procedures required to properly adjust and align the Model 83545A RF Plug-in after repair.
- f. **SECTION VI, REPLACEABLE PARTS**, provides information required to order all parts and assemblies.
- g. **SECTION VII, MANUAL BACKDATING CHANGES**, provides backdating information required to make this manual compatible with earlier shipment configurations.
- h. **SECTION VIII, SERVICE**, provides an overall instrument block diagram with troubleshooting and repair procedures. Each assembly within the instrument is covered on a separate Service Sheet which contains a circuit description, schematic diagram, component location diagram, and troubleshooting information to aid in the proper maintenance of the instrument.

1-4. Supplied with this manual is an Operating Information Supplement. This is simply a copy of the first three sections of the manual which should be kept with the instrument for use by the instrument operator.

1-5. On the title page of this manual is a "Microfiche" part number. This number may be used to order 10- by 15-centimeter (4- by 6-inch) microfilm transparencies of the manual. Each microfiche contains up to 60 photo duplicates of the manual pages. The microfiche package also includes the latest Manual Changes sheet as well as all pertinent Service Notes.

1-6. Refer any questions regarding this manual, the Manual Changes sheet, or the instrument to the nearest HP Sales/Service Office. Always identify the instrument by model number, complete name, and complete serial number in all correspondence. Refer to the inside rear cover of this manual for a worldwide listing of HP Sales/Service Offices.

### 1-7. SPECIFICATIONS

1-8. Listed in Table 1-1 are the specifications for the Model 83545A RF Plug-in. These specifications are the performance standards, or limits, against which the instrument may be tested.

Table 1-2 lists the RF Plug-in supplemental performance characteristics. Supplemental performance characteristics are not specifications but are typical characteristics included as additional information for the user.

### 1-9. SAFETY CONSIDERATIONS

1-10. This product has been manufactured and tested in accordance with international safety standards. Before operation, this product and related documentation must be reviewed for familiarization with safety markings and instructions. A complete listing of Safety Considerations precedes Section I of this manual.

### 1-11. INSTRUMENTS COVERED BY MANUAL

1-12. Attached to the rear panel of the instrument is a serial number plate. A typical serial number plate is shown in Figure 1-2. The serial number is in two parts. The first four digits followed by a letter comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The content of this manual applies directly to instruments having the same serial number prefix as those listed on the title page of this manual under SERIAL NUMBER.

1-13. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. An unlisted serial prefix indicates that the instrument is different from those documented in this manual. The manual for the instrument is then supplied with a Manual Changes supplement that contains information which documents the differences.

1-14. In addition to change information, the Manual Changes supplement contains information for correcting errors in the manual. To keep this manual as current as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to the manual's print date and part number, both of which appear on the title page. Complimentary copies of the Manual Changes supplement are available on request from Hewlett-Packard.

1-15. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes Supplement, contact your nearest Hewlett-Packard Sales/Service Office.

### 1-16. DESCRIPTION

1-17. The Model 83545A is an RF plug-in which has been designed for use with the Model 8350A Sweep Oscillator. The RF frequency source for the 83545A is a solid-state tunable YIG Oscillator with a frequency range of 5.9 to 12.4 GHz.

1-18. Model 83545A front panel functional controls, pushbuttons, and the Rotary Pulse Generator (RPG), are monitored by the Model 8350A via the RF plug-in interface circuits. The Model 8350A generates a tuning voltage according to the mode of operation (CW, START/STOP, CF/ $\Delta$ F). This signal is scaled and offset by the plug-in to provide a voltage ramp (in swept modes) proportional to the YIG oscillator frequency. The Model 83545A tuning circuits accept the tuning ramp output from the Model 8350A and convert it to a current which drives the YIG oscillator tuning coil.

1-19. The Model 83545A offers a maximum leveled RF output power of +17 dBm. Internal (INT), External (EXT), and Power Meter (MTR) leveling is available as selected by the front panel pushbuttons. A front panel EXT/MTR ALC input connector and offset control (CAL) are provided to use with an external leveling loop. A front panel LED indicates when the RF output becomes unlevelled. The RF output level is controlled by the Model 83545A RPG, the Model 8350A data entry controls (keypad and step keys), or through HP-IB control via the Model 8350A.

1-20. A power sweep function allows the RF output power to be swept at least 15 dB during CW mode or swept frequency modes. (The calibrated range of the power sweep function in Option 002 instruments is at least 14 dB.) Power sweep is selected by the front panel POWER SWEEP pushbutton. Slope compensation control is also available by selecting the SLOPE pushbutton and rotating the Model 83545A RPG or manipulating the Model 8350A data entry controls. The power sweep function

and slope compensation may both be selected and modified through HP-IB control via the Model 8350A.

1-21. The RF output may be internally or externally amplitude modulated, or externally frequency modulated. Internal squarewave modulation frequency is selectable by a Model 8350A internal jumper to be either 1 kHz or 27.8 kHz (for use with the Model 8755 Swept Amplitude Analyzer). Rear panel BNC connectors accept an external AM or FM frequency. FM coupling (direct coupled or cross-over) and sensitivity is selected by an internal configuration switch in the Model 83545A. Refer to Section III, Operation, of this manual for detailed information on the configuration switch.

1-22. A rear panel 1V/GHz signal corresponds to the RF output frequency. This output voltage may be used as a reference for pre-tuning external equipment in phase locking applications. (The Model 8410B/8411A Network Analyzer utilizes this output in such a configuration.)

1-23. The RF output may be turned off by the RF ON/OFF pushbutton. RF power ON is indicated by the LED in the center of the pushbutton. Additionally, in CW mode, the CW FILTER, when selected, places a capacitor across the YIG oscillator tuning coil to filter high frequency noise which would appear at the RF output. All front panel functions, with the exception of the EXT/MTR ALC CAL adjustment, may be set or altered by computer control via the HP-IB bus connection on the Model 8350A.

## 1-24. OPTIONS

### 1-25. Option 002, 70 dB Attenuator

1-26. Option 002 instruments contain a digitally controlled attenuator just before the RF output. Up to 70 dB of attenuation in 10 dB steps is automatically selected as required to attenuate the RF output power to the indicated level. The continuously variable power level function operates as in a standard instrument with the data entry controls. Maximum leveled RF output power is specified at +16 dBm in Option 002 instruments.

### 1-27. Option 004, Rear Panel RF Output

1-28. Option 004 instruments have the Type N RF output connector and the BNC EXT/MTR ALC input connector on the rear panel instead of the front panel.

### 1-29. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-30. To have a complete operating sweep oscillator unit, the Model 83545A RF plug-in must be installed in a Model 8350A Sweep Oscillator. Refer to Section II Installation in this manual for a detailed description of RF plug-in installation.

### 1-31. EQUIPMENT AVAILABLE

### 1-32. Service Accessories

1-33. A Service Accessory Kit (HP Part Number 08350-60020) is available for servicing the Model 83545A RF plug-in and the Model 8350A Sweep Oscillator. HP Part Numbers for the individual pieces of the kit are provided in Table 1-3. The accessory kit includes:

- Two 44-pin printed circuit board extenders. These boards have keyed slots which allow them to be used in each of the keyed pc board receptacles in the Model 83545A, and in the Model 8350A as well.
- An RF Plug-in extender cable set that provides all electrical connections when the RF Plug-in is removed from the sweep oscillator. The RF Plug-in Interface connector (P2) and the Power Supply Interface connector (P1) are extended by separate cables.
- One Hex Balldriver for use in Model 8350A front panel repairs.
- One 16-pin and one 20-pin I.C. Test Clip for probing integrated circuits.

1-34. A listing of service accessories available including service cables, wrenches, adapters, and extender boards is given in Table 1-3.

**1-35. Model 8410B/8411A Network Analyzer**

1-36. The Model 8350A Sweep Oscillator, with the Model 83545A RF Plug-in installed, is compatible with the HP Model 8410B Network Analyzer system. The combination of the Model 8410B Network Analyzer, the Model 8411A Frequency Converter, and an appropriate display plug-in forms a phasemeter and a ratiometer for direct phase and amplitude ratio measurement on RF voltages. These measurements can be made on single frequencies and on swept frequencies from 110 MHz to 18 GHz. The Model 8350A/83545A combination is capable of operation from 5.9 GHz to 12.4 GHz within this range. The Model 8410B has an Auto-Frequency range mode which gives it the capability of automatically tracking the Model 8350A Sweep Oscillator over octave and multi-octave frequency bands. Two interconnections to the Model 8350A are necessary to ensure that the Model 8410B will phase lock properly. The Model 8410B Source Control Cable (HP 08410-60146) connects the Model 8410B rear panel SOURCE CONTROL connector to the Model 8350A rear panel PROGRAMMING CONNECTOR. Additionally, the Model 83545A RF Plug-in rear panel 1V/GHz output connects to the Model 8410B rear panel FREQ REF INPUT. The Model 8410B Source Control Cable connector pins and signals are illustrated in the Model 8350A Sweep Oscillator Operating and Service Manual.

**1-37. Model 8755 Frequency Response Test Set**

1-38. The Model 8350A Sweep Oscillator with the Model 83545A RF Plug-in installed is compatible with the Model 8755 Frequency Response Test Set for broadband swept scalar measurements. The Model 8350A provides internal 27.8 kHz square wave amplitude modulation of the RF output, eliminating unnecessary cable connections to the Model 8755 or the use of an external modulator. The Model 8350A can also produce alternate

sweeps through use of the ALT n function which works in conjunction with the channel switching circuits in the Model 8755C. This permits Channel 1 on the Model 8755C to respond only to the Model 8350A current state and Channel 2 to the alternate state. A single cable (HP Part Number 8120-3174) connects between the Model 8350A rear panel ALT SWP INTERFACE connector and the Model 8755C front panel ALT SWP INTERFACE connector.

**1-39. Power Meters and Crystal Detectors**

1-40. The RF output can be externally leveled using the HP Model 432 Power Meter or negative polarity output crystal detectors. Refer to Section III Operation of this manual for detailed information on leveling techniques that may be used with the Model 8350A/RF Plug-in combination.

**NOTE**

The Model 435A and 436A Power Meters should not be used in Model 8350A/Model 83545A external leveling systems.

**1-41. RECOMMENDED TEST EQUIPMENT**

1-42. Equipment required for testing and adjusting the instrument is listed in Table 1-4. Other equipment may be substituted if it meets or exceeds the critical specifications indicated in the table.

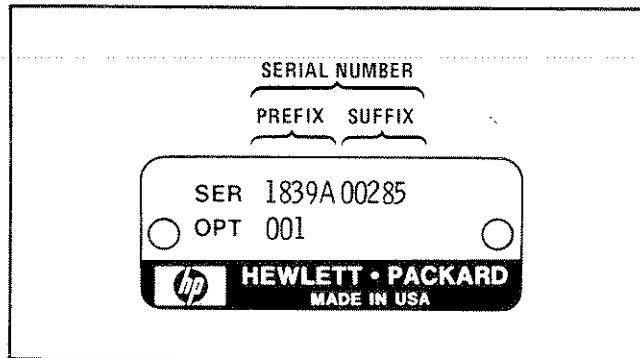


Figure 1-2. Typical Serial Number Plate

Table 1-1. Specifications for Model 83545A Installed in Model 8350A (1 of 2)

<b>FREQUENCY<sup>1</sup></b>			
<b>Range</b>	5.9 to 12.4 GHz		<b>Stability</b>
<b>Accuracy</b> (25°C ±5°C)			With 10% Line Voltage Change      ±40 kHz
CW Mode <sup>2</sup>	±20 MHz		With 10 dB Power Level Change      ±1.5 MHz
All Sweep Modes (Sweep time ≥100 ms)	±35 MHz		With 3:1 Load SWR      ±250 kHz
Frequency Markers (Sweep time ≥100 ms)	±35 MHz ±0.5% of sweep width		Residual FM, Peak (10 Hz to 10 kHz Bandwidth)      <15 kHz
<b>POWER OUTPUT<sup>1</sup></b>			
<b>Maximum Levelled Output Power<sup>3</sup></b> (25°C ±5°C)	+17 dBm		<b>Power Variation</b> (at or below specified Maximum Levelled Power)
With Option 002	+16 dBm		Internally Levelled      ±0.6 dB
<b>Power Level Accuracy<sup>4</sup></b> (Internally Levelled)	±1.0 dB		With Option 002 (at 0 dB attenuator step)      ±0.6 dB
With Option 002 <sup>5</sup> (at 0 dB attenuator step)	±1.2 dB		Externally Levelled
<b>Calibrated Range</b>	15 dB		Negative Crystal Detector <sup>6</sup> ±0.1 dB
With Option 002	84 dB		Power Meter <sup>7</sup> ±0.1 dB
<b>Attenuator Accuracy</b> (±dB referenced from the 0 dB setting)			<b>Residual AM in 100 kHz Bandwidth</b> (in dB below carrier and at specified maximum levelled power)      ≥50 dB
			<b>Spurious Signals:</b> at specified maximum levelled power
			<b>5.9 to 7.0 GHz</b> <b>7.0 to 12.4 GHz</b>
			Harmonics (in dB below carrier)      ≥17 dB      ≥30 dB
			Non-Harmonics (in dB below carrier)      ≥60 dB      ≥60 dB

<b>Attenuator Setting (dB)</b>	10	20	30	40	50	60	70
<b>Attenuator Accuracy</b>	0.5	0.7	0.9	1.2	1.5	1.8	2.1

Table 1-1. Specifications for Model 83545A Installed In Model 8350A (2 of 2)

<b>POWER OUTPUT (Cont'd)</b>																			
<b>Output VSWR</b> (internally leveled)	<1.6	<b>Power Sweep</b> <sup>8</sup> Calibrated Range: ≥15 dB With Option 002: <sup>9</sup> ≥14 dB																	
<b>MODULATION<sup>1</sup></b>																			
<p><b>Internal AM</b></p> <p>Selectable (by internal jumper in 8350A) to 1 kHz or 27.8 kHz squarewave modulation. The 27.8 kHz modulation allows operation with HP Model 8755A/B/C Swept Amplitude Analyzer.</p> <p>On/Off Ratio: ≥40 dB below specified maximum leveled power.</p> <p>Symmetry: 40/60.</p>		<p><b>External FM</b></p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th rowspan="2" style="padding: 5px;">Modulation Frequency</th> <th colspan="2" style="padding: 5px;">Maximum Deviation</th> </tr> <tr> <th style="padding: 5px;">Cross Over Coupled</th> <th style="padding: 5px;">Direct Coupled</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">DC to 100 Hz</td> <td style="padding: 5px; text-align: center;">±75 MHz</td> <td style="padding: 5px; text-align: center;">±12 MHz</td> </tr> <tr> <td style="padding: 5px;">100 Mz to 1 MHz</td> <td style="padding: 5px; text-align: center;">±7 MHz</td> <td style="padding: 5px; text-align: center;">±7 MHz</td> </tr> <tr> <td style="padding: 5px;">1 MHz to 2 MHz</td> <td style="padding: 5px; text-align: center;">±5 MHz</td> <td style="padding: 5px; text-align: center;">±5 MHz</td> </tr> <tr> <td style="padding: 5px;">2 MHz to 10 MHz</td> <td style="padding: 5px; text-align: center;">±1.5 MHz</td> <td style="padding: 5px; text-align: center;">±1.5 MHz</td> </tr> </tbody> </table> <p>Frequency Response (DC to 2 MHz) ±1.5 dB</p>	Modulation Frequency	Maximum Deviation		Cross Over Coupled	Direct Coupled	DC to 100 Hz	±75 MHz	±12 MHz	100 Mz to 1 MHz	±7 MHz	±7 MHz	1 MHz to 2 MHz	±5 MHz	±5 MHz	2 MHz to 10 MHz	±1.5 MHz	±1.5 MHz
Modulation Frequency	Maximum Deviation																		
	Cross Over Coupled	Direct Coupled																	
DC to 100 Hz	±75 MHz	±12 MHz																	
100 Mz to 1 MHz	±7 MHz	±7 MHz																	
1 MHz to 2 MHz	±5 MHz	±5 MHz																	
2 MHz to 10 MHz	±1.5 MHz	±1.5 MHz																	
<b>GENERAL SPECIFICATIONS</b>																			
<b>Minimum Sweep Time (over full band):</b> 10 ms		<b>RF Output Connector:</b> Type N Female																	
<p><sup>1</sup> Unless otherwise noted, all specifications are at the RF OUTPUT connector and at 0° to 55°C.</p> <p><sup>2</sup> Approach desired frequency from low end of band.</p> <p><sup>3</sup> For temperatures greater than 30°C, maximum leveled output power typically degrades 0.1 dBm/°C.</p> <p><sup>4</sup> Includes internally leveled power variation.</p> <p><sup>5</sup> Attenuator switch points are every 10 dB starting at +2 dBm indicated power.</p>	<p><sup>6</sup> Excludes coupler and detector variation. Crystal detector output should be between -10 mV and -200 mV at specified maximum leveled power.</p> <p><sup>7</sup> Use HP Model 432A/B/C Power Meter. Sweep duration ≥50 seconds.</p> <p><sup>8</sup> Power Sweep and Slope Compensation total must not exceed 15 dB (14 dB for Option 002).</p> <p><sup>9</sup> With Option 002, in power sweep or slope functions, power can exceed attenuator step by 4 dB.</p>																		

Table 1-2. Supplemental Performance Characteristics for Model 83545A Installed in Model 8350A (1 of 2)

<b>NOTE</b>			
Values in this table are not specifications, but are typical characteristics included for user information.			
<b>FREQUENCY CHARACTERISTICS<sup>1</sup></b>			
<b>Accuracy</b> (25°C ±5°C)		Internal Sweep Mode (Cont'd) (Sweep Time >100 ms) Typically ±20 MHz	
CW Mode		Sweep Mode Linearity <sup>2</sup>	Typically ±50 MHz
5.9 to 12.4 GHz	Typically ±10 MHz	5.9 to 12.4 GHz	Typically ±50 MHz
Manual Sweep		<b>Stability</b>	
Typically ±20 MHz ±0.3% of Sweep Width		With Temperature	Typically ±1.2 MHz/°C
Internal Sweep Mode		With Time (in a 10 minute period after one hour warmup)	Typically ±600 kHz
(Sweep Time 10 ms to 100 ms)	Typically ±50 MHz		
<b>OUTPUT CHARACTERISTICS</b>			
<b>Power Output</b>		<b>Impedance</b>	50 Ohms
Resolution (Displayed)	0.1 dB	Source VSWR (unleveled)	Typically <2.5
Remote Programming (settable)	Typically ±0.01 dB	<b>Power Sweep<sup>4</sup></b>	
Stability with Temperature (at maximum specified leveled power)	Typically ±0.1 dB/°C	Accuracy (including linearity)	Typically ±1.0 dB
		Resolution (displayed)	0.1 dB
<b>Spurious Signals (in dB below carrier)</b>		<b>Slope Compensation<sup>4</sup></b>	
Harmonics	<b>5.9 to 7.0 GHz</b>	Linearity	Typically <0.2 dB
		Calibrated Range <sup>3</sup>	Up to 5 dB/GHz Up to 15 dB for full sweep range
At specified maximum leveled power	Typically ≥25 dB	Resolution (displayed)	0.01 dB/GHz
At +10 dBm	Typically ≥30 dB		
	<b>7.0 to 12.4 GHz</b>		
	Typically ≥40 dB		
	Typically ≥50 dB		

Table 1-2. Supplemental Performance Characteristics for Model 83545A Installed in Model 8350A (2 of 2)

<b>MODULATION CHARACTERISTICS<sup>1</sup></b>			
<b>External AM</b>		<b>Pulse In (Cont'd)</b>	
Frequency Response	Typically 100 kHz	Minimum Pulse Width	
Input Impedance	Approximately 10k Ohm	Leveled	Typically 1 us
Range of Amplitude Control	Typically 15 dB	Unleveled (power level set to +26 dBm)	Typically 100 ns
Sensitivity	Typically 1 dB/V	<b>External FM</b>	
Maximum Input	15V	Sensitivity (switch selectable)	
<b>Pulse In</b>		FM Mode	Typically -20 MHz/V
Minimum input for maximum On/Off ratio	+5 Vdc (50 ohm source)	Phase-Lock Mode	Typically -6 MHz/V
Rise/Fall Time	Typically 15 ns	Input Impedance	2000 Ohms nominally
<b>GENERAL CHARACTERISTICS</b>			
<b>Frequency Reference Output</b> (over full sweep range) rear panel BNC output	1 V/GHz ±15 mV	<b>Weight</b>	
		Net	4.05 kg (9 lbs.)
		Shipping	7.65 kg (17 lbs.)
<sup>1</sup> Unless otherwise noted, all characteristics are at the RF OUTPUT connector and at 0° to 55°C.		<sup>3</sup> With Option 002, in power sweep or slope functions, power can exceed attenuator step by 4 dB.	
<sup>2</sup> With respect to the SWEEP OUT voltage.		<sup>4</sup> Power Sweep and Slope Compensation must not exceed 15 dB (14 dB in Option 002).	



Table 1-3. Service Accessories Available

Name	HP Part Number	Description
44-pin printed circuit board extender	08350-60031*	Extends printed circuit boards.
RF Plug-in Extender Cables	08350-60034* 08350-60035*	Extends RF Plug-in Interface connector (P2). Extends RF Plug-in Power Supply Interface connector (P1).
Adjustment Tool	8830-0024	Fits miniature adjustment slot on potentiometers
Wrenches	08555-20097 8710-0946	5/16" slotted box/open end. 15/64" open end.
Service Cables	8120-1578 83525-60019	18" coax with SMA (m) connector on each end. 10" coax with SMB snap on (f) and SMA (m).
Adapters	1250-0777 1250-0082 1250-1404 1250-1158 1250-0674 1250-0675 1250-0069	Type N (f) to BNC (m) Type N (m) to BNC (m) Type N (f) to SMA (f) SMA (f) to SMA (f) SMA (f) to SMB (m) SMA (f) to SMC (m) SMB snap on (m) to SMB snap on (m).
Hex Balldriver	8710-0523*	Removes front panel hold down plate hex screws in 8350A.
IC Test Clip	1400-0734* 1400-0979*	16-pin IC test clip 20-pin IC test clip
<p>*These items are included in a Service Accessories Kit HP Part No. 08350-60020. (2 board extenders are included in this kit.</p>		

Table 1-4. Recommended Test Equipment (1 of 3)

Instrument	Critical Specifications	Recommended Model	Use <sup>1</sup>
Sweep Oscillator	No Substitute	HP 8350A	P, A, T
Spectrum Analyzer	Frequency Range: 5.9 to 24.8 GHz with External Mixer Residual FM: $\leq 100$ Hz Must have auxiliary IF output when used with the HP 8901A Modulation Analyzer.	HP 8565A or HP 8566A HP 11517A	P, T P
Oscilloscope	Dual channel X vs. Y display mode Sensitivity: $\leq 5$ mV Horizontal Sweep Rate: $\leq 0.1$ uS/DIV	HP 1740A	P, A, T
Display Mainframe	Compatible with HP 8755C Swept Amplitude Analyzer and HP 8750A Storage Normalizer	HP 182T, 180TR	P, A, T
Swept Amplitude Analyzer	Capable of transmission measurements Power Resolution: $\leq 0.25$ dB/DIV	HP 8755C	P, A, T
Detector	Compatible with Swept Amplitude Analyzer Frequency Range: 5.9 to 12.4 GHz Power Range: $-20$ to $+10$ dBm	HP 11664A	P, A, T
Power Splitter	Frequency Range: 5.9 to 12.4 GHz Output Port Tracking: $\leq 0.25$ dB Maximum Input Power: $\geq +20$ dBm	HP 11667A	P, A
Storage-Normalizer	Compatible with Display Mainframe and Swept Amplitude Analyzer	HP 8750A	P
Digital Voltmeter	Accuracy: $\leq 0.005\%$ Input Impedance: $\geq 10$ MOhms Resolution: $\geq 1$ uV	HP 3455A	A, T
Oscilloscope Probes	1:1 General Purpose Probe 10:1 Miniature Probe	HP 10008B HP 10040A	A A, T
Modulation Analyzer	(May be used in addition to Spectrum Analyzer) Frequency Range: Must cover auxiliary IF Output frequency of Spectrum Analyzer used Residual FM: $\leq 10$ Hz	HP 8910A	P
Power Meter	Power Range: $-20$ to $+10$ dBm (No substitution when used for external power meter leveling).	HP 432A	P, A
Thermistor Sensor	Frequency Range: 5.9 to 12.4 GHz Maximum SWR: $\leq 1.75$	HP 8478B	P, A
Power Meter	Power Range: 1 uW to 100 mW	HP 436A	P, A

Table 1-4. Recommended Test Equipment (2 of 3)

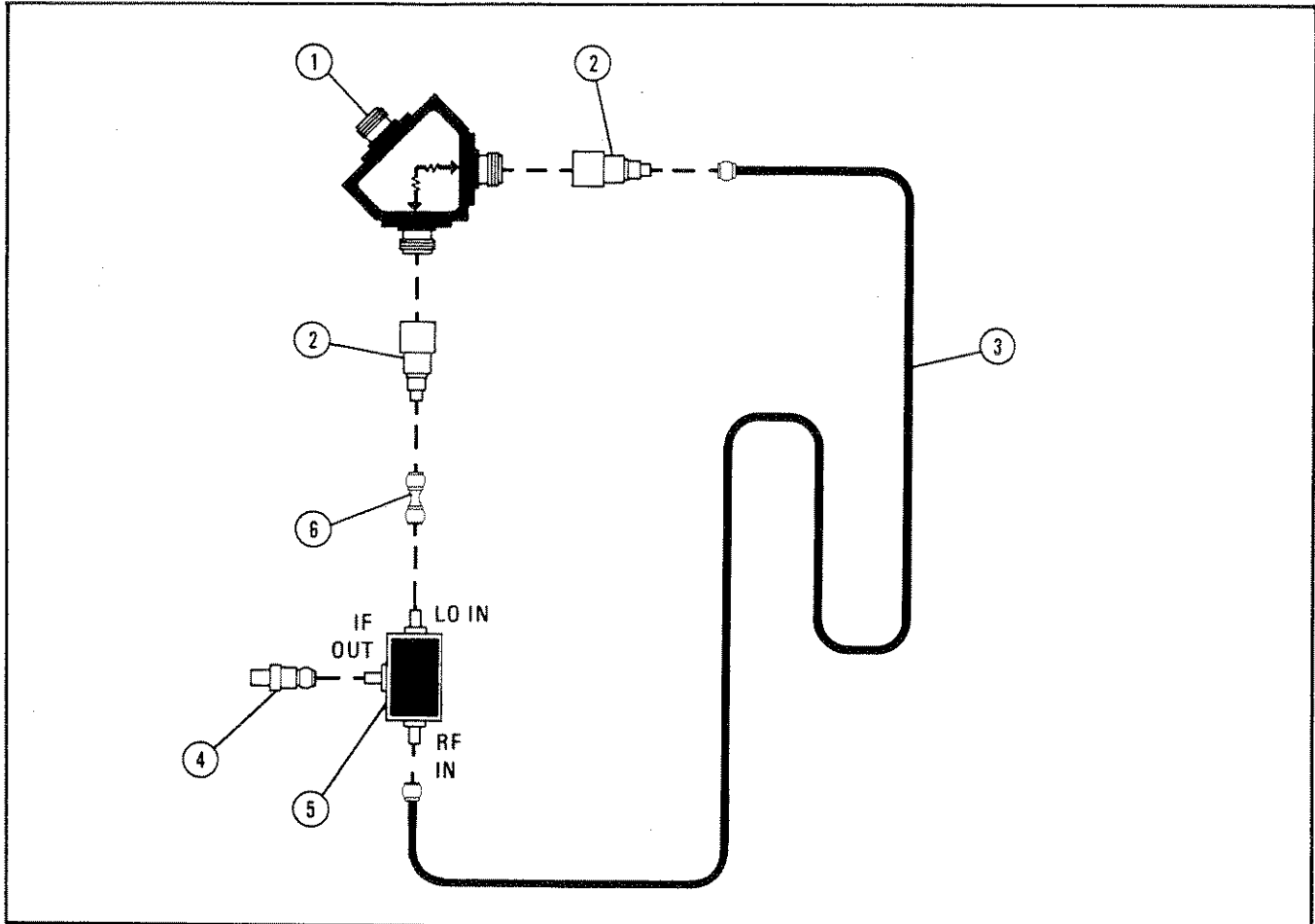
Instrument	Critical Specifications	Recommended Model	Use <sup>1</sup>
Power Sensor	Frequency Range: 5.9 to 12.4 GHz Maximum SWR: $\leq 1.18$	HP 8481A	P, A
Frequency Counter	Frequency Range: 5.9 to 12.4 GHz Sensitivity: $\leq -20$ dBm Maximum Input Power: $\geq 0$ dBm Frequency Accuracy: $\leq 1$ kHz	HP 5343A	P, A
Directional Coupler (2 required)	Frequency Range: 5.9 to 12.4 GHz Mean Output Coupling: $\geq 20$ dB Output Coupling Variation: $\leq \pm 1$ dB Minimum Directivity: $\geq 26$ dB	HP 779D	P, A
RMS Voltmeter	dB Range: $-20$ to $-70$ dBm (0 dBm = 1 mW into 600 Ohms) Frequency Range: 10 Hz to 10 MHz Accuracy: $\pm 5\%$ of full scale	HP 3400A	P
Function Generator	Frequency Range: 0.1 Hz to 10 MHz Output Level: 10 Vp-p into 50 Ohms Output Level Flatness: $\leq \pm 3\%$ from 10 Hz to 100 kHz $\leq \pm 10\%$ from 100 kHz to 10 MHz	HP 3312A	P, T
Crystal Detector	Frequency Response: 5.9 to 12.4 GHz Maximum Input Power: $\geq 100$ mW	HP 423B	P, A, T
Air Line Extension (2 required)	Impedance: 50 Ohms Frequency Range: dc to 12.4 GHz Reflection Coefficient: 0.018 + 0.001 (times the frequency in GHz)	HP 11567A	P
RF Cable	Impedance: 50 Ohms Length: 61 cm. (24 in.)	HP 11770B	P
Step Attenuator	Frequency Range: dc to 12.4 GHz Incremental Attenuation: 1 to 70 dB in 10 dB steps Calibration Accuracy: $\leq \pm 0.1$ dB at all steps	HP 8495A Option 890	P
Attenuator	Attenuation: 3 dB $\pm 0.5$ dB Frequency Range: 0.01 to 12.4 GHz Maximum Input Power: $\geq +20$ dBm	HP 8491B Option 003	P
Attenuator	Attenuation: 6 dB $\pm 0.5$ dB Frequency Range: 0.01 to 12.4 GHz Maximum Input Power: $\geq +20$ dBm	HP 8491B Option 006	P
Attenuator	Attenuation: 10 $\pm 0.5$ dB Frequency Range: 0.01 to 12.4 GHz Maximum Input Power: $\geq +20$ dBm	HP 8491B Option 010	P
Attenuator	Attenuation: 20 $\pm 0.5$ dB Frequency Range: 0.01 to 12.4 GHz Maximum Input Power: $\geq +20$ dBm	HP 8491B Option 020	P

Table 1-4. Recommended Test Equipment (3 of 3)

Instrument	Critical Specifications	Recommended Model	Use <sup>1</sup>
Adjustable Short	Frequency Range: 1.8 to 12.4 GHz Impedance: 50 ±1.5 Ohms	Maury Microwave <sup>2</sup> 1953-2	P
Adjustable AC Line Transformer	Select to cover line voltage used 100–120 volt 220–240 volt	General Radio <sup>3</sup> W5MTB General Radio W10HM73	P P
Line Voltage Monitor	To be used with above Adjustable AC Line Transformers 120 volt Monitor 240 volt Monitor	RCA <sup>4</sup> 5 120B RCA WV 503A	P P
Frequency Meter	Frequency Accuracy: ≤0.17% Calibration Increments: ≤2 MHz 5.9 to 12.4 GHz	HP 537A	P, A
DC Power Supply	DC Output: 0 to 6.5 Vdc ±0.05 Vdc	HP 6213A	A
50 Ohm Termination	Type N, 50 ±0.5 Ohms	HP 909A	P, A
Adapter	APC-7 to Type N (m)	HP 11525A	P
Adapter	APC-3.5(f) to Type N(m)	Amphenol <sup>5</sup> 131-7018	P
Adapter	Type N(m) to Type N(m)	HP Part Number 1250-1528	A
Adapter (2 required)	Waveguide (WR51) to Waveguide (WR42)	HP NP292	A
Adapter (2 required)	Coaxial Type N to Waveguide (WR42) Frequency Range: 12.4 to 18 GHz	HP P281B, Opt 013	A
Delay Line Discriminator	Refer to Figure 1-3		P

FOOTNOTES

- <sup>1</sup> P=Performance Test; A=Adjustments; T=Troubleshooting
- <sup>2</sup> Maury Microwave Corp., 8610 Helms Ave., Cucamonga, CA 91730
- <sup>3</sup> General Radio, 300 Baker Ave., Concord, MA 01742
- <sup>4</sup> RCA Distribution & Special Products Div., Dept. EM, New Holland Ave., Lancaster PA 17604
- <sup>5</sup> Amphenol North America, Bunker-Ramo Corp., RF Operation, 33 E. Franklin St., Danbury, CT 06810



Item	Description	HP Part Number
1	Power Splitter	HP 11667A
2	Adapter: Type N Male to SMA Female (2 required)	1250-1250
3	Delay Line: >1 meter (3 feet) in length, SMA male connectors	08503-20038
4	Adapter: BNC Female to Male SMA	1250-1200
5	Mixer: Double Balanced 1 to 12 GHz: RHG Electronics Part No. DM 1-12 1 to 18 GHz: RHG Electronics Part No. DM 1-18  RHG Electronics Laboratories, Inc. Deer Park, NY 11729	0960-0451       0960-0543
6	Adapter: SMA Male to SMA Male	1250-1159

Figure 1-3. Delay Line Discriminator



## SECTION II INSTALLATION

### 2-1. INTRODUCTION

2-2. This section provides installation instructions for the Model 83545A RF Plug-in. This section also includes information about initial inspection, and damage claims, preparation for use, packaging, storage, and shipment.

### 2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV, Performance Tests, in the Model 8350A Operating and Service Manual. Performance Test limits are given in Section IV of this manual. If the instrument combination does not pass the electrical Performance Tests, refer to Section V, Adjustments, of this manual. If, after the adjustments have been made, the instrument combination still fails to meet specifications, and a circuit malfunction is suspected, refer to trouble shooting procedures in Section VIII, Service, in this manual. If the instrument does not pass the above electrical tests, if the shipment contents are incomplete, or if there is mechanical damage or defect, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or if the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

### 2-5. PREPARATION FOR USE

### 2-6. Power Requirements

2-7. When the Model 83545A RF Plug-in is properly installed, it obtains all power through

the rear panel interface connector from the Model 8350A Sweep Oscillator.

### 2-8. RF Plug-in Configuration Switch

2-9. The Model 83545A RF Plug-in has a configuration switch (A3S1) located on the A3 Digital Interface Board. This switch must be preset prior to RF Plug-in operation in the Model 8350A. The configuration switch is an 8-section multiple switch. Each separate switch corresponds to a separate RF plug-in function such as FM sensitivity selection, FM input coupling selection (direct coupled or cross-over), RF power level at power on (maximum or off), and Option 002 Step Attenuator operation. Refer to Section III, Operation, in this manual for a complete description of the configuration switch and instructions on how to set the switches.

### 2-10. Interconnections

2-11. There are two rear panel interconnections from the Model 83545A RF Plug-in to the Model 8350A Sweep Oscillator. These are the RF Plug-in Interface connector (P2) and the Power Supply Interface Connector (P1). A complete listing of pins and associated signals and voltages for these connectors are listed on the Wiring List in Section VIII, Service, of this manual. In addition, both connectors, with signal mnemonics, are illustrated in Figures 2-1 and 2-2.

### 2-12. Mating Connectors

2-13. All of the externally mounted connectors on the Model 83545A are listed in Table 2-1. Opposite each connector is an industry identification, the HP part number of a mating connector, and the part number of an alternate source for the mating connector. For HP part numbers of the externally mounted connectors themselves, refer to Section VI, Replaceable Parts, of this manual.

Table 2-1. Mating Connectors

83545A Connector		Mating Connector	
Connector Name	Industry Identification	HP Part Number	Alternate Source
J1 RF INPUT	TYPE N (f)	1250-0882	Specialty Connector 25-P117-2
J2 EXT/MTR ALC INPUT	BNC (f)	1250-0256	Specialty Connector 25-P118-1
J3 PULSE IN	BNC (f)	1250-0256	Specialty Connector 25-P118-1
J4 1V/GHz	BNC (f)	1250-0256	Specialty Connector 25-P118-1

**2-14. Operating Environment**

**2-15. Temperature.** The instrument may be operated in temperatures from 0°C to +55°C.

**2-16. Humidity.** The instrument may be operated in environments with humidity from 5% to 80% relative at +25°C to +40°C. However, the instrument should also be protected from temperature extremes which cause condensation within the instrument.

**2-17. Altitude.** The instrument may be operated at altitudes up to 4572 meters (approximately 15,000 feet).

**2-18. Cooling.** When the Model 83545A RF Plug-in is properly installed in the Model 8350A Sweep Oscillator, it obtains all of its cooling airflow by forced ventilation from the fan in the Model 8350A. A diagram showing the various cooling airflow paths within the sweep oscillator is given in Section II, Installation, of the Model 8350A Sweep Oscillator Operating and Service Manual. Ensure that all airflow passages in the Model 8350A and the Model 83545A are clear before installing the RF Plug-in in the Sweep Oscillator.

**2-19. Installation Instructions**

2-20. To operate as a completely functional sweep oscillator, the Model 83545A RF Plug-in must be installed in a Model 8350A Sweep Oscillator. To install the Model 83545A RF plug-in in the Model 8350A Sweep Oscillator:

- a. Set the Model 8350A mainframe LINE switch to OFF.

- b. Remove all connectors and accessories from the front and rear panel connectors of the Model 83545A to prevent them from being damaged.
- c. Position the RF plug-in unit latching handle in the fully raised position. The latching handle should spring easily into the raised position and be held by spring tension.
- d. Ensure that the Model 8350A RF plug-in channel is clear, align the RF plug-in in the channel and slide it carefully into place toward the rear of the channel. It should slide easily without binding.
- e. The drawer latch handle slot will engage with the locking pin just before the RF plug-in is fully seated in position.
- f. Press the latch handle downward, while still pushing in on the RF plug-in, until the drawer latch is fully closed and the front panel of the RF plug-in is aligned with the sweep oscillator front panel.

**2-21. STORAGE AND SHIPMENT**

**2-22. Environment**

2-23. The instrument may be stored or shipped in environments within the following limits:

- Temperature . . . . . -40°C to +75°C
- Humidity . . . . . 5% to 95% relative at  
0° to +40°C
- Altitude . . . . . Up to 15240 meters  
(approximately 50,000 feet)



2-24. The instrument should also be protected from temperature extremes which may cause condensation in the instrument.

**2-25. Packaging**

**2-26. Original Packaging.** Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. A complete diagram and listing of packaging materials used for the Model 83545A is shown in Figure 2-3. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number (located on rear panel serial plate). Mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

**2-27. Other Packaging.** The following general instructions should be used for repack-

aging with commercially available packaging materials:

- a. Wrap the instrument in heavy paper or plastic. If shipping to a Hewlett-Packard Office or Service Center, attach a tag indicating the type of service required, return address, model number, and full serial number.
- b. Use a strong shipping container.
- c. Use enough shock-absorbing material around all sides of the instrument to provide a firm cushion and to prevent movement inside the container. Protect the control panel with cardboard.
- d. Seal the shipping container securely.
- e. Mark the shipping container FRAGILE to assure careful handling.
- f. In any correspondence, refer to the instrument by model number and full serial number.

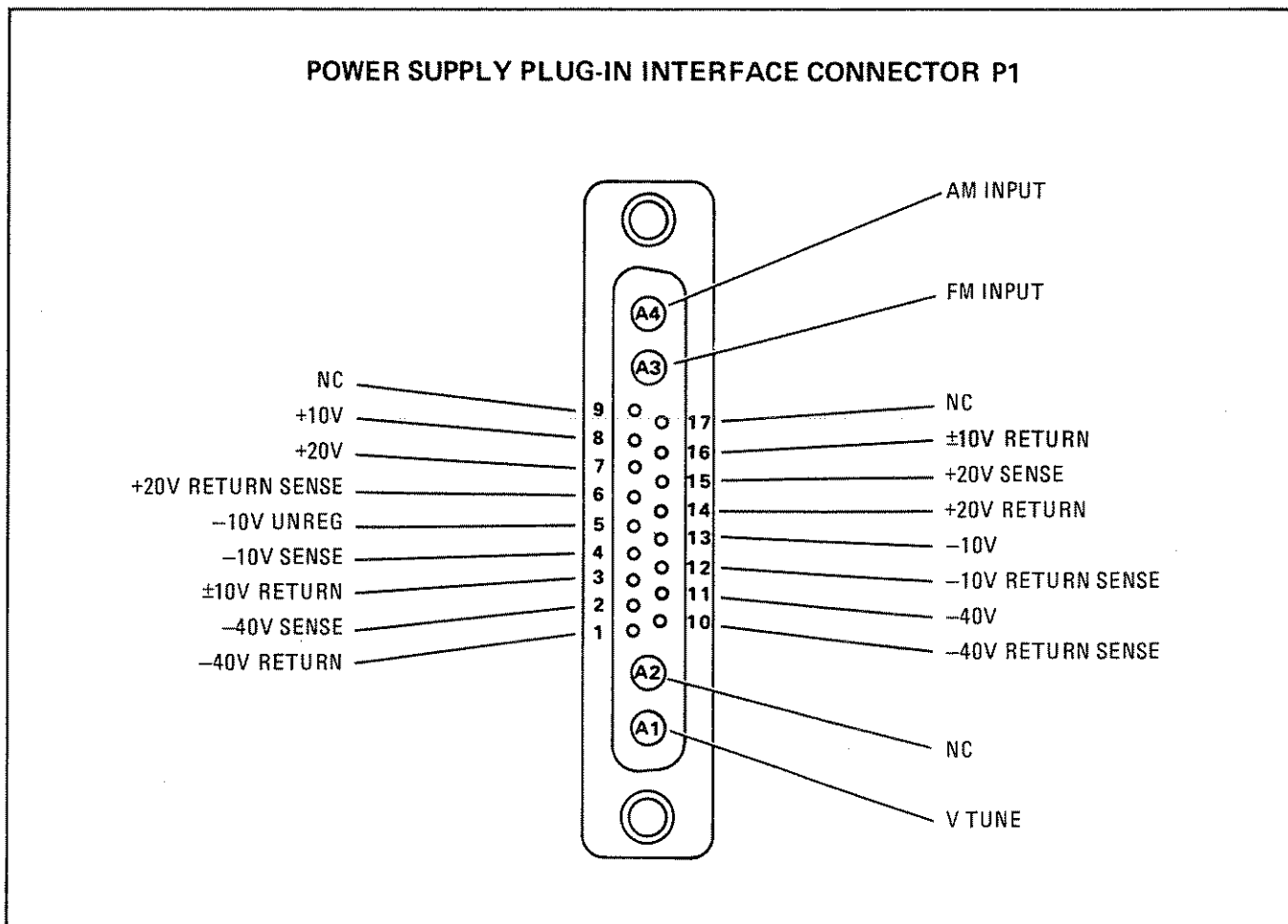


Figure 2-1. Interface Signals on Connector P1

PLUG-IN INTERFACE CONNECTOR P2

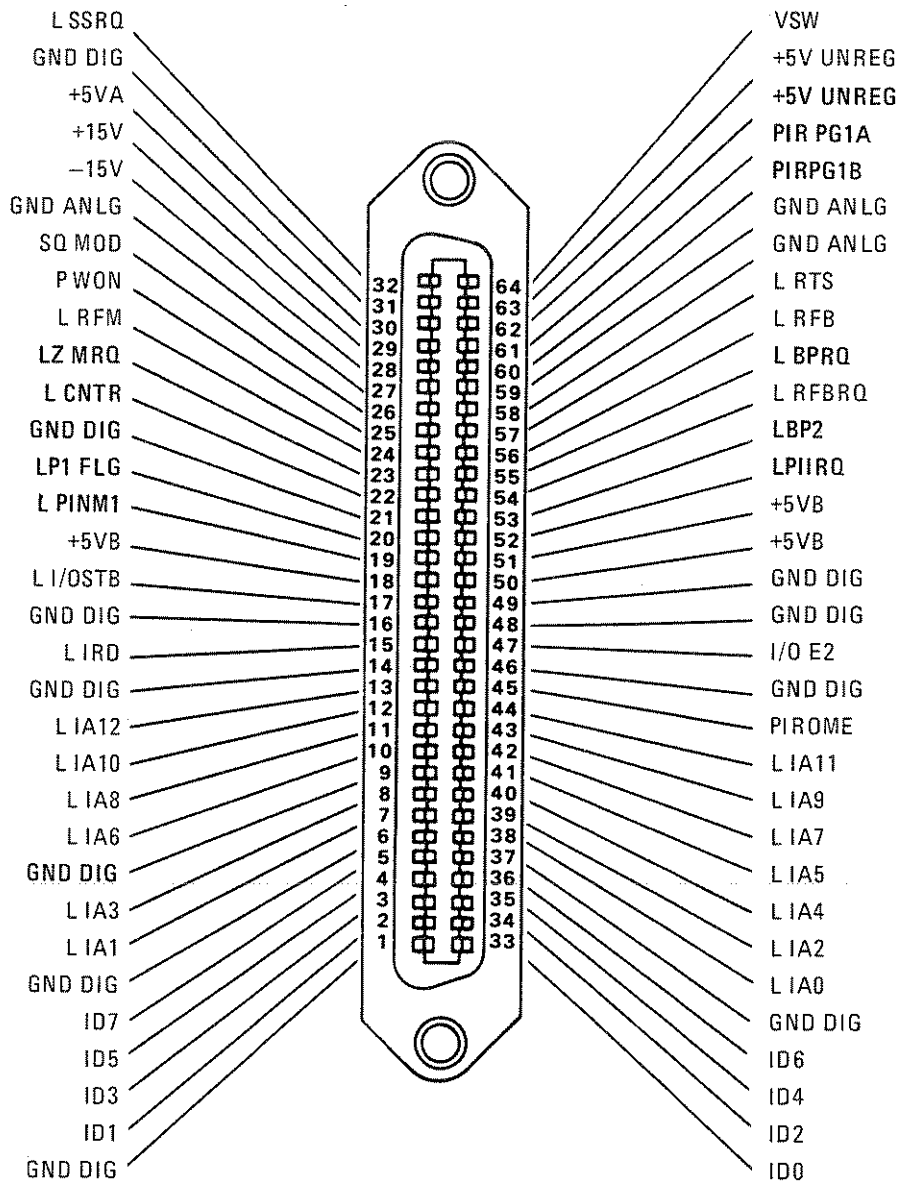
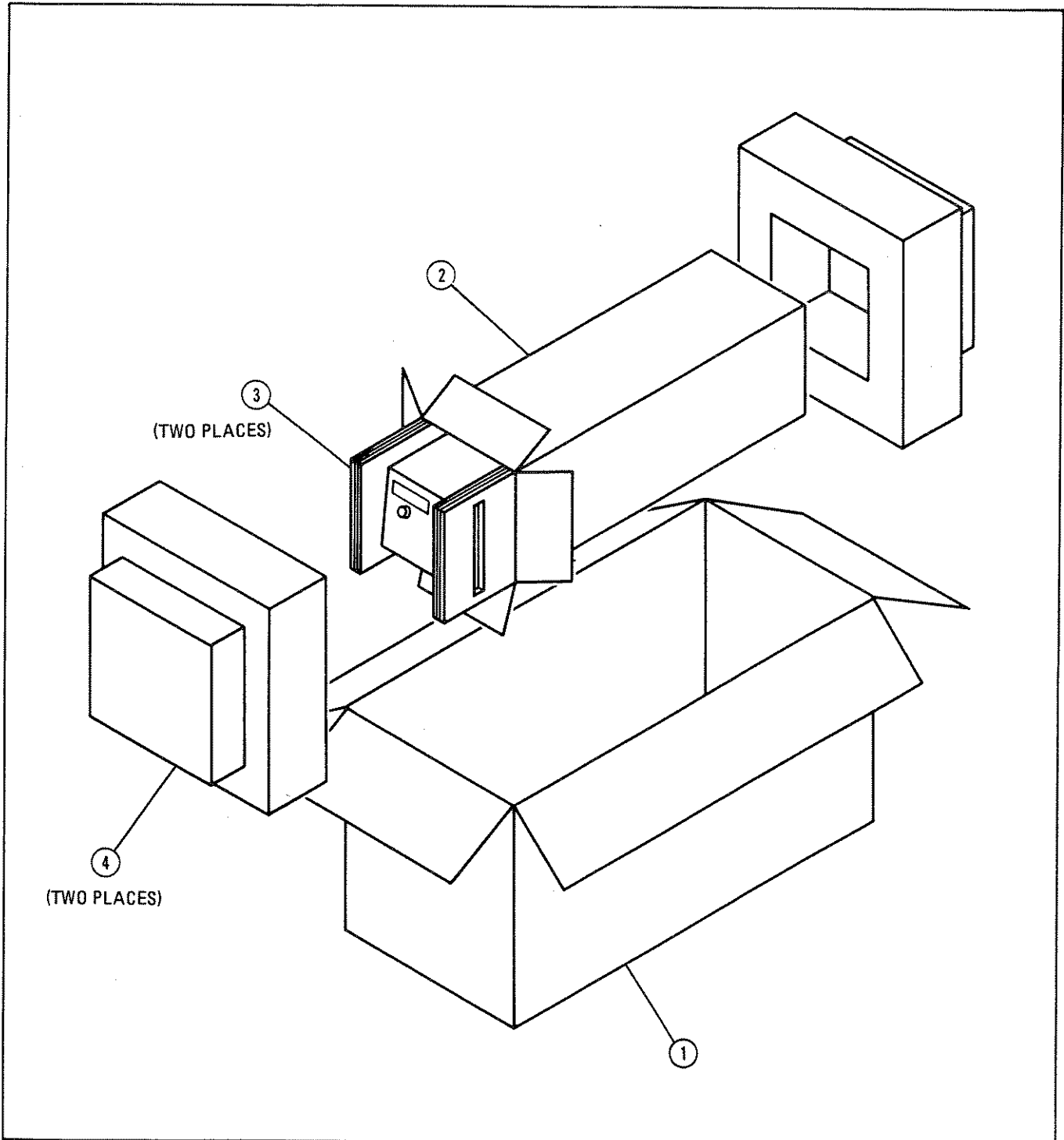


Figure 2-2. Interface Signals on Connector P2



Item	Quantity	HP Part Number	C D	Description
1	1	9211-3515	6	Outer Carton
2	1	9211-3514	5	Inner Carton
3	2	9220-3409	6	Side Pads – Corrugated Cardboard
4	2	9220-3406	3	Foam Pads
	1	9222-0352	6	Poly Bag – to cover instrument

Figure 2-3. Packaging for Shipment Using Factory Packaging Materials



## SECTION III OPERATION

### 3-1. INTRODUCTION

3-2. This section is divided into four major parts. Operating Characteristics explains the frequency resolution characteristics in continuous wave (CW) and swept modes. Front and rear Panel Features are illustrated with descriptions. Operating Instructions provide configuration switch setting instructions, and crystal detector and power meter leveling procedures. Operator's Maintenance includes information on the plug-in error codes, fuses, and service tags.

### 3-3. OPERATING CHARACTERISTICS

#### 3-4. Frequency Resolution

3-5. Two areas relating to frequency resolution must be considered; these are input resolution and displayed resolution. Input resolution refers to the number of bits (8 bits = 256 points) used in the digital to analog converters (DACs) to generate the tuning voltage for a particular mode of operation. Table 3-1 cross references input resolution with each DAC used. Displayed frequency resolution refers to the number of digits shown on the 8350A FREQUENCY displays.

*Table 3-1. Input Resolution*

DAC Used	Voltage Resolution	Frequency Resolution
CF	2.5 mV	1.65 MHz
Vernier	40 mV	25.79 kHz
$\Delta F$ 1 - 1/8 of band	10 mV	6.6 MHz
$\Delta F$ 1/8 - 1/64 of band	1.25 mV	0.82 MHz
$\Delta F \leq 1/64$ of band	0.156 mV	103.1 kHz

3-6. Figure 3-1 is a simplified block diagram of the frequency tuning circuits. The net tuning voltage results from the summation of the three

DAC outputs. With this DAC configuration the START/STOP sweep mode is computed by the microprocessor into a center frequency and a  $\Delta F$  sweep width. Therefore the operation of all sweeps are set with a center frequency and sweep width. The center frequency is specified by the center frequency (CF) DAC and the Vernier DAC, and the sweep width is determined by the  $\Delta F$  DAC.

3-7. The CF DAC has 12 bits, hence 4096 points across the plug-in frequency band (including overrange). The analog output ranges from zero to ten volts, which is used to coarsely specify the center frequency output of the plug-in. These parameters give the CF DAC a resolution of 0.024% (2.5mV) over the full band (including overrange).

3-8. Resolution of Center Frequency is enhanced by a summed voltage generated by an 8-bit (256 points) Vernier DAC. Vernier range is set to  $\pm 0.05\%$  of RF plug-in bandwidth (including overrange). In multiband plug-ins, total range of the vernier will vary with each band sweep. Vernier resolution is determined by dividing  $\pm 0.05\%$  bandwidth by 256 points (128 points either side of CF). The voltage range of the total 256 points on the Vernier DAC is equal to four points on the 12-bit CF DAC (two points on either side of CF). This increases CF resolution from 0.024% (2.5mV) to 0.00038% (.04mV), and improves the relative accuracy of the CF by a similar factor.

#### NOTE

When adjusting the vernier through its zero-point, the CF DAC is incremented or decremented by the total value of the vernier (2 points on the CF DAC). At this time the accuracy of the Center Frequency is again entirely dependent on the CF DAC, 0.005% of bandwidth.

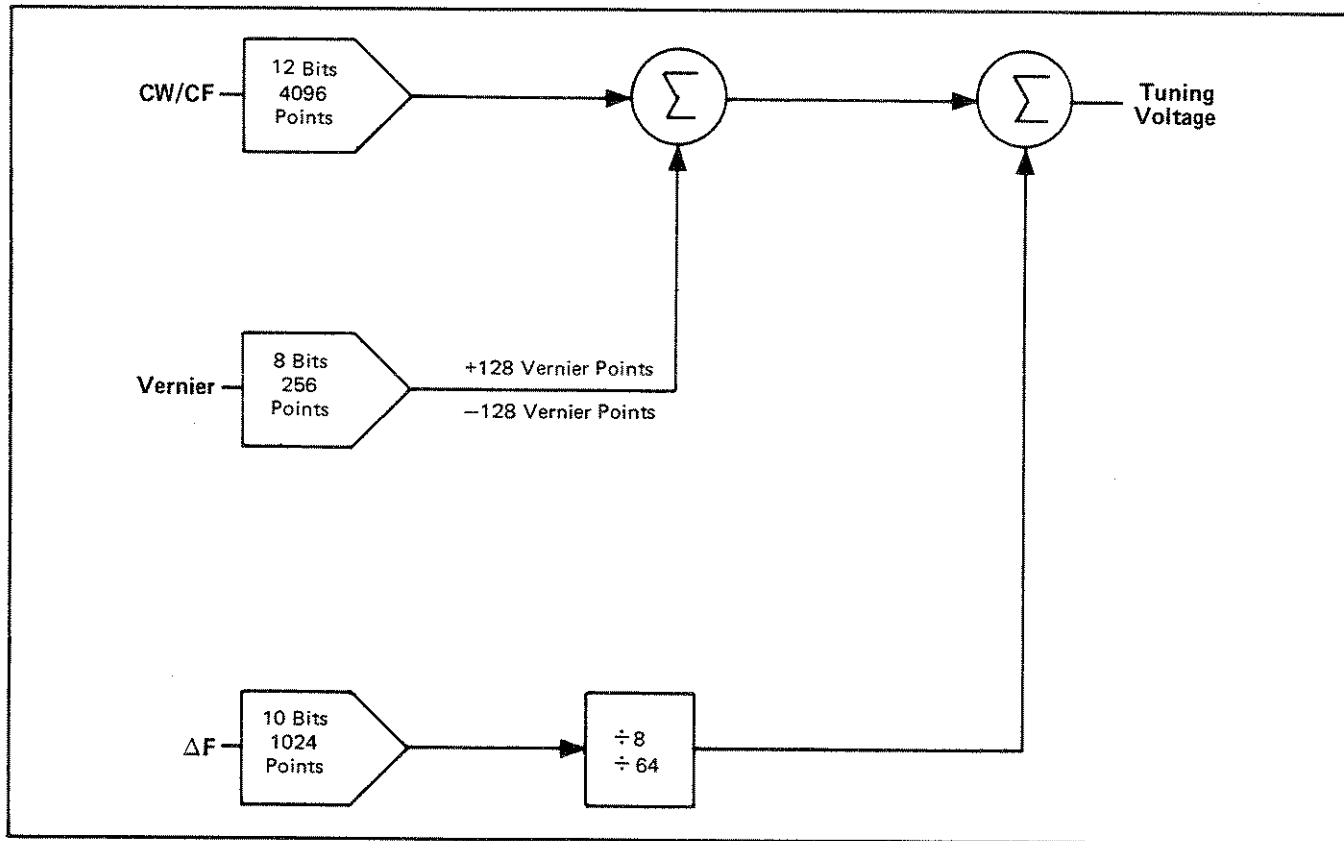


Figure 3-1. Simplified Tuning Voltage Block Diagram

3-9. The  $\Delta F$  DAC has 10 bits (1024 points). The analog output from this DAC ranges from  $-5$  to  $+5$  volts to produce an even sweep on either side of the center frequency. The  $\Delta F$  resolution improves with narrower sweep widths. For broad sweeps, the resolution is 0.1% of the full band. Greater resolution is provided for sweep widths less than  $1/8$  of the full band range. At these sweep widths, the resolution is improved to 0.012% of the full band.

3-10. Center Frequency (CF) is always displayed with 1 MHz resolution. Likewise, Vernier values are always displayed at 10 kHz resolution. Display resolutions for  $\Delta F$  values vary with sweep width. Figure 3-2 illustrates the relationship of  $\Delta F$  mode display resolution and  $\Delta F$  sweep widths.

### 3-11. PANEL FEATURES

3-12. Front and rear panel features are described in Figure 3-3 and 3-4, respectively. Each feature is depicted by number designators; descriptions are provided below each figure.

### 3-13. OPERATORS CHECKS

3-14. The Operator's Checks (local and remote) in the 8350A sweep oscillator manual provide a quick evaluation of both 8350A and 83545A main functions. Error codes 50 to 99, displayed on the 8350A FREQUENCY display, indicate plug-in related problems. The 8350A Local Check covers the sweep oscillator and RF plug-in. If the correct indications are not obtained, trouble may be in either of the units. If the RF plug-in is suspected, follow the troubleshooting information in Section VIII, Service, in this manual, to isolate the problem.

### 3-15. OPERATING INSTRUCTIONS

#### 3-16. Internal Leveling

3-17. The most convenient method of RF output leveling is internal leveling. A portion of the RF output is coupled out of an internal directional detector, producing a dc voltage proportional to the RF output signal. This detected dc voltage is applied to the automatic leveling control circuit (ALC).

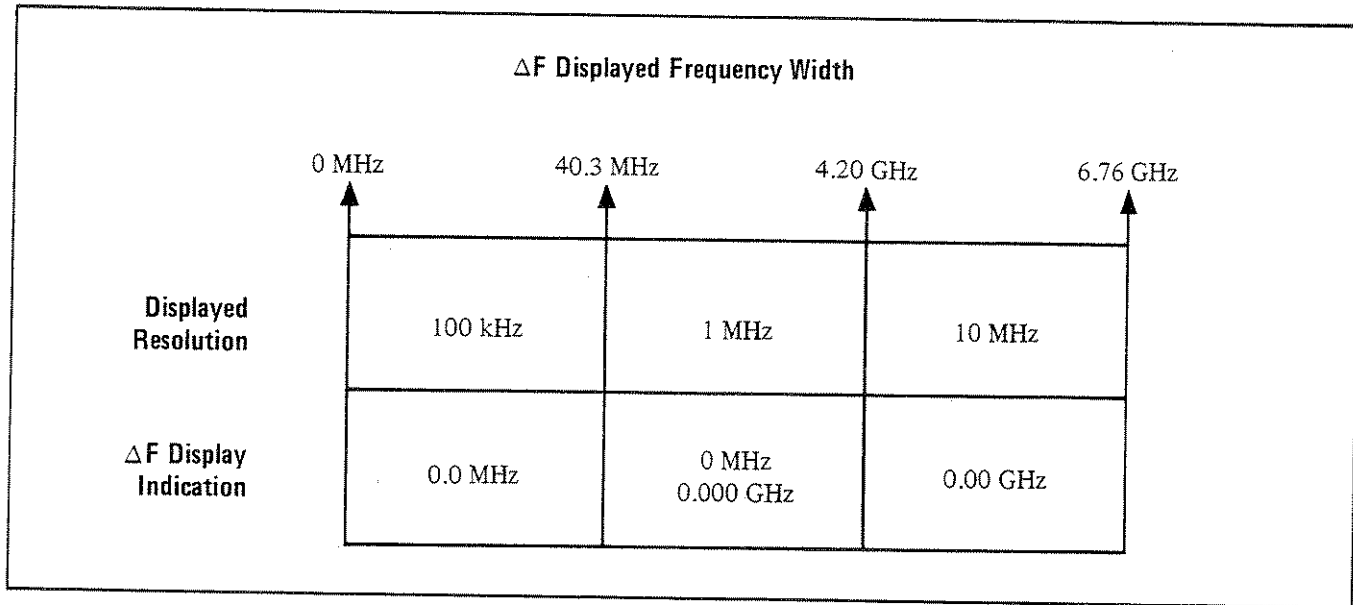


Figure 3-2. Model 83545A Delta F Sweep Mode Displayed Resolution

### 3-18. External Crystal Detector Leveling

3-19. RF output power may also be leveled externally using a power splitter (or directional coupler) and external crystal detector. This leveling system uses a power splitter to sample the RF output signal and a crystal detector to produce a dc voltage proportional to the RF power level. The detector output voltage is compared with an internal reference voltage, and the difference voltage changes the output power level to maintain a constant output level. A directional coupler may be used instead of a power splitter to sample the RF signal for the leveling loop. Directional couplers are usually narrow band, whereas the power splitter has a flatter frequency response over a wide frequency range. The advantage of a directional coupler is that it does not have as great a coupled loss as the 6 dB loss encountered with the power splitter, therefore, a higher maximum leveled power output may be obtained. Figure 3-5 illustrates a typical crystal detector leveling setup.

### 3-20. External Power Meter Leveling

3-21. RF output power may also be leveled with a power meter and power splitter (or directional coupler) as shown in Figure 3-6. The sweep time is limited to greater than 50 seconds when this leveling method is used. A sample of the RF output signal is routed to a power meter which produces a dc output

voltage proportional to the RF signal level. This dc voltage is applied to the 83545A ALC circuits and compared with an internal reference voltage. A difference voltage is produced and amplified by the ALC amplifier before being applied, as modulator drive, to a PIN Modulator. Figure 3-6 illustrates a typical power meter leveling setup.

### 3-22. External FM

3-23. The 83545A RF output signal can be frequency modulated using an external modulating signal applied to the 8350A FM INPUT connector. The external FM function provides a means of obtaining an output frequency that varies under the control of an external modulating signal. A positive going voltage at the FM INPUT causes output frequency to decrease while a negative going voltage causes output frequency to increase. The sensitivity and coupling of the modulating signal may be set via configuration switch (A3S1). Figure 3-7 lists the available configuration switch settings. These settings override Sweep Oscillator non-volatile memory settings at Instrument Preset.

### 3-24. External Amplitude Modulation

3-25. **Pulse Modulation (PULSE IN Connector on Plug-in).** The PULSE IN connector provides pulsed or square wave modulation, where the RF output is switched on and off. This input provides an on/off

power ratio of greater than 40 dB below specified maximum leveled power. The PULSE IN input is typically at +0.5 Vdc. The PULSE IN voltage threshold to initiate amplitude modulation of the RF signal occurs at approximately +1 Vdc. Applying +3 Vdc or greater will completely shut off the RF signal. For best Pulse Modulation performance, PULSE IN should be driven by a 50 ohm pulse generator with the RF output power set at +26 dBm. With this power setting, pulse repetition rates up to 5 MHz are achievable from 5.9 to 12.4 GHz. With leveled power in this frequency range, pulse repetition rates are possible up to 100 kHz. The dc input impedance at PULSE IN is approximately 200 ohms with an applied input voltage of -0.6 to +5.7 Vdc. Beyond these voltage limits diode clamping decreases the impedance to less than 20 ohms. Refer to Table 1-2, Supplemental Performance Characteristics, for more details on modulation capability using this input.

**3-26. Amplitude Modulation (AM INPUT Connector on 8350A).** The AM INPUT connector provides linear amplitude changes (up to approximately 15 dB) proportional to the modulating input voltage. It is limited to a frequency response of about 100 kHz. For maximum depth of modulation (i.e., maximum modulation index), the RF power level should be set to the middle of the control range (e.g., +9.5 dBm for a plug-in with calibrated power control from +2 to +17 dBm). For plug-ins equipped with Option 002 (70 dB Step Attenuator), the middle of the attenuator range should be selected. The center of the power control range may be selected with the front panel power control knob or by applying a dc bias voltage on the external modulating signal. A positive (+) dc voltage into the AM INPUT causes a decrease in RF output power; a negative (-) dc voltage causes an increase in RF output power.

### 3-27. RF Power Control

3-28. The RF power set at power-up (Instrument Preset) may be either maximum power (+17 dBm; +16 dBm in Opt. 002 instruments) or RF power OFF as selected on the configuration switch (A3S1). Refer to Figure 3-7 for this setting. Configuration switch settings for specific model plug-in used and Option 002 Step Attenuator equipped instru-

ments must be set prior to operation. These switches (1, 2, 3, and 7) are set at the factory and should not be changed.

### 3-29. Option 002 Step Attenuator

3-30. With Option 002 installed, the RF output power may be continuously controlled from +16 dBm to -68 dBm. When the selected POWER setting goes below +2 dBm, the step attenuator increments as required in 10 dB steps down to a maximum attenuation of 70 dB. Within the individual 10 dB steps of the attenuator, the ALC loop adjusts the power output to the power level programmed at the front panel POWER control.

### 3-31. Alternate Sweep Mode With Option 002

3-32. If Option 002 attenuator is installed, and alternate sweep mode is selected, a slow sweep default condition of 1 sec/sweep may occur. This default condition only occurs when the POWER settings of the two alternate sweeps require the attenuator to switch after each sweep. The program prevents the attenuator from switching faster than 1 step per second. This prevents damage to the attenuator coils due to overheating.

### 3-33. Phase Lock Operation

3-34. The 83545A RF plug-in RF output (CW) signal may be phase-locked to an external reference oscillator by using an external phase-lock signal applied to the 8350A sweep oscillator FM INPUT connector (rear panel). The phase-lock function provides a means of obtaining a very stable CW frequency by transferring the frequency stability of the reference oscillator to the 8350A Sweep Oscillator. If the CW frequency starts to drift, the phase difference between the CW frequency and the reference frequency (reference oscillator) is detected, producing a dc voltage. The dc voltage is applied to the FM INPUT as a correction signal which restores the CW frequency to its previous point. Stability of the 8350A CW frequency is thus determined by the stability of the reference oscillator. The CW filter should be turned off in phase lock operation.



**3-35. OPERATOR'S MAINTENANCE****3-36. Plug-in Error Codes**

3-37. The 8350A FREQUENCY window will display RF plug-in error codes (50 to 99) or sweep oscillator error codes. Information necessary to interpret plug-in error codes may be found in section VIII, Service, of this manual.

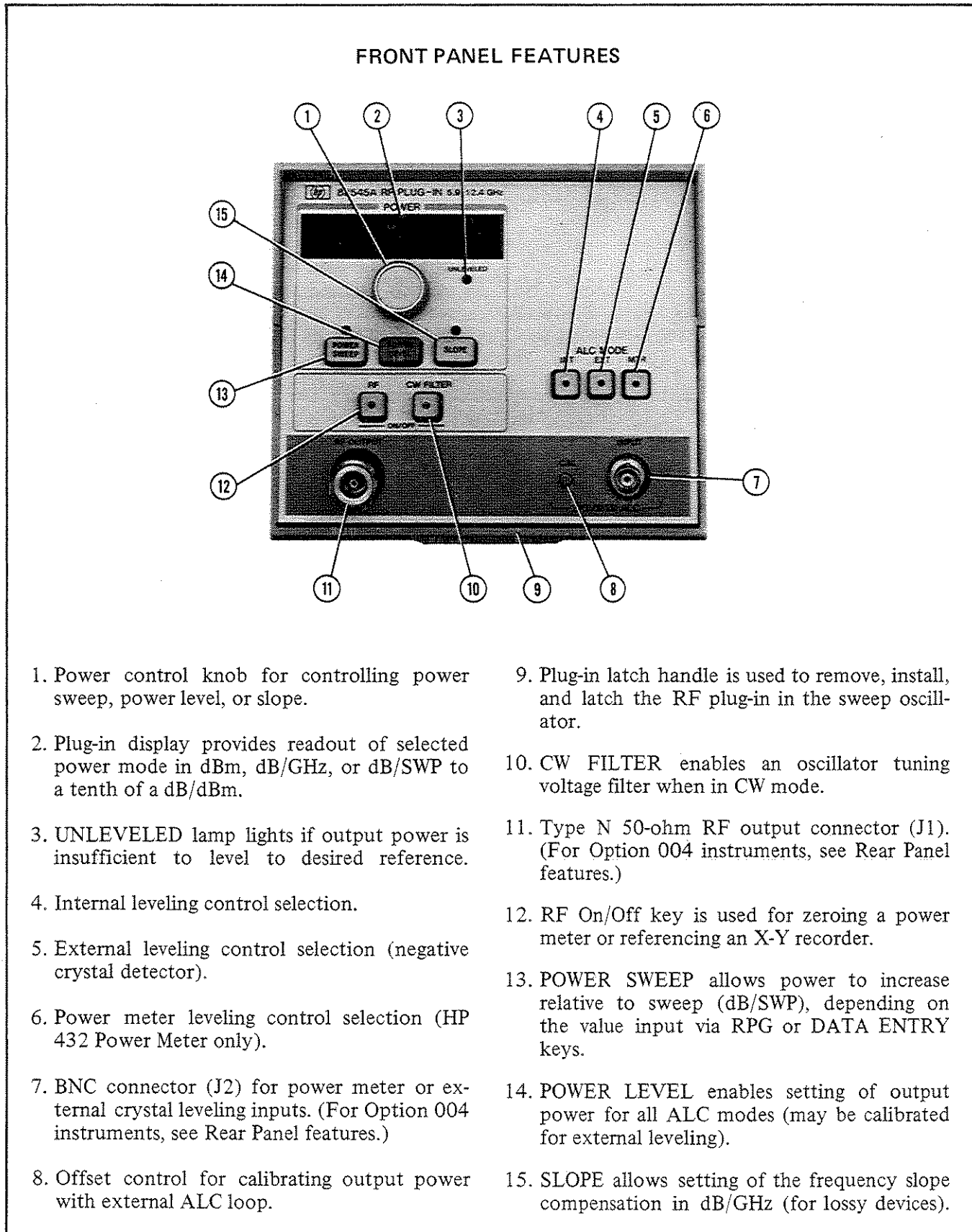
**3-38. Fuses**

3-39. Power circuits for the Model 83545A RF Plug-in are fused in the 8350A sweep oscillator. See the 8350A Sweep Oscillator Operating and

Service Manual for fuse location and replacement instruction.

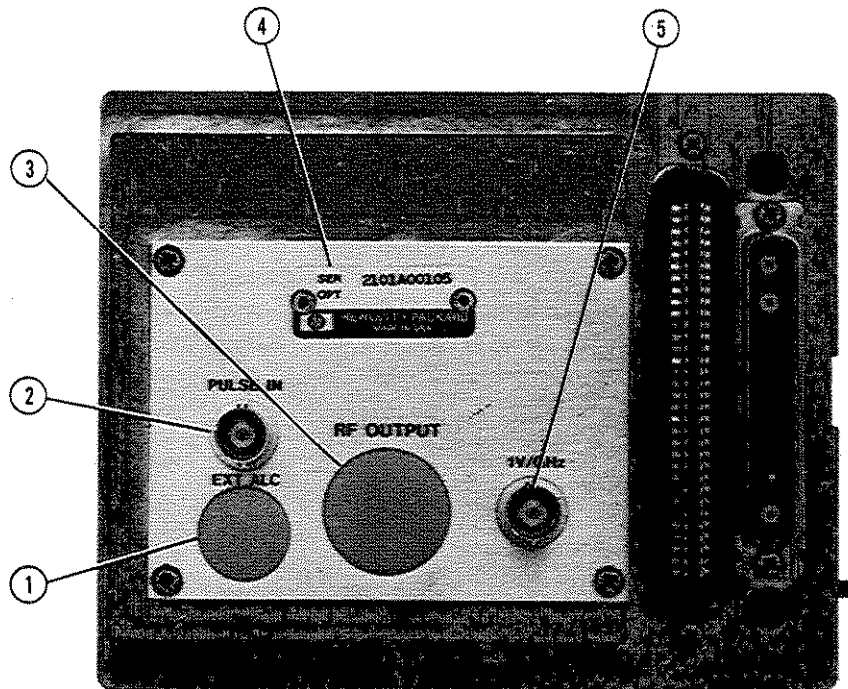
**3-40. Blue Service Tags**

3-41. If the 83545A RF Plug-in requires service the instrument may be sent to your local HP service organization as described in Section II, Installation, in this manual. Before sending the instrument back, fill out and attach one of the blue service tags located at the rear of this section. Record any error codes observed under FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS section of the tag.



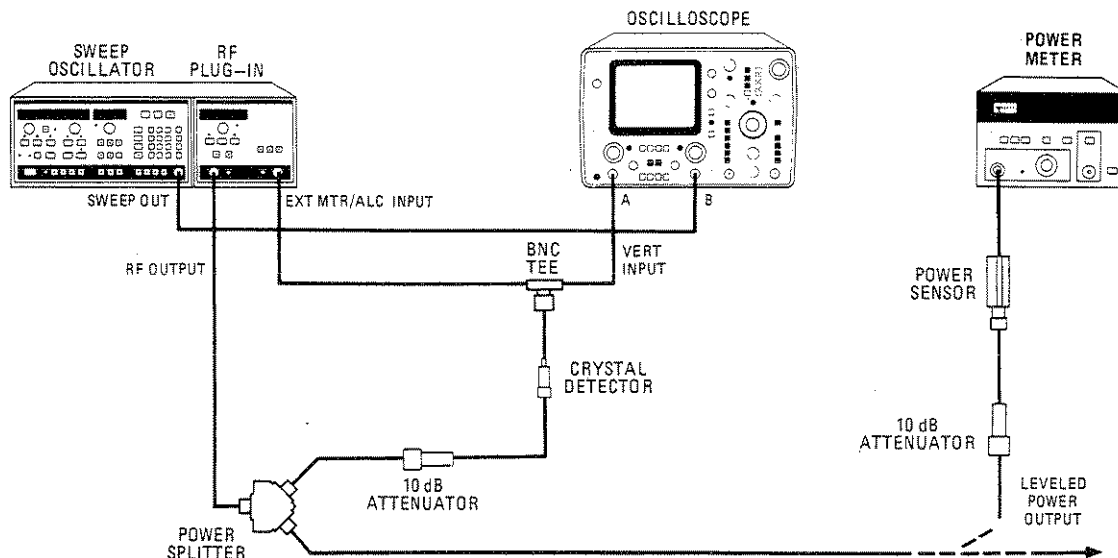
*Figure 3-3. Front Panel Features*

## REAR PANEL FEATURES



1. EXT ALC connector (J2) replaces front panel EXT ALC connector on Option 004 plug-ins.
2. PULSE IN connector (J3) receives external pulse or squarewave modulation signals.
3. RF OUTPUT connector (J1) replaces front panel RF output connector in Option 004 plug-ins.
4. Serial Number Plate has a ten digit serial number (to be used in any correspondence concerning the instrument) and Option number if applicable.
5. 1V/GHz connector (J4) provides a frequency reference output of approximately 1 volt dc per GHz.

Figure 3-4. Rear Panel Features



**EQUIPMENT:**

Sweep Oscillator .....	HP 8350A
RF Plug-in .....	HP 83545A
Oscilloscope .....	HP 1740A
Power Meter .....	HP 436A
Power Sensor .....	HP 8481A
Crystal Detector .....	HP 423A
Power Splitter .....	HP 11667A
10 dB Attenuator (2 required) .....	HP 8491A, Option 010
BNC Tee .....	HP 1250-0781

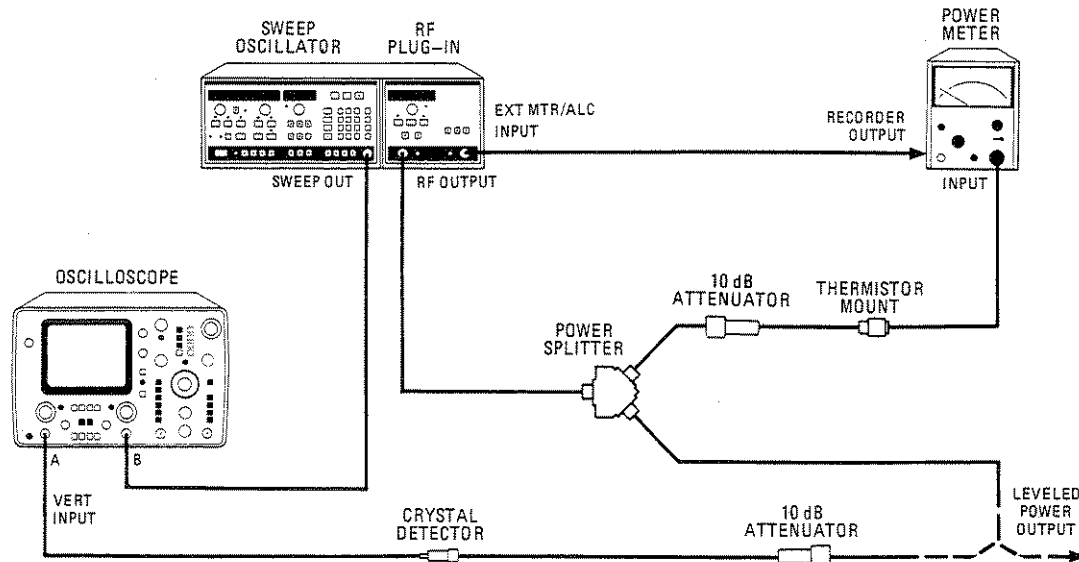
**PROCEDURE:**

**NOTE**

Crystal output signal must be between  $-10$  mVdc and  $-200$  mVdc.

1. Connect equipment as shown in test setup.
2. Switch 8350A LINE switch to ON. Press INSTR PRESET key. The START and STOP indicators should be on.
3. Press 83545A ALC MODE EXT.
4. Adjust EXT/MTR ALC CAL for a proper meter reading equal to the front panel output power.
5. To use leveled RF power output for testing external equipment, make connection at point marked "Leveled Power Output".

Figure 3-5. External Crystal Detector Leveling



**EQUIPMENT:**

Sweep Oscillator .....	HP 8350A
RF Plug-in .....	HP 83545A
Power Meter .....	HP 432A
Thermistor Mount .....	HP 8478A
Oscilloscope .....	HP 1740A
Crystal Detector .....	HP 423A
10 dB Attenuator (2 required) .....	HP 8491A, Option 010
Power Splitter .....	HP 11667A

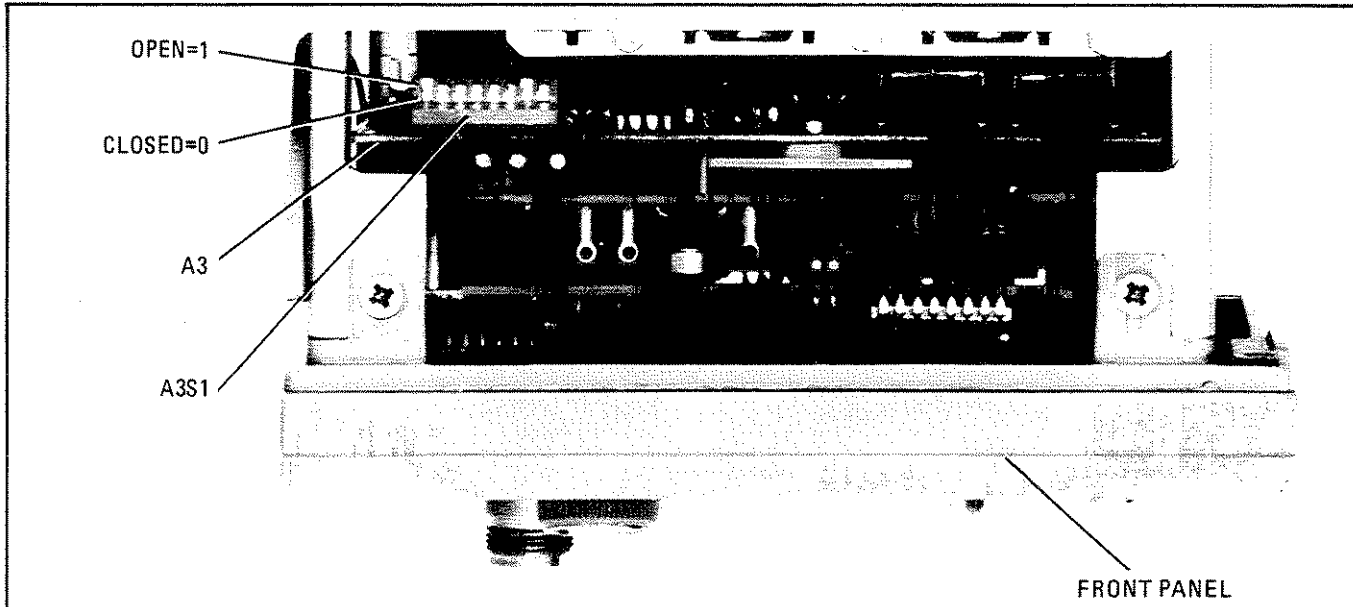
**NOTE**

For power meter leveling, sweep rates should be slower than 50 sec/sweep to ensure proper leveling due to the slow response of the thermistor mount. The HP 435 and 436 power meters will not power meter level this plug-in. Only an HP 432 may be used.

**PROCEDURE:**

1. Connect equipment as shown in test setup.
2. Set line switch to turn on sweep oscillator. The START and STOP indicators should light, indicating the START/STOP mode is selected.
3. Press 8350A INSTR PRESET . Set SWEEP TIME to 50 seconds.
4. Select 83545A EXT ALC MODE. Set Power at maximum specified leveled output.
5. Select +5 dBm range on power meter.
6. Adjust 83545A EXT/MTR ALC CAL for a -4 dBm reading on the 432A power meter. Press 8350A SWEEP TRIGGER SINGLE key twice to set single sweep mode and start a sweep.
7. To use level RF power output for testing external equipment, make connection at point marked "Leveled Power Output".

Figure 3-6. Power Meter Leveling



Description	Switch Number							
	1	2	3	4	5	6	7	8
† Code for 83545A Plug-in (Note 4)	1	1	0	X	X	X	X	X
RF Power Off at Instrument Preset	X	X	X	1	X	X	X	X
Maximum RF Power at Instrument Preset	X	X	X	0	X	X	X	X
-6 MHz/V FM Sensitivity	X	X	X	X	1	X	X	X
-20 MHz/V FM Sensitivity	X	X	X	X	0	X	X	X
Direct-Coupled FM (Note 3)	X	X	X	X	X	1	X	X
Crossover- Coupled FM	X	X	X	X	X	0	X	X
† Step Attenuator Option 002 Installed (Note 4)	X	X	X	X	X	X	1	X
† No Step Attenuator (Note 4)	X	X	X	X	X	X	0	X

**NOTES**

- Switch Positions  
 1 = Switch Open = High  
 0 = Switch Closed = Low (Ground)  
 x = Don't Care  
 \* = Varies; 1 if Opt. 002, 0 if no Opt. 002
- Switch is set at the factory as follows:
- When direct-coupled FM is selected, FM sensitivity is -20 mHz/V and switch Number 5 is overridden.
- Switches with † should not be changed from Factory setting.

Switch No.	1	2	3	4	5	6	7	8
Position	1	1	0	0	0	0	*	X

Figure 3-7. Configuration Switch