Errata

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Service Quick Reference Guide

HP 85301B Antenna Measurement System

HP Part No. 85301-90109
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Santa Rosa Systems division, 1400 Fountaingrove Pkwy, Santa Rosa, CA

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1

Installation "Preflight" Checkout

Receiver Settings

1. Turn on the receiver. Make sure that the HP 8530 firmware is loaded into the receiver.
2. Press (LOCAL) on the receiver to call up the HP-IB Menu. Enter the HP-IB addresses you selected earlier for the RF source, printer, plotter, and the receiver itself. Refer to Table 1-1 for default HP-IB settings.

   The receiver cannot control the positioner-controller directly and therefore does not have an HP-IB Menu entry for this. The HP-IB address in Table 1-1 (for the positioner-controller) is for use by antenna measurement software.

Table 1-1. Default HP-IB Addresses

Configuration Device	Standard Instrument	Default Address	Connect To:
Receiver	HP 8530A	716[1]	HP-IB Bus
SYSTEM BUS		25	
Converter	HP 85310A or HP 85309A		None
SET ADDRESS		31	
CONVERTER ALL OTHERS			
RF Source SOURCE1	HP 836xx	19	System Bus
LO Source SOURCE2	HP 836xx	18	System Bus
Positioner		717[1]	HP-IB Bus

1 The HP-IB bus address is 700. The last two digits in this address is the actual address of the instrument.

   To activate these changes, Press (RECALL) MORE FACTORY PRESET.

3. On the HP 8530A receiver, press (DOMAIN) FREQUENCY.
4. Set the receiver by pressing:

   STIMULUS (MENU) STEP
   MORE CONTINUOUS

   TRIGGER MODE

   TRIG SRC INTERNAL

5. The receiver will be controlling two sources with can drive the mixers in either fundamental or harmonic mode. The mode of operation is determined by the settings of the multiplier numerator and denominator of each source. When setting LO power, use the fundamental mode.

a. Set the RF (#1) source. To do this, press the following keys on the receiver:

(SYSTEM) MORE EDIT MULTI. SRC. DEFINE: SOURCE 1
MULTIPLIER NUMER. 1 (x1) MULTIPLIER DENOM 1 (x1)
OFFSET FREQUENCY 0 (x1) DONE

b. Set the LO (#2) source. To do this, press the following keys on the receiver:

SOURCE 2 MULTIPLIER NUMER. 1 (x1)
MULTIPLIER DENOM. 1 (x1) (activates Fundamental Mode; .1 to 18 GHz) or
MULTIPLIER DENOM. 3 (X1) (activates 3rd Harmonic Mode; 18 to 50 GHz)
OFFSET FREQUENCY 20 (M/u) DONE

c. Set the receiver. Press:

RECEIVER CONSTANT FREQUENCY 20 (M/u)
DONE

d. Save and turn on multiple source mode. Press:
MULTI. SRC: ON/SAVE

6. Set the receiver's start and stop frequency as appropriate for your system.

(SYSTEM) MORE
SYSTEM PHASELOCK NONE (use EXTERNAL if HP 8350B LO source)
LOCK SPEED: NORMAL
PRIOR MENU
POWER LEVELING SOURCE 1: INTERNAL
SOURCE 2: INTERNAL
STIMULUS (MENU)
STEP
MORE CONTINUAL
PRIOR MENU
POWER MENU
POWER SOURCE 1 0 (x1) This value can vary depending on the system in use.
POWER SOURCE 2 10 (x1)

Note Under certain circumstances POWER SOURCE 2 (LO source power) should be set to +13 dBm. Refer to "Set the LO Power" for details.

If the IF OVERLOAD error message comes on, reduce the source 1 RF power level by pressing:

STIMULUS (MENU) POWER SOURCE 1 and use the rotary knob or entry keys to reduce source 1 power.
Press (ENTRY OFF) to deactivate an existing error message. If the error message stays on, reduce power futher. Repeat the last two steps until the error goes away.

If a HP 85370A is installed, see the *HP 85370A Operating and Service* manual for set up instructions.

Set the LO Power

About This Procedure

The front panel of the LO/IF unit shows the voltage coming from a power detector in the reference mixer. The voltage is directly proportional to the amount of LO power arriving at the mixer. A label on the reference mixer shows the precise voltage which correspon\ ds to +10 dBm at the mixer's LO input. In this procedure you must adjust the LO POWER ADJUST so the DETECTOR VOLTAGE display matches the voltage on the mixer label.

Once set, the ALC loop will maintain the desired LO power level regardless of LO frequency. Repeat this procedure only if you change one of the mixer modules or the LO source.

Procedure

All keystrokes in this procedure are performed on the receiver. The receiver controls the LO source.

1. To set the LO power:
   a. Press (SPAN) 0 (x1) (use 1 (M/u) if HP 834X or HP 8350B Sources)
   b. Press (CENTER) 3.5 (G/n)
2. The LO power must be set to either +10 or +13 dBm. Refer to Table 1-2 to determine which value you should use. If you are unsure of what power level to set, set the LO to 10 dB.

Table 1-2. Proper LO Source Power Setting

Max. LO Frequency 8.4 GHz		Max LO Frequency 12.4 GHz		Max LO Frequency 18.0 GHz	
LO Cable Length	Proper LO Source Power	LO Cable Length	Proper LO Source Power	LO Cable Length	Proper LO Source Power
<12m	+10 dBm	<9m	+10 dBm	<7m	+10 dBm
≥12m	+13 dBm	≥9m	+13 dBm	≥7m	+13 dBm

Example of Table Use:

Assume the maximum LO frequency of your system is 12.4 GHz, and your LO cable (the RF cable that goes from the LO source to the imput of the LO/IF unit) is 13 meters long.

Look in Table 1-2 under "Max LO Frequency 12.4 GHz." Since your cable is 13 meters long, find the ≥9m entry. Look to the right of ≥9m, at the value shown under "Proper LO Power," in this case the proper LO source power setting is +13 dBm.

3. To set LO power, press (on the receiver):

   STIMULUS (MENU) POWER MENU
   POWER SOURCE 2 *numeric value* (X1)
   (*numeric value* represents the value in dB), (default is 10)

4. Observe the voltage displayed on the front panel of the LO/IF unit. Adjust the HP 85309A's LO POWER ADJUST until the leveling voltage is equal to the voltage shown on the reference mixer label.

Note The voltage in the LO VOLTAGE display window will vary with frequency. This is normal. The LO POWER OUT OF RANGE light will come on only if the system's automatic leveling loop cannot level the voltage sufficiently. This can happen if the LO source is disconnected, or if you are requesting more power than the LO/IF unit can supply for a given frequency range.

Saving the Setup

Press (SAVE) USER PRESET 8 to save the current instrument setup. Whenever you press (USER PRESET) or turn the receiver on, the proper settings for this system will be recalled.

In order to make the HP 8530A easier to set back to this configuration if it changes for any reason, or in case the HP 8530A operating system has to be reloaded, make a backup disk of the operating system and a machine dump.

To make a backup disk:

1. Save the basic instrument set up into USER PRESET 8 as shown above.
2. Save any other potental instrument set ups into other (SAVE) registers. These can be setup changes such as; Start/Stop Frequencies, Number of Points, Domains, and others. To save this set up press (SAVE) #.
3. To store the operating system on to a blank disk:
   a. Insert a formatted disk into the HP 8530A
   b. Press:

      (SYSTEM) MORE SERVICE FUNCTIONS

      TEST MENU (2) (0) (=MARKER).

      Make sure you name the file with a recognizable name that will tell what this file is for.
   c. After the operating system has been stored, press:

      (1) (5) (=MARKER).
4. To store the machine dump press:

   (DISC) STORE MORE MACHINE DUMP. Be sure that your name the file with a recognizable name that will tell an operator what this file is for.

   Label the backup disk.

To load from the backup disk, perform the following:

1. Insert the backup disk into the HP 8530A.
2. To load the operating system into the HP 8530A press:

   (SYSTEM) MORE SERVICE FUNCTIONS

   TEST MENU (1) (9) (=MARKERS).

   Select the correct file.
3. To load the machine dump, press:

   (DISC) LOAD MORE MACHINE DUMP.

   Select the correct file.
4. The system is now set up exactly like it was before.

2

Compatible Instruments

Compatible RF Sources

HP 8360 Family Sources

All HP 8360 series instruments are compatible, but not all allow the use of the quick-step without upgrading them. If your source firmware is earlier than March 8, 1991 version, refer to Table 2-1 for upgrades required for these functions.

Table 2-1.
Sources Compatible with Fast Measurement Speeds and Quick Step Mode

HP Model	Recommended Options	Hardware Serial Prefix	Firmware Revision[1]	Upgrade Kit
83630A, 83650A or 83651A	008	All	≥ March 8, 1991[2]	Compatible-None required
83621A or 83631A	none	< 3103A	≥ March 8, 1991[2]	Requires HP 83601A hardware kit[3]
		3103A	≥ March 8, 1991[2]	Requires 08360-60167 firmware kit
		3104A to 3111A	≥ March 8, 1991[2]	Requires 08360-60201 firmware kit
		≥ 3112A	≥ March 8, 1991[2]	Compatible-None required
83620A, 83622A, 83623A, 83624A or 83640A	008	< 3145A	≥ Nov. 14, 1991[2]	Not Compatible[4]
		≥ 3145A	≥ Nov. 14, 1991[2]	Compatible-None required
83642A	008	Not compatible		Not compatible[4]

1 For millimeter wave band "W" compatibility, Firmware revision date must be ≥ October 23, 1992.

2 If the firmware revision is dated earlier than March 8, 1991, it is *not* compatible, even if the hardware *is* compatible.

3 Includes installation.

4 Cannot be upgraded.

HP 8340 Family Soruces

The HP 8340A/B and HP 8341A/B are compatible as RF sources with no firmware dating.

HP 8350B Family Sources

The HP 8530A/B sources are not compatible as the RF source.

Compatible LO Sources

The LO source firmware revision must be compatible with the receiver.

HP 8350B Plug-Ins

HP 83525A HP 83592A HP 83540A HP 83592B HP 83590A

- Firmware rev $\leq$6 for 8350B main frame.
- Firmware rev $\geq$7 for 8359X series plug-ins.
- Firmware rev $\geq$6 for 835XX series plug-ins.

HP 8340 Family Sources

The HP 8340A/B and 8341A/B are not compatable as LO sources, but may be used as the RF source.

HP 8360 Family Sources

See Table 2-1 for firmware compatibility.

Table 2-2. Required Options for HP 8360 LO Sources

Model	Recommended Options	Special Option Requirements
HP 83620	008	HP 83620A's with a serial prefix less than 3103A require option H87. If cable length between the LO source and HP 85309A is greater than 7 meters, contact your local HP representative.
HP 83621A	None	HP 83621A's with a serial prefix less than 3103A require option H87.
HP 83622A	008	HP 83622A's with a serial prefix less than 3103A require option H87. If cable length between the LO source and HP 85309A is greater than 7 meters, contact your local HP representative.
HP 83623A	008	HP 83623A's with a serial prefix less than 3103A require option H87.
HP 83624A	008	HP 83624A's with a serial prefix less than 3103A require option H87.
HP 83630A	008	
HP 83631A	None	HP 83631A's with a serial prefix less than 3103A require option H87.
HP 83640A	008	None
HP 83642A	008	None
HP 83650A	008	None
HP 83651A	008	None

Compatible Positioner Controllers

Without HP 85330A

Without Antenna Positioner Encoder HP 85370A, or when using the HP 85360A measurement software, use Table 2-3.

Table 2-3.

Controller	Model	Firmware
Flam & Russell	FR 8502	Revision 1.5
Orbit	AL-4706-3A	Revision 1.7 or later
Scientific Atlanta	SA 4139	Controller 461-703
		PAU 461-731

With HP 85370A

With Antenna Positioner Encoder HP 85370A, any positioning system that uses synchro encoders will work.

With Flam and Russell FR 959

With FR 959 measurement software, any positioning system that uses synchro encoders will work.

Compatible External Monitors

The HP 8530A is designed to work with monitors that need these four specifications:

1. Horizontal scan rate of 25.5 kHz must be supported.
2. Vertical scan rate of 60 Hz must be supported.
3. The monitor must accept separate R G B signals.
4. The monitor must accept RGB signals at .7 volts.

Multisync monitors commonly meet all these requirements. The monitor can have one or two sync inputs (composite sync or separate H, V sync), and positive and negative sync is supported.

Some of the monitors that can be run with the HP 8530A are listed in: Table 2-4

Table 2-4. External Monitors

Manufacturer	Model
NEC	Multisync XL Multisync II Multisync Plus
Nanao	Flexscan 8060
Concorde Technologies	CT 5117 Multiflat Plus 17 CT 5121 Multiflat Plus 21
IIYAMA Electric Co	MF 5117 Multiflat Plus 17

At the time this manual was published, the only compatible HP monitor was the HP 3574IBM. This monitor has no sync connections as such. Sync pulses are superimposed on the green video signal. The HP 8530A *cannot* drive dedicated-format monitors such as CGA, EGA, VGA or SVGA.

3

Making Adjustments

The following provides the adjustments most frequently needed for HP 8530A system service. Table 3-1 Most of the HP 8530A is self adjusting except for the following:

Table 3-1. Typically Used HP 8530A Adjustments

Title	Adjustment Function	Assembly Adjusted
Verticle Alignment Adjustment	Aligns softkey labels and mechanical softkey buttons	A11
Degausing the Display (Demagnetizing HP 85101 Display)	Demagnetize the display	A11
HP 8350A Pllug-ins Front Panel FREQ CAL	RF frequency calibration	HP 8350B plug-in
HP 8360 Serires Sources Full User Cal	Full user calibration	HP 836XX Series Sources

Table 3-2. Required Test Equipment for HP 8530A System Adjustments

Equipment	Recommended Model	Substitute
CRT demagnitizer or bulk tape eraser	Radio Shack Model 44-233	1 to 2 amp pencil sharpener motor base held near CRT with motor on
Flat-head screwdriver	At least 2-inches long, non-conductive	none
10 dB pad	HP 8493C	HP 8360 Series souce with built-in attenuator
HP 85102A/B and test set adjust software	HP part number 08510-10024	Rev.A.01.10

Procedure 1. Vertical Alignment Adjustment

Note The vertical alignment can be adversely affected by magnetic interference. Before adjusting the vertical position, be sure the analyzer is in a non-magnetic environment and the CRT is degaussed.

1. Switch on the system and allow it to warm up for 60 minutes.
2. To access the vertical position and focus controls, remove the side panel nearest the display. See Figure 3-1.
3. Insert a narrow, non-conductive, flat-head scewdriver (2 or more inches long) into the vertical position hole.
4. Adjust the control until the softkey labels align with the sofkeys.

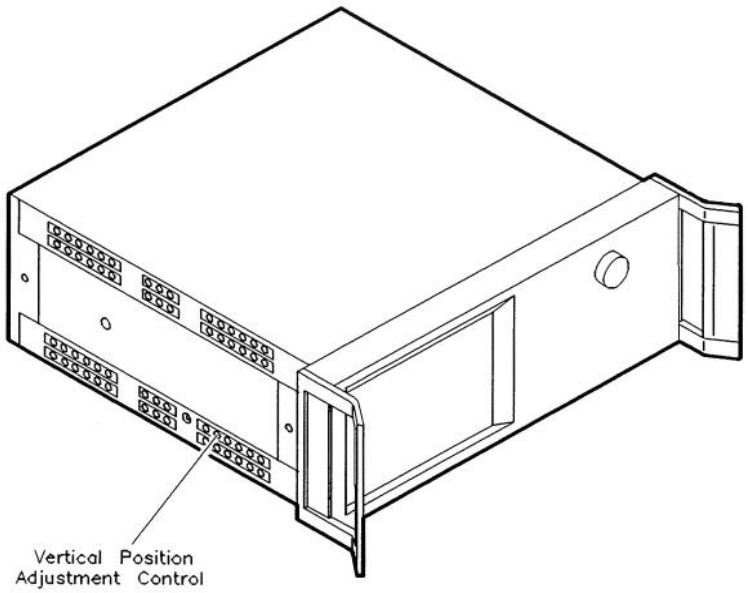

Figure 3-1. Vertical Adjustment Location

Procedure 2. Degaussing (Demagnetizing) the Display

Use any CRT demagnetizer or bulk tape eraser for this procedure. The color monitor display is very susceptible to external magnetic fields, such as metal frame tables, welded cabinets, the earth, unshielded motors and other sources. The usual symptom is discoloration or slight dimming of the display (usually near a top corner of the CRT). In extreme cases, a total color shift may be observed; for example, a trace that was red may shift to green. This shift does not suggest a problem with the display; it is characteristic of color displays needing demagnetizing. In countries using 50 Hz, some 10 Hz jitter may be observed. If this problem is observed, remove the device causing the magnetic field.

If the display becomes magnetized, or if color purity is a problem, cycle the power several times. Leave the instrument off for at least 15 seconds before switching power on. To trigger the automatic deqaussing circuit in the display. If this is insufficient to get color purity, use a commercially available demagnetizer. (Either a CRT demagnetizer or a bulk tape eraser). Follow the manufacturer's instructions keeping in mind that it is imperative when demagnetizing a display that the degausser is kept farther than 4 inches (10cm) from the face of the CRT. Generally, degaussing is done with a slow rotary motion of the degausser, moving it in a circle of increasing radius while simultaneously moving away from the CRT. The following figure illustrates the motion for degaussing display.

CAUTION Applying an excessively strong magnetic field to the CRT face can permanently destroy the CRT.

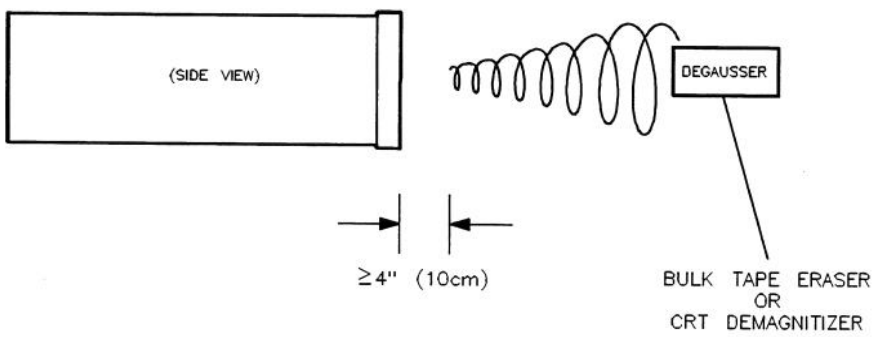

Figure 3-2. Using a Degauser on the Display

Cleaning the CRT

1. Remove the softkeys cover (a plastic cover through which the front panel softkeys protrude): carefully insert a thin, flat screwdriver blade (or your fingernail) between the upper left-hand corner of the softkeys cover and the glass filter. See Figure 3-3. Be extremely careful not to scratch or break the glass. Pull the cover forward and off.
2. Remove the two screws that are now uncovered.
3. Remove the display bezel assembly by pulling out the end that is now free. Pivot the bezel around its left edge until it is released.
4. Clean the CRT surface and the inner glass filter surface gently, with hot soapy water or camera lens cleaner.
5. Allow the surfaces to dry, then reassemble the instrument.

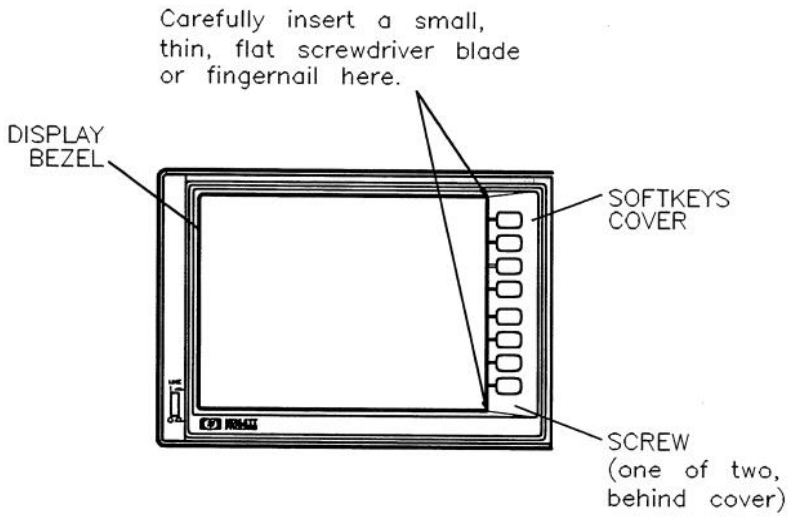

Figure 3-3. Removing the Glass Filter

Procedure 3. HP 8360 Series Sources Full User CAL

Full User Cal initiates a full synthesizer calibration. The calibration performed is instrument state dependent. For example, if the synthesizer is in ramp sweep mode, a sweep span and an auto track calibration are done. If the synthesizer has amplitude modulation active on an SW signal, then RF peaking and AM bandwidth calibrations are performed. For HP 8510C purposes only, ramp-sweep mode is needed. Perform the following calibration procedure:

1. On the HP 8360, press (PRESET) (USER CAL).
2. Select `Full User CAL`. Wait for the calibration to complete (usually $\leq$1 minute).

Attenuation Needed

If your HP 8360 Series source does not have a built in attenuator, you are prompted to connect a 10 dB attenuator to the HP 8360 Series RF output port. Auto track is done as part of Full User Cal.

4

System Performance Verification

A more detailed description of this verification is included in the *HP 85301B Operating and Service Manual*

Recommended Test Equipment

Table 4-1 lists the equipment that is mandatory when running the performance verification.

Table 4-1. Required Equipment

Qty.	Item	HP Part or Model Number	Use[1]
1	Computer with 2 Mbyte memory	HP Series 300	T, R
1	HP 85310A Verification Software	85309-10001	R
1	HP 836xx Verification Software	08360-10001 or 08360-10002	T
1	Power meter with HP-IB and cable	HP 436A opt 022, or 437A, or 438A	T, R
1	Power sensor (3.5 mm connector)	HP 8485A[2]	T, R
1	RF synthesized source	HP 8340/41 or 8360 Family[3]	R
1	Microwave frequency counter	HP 5351B option 001 or HP 5343A option 001	T
1	Oscilloscope - Dual Channel[4]	Any with a bandwidth greater than 20 MHz	T
1	3.5 mm adapter (f to f)	1250-1865 (supplied w/HP 85310A)	R
1	Power splitter	HP 11667B (or 5086-7408, part of receiver service kit)	R
2	RF cable, 3.5 mm (m) to (f)[5]	08513-60009 (or other low loss)	R
1	50 ohm load, 3.5 mm (m)	HP 909D (or 85052-60001, part of HP 85052A cal kit; or 85052-60010, part of HP 85052B)	R
1	50 ohm load, 3.5 mm (f)	HP 909D opt. 001 (or 85052-60002, part of HP 85052A cal kit; or 85052-60011, part of HP 85052B)	R
3	3 dB attenuator, 3.5 mm[6]	HP 8493C option 003	R
1	10 dB attenuator, 3.5 mm	HP 8493C option 010	T, R
3	20 dB attenuator, 3.5 mm	HP 8493C option 020	R
1	Torque wrench, 5 in-lb	8710-1582[7]	R
4	LO/IF Unit to Mixer cable[8]	Backup 85381A/B/C cable	R

1 T = transmitter performance verification; R = receiver performance verification;

2 You can use a different power sensor, if it covers the frequency range of the HP 85310A system.

3 The RF (transmitter) source may be used.

4 Required if LO source is a synthesizer and the LO, RF, and receiver timebases are *not* connected together.

5 Some sources may require a Type-N (m) to 3.5 mm (m) adapter.

6 During the compression calibration, one additional 6 dB 3.5 mm attenuators may be required: HP 8493C option 006.

7 Use this wrench for all SMA/3.5 mm connections in this procedure.

8 Required if the mixer/cable assembly cannot be removed from their normal location and therefore cannot be placed next to the verification system. These cables provide LO and IF signal paths for the test mixer and LO, IF, and detector voltage paths for the reference mixer.

Synthesized LO Source Timebase Check and Adjustment

If you are using an HP 8360 series synthesizer as the LO source and the timebase of the LO source, RF source, and receiver are not connected together you need to do the following procedure.

Description and Procedure

This procedure adjusts the frequency accuracy of the internal 10 MHz timebase of the LO source. This adjustment should be done on a regular basis if you cannot connect the timebases (LO, RF, and receiver) together.

This adjustment procedure should be done at least once a year. Millimeter wave systems should be done more often. See "Adjustment Interval," following this adjustment, for information on how to determine a periodic adjustment schedule. For best accuracy, readjust the 10 MHz timebase oscillator after the LO source and RF source have been ON or in STANDBY for 24 hours.

After the LO source timebase is adjusted, the timebase frequency should stay within the aging rate if the following things happen:

- The timebase oven does not cool down.
- The instrument keeps the same orientation with respect to the earth's magnetic field.
- The instrument stays at the same altitude.
- The instrument does not receive any mechanical shock.

If the timebase oven cools (the instrument is disconnected from AC power), you may have to readjust the timebase frequency after a new warm-up cycle. Typically, however, the timebase frequency returns to within ±1 Hz of the original frequency.

Note You can adjust the internal timebase after reconnecting AC power for 10 minutes, but for best accuracy, test again after the instruments have been ON or in STANDBY for 24 hours.

Frequency changes, due either to a change in orientation with respect to the earth's magnetic field or to a change in altitude, are usually eliminated when the instrument is returned to its original position. A frequency change due to mechanical shock usually appears as a fixed frequency error.

1. Connect the equipment as shown in Figure 4-1. Preset all instruments and let them warm up for one hour.

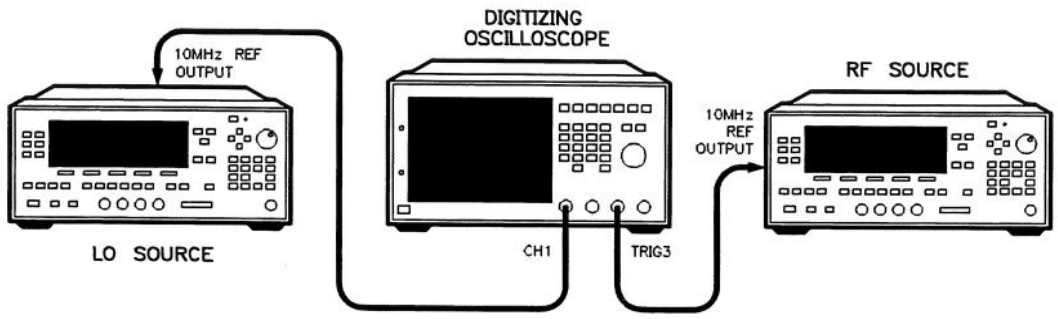

Figure 4-1. LO Source 10 MHz Timebase Adjustment Setup

Note If the oscilloscope does not have a 50Ω input impedance, connect channel 1 and the Trig 3 input through a 50Ω feedthrough. Ensure that an external frequency standard is not connected to either of the synthesizers. (At instrument preset the synthesizers automatically choose the external standard as the reference if one is connected to the 10 MHz REF INPUT.)

2. On the oscilloscope, set:

Channel 1:	
Display	On
Volts/Division	200 mV
Input Coupling	dc
Input Impedance	50Ω
Channel 2:	
Display	Off
Timebase:	
Time/Division	10 ns
Trigger	External
Trigger:	
Trigger Mode	Edge
Trigger Source	Trig 3
Input Coupling	ac
Display:	
Display Mode	Real Time

3. On the oscilloscope, adjust the trigger level so that the sweep is synchronized to the synthesizer's internal standard. The waveform will appear to drift.
4. Using a non-metallic tool, adjust the LO source's A23 10 MHz standard (see Figure 4-2) for minimum horizontal movement of the oscilloscope waveform.

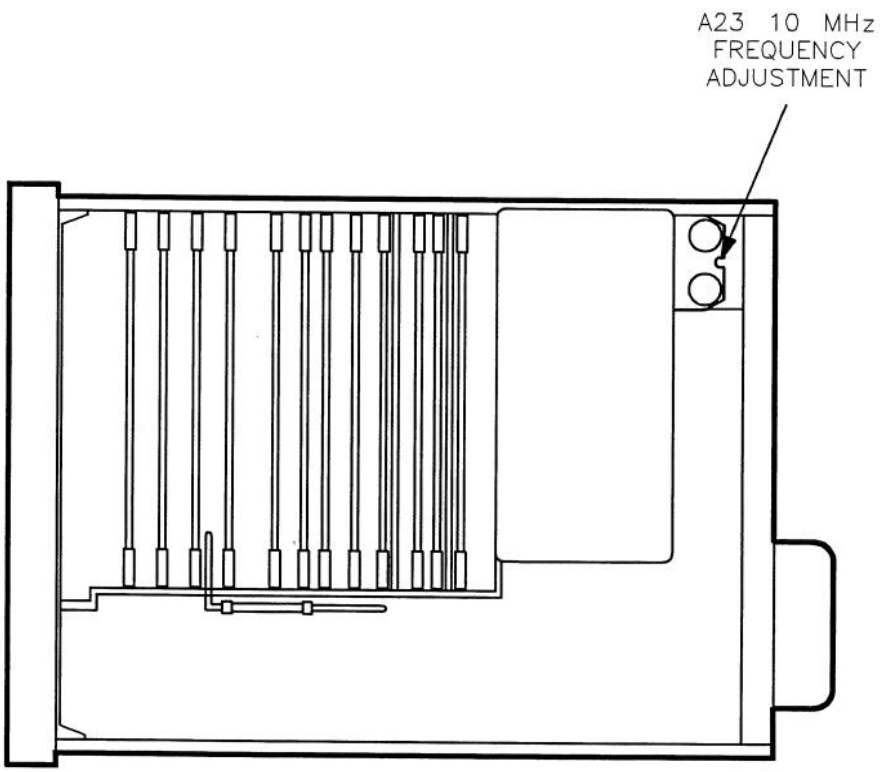

Figure 4-2. 10 MHz Standard Adjustment Location

Table 4-2 shows the required adjustment interval to maintain a given accuracy. If you know the aging rate, you can determine a more precise adjustment interval. See the HP 8360 series synthesizer Service Manual for more information.

Table 4-2. Suggested Adjustment Interval for LO Sources

Highest Frequency Tested	Interval
≤26.5 GHz	1 year
Between 26.5 and 50 GHz	6 months
Between 50 and 110 GHz	3 months

Transmitter Performance Verification

The transmitter performance verification checks the transmitter section of the antenna measurement system. The following tests are performed:

CW Frequency Accuracy	Checks the frequency accuracy of the transmitter source.
Maximum Leveled Power	Ensures that the RF source and optional amplifier produce specified leveled power.

A test record form is provided at the end of these transmitter tests. There is no test record form for the receiver tests, because the computer prints them for you.

If your HP 8360A (836xx) source has a front panel, proceed with the tests provided below. If your source does not have a front panel, use the front panel emulator under the (SYSTEM) MORE (SERVICE) key on the HP 8530A

CW Frequency Accuracy Test

Description

This procedure measures minimum and maximum CW synthesizer frequencies using a frequency counter. Afterward, the self tests verify that the internal hardware is maintaining frequency accuracy over the full frequency range.

Procedure

1. Connect the equipment as shown in Figure 4-3. Preset the instruments and let them warm up for one hour. The computer is only required if you use an HP 8360 source that does not have front panel controls.

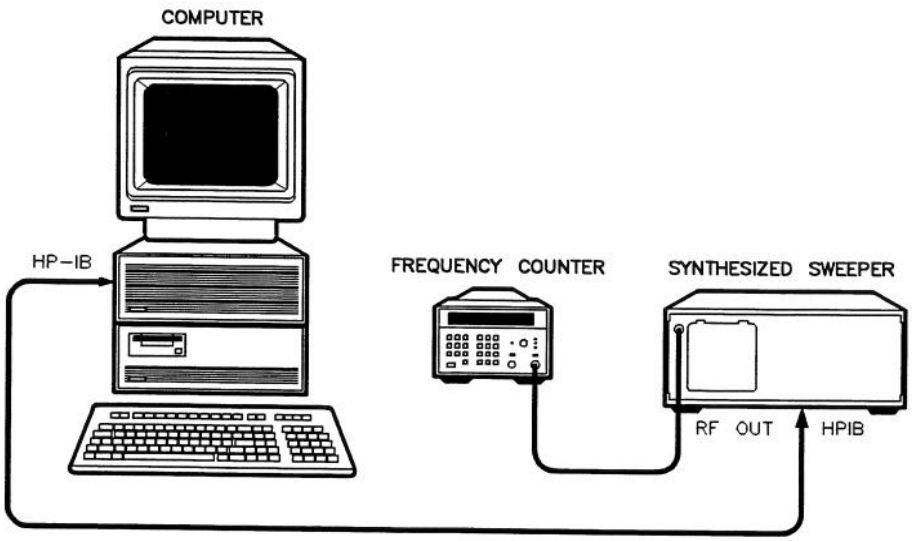

Figure 4-3. CW Accuracy Test Setup

2. Preset the HP 8360A
3. Enter the minimum frequency of your system.

   Front panel commands:
   [CW FREQUENCY] [#] [GHz]

   Where [#] represents the appropriate number keys for the frequency you are entering.
4. Measure the frequency with the counter and record this value in the test record (located at the end of this chapter).
5. Now set CW frequency to the maximum system frequency:

   Front panel commands:
   [CW FREQUENCY] [#] [GHz]
6. Measure the frequency with the counter and record this value in the test record (located at the end of this chapter).
7. Run selftest (the selftest verifies that frequency accuracy is maintained over the remaining frequency range of the HP 8360A):

   Front panel commands:
   [SERVICE] `Selftest (Full)`

In Case of Difficulty

1. Make sure the frequency counter has a current calibration sticker and that it meets its published specifications.
2. See section 1, "Troubleshooting" in the HP 8360A's Assembly-Level Repair manual.

Maximum Leveled Power Test

Description

This test uses a power meter to measure the maximum leveled power at 100 MHz intervals across the system's frequency band.

This procedure considers the RF source and (optional) amplifier a single unit. Therefore, when the procedure refers to the "transmitter source" or "source" it is referring to both units connected together. In this case, when the procedure says to "connect the power meter to the output of the source" you should actually connect the power meter to the output of the amplifier.

Specification "Bands"

Many HP synthesizers give different power specifications in frequency ranges. For example, the HP 83640A has *three* different leveled power specifications, each for a specific range of frequencies. These are called "specification bands" throughout this procedure.

Overview

Please familiarize yourself with this overview before performing the procedure. In this procedure you will:

a. Connect the equipment. If you have a high power synthesizer or are using an amplifier, the power meter must be protected by an HP 8493C 10 dB attenuator.

b. Peak the synthesizer performance using Peak and Autotrack features. (Autotrack affects swept performance, Peaking affects CW/manual performance.)

c. Set start and stop frequencies as appropriate for the first specification band.

d. Find the maximum leveled power. To accomplish this, increase the power until the synthesizer becomes unleveled, then decrease power in 0.1 dBm steps until power is leveled again.

e. Set the synthesizer to manual sweep mode, and enter the lowest frequency in the specification band. Observe the power on the power meter.

f. Increment the frequency in 100 MHz steps across the specification band, while watching for the lowest power in that band. A space is provided in the procedure so you can write down the lowest power.

g. Overview steps c through f are repeated for each specification band. (The steps in the procedure do not match the steps in the overview. The procedure will explain the actual steps to be repeated.) If your HP 8360A only has one specification band, you don't have to repeat the procedure.

h. After all the specification bands are measured, the lowest power in each band is compared with the "Maximum Leveled Power" specification listed in the synthesizer's manual. The results of the test are written in the test record, located at the end of the transmitter verification procedures.

Note High power transmitter sources (those that are specified to output more than 15 dBm) require the use of a 10 dB attenuator to protect the power meter. This is because high-power units often output more than 20 dBm, even though they might be specified to lower power levels.

Sometimes the measured output power will be within 1 dBm of the specification. This causes a problem because of a maximum ±0.5 dBm inaccuracy caused by the 10 dB attenuator. If this happens, additional procedure steps explain how to find the exact attenuation of the 10 dB attenuator at each frequency increment, so you can determine the *exact* performance of the source.

Procedure

1. Connect the power sensor to the power meter and turn the power meter on.
2. Connect the equipment as shown in Figure 4-4.

   Do not connect the power sensor to the source until later in the procedure. Let the power meter warm up for one hour.
3. If the power meter has a preset key, press it now. Zero and calibrate the power meter.

4. If the transmitter source is specified to output more than +15 dBm, connect an HP 8493C 10 dB attenuator to the input of the power sensor.

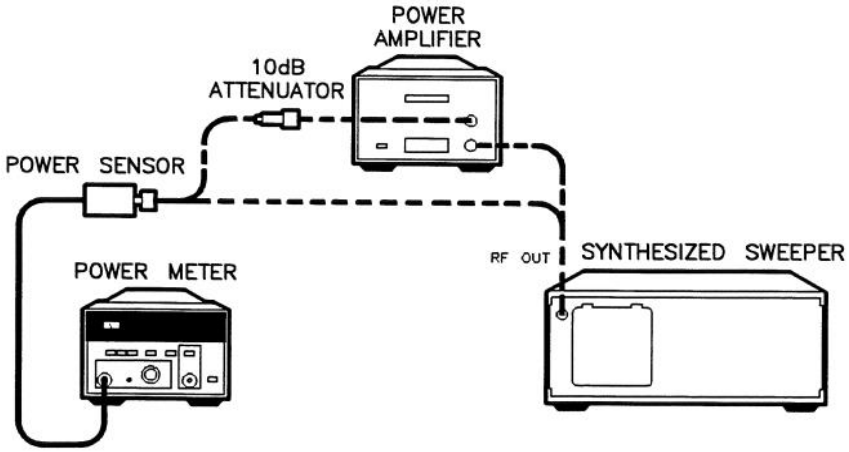

Figure 4-4. Maximum Leveled Power Setup

5. Set the power meter to dBm mode.
6. Connect the power meter to the transmitter source. The power sensor (with or without the 10 dB attenuator, as appropriate) should be connected directly to the transmitter source's RF output connector.
7. Press (PRESET) on the HP 8360A.
8. Remove the BNC short circuit from the stop sweep connectors.
9. Turn on the Peak RF Always and Auto Tracking features as follows:

   Front panel commands:
   (USER CAL) `Tracking Menu` `Peak RF Always` `Auto Track`

Note Some HP 8360As will now present a `Proceed` softkey. If this is the case with your unit, press `Proceed`.

   The Auto Track will take about 90 seconds to complete. The front panel emulator will show a caution message during the Autotrack. It will show the normal emulator display when Autotracking is finished.

10. Enter the start frequency of the desired specification band.

    Front panel commands:
    (START) (#) (GHz)

    Where (#) represents the start frequency.

11. Enter the stop frequency of the desired specification band. This would be the maximum frequency of the transmitter source if there is only one power specification band.

    Front panel commands:
    (STOP) (#) (GHz)

Note If the UNLVLED indicator is already on, skip to step 14.

12. Select 1 dBm resolution for the ▲ and ▼ keys as follows:

    Front panel commands:
    POWER MENU `Up/Down Power` 1 dB(m)

13. Press POWER LEVEL (v if using the emulator) to make power the active function.
14. Press the ▲ key to increase the power level until the unleveled indicator keeps flashing or comes on permanently.

Note At high power levels it is normal for the UNLVLED indicator to flash once each time you press the ▲ key. Ignore this. The HP 8360A is not really unleveled until the UNLVLED indicator keeps flashing, or stays on permanently.

15. Select 0.1 dB resolution for the ▲ and ▼ keys as follows:

    Front panel commands:
    POWER MENU `Up/Down Power` .1 dB(m)

16. Press POWER LEVEL to make power the active function.
17. Press ▼ until the unleveled message stops flashing. It is acceptable for it to flash once after pressing ▼.
18. Press ▼ once more.
19. Set the ▲ and ▼ keys to a 100 MHz resolution by pressing:

    Front panel commands:
    FREQUENCY MENU `more` `Step Swp Menu` `Step Size` 100 MHz

20. Set the HP 8360A to manual sweep mode and set the manual frequency to the first frequency in the power specification band:

    Front panel commands:
    SWEEP MENU `Manual Sweep` `Step` # GHz

    An asterisk (*) should appear next to `Manual Sweep` on the HP 8360A display, showing that Manual Sweep is now ON.

21. Observe the power meter reading at the first frequency in the specification band.

Note When performing the next step, change the power meter sensor calibration factor as necessary to keep the power reading calibrated. When performing steps 20 through 22, the goal is to determine the lowest power meter reading.

Hint If your power meter has automatic ranging, measurements will be faster if feature is turned off. This is usually done by selecting the 20 dBm range manually.

22. Use the ▲ key to measure the next frequency increment. Repeat this step for each 100 MHz increment in the specification band. Remember to change the power meter calibration factor when needed.

23. After measuring all frequency points in the band, write the lowest power meter reading under "Lowest Measured Power."

    Lowest Measured Power:

    Specification Band 1:_____dBm

    Specification Band 2:_____dBm

    Specification Band 3:_____dBm

24. Press `Ramp` `Manual Sweep`. At this time the asterisk (*) next to `Manual Sweep` should disappear, indicating that Manual Sweep mode is turned OFF.

25. Repeat steps 9 through 23 for each power specification band. When finished, proceed with following sections.

26. Re-install the BNC short circuit onto the STOP SWEEP as it was originally connected.

Does the Source Meet Specifications?

If Your Source is Specified to Output Less Than 15 dBm

Refer to the specified output power of the source (refer to the source's operating manual). If the values written in "Lowest Measured Power" meet or exceed the Maximum Leveled Power specifications, the test passed. If they are lower, the test failed.

If the test passed, write the values in "Lowest Measured Power" into the test record, located at the end of these transmitter tests.

If Your Source is Specified to Output More Than 15 dBm

How to tell if the source has definitely passed the test. The HP 8493C attenuator can have up to ±0.5 dB of power inaccuracy. If the source surpasses specifications (in each band) by more than 0.5 dBm, then the power exceeds the area of possible inaccuracy. In this case the source definitely passes the test.

For example: Assume your source has a specified output power of +20 dBm in a single band. You measure the actual performance with a 10 dB pad attached (to protect the power sensor) and the lowest power level measured is +12 dBm. Add the nominal loss in signal caused by the attenuator (10 dB):

12 dBm + 10 dB = 22 dBm.

In this case, the instrument clearly meets specifications.

If all specification bands pass, write the lowest value for each band in the test record under "Lowest Measured Power."

How to tell if the source has failed the test. If the source fails specification by more than 0.5 dBm, then it has failed the test.

For example: Using the same source as in the example above, you measure the actual performance (through a 10 dB attenuator). The lowest power you measure is +8 dBm. Add the nominal loss in signal caused by the attenuator (10 dB):

8 dBm + 10 dB = 18 dBm.

In this case, the instrument clearly does not meet specifications.

How to tell if source performance is in the area of uncertainty. If the source outputs a power level within ±0.5 dBm of the specification, then it is in the area of uncertainty. In other words, because we don't know the exact loss of the attenuator, we are not sure if the source is really meeting its specifications or not.

For example: Using the same source mentioned in earlier examples, you measure the actual performance (through a 10 dB pad). The lowest power you measure is +9.9 dBm. Now, add the nominal loss in signal caused by the attenuator (10 dB): 9.9 dBm +10 dB = 19.9 dBm. In this case the source appears to have failed the test. However, the attenuator does not have exactly 10 dB of loss. Assume the true amount of loss is 10.3 dB. If this were the case, the instrument would be putting out: 9.9 dBm + 10.3 dB = 20.2 dBm.

In Case of Difficulty

See section 1, "Troubleshooting" in the HP 8360 Assembly-Level Repair manual.

Table 4-3. Worksheet for Uncertain Power Measurements

Frequency	Source Measured Power	Power After Attenuator	Actual Attenuation	Leveled Power with Attenuator	Actual Source Power

Table 4-4. HP 85301C Transmitter Test Record, CW Frequency Accuracy

Operator:	_____	
Date:	_____	
Temperature:	_____	
Humidity:	_____	
	Model Number	Serial Number
RF Source:	_____	_____
Amplifier:	_____	_____
Power Meter:	_____	_____
Frequency Counter:	_____	_____
Counter Timebase Accuracy:	_____	
10 dB Attenuator:	_____	_____
	Measured Frequency	Specification
Minimum System Freq: 2 GHz	_____	Same as Time Base[1]
Maximum System Freq:	_____	Same as Time Base[1]
Self test (circle one):	Passed	Failed

1 Specification: 1 ppm (for example, up to 1 kHz error per 1 GHz of CW frequency). Instruments disconnected from AC power for more than 24 hours require 30 days to achieve time base specification. Instrument unplugged for less than 24 hours require 24 hours to achieve time base specification.

Table 4-5. HP 85301C Transmitter Test Record, Maximum Leveled Power

Specification Band Start Frequency[1]	Specification Band Stop Frequency[1]	Lowest Measured Power	Specification[2]
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

1 Power specifications are given in frequency ranges. Write the beginning and end of each specification range in these two columns.

2 If your system has an amplifier, refer to the amplifier manual for specifications. If the system does not have an amplifier, refer to the synthesizer manual.

Receiver Performance Verification

This procedure requires an HP 9000 Series 300 computer, power meter and sensor head, RF source, and miscellaneous attenuators and splitters. Performance traceability can be provided through the power meter, sensor head, and the RF source.

Commands that must be typed into the computer are shown in `computer typeface`. These commands should be typed in exactly as printed on the page, including any quotation or punctuation marks. You can type in commands like LOAD, RUN, etc., in upper or lower-case. Filenames must be entered in the same case as used when they were created. Front panel keys are shown in an outline box (PRESET). Function keys and display softkeys are shown in a shadowed box Done.

Setting Up The Equipment

1. Be sure that the correct BASIC operating system, drivers, and language extensions are loaded into the computer controller.
2. The receiver, LO/IF unit, mixers, LO source, and cables should be in the same configuration in which they are normally used. Make sure that all cables are connected properly, and that the receiver is in the same multiple source mode as used in your system. All connectors should be properly torqued, refer Chapter 1 "Preflight".
3. Connect system components as shown in (figure 4-5), Configuration Diagram. The mixers must be placed near the verification system during the performance verification. If the RF SOURCE to SPLITTER cable is different than the recommended cable, then it must be as short as possible with very low RF loss.
4. This procedure assumes you will be using some of the cables from your actual range, specifically, the cables between the LO/IF unit and the mixers. This requires that the cables be pulled from their installation location so that the mixers can be placed near the verification system. If the cables cannot be pulled, they must be tested separately. In this case the mixers should be connected to the verification system with a backup set of HP 85381 cables of the same type and length as the cables normally used in the system.
5. Once set up, turn on all equipment and allow it to warm up for one hour.

Note If you cannot bring the mixer down from the antenna tower, consider taking the RF source and power meter up to the mixers (if possible). Two additional HP-IB extenders will be required: One to connect the power meter to the general HP-IB "700 bus", and one to connect the RF source to the receiver System Bus.

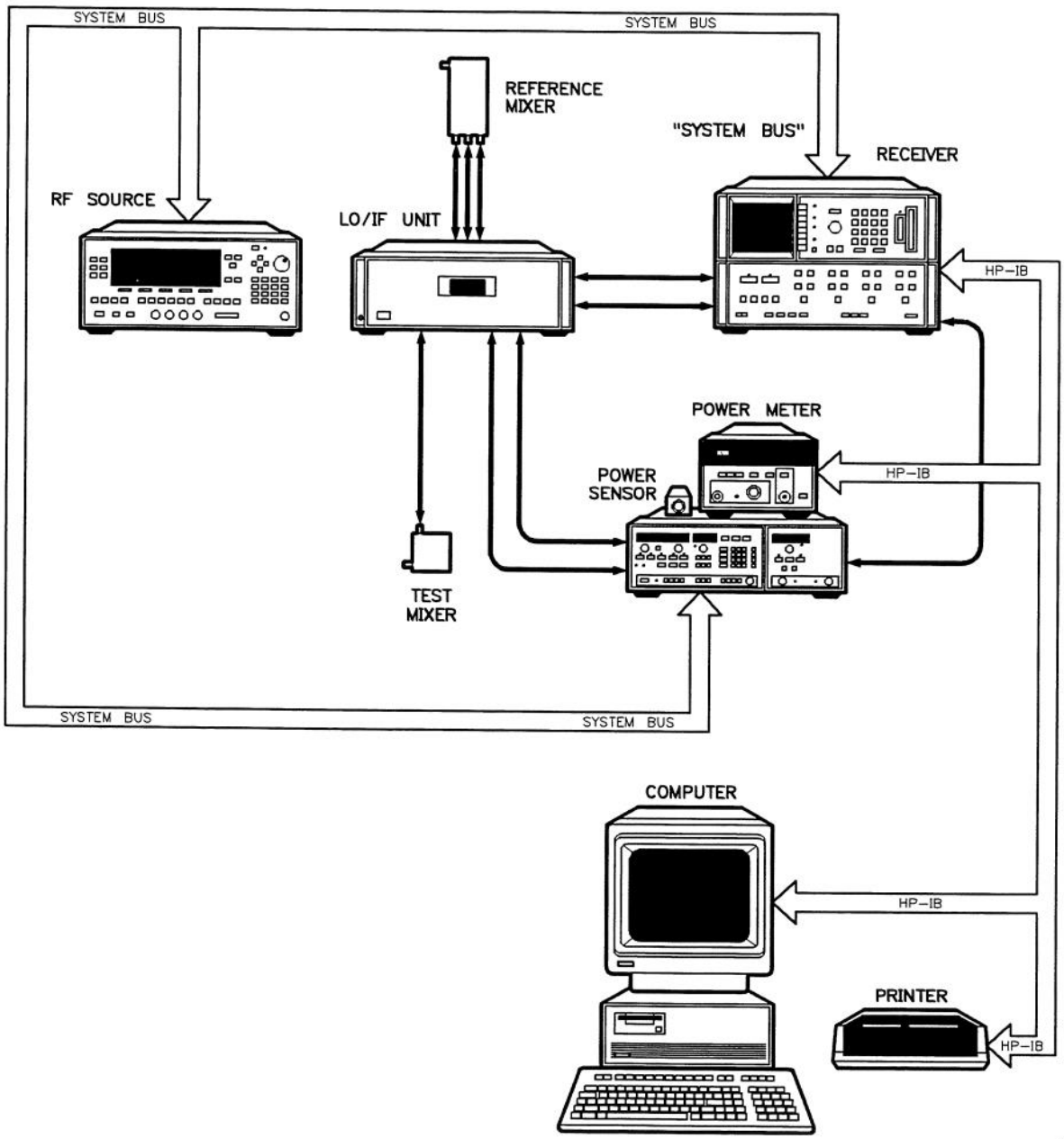

Figure 4-5. Instrument Configuration Diagram

Note This is a suggested bench configuration only. The HP 85309A LO/IF unit can be left in a system rack, so long as it is accessible by the verification system.

Connect the system printer or plotter to the general HP-IB "700 bus".

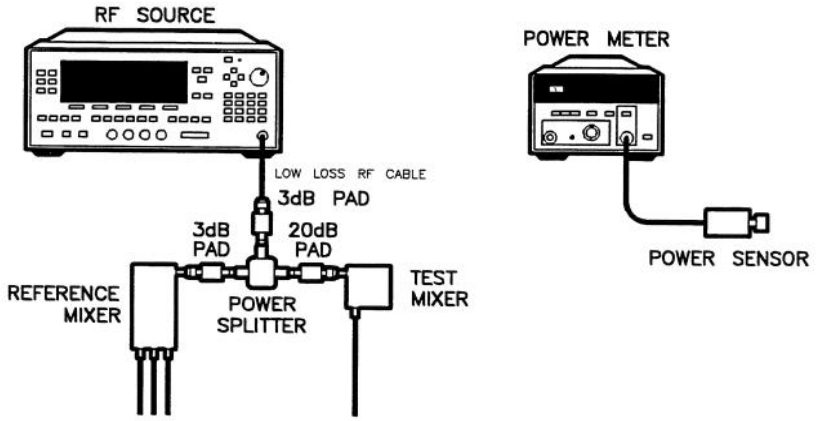

Figure 4-6. RF Test Signal Diagram

Check LO Power

The following steps verify that the LO is working properly.

LO Power Check

Check the LO source output power. The LO source should display a power level of either +10 or +13 dBm. Chapter 1 "Prefilght; Setting LO Power" explains how to determine which of these settings is appropriate.

LO Leveling Check

Perform the following test to check LO power over the entire frequency range.

Note All keystrokes in the following procedure are intended for the receiver.

---

1. Make sure the system is set up properly.

   On *HP 8530* only press:
   (DOMAIN) FREQUENCY.

2. Set the receiver to the fundamental mode by pressing:

   STIMULUS (MENU) MORE CONTINUAL (PRIOR MENU) STEP.
   (SYSTEM) MORE EDIT MULT. SRC.
   DEFINE: SOURCE 2.
   MULTIPLIER DENOM. 1 (x1).
   DONE.
   MULT. SRC ON/SAVE.

3. Press (SPAN) 1 (M/u) (CENTER) 3.5 (G/n).
4. Observe the DETECTOR VOLTAGE displayed on the HP 85309A.
5. Adjust the HP 85309A's LO POWER ADJUST, if necessary, so the DETECTOR VOLTAGE is within ±2 mV of the voltage printed on the reference mixer.

Note The voltage in the DETECTOR VOLTAGE display window may vary with frequency. This is normal. The LO POWER OUT OF RANGE light will come on only if the system's automatic leveling loop cannot level the voltage sufficiently. This can happen if the LO source is disconnected, or if you are requesting more power than the LO source can supply for a given frequency range.

Receiver Verification Software Introduction

This introduction includes a brief description of the tests in the performance verification, and a summary of the softkey functions. These tests will verify the performance of an HP 85310A downconverter operating with an HP 8510B/C receiver. These tests will not verify the performance of the converter without the receiver.

Brief Description of Tests

Required Tests

Each set of mixers in the system must be verified. Usually, a system only has *one* set of mixers - the HP 85320A/B. For *each* set of mixers, you must verify each available harmonic mode over the entire frequency range of each mixer set. For example, HP 85320 mixers must be tested twice. They must be tested first in the fundamental mode (from 2 GHz to the highest LO frequency available in your system), and once in the third harmonic mode (from 6 GHz to 26.5 GHz). If your HP 85310A has option 001 or 002, these mixers must be tested also.

- *Compression* measures the error in a ratio measurement due to compression of the HP 85310A at high input power levels.
- *Channel Isolation* measures signal leakage between the antenna reference and test channels.
- *Acquire Phaselock* checks that the receiver will phase lock at the specified power.
- *Low-Level Noise* measures sensitivity (the RMS noise level of the trace data when the channel is terminated with a 50 ohm load).

Refer to "Detailed Description of the Tests" at the end of this section for additional information.

Optional Tests

- *Mixer Port Return Loss* - of each of the HP 85320A/B mixer RF inputs may be measured using a network analyzer. This test is optional and is not required for performance verification. See the end of this chapter for more information on measuring return loss.
- *Cable Test Procedure* - is required if you were not able to include the LO/IF UNIT to MIXER cables originally installed in the system. Generally this occurs when the cables could not easily be removed from their conduits.

Softkey Summary

`HELP` presents instructions or further information about the current test or menu. This key appears throughout the test menus and does not disrupt the test sequence.

`ABORT` stops the current test or menu and returns to the last menu or the test menu. (It will take effect at the end of a sweep.)

`RESTART` displays the current connection diagram and restarts a single test without returning to the test menu. This softkey will appear after a test has been made.

`RECALIB` erases the results of the current test and restarts the entire test including calibration. Use this function when a test fails due to a faulty or questionable calibration. This softkey will appear after a test has been made.

`REMEAS` repeats a measurement with the same setup and calibration (without viewing the current connection diagram or returning to the test menu). This softkey appears following tests and calibrations.

`IO MENU` displays a menu with the following softkeys and program features:

`Print`	Prints to the printer on the HP-IB or System Bus.
`File`	Saves data to or loads data from disk.
`Equip`	Displays the required equipment list.
`Sys Confg`	Records the test instruments used in this test.
`Sys Info`	Records system serial numbers.
`Sys Frq`	Sets test frequencies and harmonic.
`MAINmenu`	Returns to main test menu.
`END_prog`	Exits the program.

Data Storage

Use the `FILE` softkey in the I/O menu to save data on a separate data disk. This feature enables you to return to an incomplete test and continue the test where you had stopped. Refer to the "Save/Load Instructions" later in this section.

Running The Program

1. Turn on the computer and load the BASIC operating system.
2. Run the program as follows:
   a. Insert the performance verification disk in the drive and type `LOAD "PERF85310A"` (RETURN). Remember, the computer is case-sensitive with regard to file names.
   b. When the program is loaded, run it by pressing the `RUN` key on your computer or by typing `RUN` (RETURN).

      If an error message is displayed now, it is usually because a driver or language extension (or both) have not been loaded.
3. When the system is configured and the program is running, the program title banner will appear on the computer's screen.
4. You can exit the program any time by pressing `END_prog` (in the I/O menu). However, `END_prog` *erases calibration data* from the program unless you previously saved the calibration data to disk. In addition, make sure the *verification data* has been printed, or has been saved on a disk before ending the program.

The appearance of the program title banner on the computer display indicates that the hardware is properly configured and the software is running properly:

```
*********************************************
* HP 8510 / 85310A PERFORMANCE VERIFICATION  *
* HP P/N 85309-10001                         *
* Revision : x.xx.xx                         *
* Copyright:                                 *
*********************************************

Accompanying text with a list of compatible RF Sources.
```

If this banner is not on the screen, check the following items:

- Are the instruments and cables set up properly? (see figure 4-5).
- Are BASIC and its extensions loaded properly?
- Are the individual instruments functioning properly? (Run self-tests, refer to the troubleshooting information in the receiver manual set.)

Use the computer softkeys when making program selections. For example, when prompted to `PRESS CONTINUE`, press the softkey labeled `CONTINUE`, not the keyboard (CONTINUE) key.

Initial Setup

1. With the title banner displayed, press the program softkey `CONTINUE`. The computer now asks if you want to see the test equipment list, press `YES` or `NO` as desired. When you are finished, press `Done`.

   The following System Configuration menu will now appear:

```
        System Configuration

Display/Processor:     HP 85101
IF/Detector:           HP 85102
RF Source:             HP 83xxx

Power meter:           HP 43xA

Printer connected to: HP-IB

LO Source:             HP 83xxx
LO Plug in:            HP 835xxx

Mixers:                HP 85320
```

2. Toggle each softkey until the System Configuration menu displays the instruments in your system. Press `Done` when the displayed information is correct.

3. The System Information menu will now appear (see below). Use the `NEXT` and `PREVIOUS` softkeys to move the cursor and use the computer keyboard to enter each instrument's serial number (and other information).

   System information is saved to the data disk when the verification data is saved. This information can also be printed after verification, otherwise it will be erased as soon as another program is run or the computer is turned off.

```
        HP 8510/85310A Performance Tests

System information:    Date:
Temperature             C  :
Humidity                %  :
HP 85101                S/N:
HP 85102                S/N:
HP 85309A               S/N:
HP 85320                S/N:
Power Meter             S/N:
HP RF Source            S/N:
HP LO Source            S/N:
HP Plug-In              S/N:
NOTE:
```

4. Press `Done` when all of the displayed information is correct.

5. The harmonic and start/stop frequency information menu will now appear (see below). Use the `NEXT` and `PREVIOUS` softkeys to move the cursor and use the computer keyboard to enter the harmonic number that will be used for this test. Enter the required start and stop frequencies. (The frequencies you select are dependent on whether you select fundamental or a harmonic mode, and on the equipment you are using. These frequencies are also limited by the highest and lowest LO frequency available in the mixer's fundamental or harmonic mode.)

The entire performance verification should be performed in fundamental mode and again in the harmonic mode. If you are using mixers that have more than one harmonic mode, run the performance tests for each of these modes.

The harmonic and start/stop frequency information is saved to the data disk when the verification data is saved. This information can also be printed after verification; otherwise it will be erased as soon as another program is run or the computer is turned off.

```
        HP 8510/85310A Performance Tests for Mixer

Mixer Test Harmonic:      1
Start Test Freq. in GHz:  2
Stop Test Freq. in GHz:   8.4
LO Source Power in dBm:   13
```

6. Press `Done` when all of the displayed information is correct.

7. To re-enter any of the above menus, press `IO Menu` followed by the appropriate softkey.

   To leave this menu, press `DONE` (after you have entered as much of the above information as you need). You can get back to the Main menu later by pressing `MAINmenu`.

8. Calibrate the power meter and the power sensor by using the power meter POWER REF OUTPUT as explained in the power meter manual.

9. The Main test menu will now appear on the screen. This menu allows you to select and perform any of the four tests. You can display additional instructions with the `HELP` key or access the I/O menu.

```
HP 8510/85310A PERFORMANCE VERIFICATION
RF Source: HP 83xxx

Compress:   Compression & Channel Isolation tests
AquireLk:   Acquire Phase lock test
Low-Lev:    Low-Level Noise tests
Help:       Testing instructions
I/O menu:   Print to printer or Save to disk
             a summary of test data.
```

10. Choose one of the tests from the Main menu. You can perform the tests in any order, but performing the tests from top to bottom is recommended. The four tests are required to ensure that the HP 85310A meets its published specifications.

The next section explains how to perform each of the verification tests.

Verification Test Procedures

Introduction

The following instructions augment the screen prompts of the program. They are step-by-step instructions intended for novice operators. The screen prompts are sufficient for technicians who are familiar with the HP 85310A system.

With the Main menu displayed on the computer display, read the instructions for each test below and follow the steps carefully. If an error message repeatedly appears during any part of the procedure, or if the program will not continue as the instructions indicate, you may have to rerun the program from the beginning. This should only be done if no other program softkey can provide a solution.

Note This verification software allows you to verify up to 4 channels; a1, b1, b2, and a2. The standard HP 85310A uses only channels a1 and b2. Do not perform the other channel tests unless your converter system has more than the two channels, such as an HP 85310A Option 001.

Saving and Loading Test Results

To stop the verification at any time and save the tests you have completed, or to recall those same tests later, refer to the "Save/Load Instructions" immediately following the last test described in this section.

Making the Connections for the Test

The program will tell you to connect RF signals to each of the mixers at different times. The instructions will also show the LO/IF unit and show the connections that must be made to the receiver. Under normal operation, the LO/IF unit is connected as follows:

- The reference mixer channel is connected to the receiver a1 input.
- The test mixer channel is connected to the receiver b2 input.

Some tests require you to connect the test mixer to the a2 port of the receiver (instead of b2). This allows the a1 channel to be tested at a time when it is not the phase lock reference. Figure 4-7 and Figure 4-8 show an example of the computer instructing you to connect the test channel to a2.

Here's how to change from a2 to b2:

1. Disconnect the green b2 cable from the LO/IF unit's *TEST IF OUTPUT*.
2. Connect the yellow a2 cable to the *TEST IF OUTPUT*.

The wire colors mentioned above exist on the "J1 Test Set Interconnect" cable that is attached to the J1 connector on the back of the receiver. If you had to extend these cables with black HP 85381A cables, determine which of them is connected to the yellow and green wires.

If the receiver displays NO IF FOUND, see if the test channel IF cable is going to b2. If it is, try moving the test cable from b2 back to a2 and try the test again. (You may have connected

the test channel to the wrong port for that test, or maybe you did not notice an instruction to change the connections.)

The reference mixer channel IF is never changed from the receiver a1 port.

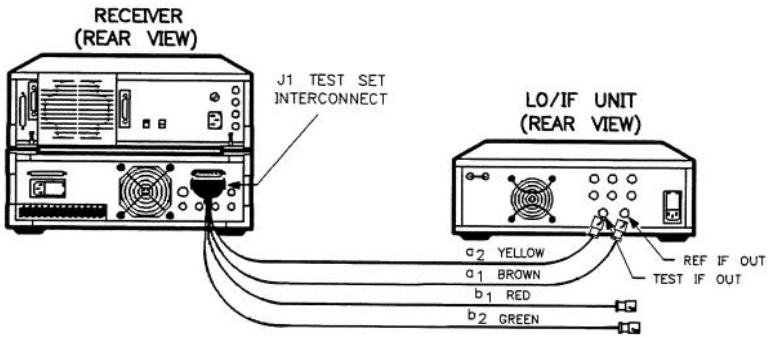

Figure 4-7. Example Receiver IF Connections

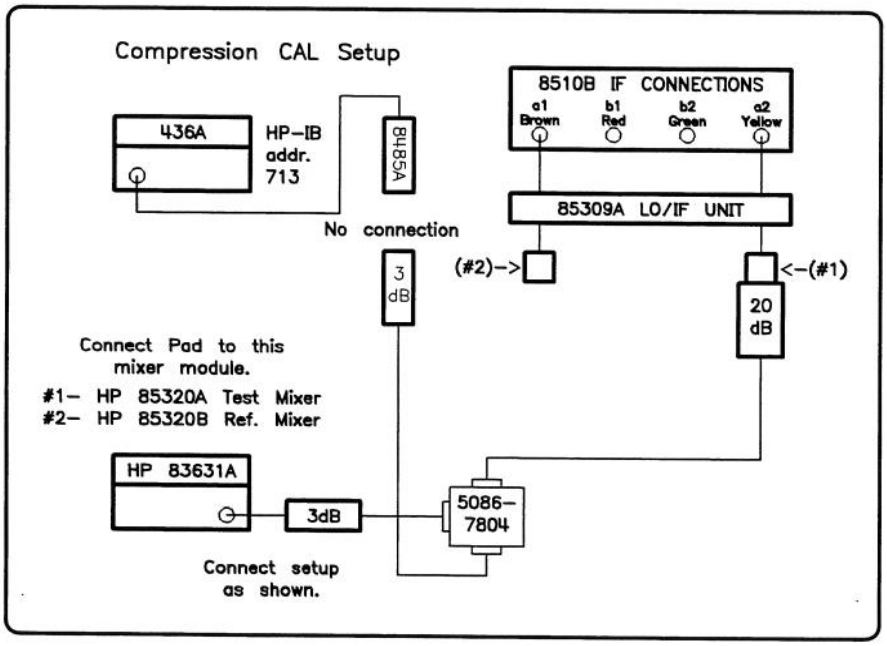

Figure 4-8. Equivalent Connection Diagram Shown on the Computer Screen

Compression and Channel Isolation Test Procedure

1. Press `Compress` to display the Compression and Channel Isolation menu. The test defaults to the reference mixer (`a1` channel) compression and channel isolation tests. This default setting can be changed, however.
2. Press `Port`. Notice that the selected port changes the combination of channel isolation tests listed below it. Press `Port` until `a1` is displayed.

Calibration

3. Press `a1 Compr` to begin. The program will search through the computer memory for compression calibration data. If data which matches the current hardware setup is found, the program will use that data and set up for the compression test (proceed with step 4).

If a Calibration is Not in Computer Memory

If the program does not find an existing calibration, it will display the following message:

```
A Compression calibration is required.

CAL:        Perform Compression calibration
LOAD:       Load Compression calibration from disk

Select a softkey
```

If there is already a valid calibration on disk. If a calibration was saved on your disk earlier in the day, press `LOAD` to display the following menu: (Do not use a calibration that is more than one day old.)

```
Default data drive is:

:xxx

Press RETURN if okay.
If not okay the enter
the MASS STORAGE UNIT SPECIFIER
of the disk drive used for data storage.
```

The default data drive will be the drive from which the program was loaded. If you want to load the calibration data from another drive, enter the address (MSUS) of that drive and press RETURN.

Error messages may result from using the wrong disk, not having a disk in the drive, not having a calibration on the disk, or specifying the wrong drive.

Note The computer system's general HP-IB "700 bus" uses addresses from 700 through 799. The receiver is connected to the computer through this bus. The HP 9000 series 320 computer uses this bus for disk drives as well.

All other HP 9000 computers use a special high speed disk drive bus. The disk drive bus is only for disk drives, and uses addresses from 1400 to 1499.

Be sure that you are using the correct bus address (14XX or 7XX) when specifying the drive address.

A calibration will not work unless two requirements are met:

Condition 1: All system hardware used during the test must be the same as the equipment used during the calibration.

Condition 2: The frequency range of the calibration must be the same as the frequency range used during the test.

The configuration file contains a record of the hardware and frequency range used when the configuration was created. The system compares the current setup to the information in the calibration file, and displays an error message if they do not match.

If You Must Create a New Calibration

- Press `CAL`.
- Enter the power sensor cal factors listed on the power sensor. The power meter sensor should not be connected to RF power at this time. Unless the program prompts "Power meter doesn't respond," assume the power meter's address is correctly set to 13 (see power meter manual) and the instrument is on the HP-IB bus (see the receiver Installation chapter in the On-Site Service Manual).
- Press `Continue` to automatically zero the power meter. If the meter does not zero, confirm that the power sensor is disconnected from RF power. Press the `TRY AGAIN` softkey.
- When the meter is zeroed, the program will display the same setup except that, now, the power meter sensor is reconnected to the pad/cable/splitter.
- Press `CONTINUE` to find the reference levels for each frequency data point. This will take approximately 10 minutes. The computer will display the results on the screen. *If the program says that the RF power is too low with the message* `Decrease Attenuation`, *then remove the 3 dB pad from RF SOURCE to SPLITTER cable.*

  When using an HP 436A power meter, the program will sometimes report that the power meter is `Out of Range`. If this occurs, press `Try Again`.
- After the last frequency point, the program will ask whether you want to save the data to disk. This is the only time that the calibration can be saved. You should save a calibration only if you intend to use it within 24 hours. Place a blank initialized disk in the drive and press `YES`. The program will automatically save the file after you tell it which drive to use.

Compression Test

- When the display shows the reference mixer `a1` Compression setup, connect the hardware exactly as shown. Remember that the program performs the following tests using the results of the calibration (for accuracy enhancement). The calibration will be degraded by excess connections and disconnections. When possible, disconnect test set-ups at the junction between the mixer RF port and attenuator; do not disconnect the attenuators (from the cables) or switch the cables unless it is unavoidable.

Note For the standard HP 85310A, only the a1 compression, a1 x b2 isolation, and b2 compression tests are performed.

- Press CONTINUE for the program to perform the a1 Compression test. The measured compression (dB) at each frequency point will be displayed on the computer display. When the test is finished, the results will be displayed similar to this:

A1 Compression

PARAMETER	LIMIT MIN.	LIMIT MAX.	UNITS	MEAS	PASS/FAIL
Compr. @−24 dBm @ 2-18 GHz	0	0.1	dB	.0356	Pass

Here, the PASS/FAIL column indicates that the HP 85310A has passed the reference mixer compression test.

- If the test passed, go to step 7. If the test failed, press one of the other softkeys. Press REMEAS to repeat the measurement. If it fails again, press RESTART to return to the setup display. Check all connections and addresses before restarting the a1 compression test. Alternatively, press RECALIB to erase the current calibration and perform another calibration.

Channel Isolation

- Press CONTINUE to begin the Channel Isolation tests by displaying the Compression/Channel Isolation test menu. The word PASS in the Pass/Fail column indicates that the a1 Compression test has passed.
- Press a1 x b2 and the a1 x b2 channel isolation setup will be displayed. Connect the hardware exactly as shown. You will use the two 50 ohm terminations (HP 909D) in this test. The test and reference mixers should be approximately .5 meters (2 feet) apart.
- Press CONTINUE to perform the a1 x b2 Channel Isolation measurement.
- When the a1 x b2 Channel Isolation test is complete, the results will be displayed on a menu similar to this:

A1 x B2 Isolation

PARAMETER	LIMIT MIN.	LIMIT MAX.	UNITS	MEAS	PASS/FAIL
Isolation @ 2-18 GHz	−150	−100	dB	−108.02	Pass
Averaging = 1024					

The measurement result displayed is the worst case measurement. The example shows a value of −108.02 dB. In this case the measurement passed.

If your instrument did not pass, press the appropriate softkey to remeasure, restart, or recalibrate. You can also increase the averaging factor and remeasure. Remember, averaging only recognizes factors of two. For example, if you entered an averaging factor of 100, the

actual averaging factor would be reduced to the nearest factor of 2. In this case 64 would be used.

- Press CONTINUE to display the a1 Compression/Channel Isolation menu and the status of the test. As indicated by the display, there are two optional tests you can perform: a1 x b1 and a1 x a2. These additional tests are for those systems that have additional measurement channels. The steps are the same as used in the a1 x b2 test.
- When the test set has passed all of the a1 Compression/Channel Isolation tests, test the next port, b2. Press PORT until the Compression/Channel Isolation test menu shows that Port is set to : b2. Then press b2 Compr and complete that test in the same manner that you completed the a1 Compression test.

Note Perform the following tests only if you have more than two channels in your system.

- When the test has passed the b2 Compression test, select the Channel Isolation tests for b2 by pressing the appropriate softkeys.
- Complete the b2 Channel Isolation tests in the same manner that you completed the a1 Channel Isolation tests. If necessary, refer to the steps above and substitute b2 for a1 as you proceed.
- Perform the Compression/Channel Isolation tests for both of the untested ports: b1 and a2. The end result should be a "Pass" indication on each Compression/Channel Isolation menu (Ports: a1, a2, b1, b2). When all of the Compression/Channel Isolation tests have passed, press MAINmenu to access the main test menu.

Acquire Phase Lock

1. Select Aquirelk from the Main menu for the program to initialize the receiver and to set up the system to check the a1 phase lock level.
2. If the LO source is a synthesizer, this test is not required. The program will recognize this and automatically send you back to the main menu.
3. If the LO source is a HP 8350 the program will prompt you to set up the RF test signal.
4. Press CONTINUE to perform the test.
5. The results will be displayed on the computer screen.

Low-Level Noise Test Procedure

1. Select Low-Lev from the Main menu. The program will initialize the receiver.
2. Press Normaliz to see the first normalization setup. You will normalize for each port to be measured (normally ports a1 and b2) and then you will perform the tests. Make all the connections exactly as shown, then press Continue. You must disconnect the RF signal from the power meter/sensor to zero the meter. Reconnect the RF signal to make the measurement.

3. Follow the prompts to normalize and test the ports that are used in the HP 85310A system.

Printing Results

If you want a copy of the results and the system information (either a printed copy or a disk file), access the I/O menu and press `PRINT` or `FILE` as desired. Make sure that the printer is properly connected, turned on and loaded with paper. The disk drive must be correctly specified, with a data (not the program) disk inserted.

Repeat Procedure for Each Harmonic

The tests should be performed again for each mixer harmonic:

1. Press `Test_frq` in the `IO Menu`.
2. Change the mixer harmonic number and enter the correct start and stop frequencies.
3. Press `Done`, `MAINmenu`.
4. Perform each test again.
5. Print the results or save them to disk.

To exit the program, press `END_prog` in the I/O menu.

When Finished with All Tests

If the HP 85310A does not pass the performance verification tests refer to the service chapter.

Perform the following steps when you have completed the verification:

1. Make sure the system has been tested while in the fundamental and in each harmonic mode. The HP 85320 mixers only have one harmonic mode (third harmonic).
2. Configure\ the system for normal use.
3. Place the test mixer IF output to `b2`.

Save/Load Instructions

Calibrations and normalizations are not automatically saved by the various performance test procedures. They must be saved on a data disk immediately after they are performed. Follow the screen instructions when the program allows you to save calibration or normalization data.

However, as long as the computer stays ON or until another program is run, calibrations, normalizations, system information and test results will remain in the computer memory.

Use the following procedures to save and load both test results and the current system information.

How To Save Test Results

1. Insert an initialized blank disk in the drive.
2. While in the Main menu, press `IO Menu` `File` to begin the save process.
3. Enter the mass storage unit specifier (MSUS) of the data disk drive and press (RETURN). The computer will present the File menu.
4. Press the `Save` softkey, type in a name for the file and press the keyboard (RETURN) key. The computer will save the test results and system information onto disk. When saving files remember that HP 9000 computers are case-sensitive with regard to file names. When you recall saved files you must use the exact case for the file name. Keep this in mind when saving file names, use a system of naming files that you can easily remember.

How To Load Test Results to Continue Testing or Print-Out Data

Note The file called for in the following procedure must have been saved in the procedure above.

1. Insert the data disk in the drive.
2. Access the Main menu and press `IO Menu` `File` to begin the load process.
3. Enter the mass storage unit specifier of the data disk drive and press (RETURN).
4. Press the `LOAD` softkey, type in a file name (using proper upper and lower-case characters) and press (RETURN). The program will load the test results and system information into the computer from the data disk.
5. Press `DONE` to return to the I/O menu.
6. To print out a copy of this data, press `PRINT`. Only the printer, disk and computer need be connected and turned on to make a print-out.
7. To continue testing an instrument, press `MAINmenu` to re-enter the test selection menu. Select one of the tests with a softkey. Connect the devices as shown in the configuration diagram and proceed with the test.

5

Troubleshooting

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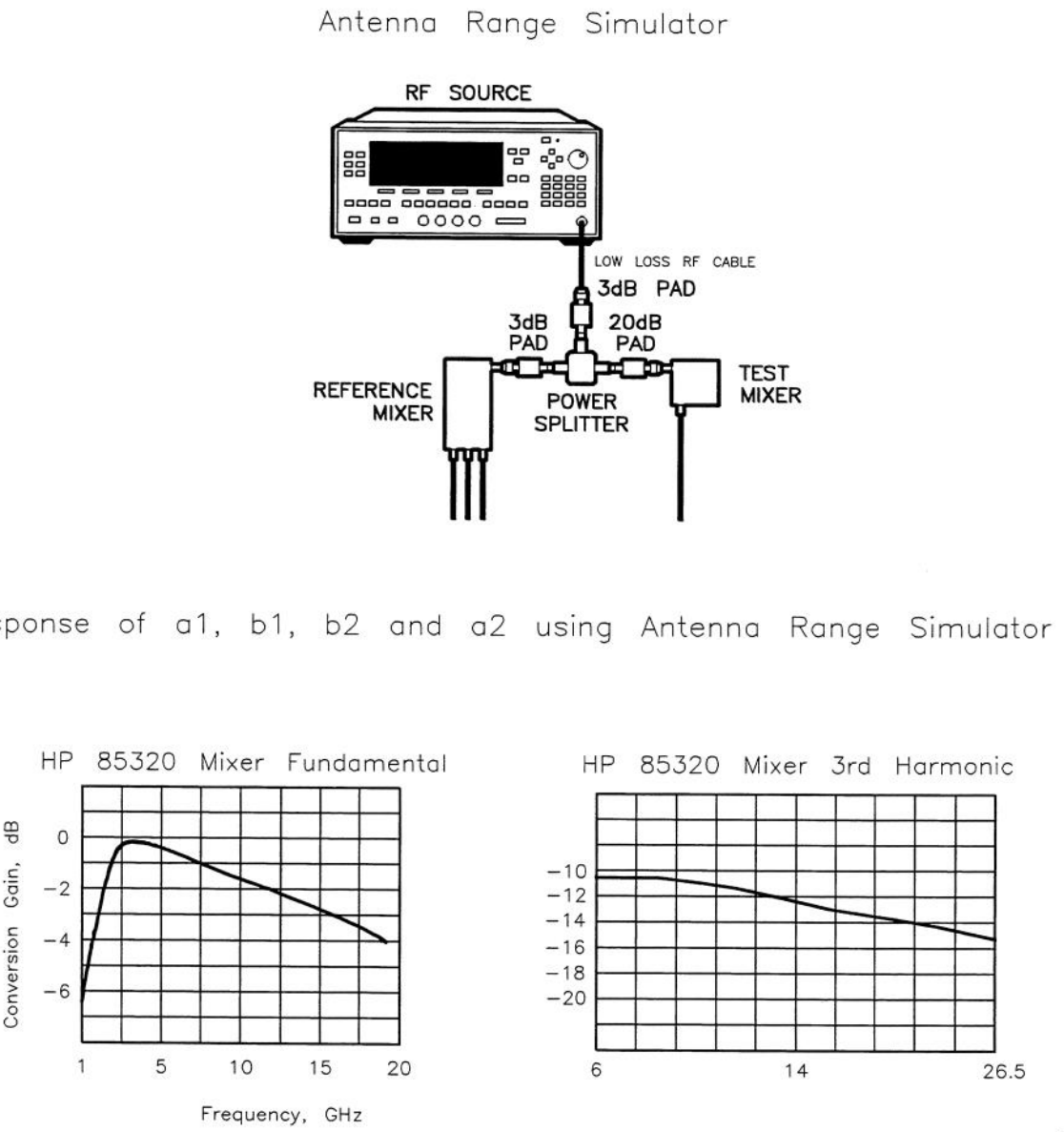

Figure 5-3. Typical System Response Using Antenna Range Simulation

Third Party Suppliers

Flam & Russell	Measurement software Positioning Systems Instruments Measurement Systems	
PO Box 999 Horsham, PA 19044 U.S.A. 1-215-674-5100 1-215-674-5108 FAX	(Based on HP 8530)	De Pichart 54 5674 CC Nuenen The Netherlands 31-40-631-179 31-40-835-615 FAX

Orbit Advanced Technologies	Measurement Software Positioning Systems Instruments Measurement System	
417 Caredean Drive, Bldg A Horsham, PA 19044 U.S.A 1-215-674-4220 1-215-674-1102 FAX	(Based on Orbit Instruments)	POB 3171 Industrial Zone Netanga 42131 Israel 972-53-333247 972-53-333819 FAX

March Microwave Systems B.V.	**Scientific Atlanta**
Measurement Software	Positioning Systems
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5674 Tim Nuenen	3845 Pleasantdale Road
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	Outside of U.S.A.
	1-404-903-2500
	1-404-903-2520 FAX