Agilent
85644A and 85645A
Tracking Source

User's Guide

Agilent Technologies

Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

Agilent Technologies

Printed in USA March 2000

By internet, phone, or fax, get assistance with all your test and measurement needs.

Table 1-1 Contacting Agilent

Online assistance: `www.agilent.com/find/assist`

United States (tel) 1 800 452 4844	**Latin America** (tel) (305) 269 7500 (fax) (305) 269 7599	**Canada** (tel) 1 877 894 4414 (fax) (905) 282-6495	**Europe** (tel) (+31) 20 547 2323 (fax) (+31) 20 547 2390
New Zealand (tel) 0 800 738 378 (fax) (+64) 4 495 8950	**Japan** (tel) (+81) 426 56 7832 (fax) (+81) 426 56 7840	**Australia** (tel) 1 800 629 485 (fax) (+61) 3 9210 5947	

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

User's Guide

HP 85644A and 85645A Tracking Source

HP part number: 85645-90020
Printed in USA July 1992

The HP 85644A and HP 85645A Tracking Sources

The HP 85644A and HP 85645A tracking sources complement and expand the measurement capability and versatility of your HP spectrum analyzer. They are designed primarily as general purpose accessories for spectrum analyzers (referred to as the host instrument).

What the HP 85644A and HP 85645A tracking sources offer. A tracking source combined with a host spectrum analyzer allows you to measure the swept amplitude response of a device, such as an amplifier or a filter. These measurements have the advantage of high dynamic range and speed. In addition, since the spectrum analyzer is a tuned receiver, measurements are not affected by spurious signals or harmonics.

Performance options

The HP 85644A tracking source is ac coupled. The frequency range is from 300 kHz to 6.5 GHz with selectable RF output power.

The HP 85645A tracking source allows you to choose ac or dc coupling. The frequency range is from 300 kHz to 26.5 GHz with selectable RF output power.

Versatility and compatibility

The tracking sources can easily be configured to track the input frequency of a variety of spectrum analyzers or the output frequency of a microwave sweep oscillator. A configuration menu, accessible at the press of a front-panel key or via HP-IB, allows you to choose from among the following compatible host instruments:

- HP 8560 Series portable spectrum analyzers
- HP 8566A/B spectrum analyzers
- HP 8590 Series portable spectrum analyzers
- HP 8340A/B synthesized sweepers
- HP 8350 Series sweep oscillators

The HP 85644A and HP 85645A tracking sources extend measurement capability.

Offset tracking

The tracking sources have offset tracking capability. Offset tracking makes possible the amplitude response measurements of many frequency translation devices (such as mixers), and of systems with delays (such as satellite links). The advantage of the host spectrum analyzer (a tuned receiver) minimizes the effects of other mixing products.

Swept TOI

With two tracking sources set to appropriate offset frequencies, swept TOI (third-order-intercept) measurements are possible over a continuous range of frequencies. The time required for the swept TOI measurement is minimal.

Power sweep

The tracking source also offers power sweep capability. Power sweep is useful for characterizing saturation effects of devices under test.

Rugged CW source

The tracking sources can generate stand-alone, CW signals at fixed, non-synthesized, frequencies of your choosing. No connections to a host instrument are required. The CW signal from the tracking source can be used, along with a host spectrum analyzer, for measuring harmonics generated by a device such as an amplifier.

EMC measurements

The tracking source combined with a transducer can make swept measurements of circuit immunity to electromagnetic interference.

In This Book

This book is your operating guide for the HP 85644A and HP 85645A tracking sources.

Chapter 1, “Installing and Configuring,” provides step-by-step instructions for installing and configuring the tracking source.

Chapter 2, “Verifying Operation,” provides instructions for verifying the tracking source.

Chapter 3, “Making Measurements,” provides instructions for making measurements with the tracking source.

Chapter 4, “Specifications and Characteristics,” provides the specifications and characteristics for the tracking source.

Chapter 5, “If You Have a Problem,” provides information about problems that may occur during the operation of the tracking source and how to resolve them.

Chapter 6, “Error Messages,” describes the error messages that may occur during the operation of the tracking source.

Chapter 7, “Front-Panel Operation,” describes the front-panel operation of the tracking source.

Chapter 8, “Programming Reference,” describes the commands used to control operations of the tracking source.

The Glossary and Index provide useful reference tools for understanding or finding information in the guide.

Warranty

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Hewlett-Packard. Buyer shall prepay shipping charges to Hewlett-Packard and Hewlett-Packard shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Hewlett-Packard from another country.

Hewlett-Packard warrants that its software and firmware designated by Hewlett-Packard for use with an instrument will execute its programming instructions when properly installed on that instrument. Hewlett-Packard does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HEWLETT-PACKARD SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HEWLETT-PACKARD SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Safety Symbols

The following safety symbols are used throughout this manual. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

CAUTION

The *caution* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a *caution* sign until the indicated conditions are fully understood and met.

WARNING

The *warning* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a *warning* sign until the indicated conditions are fully understood and met.

General Safety Considerations

WARNING

Before this instrument is switched on, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact.

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

WARNING

There are many points in the instrument which can, if contacted, cause personal injury. Be extremely careful.

Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

CAUTION

Before this instrument is switched on, make sure its primary power circuitry has been adapted to the voltage of the ac power source.

Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

Contents

Figures

Tables

1

Installing and Configuring

Installing and Configuring

What's in this chapter

This chapter provides instructions for configuring the HP 85644A and HP 85645A tracking source with a spectrum analyzer or a sweeper, and installing the tracking source into a rack.

To Prepare for installation	Instructions for preparing the HP 85644A and HP 85645A tracking source for installation.
To Configure the tracking source with an HP 8560 Series portable spectrum analyzer	Instructions for configuring the HP 85644A and HP 85645A tracking source with an HP 8560A/E, HP 8561A/B/E, HP 8562A/B, or HP 8563A/E portable spectrum analyzer as the host instrument to the tracking source.
To Configure the tracking source with an HP 8566A/B spectrum analyzer	Instructions for configuring the HP 85644A and HP 85645A tracking source with an HP 8566A/B spectrum analyzer as the host instrument to the tracking source.
To Configure the tracking source with an HP 8590 Series Option 009 portable spectrum analyzer	Instructions for configuring the HP 85644A and HP 85645A tracking source with an HP 8593A/E, HP 8594A/E, HP 8595A/E, or HP 8596E portable spectrum analyzer as the host instrument to the tracking source. (The spectrum analyzer must have Option 009.)
To Configure the tracking source with an HP 8340A/B synthesized sweeper	Instructions for configuring the HP 85644A and HP 85645A tracking source with an HP 8340A/B synthesized sweeper as the host instrument to the tracking source.
To Configure the tracking source with an HP 8350 Series sweep oscillator	Instructions for configuring the HP 85644A and HP 85645A tracking source with an HP 8350 Series sweep oscillator.
To Install the tracking source into a rack	Instructions for installing the HP 85644A and HP 85645A tracking source into a System II rack.

CAUTION

Electrostatic discharge (ESD) can damage or destroy electronic components. Therefore, the following suggestions may help reduce ESD damage that occurs during testing operations.

- Before connecting any coaxial cable to an instrument connector for the first time each day, momentarily ground the center and outer connectors of the cable.
- Personnel should be grounded with a resistor-isolated wrist strap before touching the center of any connector.
- Be sure all instruments are properly earth-grounded to prevent build-up of static discharge.

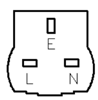
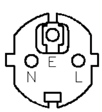
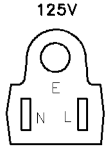
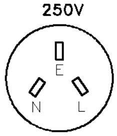
Cable connections. Various cable connections are made when you configure the tracking source with a spectrum analyzer or sweeper. Refer to Table 1-1 for a list of tracking source connections that are illustrated in the configuring instructions.

Table 1-1. Cable Connections

Connector	Description
LO INPUT	required for tracking
10 MHz IN	required for tracking in band 0 and in narrower resolution bandwidths
SWP+TUNE IN	required for tracking
HI SWEEP	required for tracking with an HP 8590 Series portable spectrum analyzer
BLANK IN	recommended to blank the unleveled indicator during retrace;
	not needed when using an HP 8590 Series portable spectrum analyzer
SWEEP IN	required for power sweep capability
EXT ALC	required for external leveling

Power cable. In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument cabinet. The type of power cable shipped with each instrument depends on the country of destination. Refer to Table 1-2 for the part numbers of available power cables.

Table 1-2. AC Power Cables Available

PLUG TYPE **	CABLE HP PART NUMBER	PLUG DESCRIPTION	CABLE LENGTH CM (INCHES)	CABLE COLOR	FOR USE IN COUNTRY
250V 	8120-1351	Straight* BS1363A	229 (90)	Mint Gray	Great Britain, Cyprus, Nigeria, Singapore, Zimbabwe
	8120-1703	90°	229 (90)	Mint Gray	
250V 	8120-1369	Straight* NZSS198/ASC112	201 (79)	Gray	Argentina, Australia, New Zealand, Mainland China
	8120-0696	90°	221 (87)	Gray	
250V 	8120-1689	Straight* CEE7-Y11	201 (79)	Mint Gray	East and West Europe, Central African Republic, United Arab Republic (unpolarized in many nations)
	8120-1692	90°	201 (79)	Mint Gray	
125V 	8120-1348	Straight* NEMA5-15P	203 (80)	Black	United States Canada, Japan (100 V or 200 V), Brazil, Colombia, Mexico, Phillipines, Saudia Arabia, Taiwan
	8120-1538	90°	203 (80)	Black	
	8120-1378	Straight* NEMA5-15P	203 (80)	Jade Gray	
	8120-4753	Straight	230 (90)	Jade Gray	
	8120-1521	90°	203 (80)	Jade Gray	
	8120-4754	90°	230 (90)	Jade Gray	
250V 	8120-5182	Straight* NEMA5-15P	200 (78)	Jade Gray	Israel
	8120-5181	90°	200 (78)	Jade Gray	

* Part number for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable, including plug.

** E = Earth Ground; L = Line; N = Neutral.

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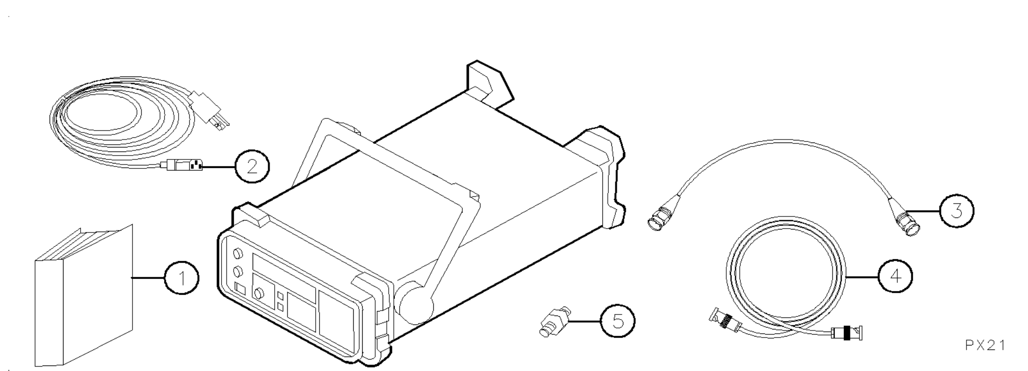
To Prepare for installation

1 Unpack the HP 85644A and HP 85645A tracking source from its shipping container. Inspect the tracking source thoroughly to ensure that it was not damaged during shipment. Verify that all accessories have been included with the HP 85644A and HP 85645A tracking source.



The following accessories are included with the HP 85644A and HP 85645A tracking source:

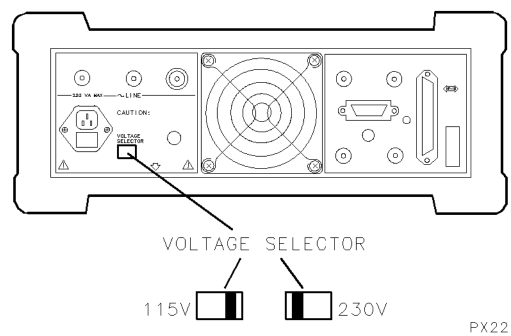
1. *HP 85644A/85645A Tracking Source User's Guide*
2. ac power cable . . . . Refer to Table 1-2
3. Cable, SMA, 1 m . . . . HP part number 5061-5458
4. Cable, BNC, 1.22 m *(quantity three)* . . . . HP part number 8120-5529
5. Adapter *(HP 85645A only)* . . . . HP part number 5061-5311

Caution

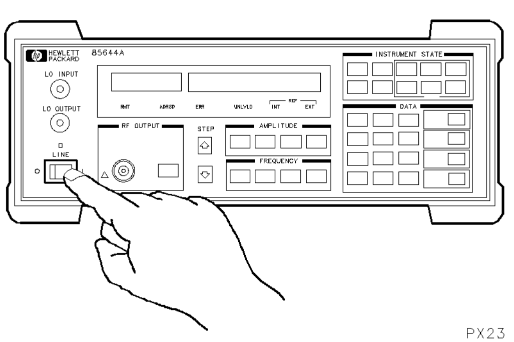
Before turning this instrument on, make sure the line-voltage selector is set to the voltage of the ac power source:

- 115 V position for 90 to 132 V ac line input voltages at 50, 60, or 400 Hz.
- 230 V position for 198 to 264 V ac line input voltages at 50 or 60 Hz.

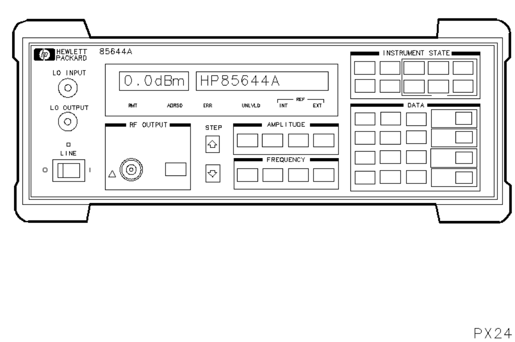
2 Set the line-voltage selector to the voltage corresponding to the power source used. The line-voltage selector is located on the rear panel. Connect the power cord to the tracking source and then to the power source.



3 Press the tracking source front-panel LINE switch to turn the tracking source on.



Either **HP 85644A** for the HP 85644A or **HP 85645A** for the HP 85645A is displayed on the tracking source.



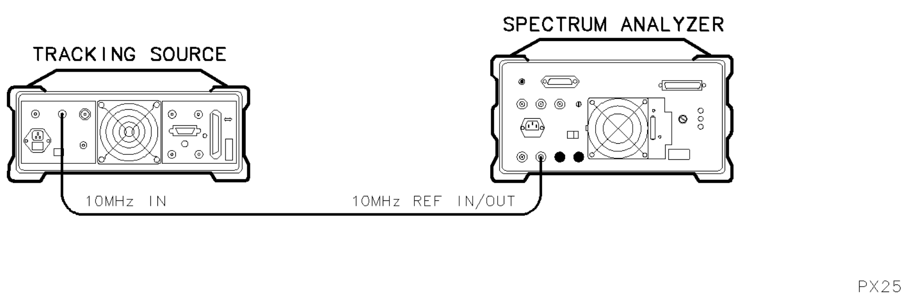
If you want to configure the tracking source with a spectrum analyzer or a sweeper, refer to the following procedures:

- "To Configure the tracking source with an HP 8560 Series portable spectrum analyzer"
- "To Configure the tracking source with an HP 8566A/B spectrum analyzer"
- "To Configure the tracking source with an HP 8590 Series Option 009 portable spectrum analyzer"
- "To Configure the tracking source with an HP 8340A/B synthesized sweeper"
- "To Configure the tracking source with an HP 8350 Series sweep oscillator"

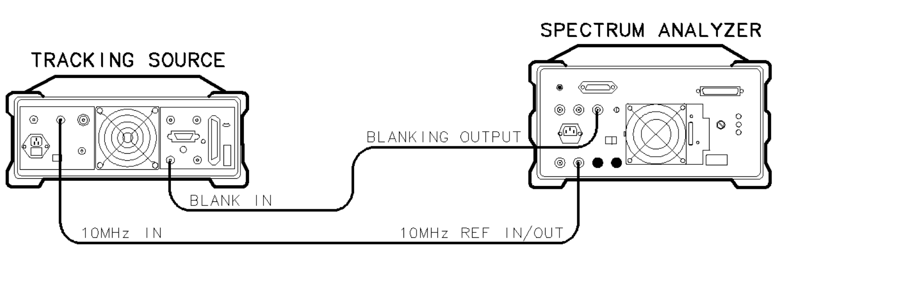
If you want instructions for mounting the tracking source into a rack, refer to "To Install the tracking source in a rack."

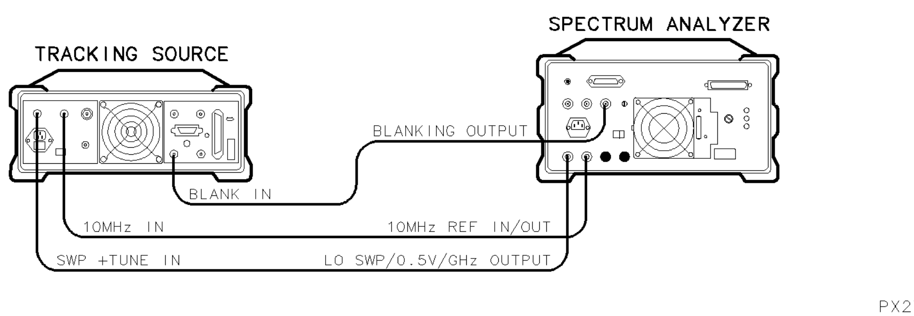
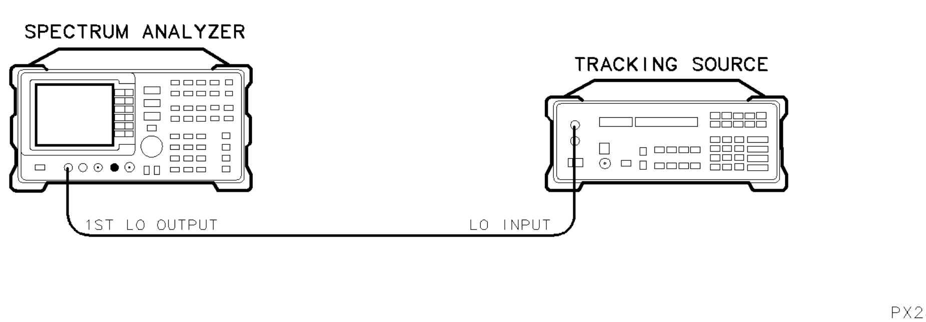
To Configure the tracking source with an HP 8560 Series portable spectrum analyzer

1 Connect a BNC cable from the tracking source 10 MHz IN connector to the spectrum analyzer 10 MHz REF IN/OUT connector.



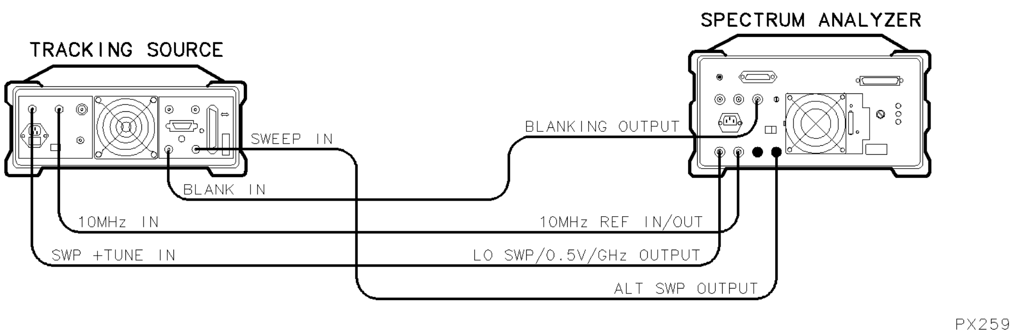
2 Connect a BNC cable from the tracking source BLANK IN connector to the spectrum analyzer BLANKING OUTPUT connector.



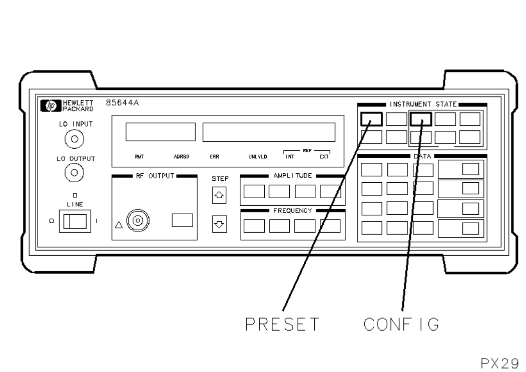
3 Connect a BNC cable from the tracking source SWP+TUNE IN connector to the spectrum analyzer LO SWP|0.5 V/GHz OUTPUT connector.

4 Connect an SMA cable from the tracking source LO INPUT connector to the spectrum analyzer 1st LO OUTPUT connector.


- If you have an HP 8560 Series portable spectrum analyzer with Option 005 installed continue at step 5.
- If your HP 8560 Series portable spectrum analyzer does not have Option 005 installed skip to step 6.

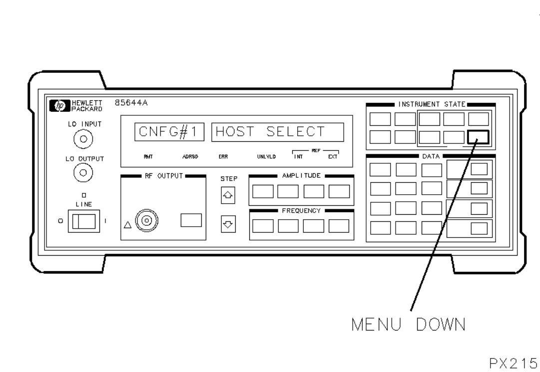
5 Connect a BNC cable from the tracking source SWEEP IN connector to the spectrum analyzer ALT SWP OUTPUT connector.



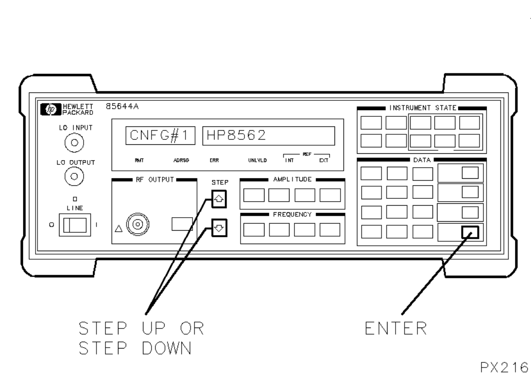
6 Press the (PRESET) key, then press the (CONFIG) key.



7 Press the (MENU DOWN) key on the tracking source until **`CNFG #1 HOST SELECT`** is displayed.

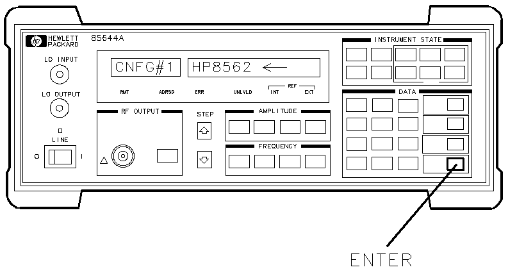


8 Press the (ENTER) key, then press the (⇧) or (⇩) keys to display the spectrum analyzer HP model number. For example **`CNFG #1 HP 8562`** is displayed for the HP 8562.



- Enter **`CNFG #1 HP 8562 OLD SN`** if you are configuring the tracking source with an HP 8562A/B portable spectrum analyzer that has a serial number prefix of 2350A or below.
- Enter **`CNFG #1 HP 8562`** if you are configuring the tracking source with an HP 8562A/B portable spectrum analyzer that has a serial number prefix above 2350A.

9 Press the (ENTER) key; an arrow will appear next to the displayed model number. For example, **CNFG #1 HP 8562 ←** is displayed for the HP 8562. The host instrument is now selected.



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- If you have an HP 8560A/E, HP 8561B/E, or HP 8563A/E portable spectrum analyzer go to step 10.
- If you have an HP 8562A/B or an HP 8561A portable spectrum analyzer go to step 11.

10 To activate the LO SWEEP on the rear panel of an HP 8560A/E, HP 8561B/E, or HP 8563A/E press the following keys:

(AUX CONTROL)
REAR PANEL
.5 V/GHz (FAV)

You are now finished configuring the tracking source with the HP 8560 Series portable spectrum analyzer.

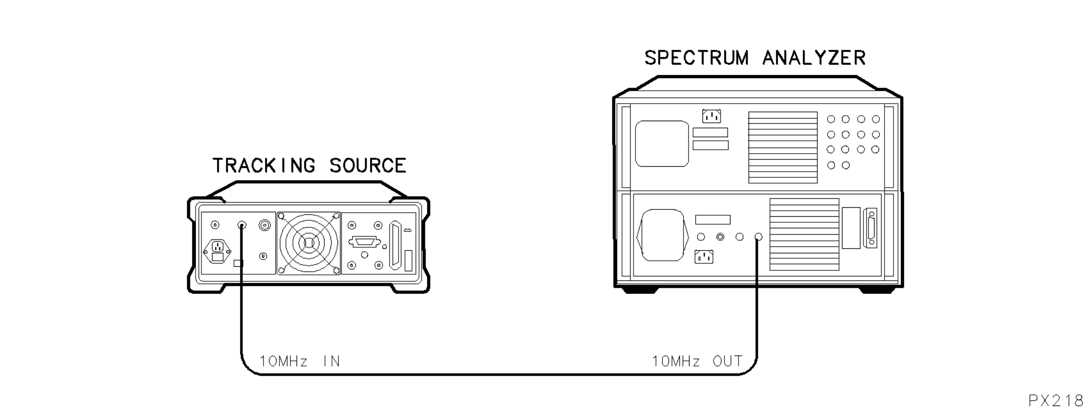
11 To activate the LO SWEEP on the rear panel of an HP 8562A/B or an HP 8561A press the following keys:

(SWEEP)
REAR PNL OUTPUT
.5 V/GHz (FAV)

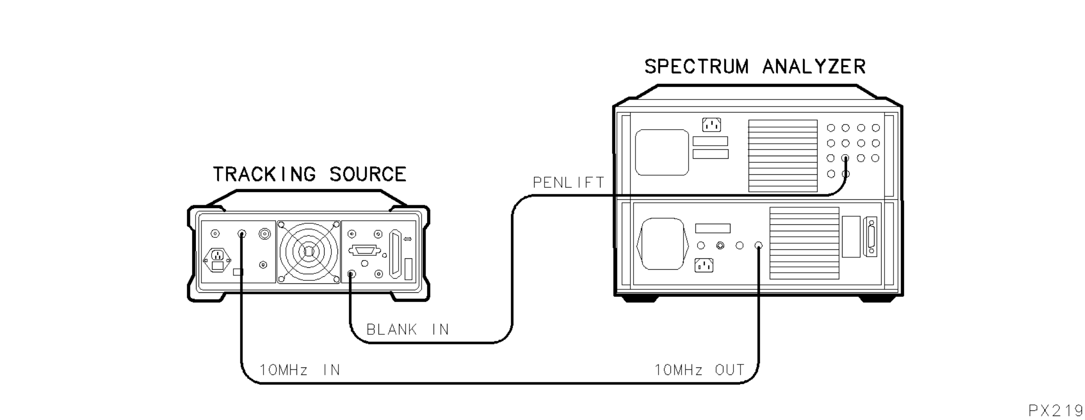
You are now finished configuring the tracking source with the HP 8560 Series portable spectrum analyzer.

To Configure the tracking source with an HP 8566A/B spectrum analyzer

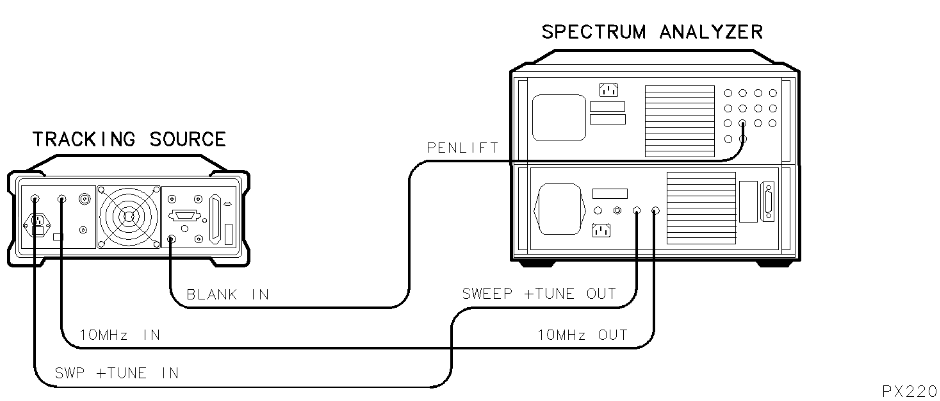
1 Connect a BNC cable from the tracking source 10 MHz IN connector to the spectrum analyzer 10 MHz OUT connector.



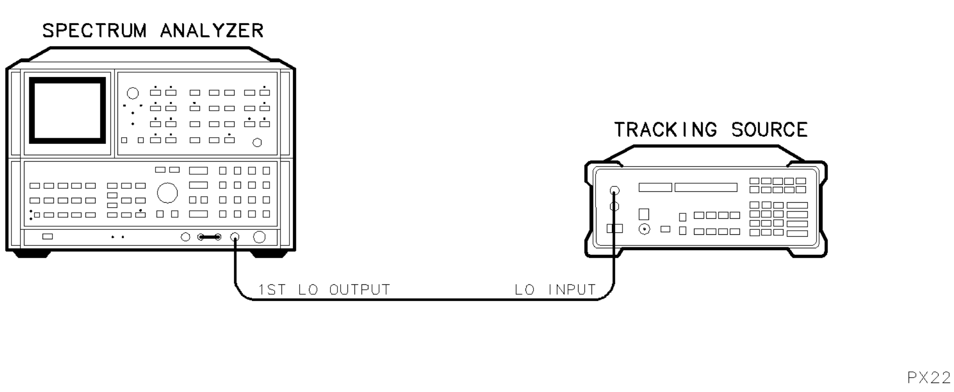
2 Connect a BNC cable from the tracking source BLANK IN connector to the spectrum analyzer PENLIFT connector.

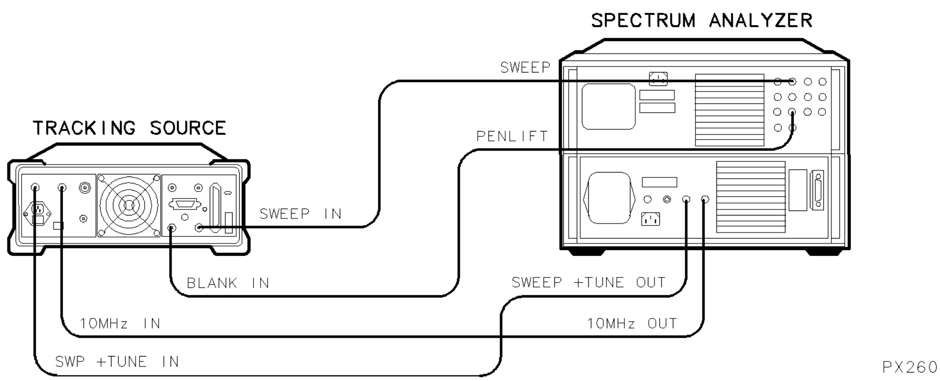
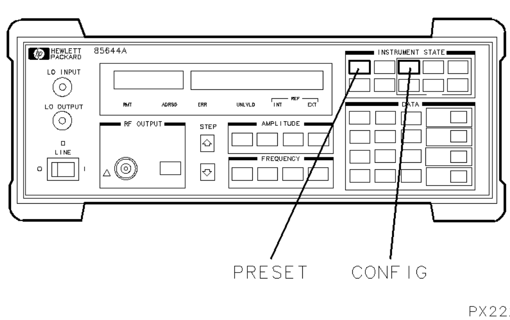
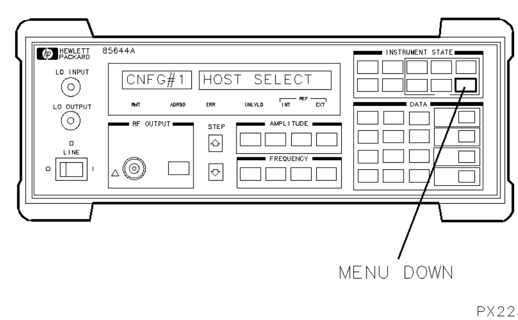


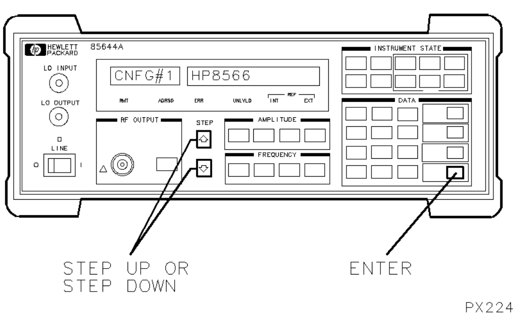
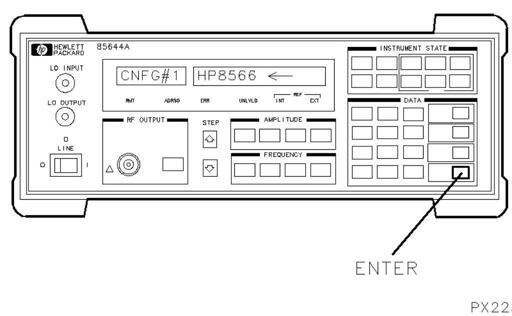
3 Connect a BNC cable from the tracking source SWP+TUNE IN connector to the spectrum analyzer SWP+TUNE OUT connector.



4 Connect an SMA cable from the tracking source LO INPUT connector to the spectrum analyzer 1st LO OUTPUT connector.



5 Connect a BNC cable from the tracking source SWEEP IN connector to the spectrum analyzer SWEEP connector.	
	
6 Press the (PRESET) key, then press the (CONFIG) key.	**7** Press the (MENU DOWN) key on the tracking source until `CNFG #1 HOST SELECT` is displayed.
	

8 Press the (ENTER) key, then press the (⇑) or (⇓) keys until **CNFG #1 HP 8566** is displayed.	9 Press the (ENTER) key; **CNFG #1 HP 8566 ←** is displayed. The HP 8566A/B is now selected as the host instrument to the tracking source.
	

To Configure the tracking source with an HP 8590 Series Option 009 portable spectrum analyzer

1 Connect an SMA cable from the tracking source LO INPUT connector to the spectrum analyzer LO OUTPUT connector.

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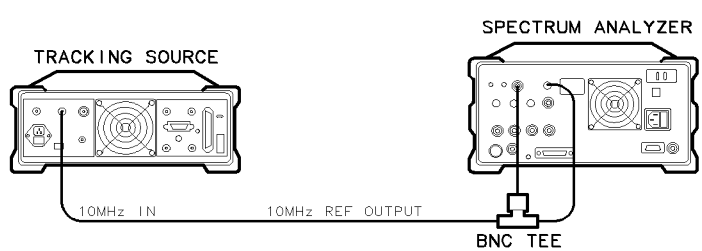
2 Connect a BNC cable from the tracking source 10 MHz IN connector to the spectrum analyzer 10 MHz REF OUTPUT connector.



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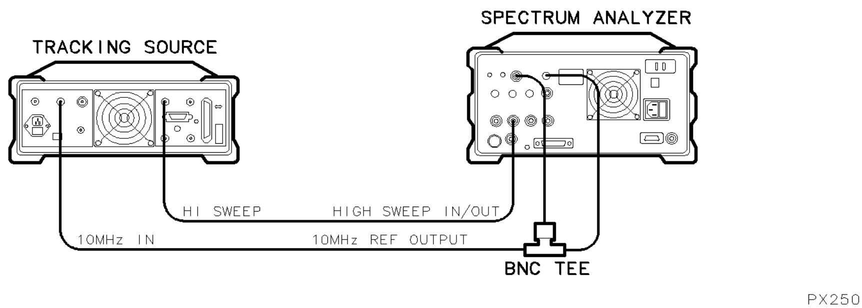
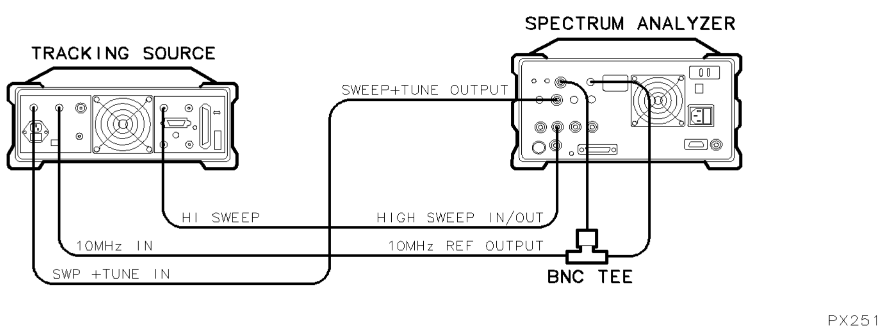
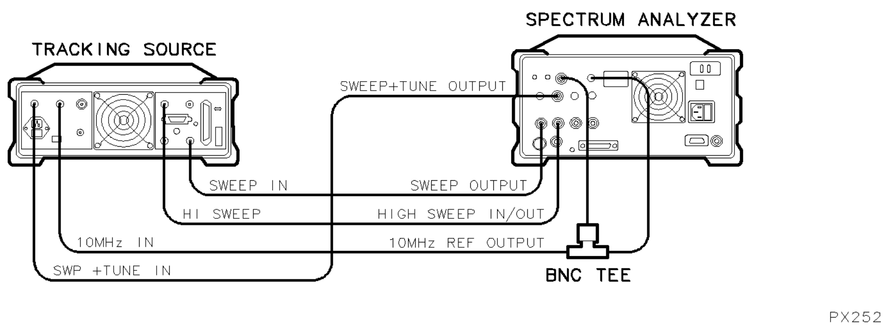
3 Connect a BNC cable from the tracking source HI SWEEP connector to the spectrum analyzer HIGH SWEEP IN/OUT connector.



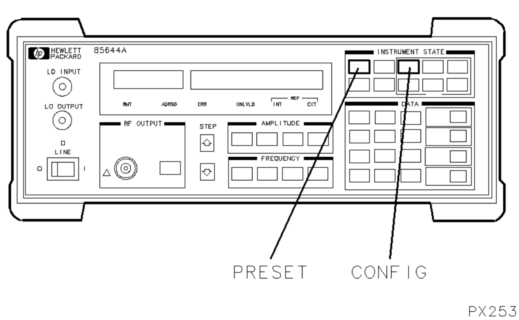
4 Connect a BNC cable from the tracking source SWP+TUNE IN connector to the spectrum analyzer SWEEP+TUNE OUTPUT connector.



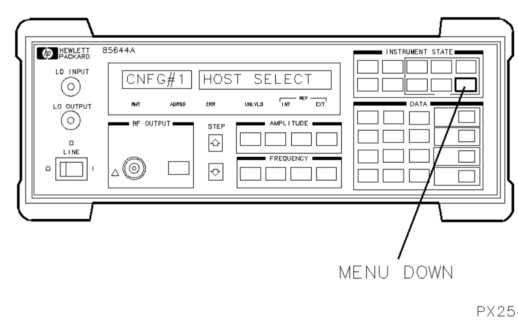
5 Connect a BNC cable from the tracking source SWEEP IN connector to the spectrum analyzer SWEEP OUTPUT connector.



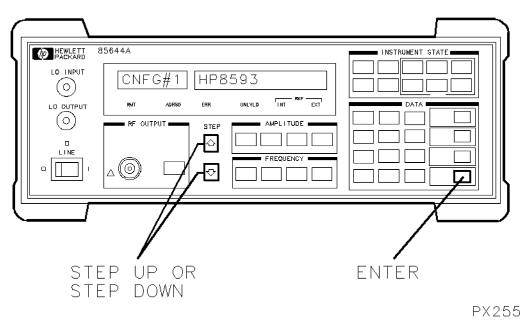
6 Press the (PRESET) key, then press the (CONFIG) key.



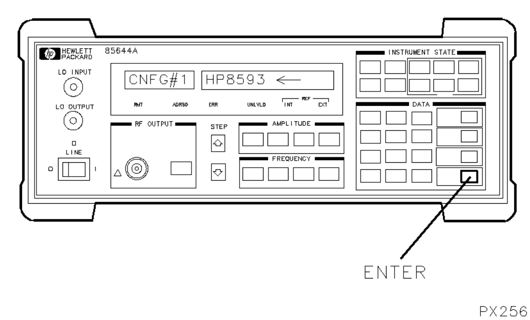
7 Press the (MENU DOWN) key on the tracking source until `CNFG #1 HOST SELECT` is displayed.



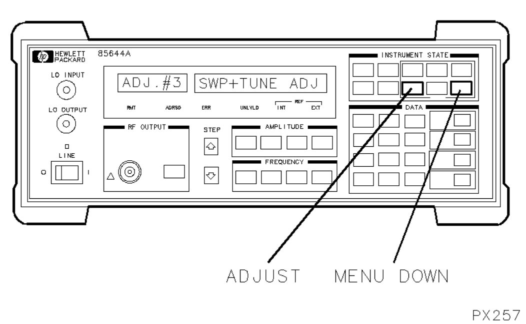
8 Press the (ENTER) key, then press the (⇧) or (⇩) keys to display the spectrum analyzer HP model number. For example `CNFG #1 HP 8593` is displayed for the HP 8593.



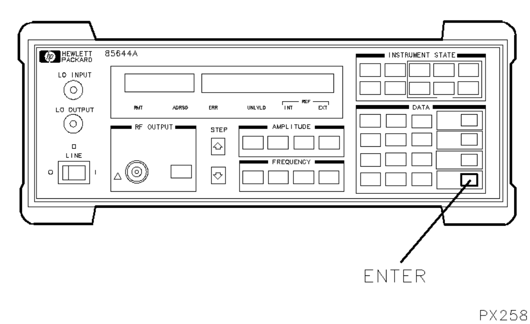
9 Press the (ENTER) key; an arrow will appear next to the displayed model number. For example, `CNFG #1 HP 8593 ←` is displayed for the HP 8593. The host instrument is now selected.



10 Press (ADJUST), then the (MENU DOWN) key until `ADJ. #3 SWP+TUNE ADJ` is displayed.

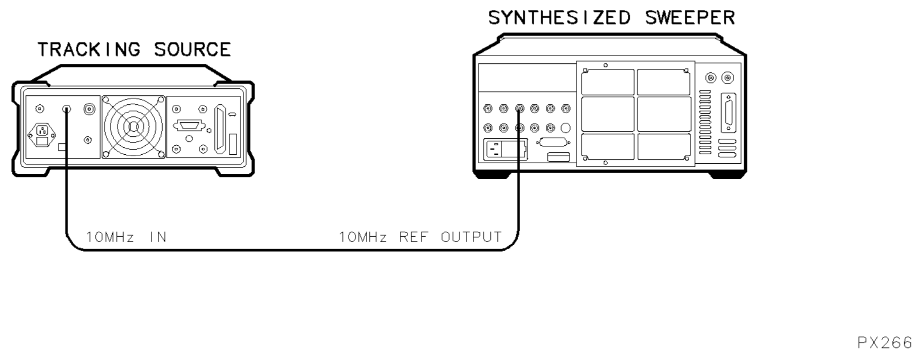


11 Press the (ENTER) key; then follow the procedure displayed on the tracking source.

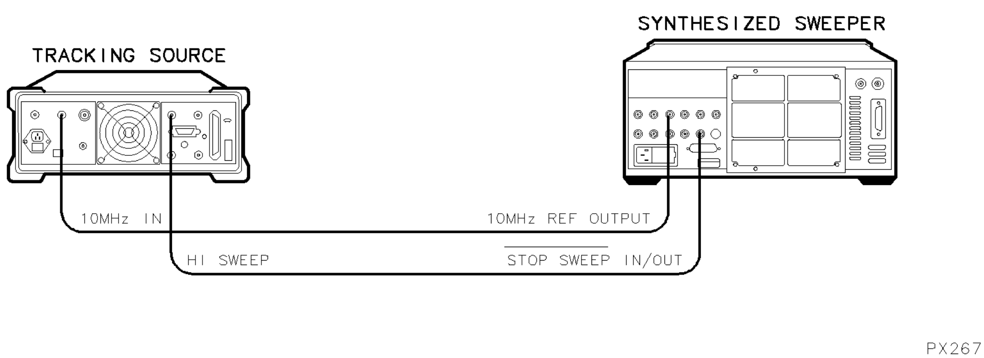


To Configure the tracking source with an HP 8340A/B synthesized sweeper

1 Connect a BNC cable from the tracking source 10 MHz IN connector to the synthesized sweeper 10 MHz REF OUTPUT connector.

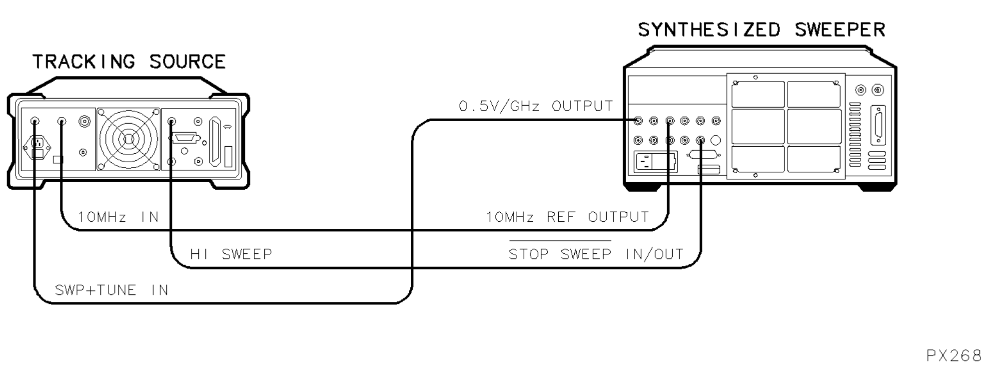


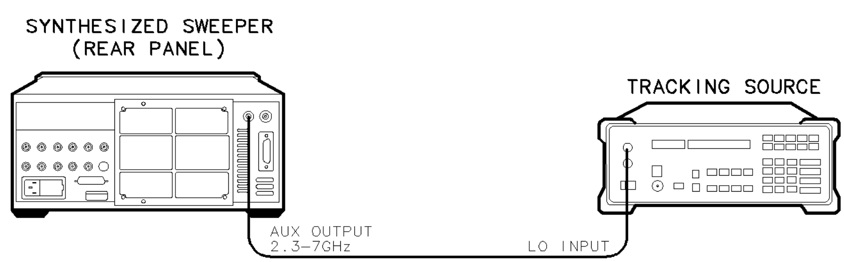
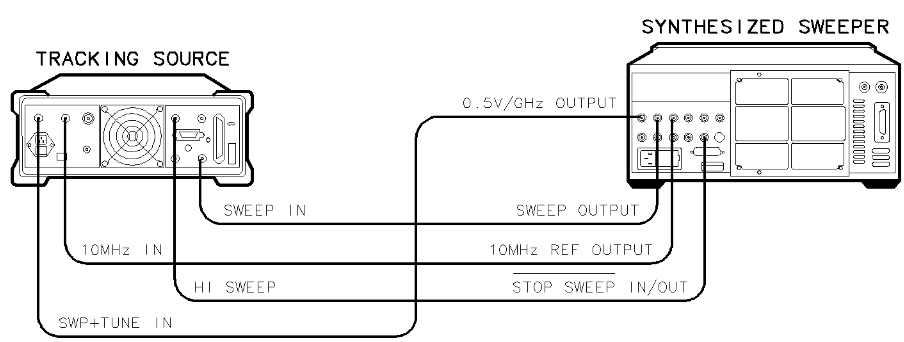
2 Connect a BNC cable from the tracking source HI SWEEP connector to the synthesized sweeper $\overline{\text{STOP SWEEP}}$ IN/OUT connector.

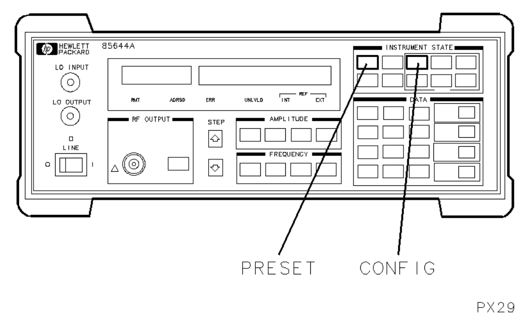
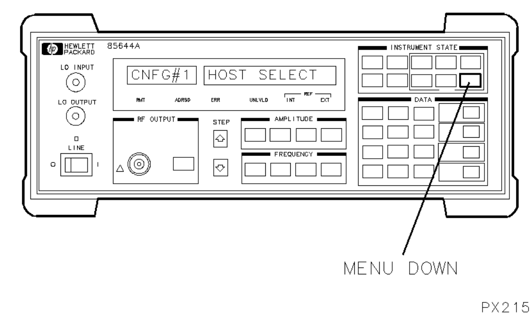
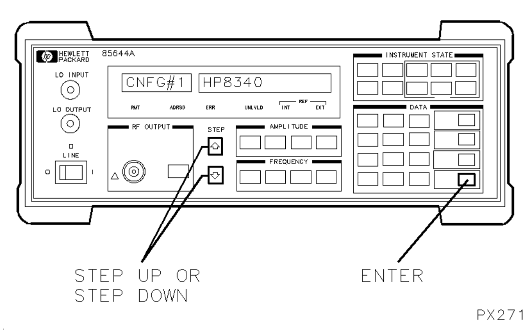
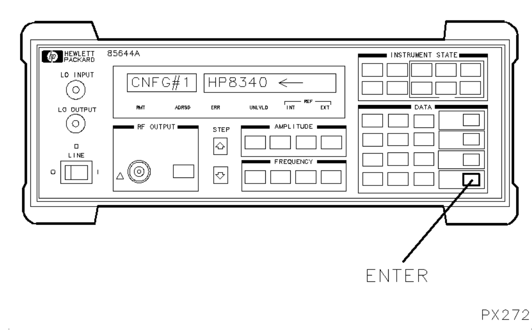


The HP 8340A synthesized sweeper has a 1.0 V/GHz OUTPUT. The tracking source requires a 0.5 V/GHz INPUT. If you are connecting the tracking source to an HP 8340A synthesized sweeper, the 1.0 V/GHz OUTPUT signal can be modified using the procedure in the HP 8340A synthesized sweeper service manual.

3 Connect a BNC cable from the tracking source SWP+TUNE IN connector to the synthesized sweeper 0.5 V/GHz OUTPUT connector.



4 Connect an SMA cable from the tracking source LO INPUT connector to the synthesized sweeper AUX OUTPUT connector.
 PX269
5 Connect a BNC cable from the tracking source SWEEP IN connector to the synthesized sweeper SWEEP OUTPUT connector.
 PX270

6 Press the (PRESET) key, then press the (CONFIG) key.	**7** Press the (MENU DOWN) key on the tracking source until **CNFG #1 HOST SELECT** is displayed.
	
8 Press the (ENTER) key, then press the (⇧) or (⇩) keys until **CNFG #1 HP 8340** is displayed.	**9** Press the (ENTER) key; **CNFG #1 HP 8340 ←** is displayed. The HP 8340A/B is now selected as the host instrument to the tracking source.
	

Remember, before making measurements, the tracking source must be offset when using a sweeper as the host instrument in bands 1 through 4.

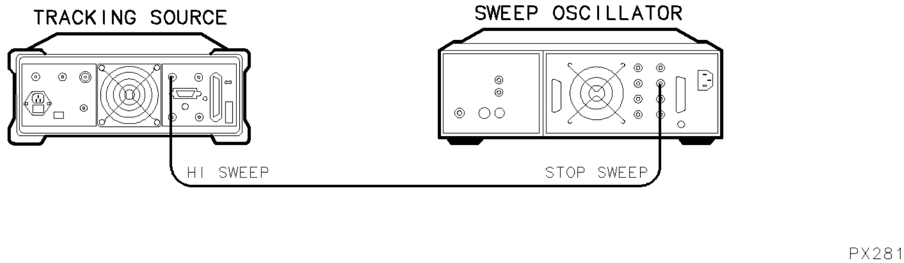
The offset frequency must be greater than the following:

± 30 MHz $\times$ N = offset frequency

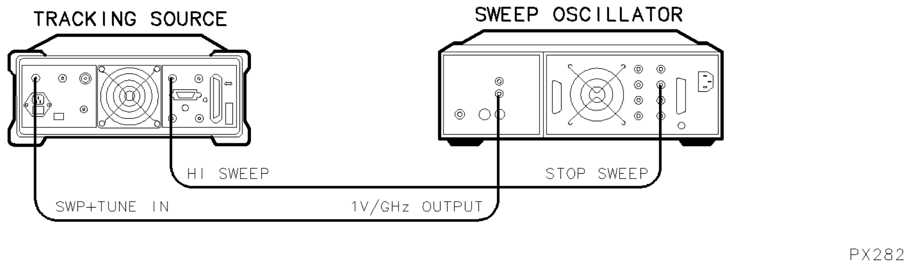
where N = the harmonic number

To Configure the tracking source with an HP 8350 Series sweep oscillator

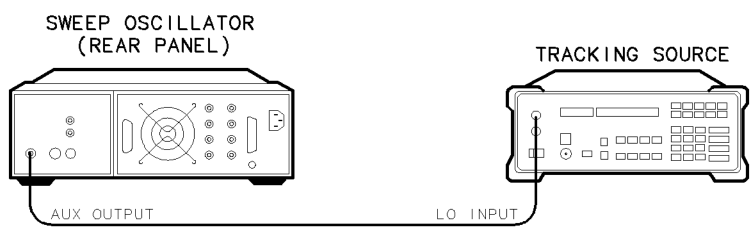
1 Connect a BNC cable from the tracking source HI SWEEP connector to the sweep oscillator STOP SWEEP connector.



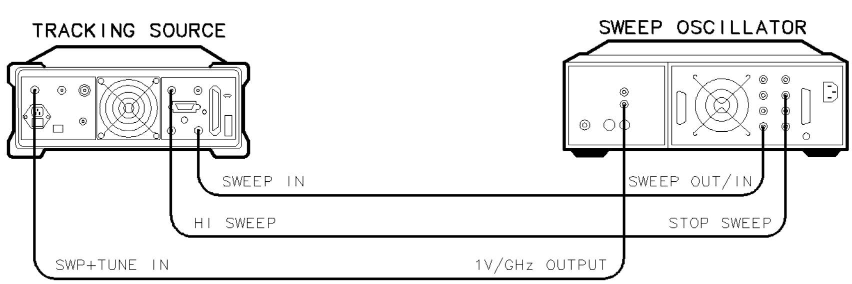
2 Connect a BNC cable from the tracking source SWP+TUNE IN connector to the sweep oscillator 1 V/GHz OUTPUT connector.



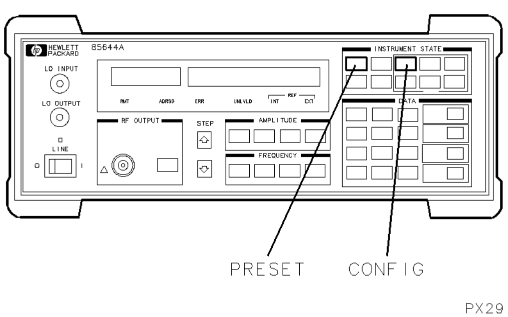
3 Connect an SMA cable from the tracking source LO INPUT connector to the sweep oscillator AUX OUTPUT connector.



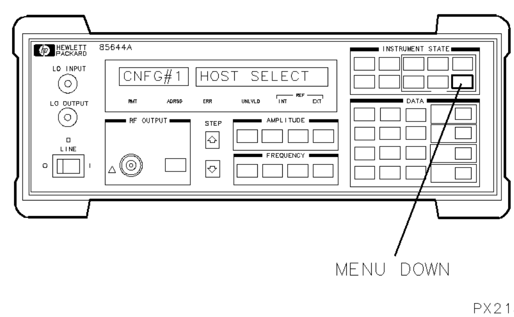
4 Connect a BNC cable from the tracking source SWEEP IN connector to the sweep oscillator SWEEP OUT/IN connector.



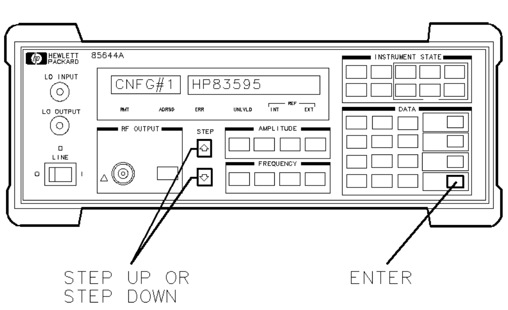
5 Press the (PRESET) key, then press the (CONFIG) key.



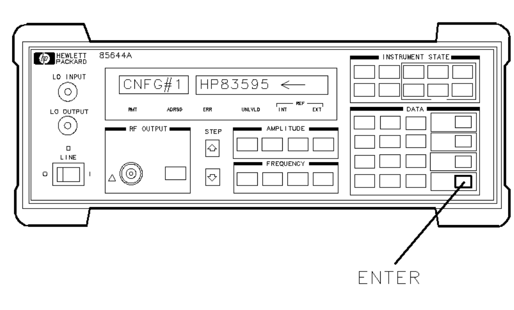
6 Press the (MENU DOWN) key on the tracking source until `CNFG #1 HOST SELECT` is displayed.



7 Press the (ENTER) key, then press the (⇑) or (⇓) keys to display the sweep oscillator HP model number. For example `CNFG # 1 HP 83595` is displayed for the HP83595.



8 Press the (ENTER) key; an arrow will appear next to the displayed model number. `CNFG #1 HP 83595 ←` is displayed for the HP 83595. The host instrument is now selected.



Remember, before making measurements, the tracking source must be offset when using a sweeper as the host instrument in bands 1 through 4.

The offset frequency must be greater than the following:

$\pm$30 MHz $\times$ N = offset frequency

where N = the harmonic number

To Install the tracking source into a rack

There are two rack-mount kits available for the tracking source:

Rack-mount kit without handles .... HP part number 5062-6450
Rack-mount kit with handles ...... HP part number 5062-6451

It is recommended that you use an HP-IB extender, HP part number 5062-8289, with the rack-mount kits listed above.

The following kits are optional; they require installation with one of the rack-mount kits listed above:

System II covers kit .... HP part number 5062-8290
Rack-slide kit .... HP part number 1494-0059

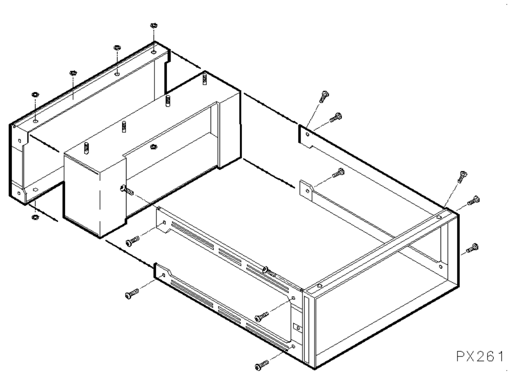
The following procedure illustrates the steps required to install the tracking source into a rack. Refer to the installation instructions included with the kits for more detailed installation.

Caution

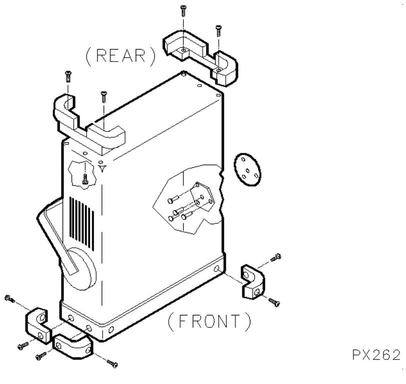
The following steps are necessary to avoid damaging the tracking source:

- Protect the front panel and frame, place the tracking source onto a cloth-protected surface.
- There are "key" locking pieces molded into the side trim. These fit into receptacles in the instrument cover. To remove the side trim and not break the locking pieces, pull the trim outwards to remove it from the cover assembly.
- Protect the tracking source's cable assemblies and components when removing and replacing the cover assembly.

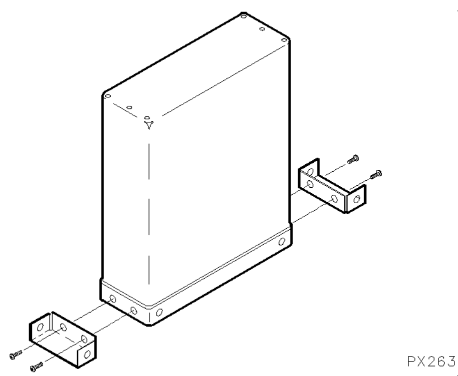
1 Assemble the rack-mount frame.



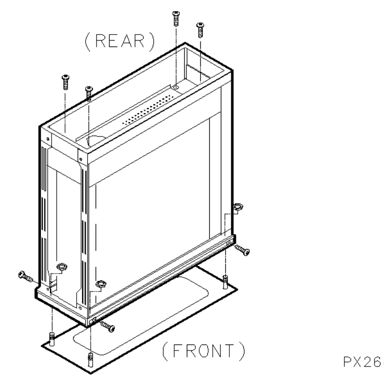
2 Remove the front bumpers, rear feet, and the handle assembly to prepare the tracking source cover assembly.



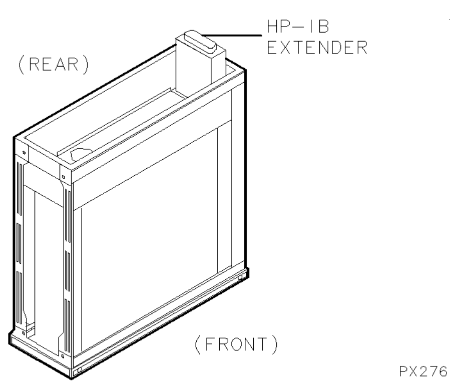
3 Install the front mounting brackets to the tracking source.



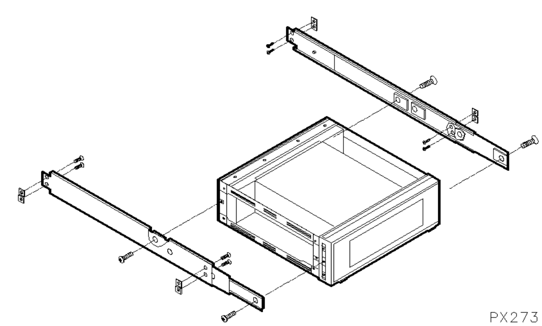
4 Attach the rack-mount frame to the tracking source.



5 Install the HP-IB extender to the HP-IB connector on the tracking source.



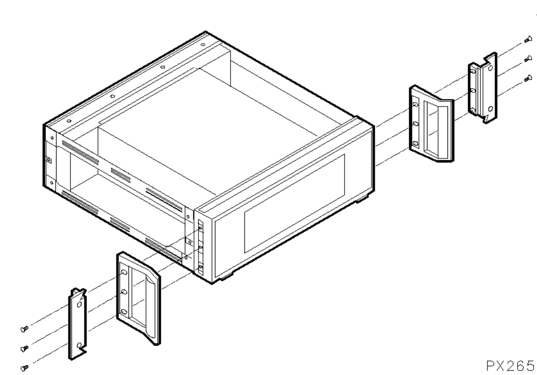
Optional: Install the rack-slide kit on the rack-mount frame.



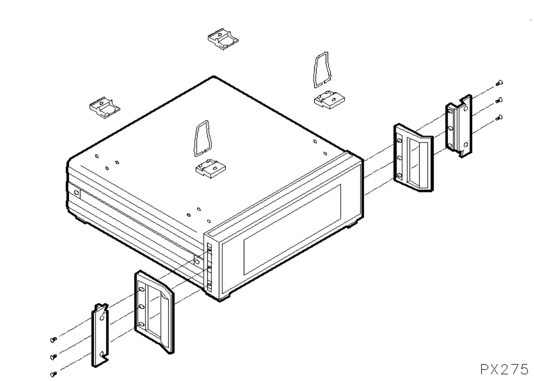
Warning

If an instrument handle is damaged, it should be replaced immediately. Damaged handles can break while the instrument is being moved or lifted. This may cause damage to the instrument or personal injury.

Optional: Install the rack flanges and handles on the rack-mount frame.



Optional: Install the System II covers, handles, and feet on the rack-mount frame.



2

Verifying Operation

Verifying Operation

What's in this chapter

The verification tests for the HP 85644A and HP 85645A tracking source verify the electrical performance of the tracking source against the specifications listed in Chapter 4. The verification tests are suitable for incoming inspections, preventative maintenance, troubleshooting, and calibration.

To verify the maximum RF power level of the HP 85644A	Procedure to verify the maximum RF power level of the HP 85644A tracking source.
To verify the maximum RF power level of the HP 85645A	Procedure to verify the maximum RF power level of the HP 85645A tracking source.
To verify offset tracking range	Procedure to verify the offset tracking range of the HP 85644A and HP 85645A tracking source.
To verify absolute amplitude accuracy	Procedure to verify the absolute amplitude accuracy of the HP 85644A and HP 85645A tracking source.
To verify flatness accuracy	Procedure to verify the flatness accuracy of the HP 85644A and HP 85645A tracking source.

Record the test results. Record verification test results in the Performance Test record located at the end of this chapter. The table lists test specifications and acceptable limits. We recommend that you make a copy of this table, record the complete test results on the copy, and keep the copy for your calibration test record. This record could prove invaluable in tracking gradual changes in test results over long periods of time.

If a test fails. If the tracking source does not meet one or more of the specifications during testing, complete any remaining tests and record all test results on a copy of the test record. Refer to Chapter 5 for instructions on how to solve the problem. If an error message is displayed refer to Chapter 7.

Use a 2-year calibration cycle. The verification tests should be used to check the tracking source against its specifications, listed in Chapter 4, every two years.

Recommended Test equipment

Table 2-1 lists the recommended test equipment for the verification tests. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model.

Table 2-1. Verification Test Equipment List

Equipment	Critical Specifications	HP Model Number or HP Part Number	Use*
Instruments			
Synthesized sweeper	2.3 GHz to 7.3 GHz, 2 dBm to 15 dBm output power	HP 8340A/B, HP 83640	C, P
Power meter	Compatible with power sensors listed below	HP 436A, HP 438A, HP 8902A	C, P
Power sensor	300 kHz to 2.9 GHz, −5 dBm to +18 dBm	HP 8482A	C, P
Power sensor	2.5 GHz to 26.5 GHz, −10 dBm to +18 dBm	HP 8485A	C, P
Spectrum analyzer	Compatible host analyzer 300 kHz to 22 GHz	HP 8566A/B	C, P
Spectrum analyzer	4.3 GHz to 4.7 GHz, 0 dBm	HP 8561A/B/E, HP 8562A/B, HP 8563A/E	C, P
Accessories			
Cable *(three required)*	BNC (m), 1.2 meters 50 Ω, triple shielded coaxial	8120-5529	C, P
Cable *(two required)*	SMA, 1 meter	5061-5458	C, P
* C = used for calibration software; P = used for manual performance tests.			

To verify the maximum RF power level of the HP 85644A

Use this procedure to verify the maximum RF power level of the HP 85644A tracking source. (Refer to the Maximum Leveled Power Output specification.) A spectrum analyzer is configured as host instrument to the HP 85644A tracking source. The tracking source is set to the maximum leveled power; the RF output power is displayed on the host spectrum analyzer and verified with a power meter.

The following equipment is required to verify the maximum RF power level:

Spectrum analyzer .... HP 8566B
Power meter .... HP 436A
Power sensor .... HP 8482A
Power sensor .... HP 8485A
Cable, BNC, 1.22 m *(three required)* .. HP part number 8120-5529
Cable, SMA, 1 m *(two required)* ...... HP part number 5061-5458

1. Connect the equipment. (Refer to Figure 2-1.)

   Connect the cables between the HP 85644A tracking source and the HP 8566B spectrum analyzer as follows:

   - Connect the BNC cables between the rear panels of the HP 85644A tracking source and the HP 8566B spectrum analyzer as described in the table below.

From HP 85644A Connector	To HP 8566B Connector
10 MHz IN	10 MHz OUT
SWP+TUNE IN	SWP+TUNE OUT
BLANK IN	PENLIFT

   - Connect an SMA cable from the HP 85644A tracking source LO INPUT connector to the HP 8566B spectrum analyzer 1st LO OUTPUT connector.

- Connect an SMA cable from the HP 85644A tracking source RF OUTPUT connector to the HP 8566B spectrum analyzer RF INPUT connector.
- Connect the HP 8482A power sensor to the HP 436A power meter.

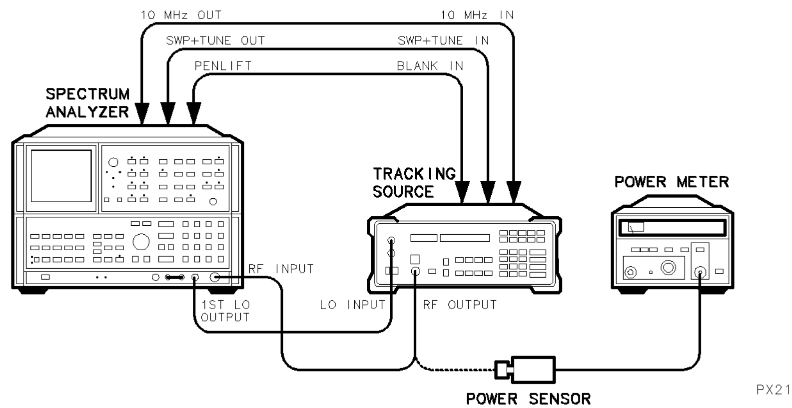


Figure 2-1. HP 85644A Maximum RF Power Level Setup

2. Configure the tracking source and HP 8566B spectrum analyzer by pressing the following HP 85644A tracking source keys:
   - Press (PRESET).
   - Press (CONFIG).
   - Press (MENU DOWN) until `CNFG #1 HOST SELECT` is displayed.
   - Press (ENTER) to select the host instrument.
   - Press (⇑) or (⇓) until `CNFG #1 HP 8566` is displayed.
   - Press (ENTER); `CNFG #1 HP 8566 ←` is displayed.

   The HP 8566B spectrum analyzer is now selected as host instrument to the HP 85644A tracking source.

3. Set up the equipment to verify the maximum RF power level from 300 kHz to 2.9 GHz.
   - Zero and calibrate the power meter and power sensor, as described in the power meter operation manual.
   - Set the HP 8566B spectrum analyzer to the following:

     Resolution bandwidth .... 100 kHz
     Reference level .... +25 dBm
4. Verify the maximum RF power level from 300 kHz to 2.9 GHz.

   The following steps are required to verify the maximum RF power level from 300 kHz to 2.9 GHz for each HP 8566B spectrum analyzer start and stop frequency listed in the table.
   - Set the HP 8566B spectrum analyzer to the first start and stop frequencies listed in the table below.

Start Frequency	Stop Frequency
300 kHz	1.8 GHz
1.8 GHz	2.5 GHz

   - Increase the tracking source power in 1 dB steps until the front-panel unleveled indicator (UNLVLD) lights.
   - Decrease the power in 0.1 dB steps until the unleveled indicator light goes off.

     Observe the signal on the spectrum analyzer for a leveled condition. An unleveled condition displays a marker power level less than −20 dB, usually on the noise floor, with random signals indicating the tracking source is no longer tracking.

     The signal may be unleveled even though the unleveled indicator may not appear to be lit. To get the maximum power out, it may be necessary to lower the power level of the tracking source until it is leveled.

- Observe the RF power level; note the marker frequency of the lowest power level. Press (CW) on the tracking source and set the frequency to the value corresponding to the lowest displayed power.

  Connect the power sensor input to the tracking source RF OUTPUT connector. Measure the tracking source output power with the power meter. Record this measured value in the Performance Test record.

  Reconnect the tracking source RF OUTPUT connector to the HP 8566B RF INPUT connector.

- Change to the next start and stop frequency settings listed in the table; repeat the steps until all the frequencies ranges have been verified.

5. Set up the equipment to verify the maximum RF power level from 2.0 GHz to 5.8 GHz.

   - Connect the HP 8485A power sensor to the HP 436A power meter.
   - Zero and calibrate the power meter and power sensor, as described in the power meter operation manual.
   - Set the HP 8566B spectrum analyzer to the following:

     Start frequency .... 2.0 GHz
     Stop frequency .... 5.8 GHz

6. Verify the maximum RF power level from 2.0 GHz to 5.8 GHz.

   The following steps are required to verify the maximum RF power level from 2.0 GHz to 5.8 GHz.

   - Increase the tracking source power in 1 dB steps until the front-panel unleveled indicator (UNLVLD) lights.
   - Decrease the power in 0.1 dB steps until the unleveled indicator light goes off.

     Observe the signal on the spectrum analyzer for a leveled condition. An unleveled condition displays a marker power level less than −20 dB, usually on the noise floor, with random signals indicating the tracking source is no longer tracking.

     The signal may be unleveled even though the unleveled indicator may not appear to be lit. To get the maximum power out, it may be necessary to lower the power level of the tracking source until it is leveled.

- Observe the RF power level; note the marker frequency of the lowest power level. Press (CW) on the tracking source and set the frequency to the value corresponding to the lowest displayed power.

  Connect the power sensor input to the tracking source RF OUTPUT connector. Measure the tracking source output power with the power meter.

  Record this measured value in the Performance Test record.

7. Verify the maximum RF power level from 5.9 GHz to 6.5 GHz.

   The following steps are required to verify the maximum RF power level from 5.9 GHz to 6.5 GHz for each HP 85644A tracking source frequency listed.

   - Set the HP 85644A tracking source to the first CW frequency listed below.

     5.9 GHz
     6.0 GHz
     6.1 GHz
     6.2 GHz
     6.3 GHz
     6.4 GHz
     6.5 GHz

   - Increase the tracking source power in 1 dB steps until the front-panel unleveled indicator lights.
   - Decrease the power in 0.1 dB steps until the unleveled indicator light goes off.
   - Record the power meter reading in the Performance Test record.
   - Change to the next frequency setting; repeat the steps until all the frequency points have been verified.

To verify the maximum RF power level of the HP 85645A

Use this procedure to verify the maximum RF power level of the HP 85645A tracking source. (Refer to the Maximum Leveled Power Output specification.) A spectrum analyzer is configured as host instrument to the HP 85645A tracking source. The tracking source is set to the maximum leveled power; the RF output power is displayed on the host spectrum analyzer and verified with a power meter.

The equipment required to verify the maximum RF power level is as follows:

Spectrum analyzer .... HP 8566B
Power meter .... HP 436A
Power sensor .... HP 8482A
Power sensor .... HP 8485A
Cable, BNC, 1.22 m *(three required)* .. HP part number 8120-5529
Cable, SMA, 1 m *(two required)* ...... HP part number 5061-5458

1. Connect the equipment. (Refer to Figure 2-2.)

   Connect the cables between the HP 85645A tracking source, the HP 8566B spectrum analyzer, and the HP 436A power meter as follows:

   - Connect the BNC cables between the rear panels of the HP 85645A tracking source and the HP 8566B spectrum analyzer as described in the table below.

From HP 85645A Connector	To HP 8566B Connector
10 MHz IN	10 MHz OUT
SWP+TUNE IN	SWP+TUNE OUT
BLANK IN	PENLIFT

   - Connect an SMA cable from the HP 85645A tracking source LO INPUT connector to the HP 8566B spectrum analyzer 1st LO OUTPUT connector.

- Connect an SMA cable from the HP 85645A tracking source RF OUTPUT connector to the HP 8566B spectrum analyzer RF INPUT connector.
- Connect the HP 8482A power sensor to the HP 436A power meter.

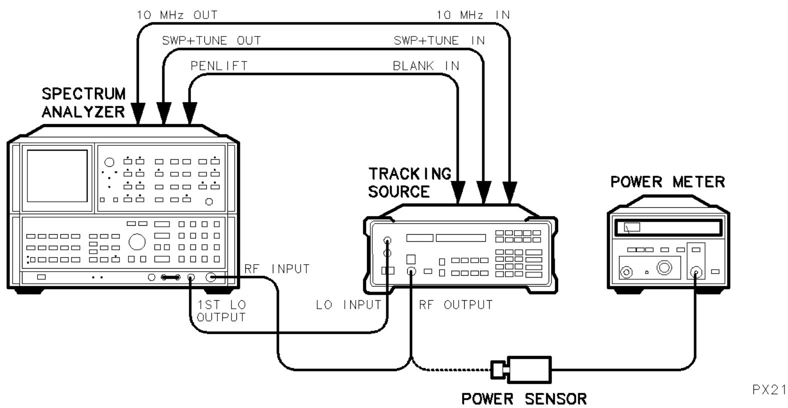


Figure 2-2. HP 85645A Maximum RF Power Level Setup

2. Configure the tracking source and HP 8566B spectrum analyzer by pressing the following HP 85645A tracking source keys:
   - Press (PRESET).
   - Press (CONFIG).
   - Press (MENU DOWN) until `CNFG #1 HOST SELECT` is displayed.
   - Press (ENTER) to select the host instrument.
   - Press (⇧) or (⇩) until `CNFG #1 HP 8566` is displayed.
   - Press (ENTER); `CNFG #1 HP 8566 ←` is displayed.

   The HP 8566B spectrum analyzer is now selected as host instrument to the HP 85645A tracking source.

3. Set up the equipment to verify the maximum RF power level from 300 kHz to 2.9 GHz.
   - Zero and calibrate the power meter and power sensor, as described in the power meter operation manual.
   - Set the HP 8566B spectrum analyzer to the following:

     Resolution bandwidth .... 100 kHz
     Reference level .... +25 dBm

4. Verify the maximum RF power level from 300 kHz to 2.9 GHz.

   The following steps are required to verify the maximum RF power level from 300 kHz to 2.9 GHz for each HP 8566B spectrum analyzer start and stop frequency range listed in the table.

   - Set the HP 8566B spectrum analyzer to the first start and stop frequencies listed in the table below.

HP 8566B Settings

Start Frequency	Stop Frequency
300 kHz	1.8 GHz
1.8 GHz	2.5 GHz

   - Increase the tracking source power in 1 dB steps until the front-panel unleveled indicator (UNLVLD) lights.
   - Decrease the power in 0.1 dB steps until the unleveled indicator light goes off.

     Observe the signal on the spectrum analyzer for a leveled condition. An unleveled condition displays a marker power level less than −20 dB, usually on the noise floor, with random signals indicating the tracking source is no longer tracking.

     The signal may be unleveled even though the unleveled indicator may not appear to be lit. To get the maximum power out, it may be necessary to lower the power level of the tracking source until it is leveled.

- Observe the RF power level; note the marker frequency of the lowest power level. Press CW on the tracking source and set the frequency to the value corresponding to the lowest displayed power. Connect the power sensor input to the tracking source RF OUTPUT connector. Measure the tracking source output power with the power meter. Record this measured value in the Performance Test record.

  Reconnect the tracking source RF OUTPUT to the HP 8566B RF INPUT.

- Change to the next start and stop frequency settings listed in the table; repeat the steps until all the frequencies ranges have been verified.

5. Set up the equipment to verify the maximum RF power level from 2.0 GHz to 22.0 GHz.

   - Connect the HP 8485A power sensor to the HP 436A power meter.
   - Zero and calibrate the power meter and power sensor, as described in the power meter operation manual.
   - Set the HP 8566B spectrum analyzer to the following:

     Resolution bandwidth . . . . 100 kHz
     Reference level . . . . +25 dBm

6. Verify the maximum RF power level from 2.0 GHz to 22.0 GHz.

   The following steps are required to verify the maximum RF power level from 2.0 GHz to 22.0 GHz for each HP 8566B spectrum analyzer frequency range listed in the table.

   - Set the HP 8566B spectrum analyzer to the first start and stop frequencies listed in the table below.

HP 8566B Settings

Start Frequency	Stop Frequency
2.0 GHz	5.8 GHz
5.8 GHz	12.5 GHz
12.5 GHz	18.6 GHz
18.6 GHz	22.0 GHz

- Increase the tracking source power in 1 dB steps until the front-panel unleveled indicator (UNLVLD) lights.
- Decrease the power in 0.1 dB steps until the unleveled indicator light goes off.

  Observe the signal on the spectrum analyzer for a leveled condition. An unleveled condition displays a marker power level less than −20 dB, usually on the noise floor, with random signals indicating the tracking source is no longer tracking.

  The signal may be unleveled even though the unleveled indicator may not appear to be lit. To get the maximum power out, it may be necessary to lower the power level of the tracking source until it is leveled.
- Observe the RF power level; note the marker frequency of the lowest power level. Press (CW) on the tracking source and set the frequency to the value corresponding to the lowest displayed power. Connect the power sensor input to the tracking source RF OUTPUT connector. Measure the tracking source output power with the power meter. Record this measured value in the Performance Test record.

  Reconnect the tracking source RF OUTPUT to the HP 8566B RF INPUT.
- Change to the next start and stop frequency settings listed in the table; repeat the steps until all the frequencies ranges have been verified.

7. Verify the maximum RF power level from 22.0 GHz to 26.5 GHz.

   The following steps are required to verify the maximum RF power level from 22.0 GHz to 26.5 GHz for each HP 85645A tracking source frequency listed.

   - Set the HP 85645A tracking source to the first CW frequency listed below.

     22.0 GHz
     23.0 GHz
     24.0 GHz
     25.0 GHz
     26.0 GHz
     26.5 GHz

   - Increase the tracking source power in 1 dB steps until the front-panel unleveled indicator lights.
   - Decrease the power in 0.1 dB steps until the unleveled indicator light goes off.
   - Record the power meter reading in the Performance Test record.
   - Change to the next frequency setting; repeat the steps until all the frequency points have been verified.

To verify offset tracking range

Use this procedure to verify the HP 85644A and HP 85645A tracking source offset tracking range. (Refer to the Offset Frequency Tracking Range specification.) The offset tracking range measurement is made at an arbitrary frequency of 4.5 GHz. The HP 85644A and HP 85645A tracking source signal is offset from the host spectrum analyzer signal, then the RF output power is measured on another spectrum analyzer to verify that the tracking source is still locked. The following equipment is required to verify the offset tracking range:

Spectrum analyzer ....HP 8562A
Spectrum analyzer ....HP 8566B
Cable, BNC, 1.22 m *(three required)* .. HP part number 8120-5529
Cable, SMA, 1 m *(two required)* ...... HP part number 5061-5458

1. Connect the equipment. (Refer to Figure 2-3.)

   Connect the cables between the HP 85644A and HP 85645A tracking source, the HP 8566B spectrum analyzer, and the HP 8562A spectrum analyzer as follows:

   - Connect the BNC cables between the rear panels of the HP 8566B spectrum analyzer and the HP 85644A and HP 85645A tracking source as described in the table below.

From HP 85644A/85645A Connector	To HP 8566B Connector
10 MHz IN	10 MHz OUT
SWP+TUNE IN	SWP+TUNE OUT
BLANK IN	PENLIFT

   - Connect one of the SMA cables from the HP 85644A and HP 85645A tracking source LO INPUT connector to the HP 8566B spectrum analyzer 1st LO OUTPUT connector.
   - Connect the other SMA cable from the HP 85644A and HP 85645A tracking source RF OUTPUT connector to the HP 8562A spectrum analyzer RF INPUT connector.

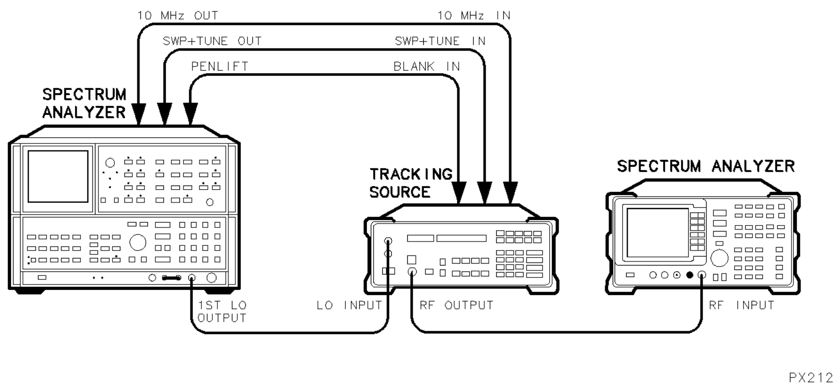


Figure 2-3. Offset Tracking Range Setup

2. Configure the tracking source and HP 8566B spectrum analyzer by pressing the following HP 85644A and HP 85645A tracking source keys:
   - Press (PRESET).
   - Press (CONFIG).
   - Press (MENU DOWN) until `CNFG #1 HOST SELECT` is displayed.
   - Press (ENTER) to select the host instrument.
   - Press (⇧) or (⇩) until `CNFG #1 HP 8566` is displayed.
   - Press (ENTER); `CNFG #1 HP 8566 ←` is displayed.

   The HP 8566B spectrum analyzer is now selected as host instrument to the HP 85644A and HP 85645A tracking source.

3. Set up the equipment to verify the offset tracking range at 4.5 GHz with a +200 MHz offset.

   The following steps are necessary to set up the HP 85644A and HP 85645A tracking source, HP 8566B spectrum analyzer, and the HP 8562A spectrum analyzer:

   - Set the HP 8566B spectrum analyzer to the following:

     Center frequency .... 4.5 GHz
     Span .... 0 Hz
     Sweep time .... 20 ms
     Resolution bandwidth .... 30 kHz

   - Set the HP 8562A spectrum analyzer to the following:

     Center frequency .... 4.7 GHz
     Span .... 10 MHz
     Reference level .... +10 dBm

   - Press (OFFSET TRKG), 200 (MHz) on the HP 85644A and HP 85645A tracking source to set the offset frequency.

   The HP 8562A is now set to verify the tracking range of the tracking source at 4.5 GHz with a +200 MHz offset.

4. Verify that the tracking source is locked at +200 MHz offset.

   To verify that the offset function is within specifications, determine whether the tracking source is locked.

   - If the HP 85644A and HP 85645A tracking source is locked, a single stable frequency with a marker power level between 0 and −3 dBm is displayed on the HP 8562A spectrum analyzer.
   - If the HP 85644A and HP 85645A tracking source is unlocked, the marker power level displayed on the HP 8562A spectrum analyzer is less than −20 dB, usually on the noise floor, with random multiple signals indicating the tracking source is no longer tracking.

   If the tracking source is locked, indicate on the Performance Test record that the tracking source stays locked at greater than +200 MHz offset.

5. Set up the equipment to verify the offset tracking range at 4.5 GHz with a −200 MHz offset.

   The following steps are necessary to set up the HP 85644A and HP 85645A tracking source and the HP 8562A spectrum analyzer:

   - Set the HP 8562A spectrum analyzer to a center frequency of 4.3 GHz.
   - Press (OFFSET TRKG), then −200 (MHz) on the HP 85644A and HP 85645A tracking source to set the offset frequency.

   The HP 8562A spectrum analyzer is now set to verify the offset tracking range of the tracking source at 4.5 GHz with a −200 MHz offset.

6. Verify that the tracking source is locked at −200 MHz.

   To verify that the offset function is within specifications, determine whether the tracking source is locked.

   - If the HP 85644A and HP 85645A tracking source is locked, a single stable frequency with a marker power level between 0 and −3 dBm is displayed on the HP 8562A spectrum analyzer.
   - If the HP 85644A and HP 85645A tracking source is unlocked, the marker power level displayed on the HP 8562A spectrum analyzer is less than −20 dB, usually on the noise floor, with random multiple signals indicating the tracking source is no longer tracking.

If the tracking source is locked, indicate on the Performance Test record that the tracking source stays locked at greater than −200 MHz offset.

To verify absolute amplitude accuracy

Use this procedure to verify the absolute amplitude accuracy of the HP 85644A and HP 85645A tracking source. (Refer to the Amplitude Accuracy specification.) The HP 85644A and HP 85645A both have one low band (band 0). However, the HP 85644A has one upper band (band 1) and the HP 85645A has four upper bands (bands 1 through 4). For both models the low-band absolute amplitude accuracy measurement is made at 300 MHz and the upper-band measurement is made at 3 GHz.

The following equipment is required to verify the absolute amplitude accuracy:

Synthesized sweeper . . . . HP 8340B
Power meter . . . . HP 436A
Power sensor . . . . HP 8482A
Cable, BNC, 1.22 m . . . . HP part number 8120-5529
Cable, SMA, 1 m . . . . HP part number 5061-5458

1. Connect the equipment. (Refer to Figure 2-4.)

   Connect the cables between the HP 85644A and HP 85645A tracking source, the HP 8340B synthesized sweeper, and the HP 436A power meter as follows:

   - Connect a BNC cable between the HP 85644A and HP 85645A tracking source 10 MHz IN connector and the HP 8340B synthesized sweeper 10 MHz REF OUTPUT connector.
   - Connect the SMA cable from the HP 85644A and HP 85645A tracking source LO INPUT connector to the HP 8340B synthesized sweeper RF OUTPUT connector.
   - Connect the HP 8482A power sensor to the HP 436A power meter.

2. Zero and calibrate the power meter and power sensor, as described in the power meter operation manual. Then, connect the power sensor input to the HP 85644A and HP 85645A tracking source RF OUTPUT connector.

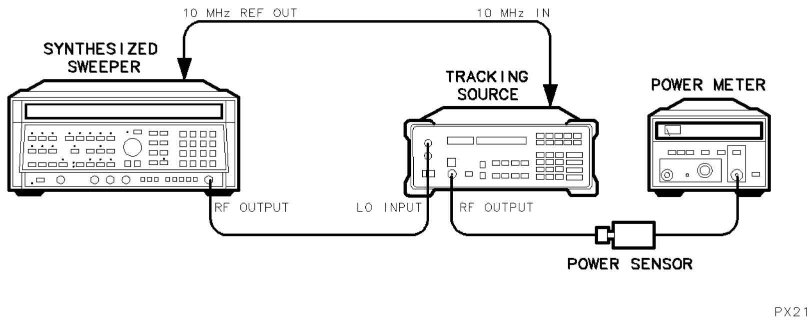


Figure 2-4. Absolute Amplitude Accuracy Setup

3. Configure the HP 85644A and HP 85645A tracking source in the test host mode with the HP 8340B synthesized sweeper by pressing the following HP 85644A and HP 85645A tracking source keys:
   - Press (PRESET).
   - Press (TEST).
   - Press (MENU DOWN) until `TEST #3 TEST HOST MODE` is displayed.
   - Press (ENTER) to select the test host mode.

   The HP 85644A and HP 85645A tracking source is now in the test host mode.

4. Set up the equipment to verify the absolute amplitude accuracy of the low band.

   The following steps are necessary to set up the HP 85644A and HP 85645A tracking source and the HP 8340B synthesized sweeper:
   - Press 300 (MHz) on the HP 85644A and HP 85645A tracking source to set the frequency.
   - Set the HP 8340B synthesized sweeper to the following:

     CW frequency . . . . 4.2 GHz
     Power level . . . . 0 dBm

5. Verify the absolute amplitude accuracy of the low band.

   The following steps are necessary to verify the absolute amplitude accuracy of the low band:

   - Measure the RF OUTPUT power with the HP 436A power meter.
   - Record the low band power measurement on the Performance Test record.

6. Set up the equipment to verify the absolute amplitude accuracy in the upper bands.

   The following steps are necessary to set up the HP 85644A and HP 85645A tracking source and the HP 8340B synthesized sweeper:

   - Set the HP 85644A and HP 85645A to band 1 by pressing (⇧).
   - Press 3 (GHz) on the HP 85644A and HP 85645A tracking source to set the frequency.
   - Set the HP 8340B synthesized sweeper CW frequency to 3.3 GHz.

   The equipment is now set to verify the absolute amplitude accuracy.

7. Verify the absolute amplitude accuracy of the upper bands.

   The following steps are necessary to verify the absolute amplitude accuracy in the upper bands:

   - Measure the RF OUTPUT power with the HP 436A power meter.
   - Record the upper band power measurement on the Performance Test record.

To verify flatness accuracy

Use this procedure to measure the HP 85644A and HP 85645A tracking source flatness accuracy. (Refer to the Output Signal Flatness specification.) The HP 85644A has one upper band (band 1) and the HP 85645A has four upper bands (bands 1 through 4). For both models a low-band reference power measurement is made at 300 MHz and an upper-band reference power measurement is made at 3 GHz. Power measurements are then made at individual frequency points in each band, then compared to the reference power.

The following equipment is required to verify flatness accuracy:

Synthesized sweeper	HP 8340B
Power meter	HP 436A
Power sensor	HP 8482A
Power sensor	HP 8485A
Cable, BNC, 1.22 m	HP part number 8120-5529
Cable, SMA, 1 m	HP part number 5061-5458

1. Connect the equipment. (Refer to Figure 2-5.)

   Connect the cables between the HP 85644A and HP 85645A tracking source, the HP 8340B synthesized sweeper, and the HP 436A power meter as follows:

   - Connect a BNC cable between the HP 85644A and HP 85645A tracking source 10 MHz connector and the HP 8340B synthesized sweeper 10 MHz REF OUTPUT connector.
   - Connect an SMA cable from the HP 85644A and HP 85645A tracking source LO INPUT connector to the HP 8340B synthesized sweeper RF OUTPUT connector.
   - Connect the HP 8482A power sensor to the HP 436A power meter.

2. Zero and calibrate the power meter and power sensor, as described in the power meter operation manual. Then, connect the power sensor input to the HP 85644A and HP 85645A tracking source RF OUTPUT connector.

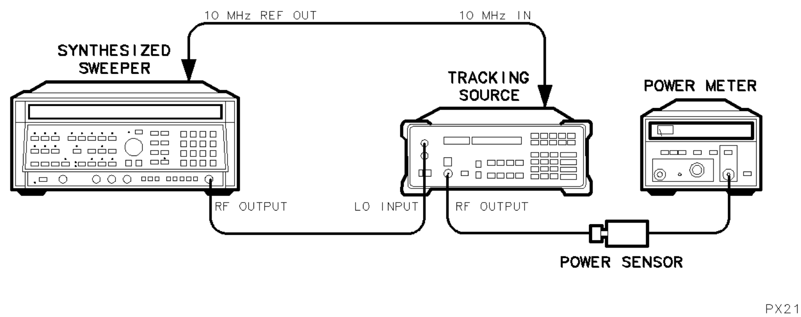


Figure 2-5. Flatness Accuracy Setup

3. Set up the equipment to verify the flatness accuracy of the low band.

   The following steps are necessary to set up the HP 85644A and HP 85645A tracking source and the HP 8340B synthesized sweeper:

   - Press (PRESET) on the HP 85644A and HP 85645A tracking source.
   - Set the HP 8340B synthesized sweeper to the following:

     CW frequency .... 4.2 GHz
     Power level .... 0 dBm

   - Press (CW), 300 (MHz) on the HP 85644A and HP 85645A tracking source to set the frequency.
   - Press (POWER STEP), 0.01 (+dBm) to set the tracking source power step.
   - Press (POWER LEVEL) then, (⇧) or (⇩) on the tracking source to adjust the output power for a −2 dBm reading on the power meter.

4. Configure the HP 85644A and HP 85645A tracking source in the test host mode with the HP 8340B synthesized sweeper by pressing the following HP 85644A and HP 85645A tracking source keys:
   - Press (TEST).
   - Press (MENU DOWN) until `TEST #3 TEST HOST MODE` is displayed.
   - Press (ENTER) to select the test host mode.

   The HP 85644A and HP 85645A tracking source is now in the test host mode.
5. Verify the flatness accuracy of band 0, 300 kHz to 2.9 GHz.

   The following steps are necessary to verify the flatness accuracy of band 0:
   - Set the HP 85644A and HP 85645A tracking source and HP 8340B synthesized sweeper to the first frequencies listed in the table below.

Band 0 Frequency Settings

HP 85644A or HP 85645A	HP 8340B
300 kHz	3.9003 GHz
600 kHz	3.9006 GHz
1 MHz	3.901 GHz
30 MHz	3.930 GHz
300 MHz	4.200 GHz
1 GHz	4.900 GHz
1.3 GHz	5.200 GHz
2.0 GHz	5.900 GHz
2.9 GHz	6.800 GHz

- Record the power meter reading in the Performance Test record. Perform the calculations required in the Performance Test record to verify the flatness accuracy of band 0 with respect to the 300 MHz reference.
- Change to the next frequency setting; repeat the steps until all the frequency points have been tested for the band 0.

6. Set up the equipment to verify the flatness accuracy of the upper bands (band 1 for the HP 85644A or bands 1 through 4 for the HP 85645A).

   The following steps are necessary to set up the HP 85644A and HP 85645A tracking source, the HP 8340B synthesized sweeper, and the HP 436A power meter to verify the flatness accuracy of the upper bands:

   - Connect the HP 8485A power sensor to the HP 436A power meter.

     Zero and calibrate the power meter and power sensor, as described in the power meter operation manual. Then, connect the power sensor input to the HP 85644A and HP 85645A tracking source RF OUTPUT connector.
   - Set the HP 8340B synthesized sweeper to a CW frequency of 3.3 GHz.
   - Press (CW), 3 (GHz) on the HP 85645A tracking source to set the frequency.
   - Press (POWER LEVEL) on the tracking source to set the power level.
   - Press (⇧) or (⇩) on the tracking source to adjust the output power for a −2 dBm reading on the power meter.

7. Configure the HP 85644A and HP 85645A tracking source in the test host mode with the HP 8340B synthesized sweeper by pressing the following HP 85644A and HP 85645A tracking source keys:

   - Press (TEST).
   - Press (MENU DOWN) until `TEST #3 TEST HOST MODE` is displayed.
   - Press (ENTER) to select the test host mode.

   The HP 85644A and HP 85645A tracking source is now in the test host mode.

8. Verify the flatness accuracy of band 1.

   The following steps are necessary to verify the flatness accuracy of band 1:

   - Press ⇧ on the HP 85644A and HP 85645A tracking source to select band 1.
   - Set the HP 85644A and HP 85645A tracking source and HP 8340B synthesized sweeper to the first frequencies listed in the table below.

Band 1 Frequency Settings

HP 85644A or HP 85645A	HP 8340B
2.0 GHz	2.3 GHz
2.3 GHz	2.6 GHz
3.0 GHz	3.3 GHz
3.7 GHz	4.0 GHz
4.6 GHz	4.9 GHz
5.5 GHz	5.8 GHz
6.5 GHz	6.8 GHz
7.0 GHz *	7.3 GHz *
* For HP 85645A only	

   - Record the power meter reading in the Performance Test record. Perform the calculations required in the Performance Test record to verify the flatness accuracy of band 1 with respect to the 3 GHz reference.
   - Change to the next frequency setting; repeat the steps until all the frequency points have been tested for band 1.

   Step 8 completes the flatness accuracy verification for the HP85644A tracking source. Continue with this procedure only if verifying the flatness accuracy of an HP 85645A tracking source.

9. Verify the flatness accuracy of band 2. *(For HP 85645A only)*

   The following steps are necessary to verify the flatness accuracy of band 2:

   - Press ⇧ on the HP 85645A tracking source to select band 2.
   - Set the HP 85645A tracking source and HP 8340B synthesized sweeper to the first frequencies listed in the table below.

Band 2 Frequency Settings

HP 85644A or HP 85645A	HP 8340B
5.8 GHz	3.05 GHz
6.3 GHz	3.3 GHz
7.1 GHz	3.7 GHz
8.1 GHz	4.2 GHz
9.5 GHz	4.9 GHz
10.1 GHz	5.2 GHz
11.3 GHz	5.8 GHz
13.0 GHz	6.65 GHz
13.5 GHz	6.9 GHz

   - Record the power meter reading in the Performance Test record. Perform the calculations required in the Performance Test record to verify the flatness accuracy of band 2 with respect to the 3 GHz reference.
   - Change to the next frequency setting; repeat the steps until all the frequency points have been tested for band 2.

10. Verify the flatness accuracy of band 3. *(For HP 85645A only)*

    The following steps are necessary to verify the flatness accuracy of band 3:

    - Press (⇧) on the HP 85645A tracking source to select band 3.
    - Set the HP 85645A tracking source and HP 8340B synthesized sweeper to the first frequencies listed in the table below.

Band 3 Frequency Settings

HP 85644A or HP 85645A	HP 8340B
12.4 GHz	4.23 GHz
13.2 GHz	4.5 GHz
14.1 GHZ	4.8 GHz
15.0 GHz	5.1 GHz
16.5 GHz	5.6 GHz
18.0 GHz	6.1 GHz
20.0 GHz	6.77 GHz

- Record the power meter reading in the Performance Test record. Perform the calculations required in the Performance Test record to verify the flatness accuracy of band 3 with respect to the 3 GHz reference.
- Change to the next frequency setting; repeat the steps until all the frequency points have been tested for band 3.

11. Verify the flatness accuracy of band 4. *(For HP 85645A only)*

    The following steps are necessary to verify the flatness accuracy of band 4:

    - Press ⇧ on the HP 85645A tracking source to select band 4.
    - Set the HP 85645A tracking source and HP 8340B synthesized sweeper to the first frequencies listed in the table below.

Band 4 Frequency Settings

HP 85644A or HP 85645A	HP 8340B
12.1 GHz	3.1 GHz
15.1 GHz	3.85 GHz
17.1 GHz	4.35 GHz
19.1 GHz	4.85 GHz
20.1 GHZ	5.1 GHz
22.1 GHz	5.6 GHz
24.1 GHz	6.1 GHz
26.5 GHz	6.7 GHz

- Record the power meter reading in the Performance Test record. Perform the calculations required in the Performance Test record to verify the flatness accuracy of band 4 with respect to the 3 GHz reference.
- Change to the next frequency setting; repeat the steps until all the frequency points have been tested for band 4.

The Performance Test record lists test specifications and acceptable limits. We recommend that you make a copy of this table, record the complete test results on the copy, and keep the copy for your calibration test record. This record could prove invaluable in tracking gradual changes in test results over long periods of time.

Calculating the Corrected Power

Perform the following steps to calculate the Corrected Power for the Performance Test record.

1. Calculate the power in milliwatts:

$$Power\ (mW) = 10^{\frac{measured\ power}{10}}$$

2. Correct the measured power with the power sensor factor:

$$\frac{power}{power\ sensor\ cal\ factor} = corrected\ power\ (mW)$$

3. Change the corrected power back to dBm:

$$corrected\ power = 10\,log[corrected\ power\ (mW)]$$

Table 2-2. HP 85644A/85645A Tracking Source Performance Test Record

Hewlett-Packard Company

Address ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (for example, 10 SEP 1990)

Model HP 85644A/85645A

Serial No. ______________

Options ______________

Firmware Revision ______________

Customer ______________________ Tested by ______________________

Ambient temperature ________°C Relative humidity ________%

Power mains line frequency __________ Hz (nominal)

Test Equipment Used

Description	Model No.	Trace No.	Cal Due Date
Spectrum Analyzer 1	________	________	________
Spectrum Analyzer 2	________	________	________
Synthesized Sweeper	________	________	________
Power Meter	________	________	________
RF Power Sensor	________	________	________
Microwave Power Sensor	________	________	________

Maximum RF Power of the HP 85644A

Frequency	Measured Power	Power Sensor Factor	Corrected* Power	Specified Maximum Power	Measurement Uncertainty
300 kHz to 1.8 GHz	________	________	________	+10 dBm	0.085 dB
1.8 GHz to 2.5 GHz	________	________	________	+4 dBm	0.085 dB
2.0 GHz to 5.8 GHz	________	________	________	+5 dBm	0.106 dB

Frequency	Measured Power	Power Sensor Factor	Corrected* Power	Specified Maximum Power	Measurement Uncertainty
5.9 GHz	________	________	________	+5 dBm	0.106 dB
6.0 GHz	________	________	________	+5 dBm	0.106 dB
6.1 GHz	________	________	________	+5 dBm	0.106 dB
6.2 GHz	________	________	________	+5 dBm	0.106 dB
6.3 GHz	________	________	________	+5 dBm	0.106 dB
6.4 GHz	________	________	________	+5 dBm	0.106 dB
6.5 GHz	________	________	________	+5 dBm	0.106 dB

* Refer to the "Calculating the Corrected Power" section in previous pages.

Maximum RF Power of the HP 85645A

Frequency	Measured Power	Power Sensor Factor	Corrected* Power	Specified Maximum Power	Measurement Uncertainty
300 kHz to 1.8 GHz	______	______	______	+10 dBm	0.085 dB
1.8 GHz to 2.5 GHz	______	______	______	+5 dBm	0.085 dB
2.0 GHz to 5.8 GHz	______	______	______	+10 dBm	0.106 dB
5.8 GHz to 12.5 GHz	______	______	______	+5 dBm	0.106 dB
12.5 GHz to 18.6 GHz	______	______	______	+5 dBm	0.106 dB
18.6 GHz to 22.0 GHz	______	______	______	−2 dBm	0.106 dB

Frequency	Measured Power	Power Sensor Factor	Corrected* Power	Specified Maximum Power	Measurement Uncertainty
22.0 GHz	______	______	______	−2 dBm	0.106 dB
23.0 GHz	______	______	______	−2 dBm	0.106 dB
24.0 GHz	______	______	______	−2 dBm	0.106 dB
25.0 GHz	______	______	______	−2 dBm	0.106 dB
26.0 GHz	______	______	______	−2 dBm	0.106 dB
26.5 GHz	______	______	______	−2 dBm	0.106 dB

* Refer to the “Calculating the Corrected Power” section in previous pages.

Offset Tracking Range

Frequency	Measured Offset Frequency	Specification	Measurement Uncertainty
4.3 GHz	____________	±200 MHz	20 kHz
4.7 GHz	____________	±200 MHz	20 kHz

Absolute Amplitude Accuracy

Band	Measured RF Output Power	Power Sensor Factor	Corrected* RF Output Power	Specified RF Output Power Accuracy	Measurement Uncertainty
0	_________	_________	_________	±1 dB	0.085 dB
1–4	_________	_________	_________	±1 dB	0.085 dB

* Refer to the "Calculating the Corrected Power" section in previous pages.

Flatness Accuracy, Band 0

Band 0	Measured Power	Power Sensor Factor	Corrected* Power	Δ Power† (300 MHz Ref.)	Specified Flatness	Measurement Uncertainty
300 kHz	________	________	________	________	±2 dB	0.12 dB
600 kHz	________	________	________	________	±2 dB	0.12 dB
1 MHz	________	________	________	________	±2 dB	0.12 dB
30 MHz	________	________	________	________	±2 dB	0.12 dB
300 MHz (Ref.)	________	________	________	0	±2 dB	0.12 dB
1 GHz	________	________	________	________	±2 dB	0.12 dB
1.3 GHz	________	________	________	________	±2 dB	0.12 dB
2.0 GHz	________	________	________	________	±2 dB	0.12 dB
2.9 GHz	________	________	________	________	±2 dB	0.12 dB

* Refer to the “Calculating the Corrected Power” section in previous pages.

† Δ Power = measured power − measured reference power

Flatness Accuracy, Band 1

Band 1	Measured Power	Power Sensor Factor	Corrected* Power	Δ Power† (300 MHz Ref.)	Specified Flatness	Measurement Uncertainty
2.0 GHz	________	________	________	________	±2 dB	0.15 dB
2.3 GHz	________	________	________	________	±2 dB	0.15 dB
3.0 GHz (Ref.)	________	________	________	0	±2 dB	0.15 dB
3.7 GHz	________	________	________	________	±2 dB	0.15 dB
4.6 GHz	________	________	________	________	±2 dB	0.15 dB
5.5 GHz	________	________	________	________	±2 dB	0.15 dB
6.5 GHz	________	________	________	________	±2 dB	0.15 dB
7.0 GHz‡	________	________	________	________	±2 dB	0.15 dB

* Refer to the “Calculating the Corrected Power” section in previous pages.

† Δ Power = measured power − measured reference power

‡ *HP 85645A only*

Flatness Accuracy, Band 2 (HP 85645A only)

Band 2	Measured Power	Power Sensor Factor	Corrected* Power	Δ Power† (3 GHz Ref.)	Specified Flatness	Measurement Uncertainty
5.8 GHz	________	________	________	________	±2 dB	0.15 dB
6.3 GHz	________	________	________	________	±2 dB	0.15 dB
7.1 GHz	________	________	________	________	±2 dB	0.15 dB
8.1 GHz	________	________	________	________	±2 dB	0.15 dB
9.5 GHz	________	________	________	________	±2 dB	0.15 dB
10.1 GHz	________	________	________	________	±2 dB	0.15 dB
11.3 GHz	________	________	________	________	±2 dB	0.15 dB
13.0 GHz	________	________	________	________	±2 dB	0.15 dB
13.5 GHz	________	________	________	________	±2 dB	0.15 dB

* Refer to the “Calculating the Corrected Power” section in previous pages.

† Δ Power = measured power − measured reference power

Flatness Accuracy, Band 3 (HP 85645A only)

Band 3	Measured Power	Power Sensor Factor	Corrected* Power	Δ Power† (3 GHz Ref.)	Specified Flatness	Measurement Uncertainty
12.4 GHz	________	________	________	________	±2 dB	0.15 dB
13.2 GHz	________	________	________	________	±2 dB	0.15 dB
14.1 GHz	________	________	________	________	±2 dB	0.15 dB
15.0 GHz	________	________	________	________	±2 dB	0.15 dB
16.5 GHz	________	________	________	________	±2 dB	0.15 dB
18.0 GHz	________	________	________	________	±2 dB	0.15 dB
20.0 GHz	________	________	________	________	±2 dB	0.15 dB

* Refer to the “Calculating the Corrected Power” section in previous pages.

† Δ Power = measured power − measured reference power

Flatness Accuracy, Band 4 (HP 85645A only)

Band 4	Measured Power	Power Sensor Factor	Corrected* Power	Δ Power† (3 GHz Ref.)	Specified Flatness	Measurement Uncertainty
12.1 GHz	________	________	________	________	±2 dB	0.15 dB
15.1 GHz	________	________	________	________	±2 dB	0.15 dB
17.1 GHz	________	________	________	________	±2 dB	0.15 dB
19.1 GHz	________	________	________	________	±2 dB	0.15 dB
20.1 GHz	________	________	________	________	±2 dB	0.15 dB
22.1 GHz	________	________	________	________	±2 dB	0.15 dB
24.1 GHz	________	________	________	________	±2 dB	0.15 dB
26.5 GHz	________	________	________	________	±2 dB	0.15 dB

* Refer to the “Calculating the Corrected Power” section in previous pages.

† Δ Power = measured power − measured reference power

3

Making Measurements

Making Measurements

This chapter contains examples of measurements that were made using the tracking sources with various host instruments.

The chapter provides some descriptions of basic measurements using both the HP 85644A tracking source and the HP 85645A tracking source.

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A tracking source is paired with either an HP 8566A/B spectrum analyzer, an HP 8563A/E portable spectrum analyzer, or an HP 8340A synthesized sweeper. This chapter contains the following:

Preparing the System for Measurements.

Refer to this information to learn how to set up the host instrument with a tracking source for calibration. Refer to Chapter 1 for illustrations of host instrument connections.

Calibrating an External Detector with a Tracking Source.

Refer to this information to learn how to calibrate an external detector for use when making tracking source measurements.

Measuring Mixer Conversion Loss with HP 85644A and an HP 8340A.

Refer to this information to learn how to measure mixer conversion loss with a fixed IF frequency.

Using an HP 85644A tracking source and an HP 8566A/B spectrum analyzer.

Refer to this information to make measurements with an HP 8566A/B spectrum analyzer and the HP 85644A tracking source. There are measurements on a mixer, including LO feedthrough, swept IF conversion loss, backwards sweep, and mixer sensitivity to LO drive level.

Using an HP 85645A tracking source and an HP 8563A/E portable spectrum analyzer.

Refer to this information to learn how to make measurements with an HP 8563A/E spectrum analyzer and the HP 85645A tracking source. There are measurements made on a lowpass filter, of cable fault isolation, and of swept third-order intermodulation distortion.

This section contains information about connecting host instruments to a tracking source, in Table 3-1, Table 3-3, and Table 3-2, for making measurements. To configure a tracking source to operate with different host instruments, use the steps in "Configure the system for measurements".

Refer to Chapter 1, "Installing and Configuring" for illustrations of basic cable connections to several host instrument models. The only host instruments used in the measurements in this chapter are the HP 8566B spectrum analyzer, the HP 8563A/E portable spectrum analyzer, and the HP 8340A synthesized sweeper.

The following tables of instrument connections list only the connections needed to make the measurement. It is assumed that you have already made the basic front- and rear-panel connections listed in Chapter 1, "Installing and Configuring." The tables are as follows:

- For measurements that use a swept signal source (such as the HP 8340 or HP 8350), a tracking source, and a spectrum analyzer combination, refer to Table 3-1.
- For measurements that use an HP 8566A/B spectrum analyzer as the host, refer to Table 3-2.
- For measurements that use an HP 8563A/E portable spectrum analyzer as the host, refer to Table 3-3.

Table 3-1. Swept Source, Tracking Source, Spectrum Analyzer Cable Connections

Swept Source Connectors	Tracking Source Connectors	Spectrum Analyzer Connectors
HP 8340A/B Connectors	**HP 85644A/85645A Connectors**	**HP 8590 Series Connectors**
AUX OUTPUT (rear panel)	LO INPUT (front panel)	— —
.5 V/GHz (rear panel)	SWEEP + TUNE IN (rear panel)	— —
10 MHz REF OUT (rear panel)	— —	EXT REF IN (rear panel)
PEN LIFT OUTPUT (rear panel)	BLANK IN (rear panel)	— —
— —	10 MHz IN (rear panel)	10 MHz REF OUTPUT
EXT TRIG INPUT (rear panel)	— —	HIGH SWP IN/OUT (rear panel)
HP 8340 A/B Connectors	**HP 85644A/85645A Connectors**	**HP 8560 Series Connectors**
AUX OUTPUT (rear panel)	LO INPUT (front panel)	— —
.5 V/GHz (rear panel)	SWEEP + TUNE IN (rear panel)	— —
10 MHz REF OUT (rear panel)	10 MHz IN (rear panel)	10 MHz REF IN/OUT (rear panel)
PEN LIFT OUTPUT (rear panel)	BLANK IN (rear panel)	— —
STOP SWEEP IN/OUT (rear panel)	— —	EXT TRIG INPUT (rear panel)
HP 8340A/B Connectors	**HP 85644A/85645A Connectors**	**HP 8566A/B Connectors**
AUX OUTPUT (rear panel)	LO INPUT (front panel)	— —
.5 V/GHz (rear panel)	SWEEP + TUNE IN (rear panel)	— —
10 MHz REF OUT (rear panel)	— —	EXT FREQ REF IN (rear panel)
PEN LIFT OUTPUT (rear panel)	BLANK IN (rear panel)	— —
— —	10 MHz IN (rear panel)	10 MHz OUTPUT (rear panel)
STOP SWEEP IN/OUT (rear panel)	— —	EXT TRIGGER INPUT 5V MAX (rear panel)
HP 8350 Connectors	**HP 85644A/85645A Connectors**	**HP 8590 Series, HP 8560 Series, HP 8566A/B Connectors**
AUX RF (rear panel)	LO INPUT (front panel)	— —
1 V/GHz (rear panel)	SWEEP + TUNE IN (rear panel)	— —
SWEEP OUT/IN	— —	SWEEP OUTPUT
— —	10 MHz REF OUT (rear panel)	10 MHz REF IN (rear panel)
POS Z BLANKING (rear panel)	BLANK IN (rear panel)	— —

Table 3-2. HP 8566A/B Spectrum Analyzer to Tracking Source Connections

Spectrum Analyzer Connectors	Tracking Source Connectors
1ST LO OUTPUT (front panel)	LO INPUT (front panel)
SWEEP+TUNE OUT (rear panel)	SWEEP + TUNE IN (rear panel)
10 MHz OUT (rear panel)	10 MHz IN (rear panel)
PENLIFT (rear panel)	BLANK IN (rear panel)

Table 3-3. HP 8563A/E Portable Spectrum Analyzer to Tracking Source Connections

Spectrum Analyzer Connectors	Tracking Source Connectors
1ST LO OUTPUT (front panel)	LO INPUT (front panel)
LO SWP|0.5V/GHz (rear panel)	SWEEP + TUNE IN (rear panel)
10 MHz REF IN/OUT (rear panel)	10 MHz IN (rear panel)
BLANKING OUTPUT (rear panel)	BLANK IN (rear panel)

Low band and the HP 8350 swept source

When using the HP 8350 swept source, generation of low band frequencies (those below 2 MHz) is done with an additional downconverter oscillator. The additional oscillator is free-running (not phase-locked). As a result the downconverter oscillator frequency can vary several MHz from the desired value, causing inaccuracies to appear in an unpredictable frequency offset at the RF output. Refer to Chapter 5 for information about resolving this problem.

Configure the system for measurements

Use the following procedure to set up your system for making measurements with a tracking source.

1. Configure the measurement system.

   To configure the tracking source for your measurement system, perform the following steps:

   - Connect the cables as listed in Table 3-1, Table 3-2, or Table 3-3 of "Preparing the System for Measurements", depending upon your host instrument.
   - On the tracking source, press (CONFIG).
   - Press (MENU DOWN) until **CNFG #1 HOST SELECT** appears in the display windows.
   - Press (ENTER).
   - Press the (⇧) or (⇩) keys until the model number of your host instrument appears in the display window.
   - Press (ENTER) to select the host model number. A left-pointing arrow indicates which host-instrument you have selected.

2. Set the HP 8563A/E portable spectrum analyzer LO SWEEP|0.5V/GHZ output for 0.5V/GHz operation.

   To set the output for 0.5V/GHz operation, press the following HP 8563A/E portable spectrum analyzer keys:

   (AUX CTRL)

   Rear Pnl Out

   0.5V/GHz

Refer to the calibration routines in this section to calibrate (or normalize) the tracking source and HP 8566A/B or HP 8563A/E spectrum analyzer system for making measurements. A calibration is not performed for the measurement example with the HP 8340A synthesized source.

In the measurement examples, the HP 85644A tracking source is paired with an HP 8566A/B spectrum analyzer. The HP 85645A tracking source is paired with an HP 8563A/E portable spectrum analyzer.

Any time you change the frequency, power settings, or cables within a measurement, repeat the calibration routine.

When the calibration is completed, you can use the displayed trace as a point of reference during measurements.

Calibrate an HP 85644A and HP 8566A/B system

Use the following procedure to calibrate a tracking source and an HP 8566A/B spectrum analyzer system. Refer to the Table 3-2 at the beginning of this chapter or to the illustrations in Chapter 1 of this manual for basic cable connections.

1. Prepare the equipment for system calibration.

   To prepare the system for calibration, connect the equipment as illustrated in Figure 3-1, and follow the steps below:

   - Set the spectrum analyzer start- and stop-frequencies as required for the device you are testing.
   - Set any other parameters (such as dB/DIV or reference level) as necessary for measurement accuracy.
   - Remove the device under test from the system, but retain the cables and adapters to be used during the measurement.
   - Connect a measurement cable to the adapters between the HP 8566A/B spectrum analyzer RF input connector and the HP 85644A tracking source RF OUTPUT connector.

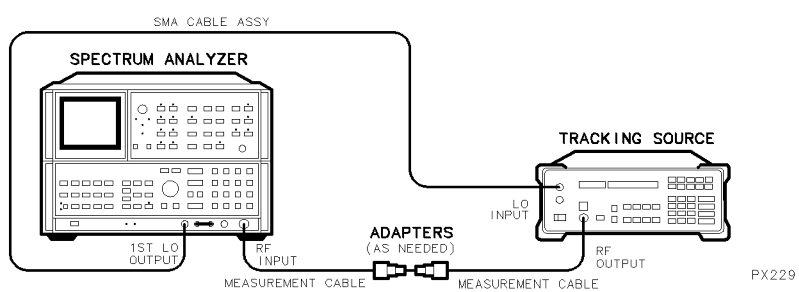

Figure 3-1. Calibrating the HP 85644A and HP 8566A/B System

2. Calibrate the system.

   To calibrate the system for measurements, press the following HP 8566A/B spectrum analyzer keys:

- Press (ENTER) in the DISPLAY LINE block, and enter 0 dBm.
- In trace B block, press (CLEAR WRITE), (B−DL▶B).
- In trace A block, press (A−B▶A).
- In trace B block, press (BLANK).

Calibrate an HP 85645A and HP 8563A/E system

Use the following procedure to calibrate a tracking source and an HP 8563A/E portable spectrum analyzer system. Refer to Table 3-3 at the beginning of this chapter or to the illustrations in Chapter 1 of this manual for basic cable connections.

1. Prepare the equipment for system calibration.

   To prepare the system for calibration, follow the steps below:

   - Connect the equipment as illustrated in Figure 3-2.
   - Set the spectrum analyzer start- and stop-frequencies as required for the device you are testing.
   - Set any other parameters (such as dB/DIV or reference level) as necessary for measurement accuracy.
   - Remove the device under test from the HP 8563A/E portable spectrum analyzer and HP 85645A tracking source system. Retain the cables and adapters to be used during the measurement.
   - Connect the measurement cables to the adapters between the HP 8563A/E portable spectrum analyzer INPUT 50 Ω connector and the HP 85645A tracking source RF OUTPUT connector.

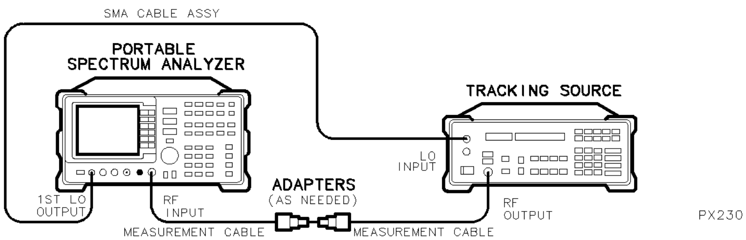

Figure 3-2. Calibrating the HP 85645A and HP 8563A/E System

2. Calibrate the system.

   To calibrate the system for measurements, press the following HP 8563A/E portable spectrum analyzer keys:

   - (AUX CTRL)
   - TRACKING GENERATOR
   - SOURCE CAL MENU
   - CAL THRU
   - STORE THRU
   - NORMALIZE ON

3. For HP 8560 Series portable spectrum analyzers that do not have the TRACKING GENERATOR key, perform the semi-automated calibration routine.

   To calibrate systems using these spectrum analyzers, press the following HP 8560 Series keys:

   - (TRACE)
   - TRACE B
   - CLEAR WRITE B
   - VIEW B
   - MORE
   - MORE (3 of 3) (if necessary)
   - A−B▸A (ON is underlined)
   - MORE (1 of 3) (or PREV MENU)
   - BLANK B

E D -

The HP 85644A tracking source is used in the following procedure to calibrate an external detector. A host instrument in not required.

Once calibration information for a detector is stored in the tracking source's memory, the detector can be used at any time for making measurements. The calibration factors for each external detector are different. A set of calibration factors is retained in memory until you calibrate a new detector and enter its calibration factors into the tracking source.

Prepare to calibrate an external detector

Use the following procedure to create external detector calibration factors and store them in memory. As you go through the procedure, observe the tracking source display windows carefully so that you do not loose the data you have created.

1. Prepare the equipment for the detector calibration.

   To prepare the equipment for detector calibration, follow the steps below:

   - Connect the equipment as illustrated in Figure 3-3.

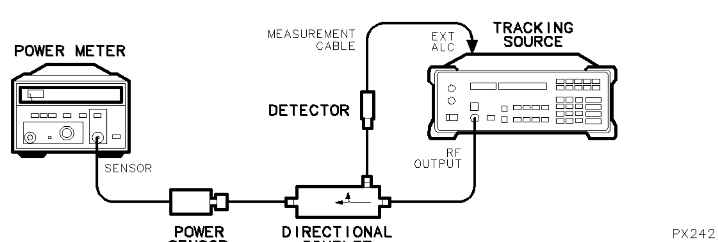

Figure 3-3. Connecting the External Detector

   - Press (ADJUST) on the tracking source.

- Press (MENU DOWN) until `ADJ. #2 ALC EXT DETECTOR` is displayed.
- Press (ENTER).

Calibrate an external detector

Use the procedure below to calibrate an external detector.

1. Measure and enter the detector power value at each DAC number.

   To measure and enter the detector power value at each DAC number, follow the steps below:

   - At the prompt **ENTER DET FREQ**, use the data keys to enter a frequency value of interest that is within the operating range of the detector. Terminate the entry with a frequency units key.
   - View the tracking source display for the DAC numbers. The first DAC number displayed should be 128.
   - Read the power meter measurement of the output power from the detector at that DAC setting.
   - Enter the power value using the data keys on the tracking source. Terminate the entry with an appropriate power units key.
   - View the tracking source display for the next DAC number.
   - Repeat the preceding steps for each DAC number displayed on the tracking source.

2. Store the external detector calibration factors.

   To store the external detector calibration factors you just created in the tracking source memory, follow the steps below:

   - At the message **ENTER TO STORE**, press (ENTER).
   - At the message **PROGRAMMING**, wait for the instrument to finish storing the calibration data in the tracking source's memory.
   - At the message **ENTER TO UNDO**, only press (ENTER) if you want to delete the calibration data you just created.
   - Press any other tracking source front-panel key to retain the calibration factors and continue with other operations.

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The HP 85644A tracking source is configured with an HP 8340A synthesized sweeper to measure mixer conversion loss. An HP 8594A/E portable spectrum analyzer is used to display the measurement results. A fixed IF frequency is used for this measurement.

Prepare to measure mixer conversion loss

Use the following procedure to prepare to measure the conversion loss of a mixer.

1. Prepare the equipment for measuring mixer conversion loss.

   To prepare for measuring mixer conversion loss with a fixed IF frequency, follow the steps below:

   - Connect the equipment as illustrated in Figure 3-4.

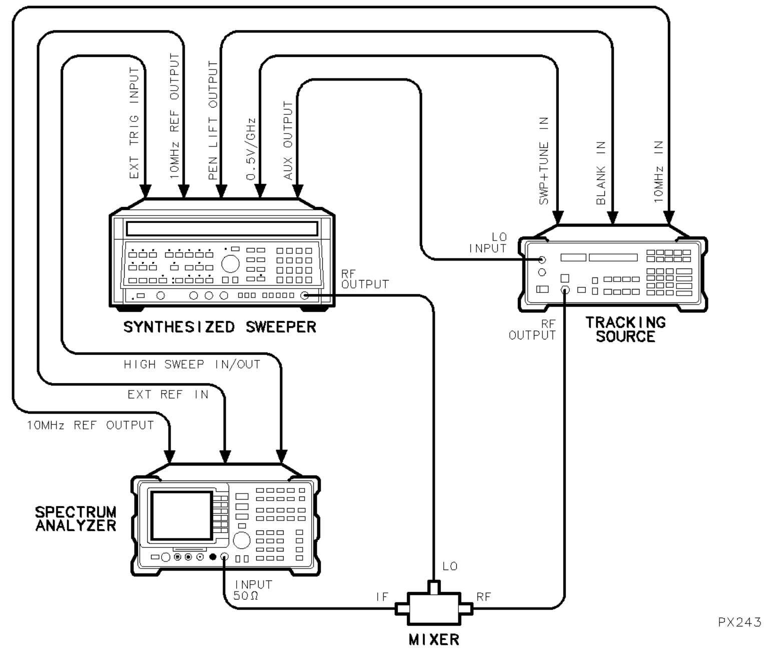

Figure 3-4. Connecting the Mixer to Measure Conversion Loss

- Configure the system for an HP 8340A synthesized source as explained in "Configure the system for measurements" at the beginning of this chapter.
- Preset the HP 8340A synthesized sweeper.

2. Set the start- and stop-frequencies to frequencies of interest.

   To set the start- and stop-frequencies of 300 MHz to 1.3 GHz, as used in this example, press the following HP 8340A synthesized sweeper keys:

   - Press (INSTR PRESET).
   - Press (START FREQ) and enter 300 MHz.
   - Press (STOP FREQ) and enter 1.3 GHz.
   - Press (EXT) in the TRIGGER block.

3. Set the power level on the HP 8340A to the power level of the mixer.

To set the power level to +10 dBm, as used in this example, press the following HP 8340A synthesized sweeper keys:

- Press (POWER).
- Enter +10 dBm.

4. Preset the tracking source and set it for offset tracking.

   To set offset tracking to −100 MHz, as used in this example, press the following HP 85644A tracking source keys:

   - Press (PRESET).
   - Press (OFFSET TRKG) and enter −100 MHz.

5. Set the RF output power level to the RF input power of the mixer.

   To set the tracking source RF output power level to the 0 dBm level of the mixer, as used in this example, press the following HP 85644A tracking source keys:

   - Press (POWER LEVEL).
   - Enter 0 dBm.

6. Preset the HP 8594A/E portable spectrum analyzer and set the spectrum analyzer frequency and span values for the measurement.

   To set the portable spectrum analyzer for a 100 MHz center frequency, 0 span, and a 100 MHz fixed IF, as used in this example, press the following HP 8594A/E portable spectrum analyzer keys:

   - Press (PRESET).
   - Press (FREQUENCY).
   - Press CENTER FREQ and enter 100 MHz.
   - Press (SPAN).
   - Press ZERO SPAN .

Synchronize the sweep times for the conversion loss display

If the synthesized source and the spectrum analyzer displaying the trace have unsynchronized sweep times, a drop-out appears in the displayed trace. Refer to Figure 3-5 for an example of unsynchronized sweeps.

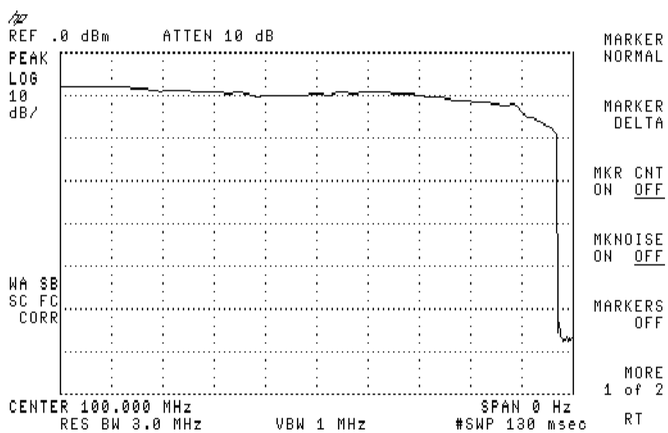

Figure 3-5. Unsynchronized Sweep Times

1. Synchronize the sweep times.

   To synchronize sweep times between the HP 8340A/B synthesized sweeper and the spectrum analyzer displaying the trace, press the following HP 8340A/B synthesized source keys:

   - Press (SWEEP TIME).
   - Use the data keys to enter a sweep time into the synthesized sweeper that is equal in numeric value to the sweep time displayed on the spectrum analyzer.

- Rotate the knob to refine the sweep time just until the signal “drop-out” disappears from the spectrum analyzer display, as illustrated in Figure 3-6.

Measure the conversion loss of a mixer

Use the step that follows to measure the conversion loss of a mixer.

1. Use the marker function to determine the RF to IF conversion loss.
2. Read the spectrum analyzer Δ marker display to determine conversion loss.

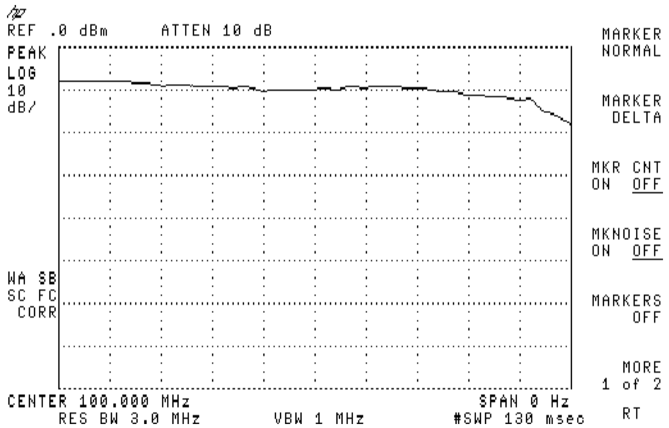

Figure 3-6. Synchronized Sweep Times with Conversion Loss Results

The HP 85644A tracking source is paired with an HP 8566B spectrum analyzer to make the following measurements:

- Measuring LO Feedthrough of a Mixer
- Measuring RF to IF Conversion Loss
- Making Backwards-Sweep Measurements
- Measuring Mixer Compression with LO Power Sweep

Dynamic Range Adjustments

To increase the measurement's dynamic range, decrease the resolution bandwidth of the spectrum analyzer.

To speed up the measurement, decrease the sweep time, and ignore the HP 8566A/B spectrum analyzer "MEAS UNCAL" message. The tracking source measurement should still be accurate.

If the sweep speed is too fast for the HP 8566A/B spectrum analyzer filters, or for the bandwidth of the lowpass filter, the displayed trace will change amplitude when the sweep-rate becomes too "high". Correct the problem by increasing the HP 8566A/B spectrum analyzer sweep time until the passband amplitude no longer changes.

Tracking Adjustment

When using narrow resolution bandwidth filters, a tracking adjustment may be needed to peak the response. This is accomplished via the tracking adjust function to correct for small errors in the spectrum analyzer's IF filter alignment.

In addition, the tracking adjust may be used to compensate for frequency errors that are due to time delays when sweeping very quickly through long cables or narrow filters.

The tracking adjust is synthesized and will remain stable. The measurement will remain drift-free to the same extent that the spectrum analyzer's IF filter is drift-free.

The HP 85644A tracking source is combined with an HP 8566A/B to measure the LO feedthrough of a mixer.

Prepare to measure LO feedthrough

Use the following procedure to measure the LO feedthrough performance of a mixer.

1. Prepare the equipment for the LO feedthrough measurement.

   To prepare the equipment for the mixer LO feedthrough measurement, follow the steps below:

   - Connect the front- and rear-panel cables as listed in Table 3-2 of "Preparing the System for Measurements".
   - Configure the system for the HP 8566A/B spectrum analyzer as explained in "Configure the system for measurements".

2. Connect the mixer as described below and illustrated in Figure 3-7.

   - Connect the mixer's IF port to the HP 8566A/B spectrum analyzer RF INPUT.
   - Connect the mixer's RF port to the a resistance that has a value equivalent to the impedance expected for your measurement application.
   - Connect the mixer's LO port to the RF Output of the HP 85644A tracking source.

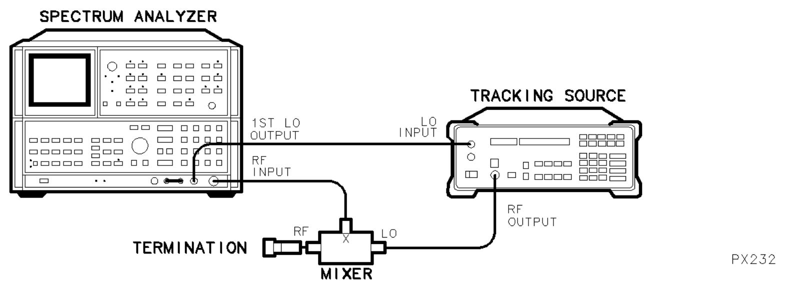

Figure 3-7. Connecting the Mixer

3. On the HP 85644A tracking source, press (POWER LEVEL), and enter 7 dBm. This sets the LO drive level for the mixer in this example.
4. Press (INSTR PRESET) on the HP 8566A/B spectrum analyzer.
5. View the LO feedthrough level displayed in dBm on HP 8566A/B spectrum analyzer.

Measure the LO feedthrough of the mixer

1. Set the start-frequency and reference level of the spectrum analyzer.

   For this example, set the start frequency on the HP 8566A/B spectrum analyzer to 1 MHz and the reference level to 10 dBm.

   - On the HP 8566A/B spectrum analyzer press (START FREQ), and enter 1 MHz.
   - Press (REFERENCE LEVEL) and enter +10 dBm.
2. Calibrate the system as described in "Calibrate an HP 85644A and HP 8566A/B system" at the beginning of this chapter.
3. Connect the mixer to the system. Refer to Figure 3-7 at the beginning of this measurement.

4. View the calibrated LO feedthrough displayed in dB on the spectrum analyzer. Refer to Figure 3-8 for an example of the results.

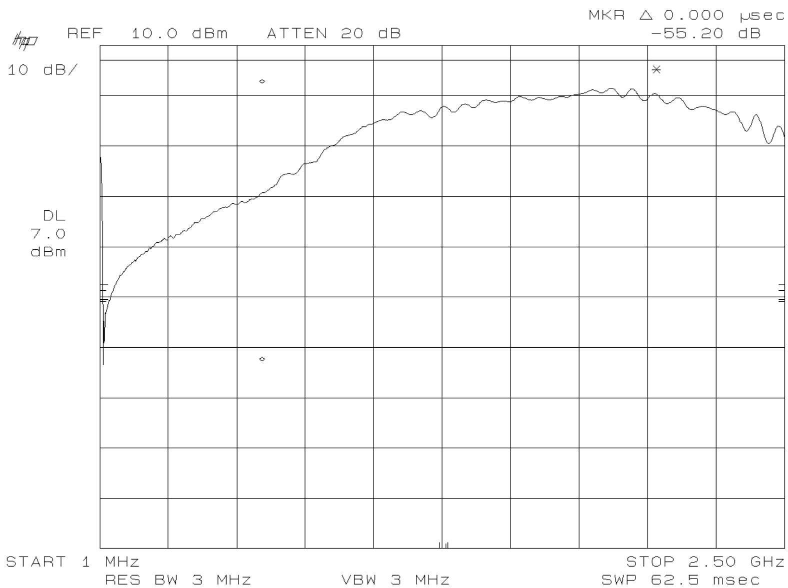

Figure 3-8. Calibrated LO Feedthrough Measurement Results

An HP 85644A tracking source and an HP 8566A/B are used to measure the RF to IF conversion loss properties of a mixer.

Prepare to measure RF to IF conversion loss

Use the following procedure to measure the RF to IF conversion loss of a mixer with a swept frequency IF. The results are displayed as mixer output vs frequency.

1. Prepare the equipment for the IF to RF conversion loss measurement.

   To prepare the equipment for the IF to RF conversion loss measurement, follow the steps below:

   - Connect the front- and rear-panel cables as listed in Table 3-2 of "Preparing the System for Measurements".
   - Configure the system for the HP 8566A/B spectrum analyzer as explained in "Configure the system for measurements".
2. Preset the HP 8566A/B spectrum analyzer and set it to band 0.

Measure RF to IF conversion loss of a mixer

1. Set the spectrum analyzer controls to measure conversion loss.

   To set the HP 8566A/B controls for this measurement, follow the steps below:

   - Press (INSTR PRESET).
   - Press (START FREQ) 1 MHz.

2. Connect the mixer.

   To connect the mixer, refer to Figure 3-9 and follow the steps below:

   - Connect the mixer's IF port to the HP 8566A/B spectrum analyzer RF INPUT.
   - Connect the mixer's RF port to the HP 85644A tracking source RF OUTPUT connector.
   - Connect the mixer's LO port to an LO signal source. In this example, the LO source is set to a frequency of 100 MHz.

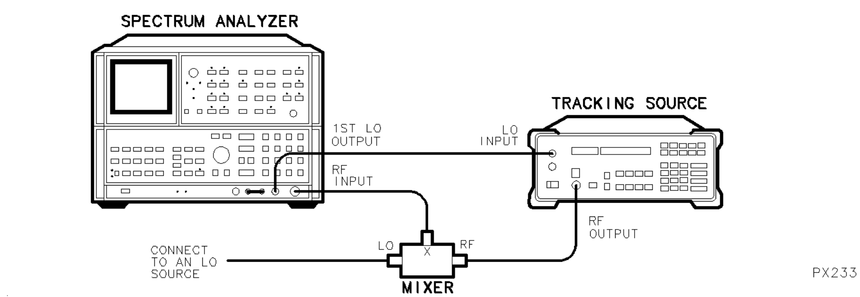

Figure 3-9. Connecting the Mixer to Measure Conversion Loss

3. Set the HP 85644A tracking source to 100 MHz offset tracking.

   To set the HP 85644A tracking source to for 100 MHz offset tracking, follow the steps below:

   - Press (OFFSET TRKG), and enter 100 MHz.
   - Press (POWER LEVEL), and enter −10 dBm.

4. View the display of the mixer's output level versus frequency. Refer to Figure 3-10 for an example of the measurement results.

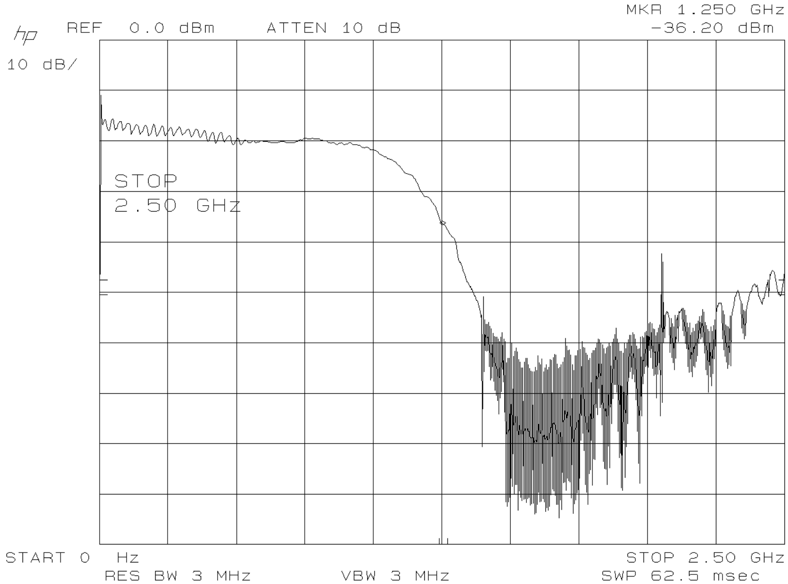

Figure 3-10. RF to IF Conversion Loss Measurement Results

In some applications, a mixer's fixed LO frequency is above its RF frequency range. The result is an IF frequency that sweeps in the opposite direction from the RF frequency.

Prepare to make a backwards-sweep measurement

Use the following procedure to make "backwards sweep" measurements with a mixer. Over limited frequency ranges, the output of the HP 85644A tracking source can "sweep backwards" (higher frequency to lower frequency) with respect to its host spectrum analyzer. Refer to Figure 3-11 below for an example of how the signals mix.

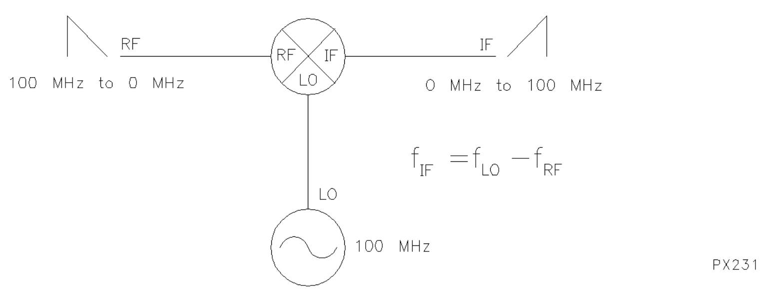

Figure 3-11. The Mixing Properties That Occur with Backwards Sweep

1. Prepare the equipment for making a backwards-sweep measurement.

   To prepare the equipment for the backwards-sweep measurement, follow the steps below:

   - Connect the front- and rear-panel cables as listed in Table 3-2 of "Preparing the System for Measurements".
   - Configure the system for the HP 8566A/B spectrum analyzer as explained in "Configure the system for measurements".

Make a backwards sweep measurement with a mixer

1. Attach the mixer to the system.

   To attach the mixer to the system, follow the steps below or refer to Figure 3-12:

   - Connect the mixer's IF port to the HP 8566A/B spectrum analyzer RF INPUT connector.
   - Connect the mixer's RF port to HP 85644A tracking source RF OUTPUT connector.
   - Connect the mixer's LO port to an LO signal source. In this example, the LO source is set to 100 MHz.

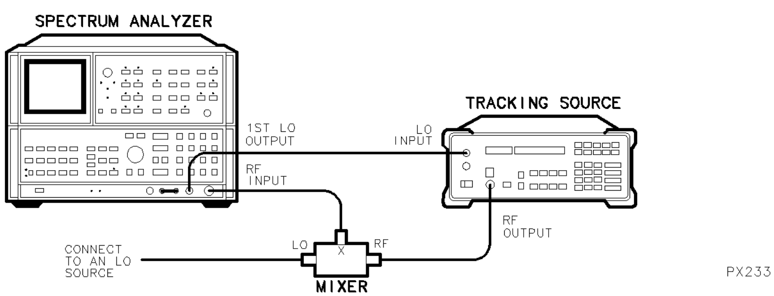

Figure 3-12. Connecting the Mixer for a Backwards Sweep Measurement

2. Set the HP 8566A/B spectrum analyzer to sweep from 0 Hz to 99.7 MHz.
   - Press (START FREQ) 0 Hz.
   - Press (STOP FREQ) 99.7 MHz.
3. Set the HP 85644A tracking source (OFFSET TRKG) to −100 MHz.

Now, due to the HP 85644A tracking source hardware architecture, the RF output is sweeping from 100 MHz to 300 kHz while the HP 8566A/B spectrum analyzer is sweeping from 0 Hz to 99.7 MHz.

The HP 8566A/B spectrum analyzer displays the result as the following:

[fixed 100 MHz LO − the sweeping RF]

Limits of backwards sweeping

Backwards sweeps are only available in band 0, with an HP 8566A/B spectrum analyzer, and are limited to frequencies below 500 MHz. They are limited to below 250 MHz with an HP 8560 Series or HP 8590 Series portable spectrum analyzer.

An HP 85644A tracking source and an HP 8566A/B are used to measure mixer compression. The tracking source's power sweep feature is used in this measurement.

A measurement similar to this one may be made by using the tracking source to sweep the power at the mixer's RF input, while the power level at the LO port remains fixed.

Prepare to measure mixer compression

Use the following procedure to measure the compression characteristics of a mixer. The power sweep feature of the HP 85644A tracking source is used for this measurement.

1. Prepare the equipment for making the mixer compression measurement.

   To prepare the equipment for the measurement, follow the steps below:

   - Connect the front- and rear-panel cables as listed in Table 3-2 of "Preparing the System for Measurements".
   - Configure the system for the HP 8566A/B spectrum analyzer as explained in "Configure the system for measurements".

2. Retain the mixer cable connections.

   If the cable connections need to be made, follow the steps below and refer to Figure 3-13:

   - Connect the mixer's IF port to the HP 8566A/B spectrum analyzer RF INPUT connector.
   - Connect the mixer's RF port to a lowpass filter, then to an RF signal source. The RF source is set to 100 MHz at −10 dBm in this example.
   - Connect the mixer's LO port to the RF OUTPUT connector of the HP 85644A tracking source.

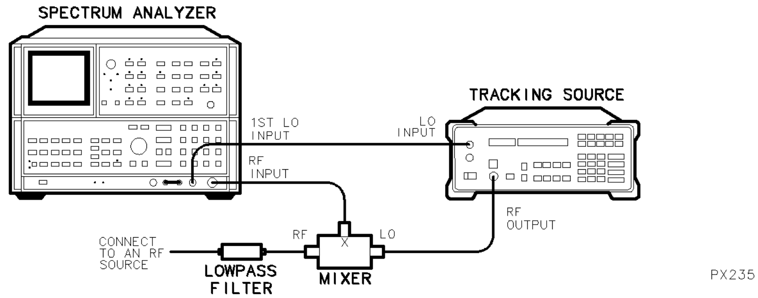

Figure 3-13. Connecting the Mixer for a Compression Measurement

3. Connect the HP 8566A/B SWEEP RECORDER OUTPUT signal to the HP 85644A tracking source SWEEP IN connector.
4. Preset the host spectrum analyzer and enter a frequency of interest.

   To set the HP 8566A/B spectrum analyzer frequency, choose a frequency setting that is not a multiple of the 100 MHz RF input frequency. Otherwise, differences in phase from sweep-to-sweep result in "beats" between harmonics of the RF input and the LO output signal. For this example, 333 MHz is used.

   - Press (INSTR PRESET).
   - Press (CENTER FREQUENCY), and enter 333 MHz.
5. Set the HP 8566A/B spectrum analyzer span and reference level to 0 Hz and 10 dBm.

   To set the HP 8566A/B span and reference level, follow the steps below:

   - Press (SPAN), and enter 0 Hz.
   - Press (REFERENCE LEVEL), and enter 10 dBm.
6. Create a reference trace to store in memory.

   To create reference trace to store in the spectrum analyzer's memory, follow the steps below:

   - Disconnect the cables from the mixer's IF port and LO port.
   - Connect the cables together so that the output of the tracking source drives the host spectrum analyzer.

- Preset the HP 85644A tracking source.
- Set the tracking source for a 30 dB power sweep, from −20 dBm to +10 dBm.
  - □ Press (POWER LEVEL) 20 −dBm.
  - □ Press (POWER SWEEP) 30 dBm.

7. Store the resulting trace in TRACE B of the HP 8566A/B spectrum analyzer.

   To store the trace in the HP 8566A/B spectrum analyzer's memory, follow the steps below:

   - Press (CLEAR WRITE).
   - Press (VIEW) in trace B block.

The trace displays the power level of the signal sweeping the 30 dB range from −20 dBm to +10 dBm. The sweep is approximately linear.

Measure the mixer's sensitivity to the LO drive level

Use the procedure below to determine the sensitivity of the mixer to the LO drive level.

1. Reconnect the mixer to the system.

   To reconnect the mixer, follow the steps below, and refer to Figure 3-13 if necessary:

   - Connect the mixer's IF port to the HP 8566A/B spectrum analyzer RF INPUT connector.
   - Connect the mixer's LO port to the HP 85644A tracking source RF OUTPUT connector.

2. Set the HP 85644A tracking source for offset tracking.

   To set the HP 85644A tracking source to 100 MHz offset tracking for this example, follow the steps below:

- Press (OFFSET TRKG) 100 MHz, or enter the frequency value applied to the mixer's RF port.
- View the HP 8566A/B spectrum analyzer display of the mixer's output as the LO power is swept.

Superimposed on the resulting trace is a trace showing the power input to the mixer's LO port. Refer to Figure 3-14 for an example of the measurement results.

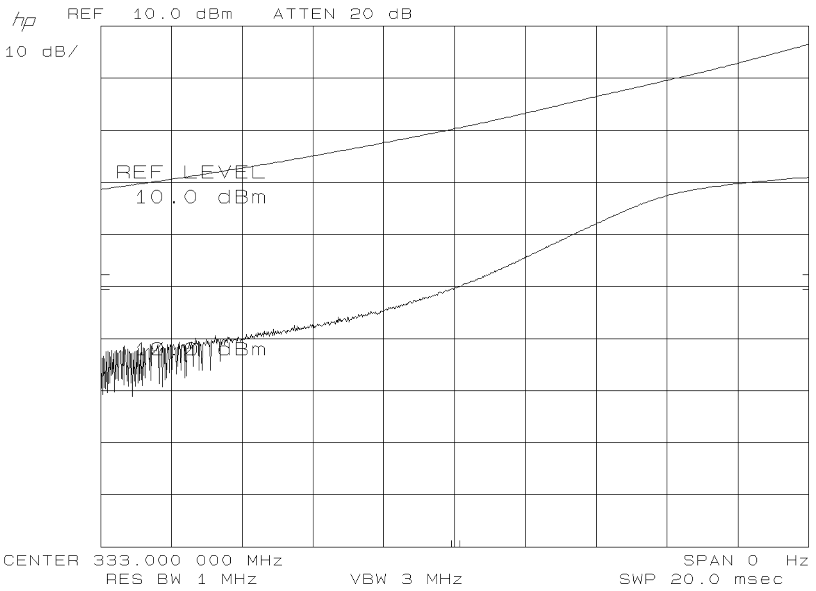

Figure 3-14. LO Power Sweep Measurement Results

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P 853 E P

The HP 85645A tracking source is paired with an HP 8563A/E portable spectrum analyzer to make the following measurements:

- Determining the Location of a Cable Fault
- Making a Calibrated Filter Roll-Off Measurement
- Making a Calibrated Filter Passband Measurement
- Making a Filter Stop-Band Measurement
- Making TOI Measurements

An HP 85645A tracking source is paired with an HP 8563A/E portable spectrum analyzer for this measurement. The equipment is used to determine the location of a fault or discontinuity along a measurement cable.

A power divider is used and recommended over a power splitter in the test setup. This is because the divider provides a better match at its ports. The port-match is an important consideration in the following measurement example.

Prepare for the cable fault-location measurement

Use the following procedure to determine the location of a cable fault.

1. Prepare the equipment for the fault-location measurement.

   To prepare the equipment for the fault-location measurement, follow the steps below:

   - Connect the front- and rear-panel cables as listed in Table 3-2 of "Preparing the System for Measurements".
   - Configure the system for the HP 8563A/E portable spectrum analyzer as explained in "Configure the system for measurements".
   - For this example, the cable used is HP part number 5061-9038.
   - Connect the equipment as illustrated in Figure 3-15.
   - Preset the tracking source and the host spectrum analyzer.

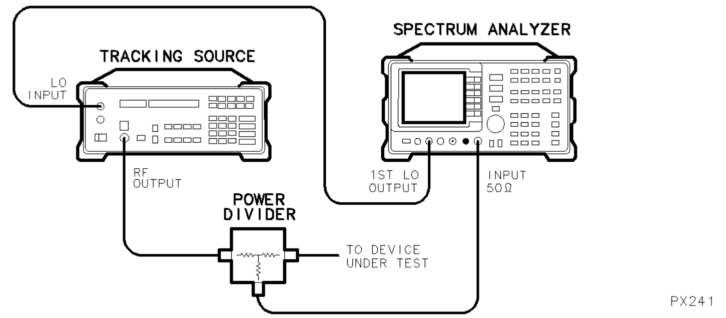


Figure 3-15. Cable Fault-Location Test Setup

Make the fault-location measurement

Use the procedure below to measure the location of a measurement cable fault.

1. Set the output power of the tracking source.

   For cables that are long, the maximum available output power from the HP 85645A tracking source is desirable.

   To set the output power to maximum level, follow the steps below:

   - On the HP 85645A tracking source, press (POWER LEVEL).
   - Press (⇧) to increase the output power until the UNLVLD status indicator begins flashing.

2. Set the spectrum analyzer span width and dB/div setting until there are several, easily measured ripple cycles displayed.

   The swept-frequency mode is used to determine the fault-location. The swept mode is advantageous because the tracking source signal travels two paths simultaneously. One is a direct path through the power divider to the spectrum analyzer. The second path is through the power divider, out to the discontinuity, then back to the spectrum analyzer. Refer to the Figure 3-16 for an example of this phenomenon.

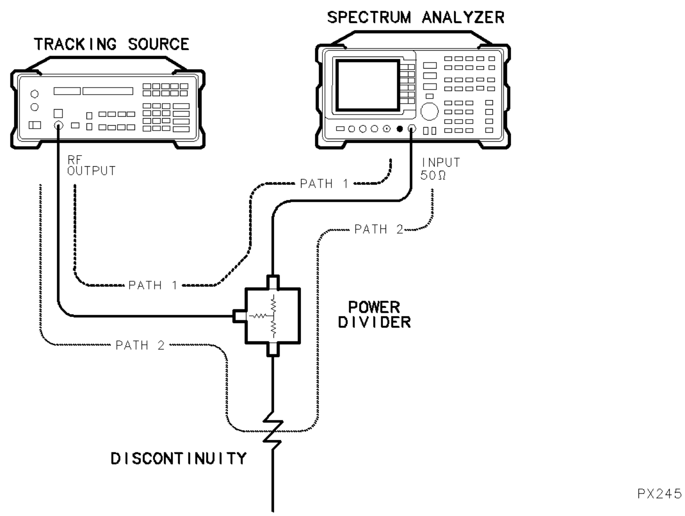


Figure 3-16. The Signal Paths of a Fault-Location Measurement

To set the HP 8563A/E portable spectrum analyzer to 1 GHz and 2 dB/div used in this example for measuring the location of a cable fault, follow the steps below:

- Press (SPAN) and enter 1 GHz.
- Press (AMPLITUDE).
- Press LOG dB/DIV and enter 2 dB.

3. Refer to Figure 3-17 for an example of the resulting display.

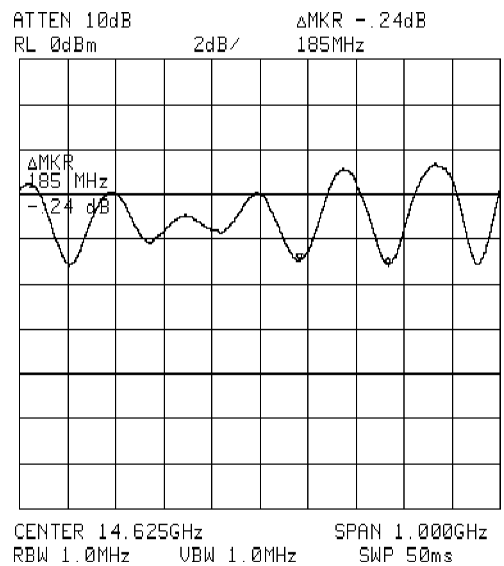


Figure 3-17. Fault Isolation with Markers on Ripple Nulls

4. Use the spectrum analyzer marker functions to measure the delta frequency between ripple nulls.

   To use the HP 8563A/E portable spectrum analyzer marker functions to measure the delta frequency, follow the steps below:

   - Press (MKR).
   - Use the knob to move the marker to one of the ripple nulls.
   - Press `MARKER DELTA` and move the marker to an adjacent ripple null.
   - For measurement accuracy, measure and record several ripple nulls, then average the measurements.

5. Calculate the location of the cable fault (in this case the open end of the cable).

   The difference in length between the two paths consists of the distance from the divider, to the discontinuity, and back. As the frequency is swept, the phase difference between the two paths causes a ripple pattern due to the addition or cancellation of the two signals. If the Vp of the cable is known (as it is with the cable HP part number 5061-9038 used in this example), the distance to the cable fault can be calculated given the period, in frequency, of the ripple. If the Vp is not known, the Vp of another cable with the same phase velocity and a known length can be used. In this case, the equation provided in the following procedure can be solved with Vp as the unknown value.

To calculate the location of the cable fault, use the following equation:

$$\text{Lmeas} = \text{Vp} / (2 \times \Delta\ \text{Fmeas})$$

Where:

Lmeas =	distance to the cable discontinuity
Vp =	phase velocity of the cable = speed of light × Vrel
Δ Fmeas =	the frequency difference between ripple nulls

If the Vp of the cable is $(3 \times 10^{10}\text{cm/s}) \times 0.66$ and the Δ Fmeas is 185 MHz, the results would be as follows:

$$\text{Lmeas} = (3 \times 10^{10}\text{cm/s}) \times 0.66/(2 \times 185\ \text{MHz})$$
$$\text{Lmeas} = 54\ \text{cm}$$

Determine the cable fault location with FFT

Another way to determine the location of a cable fault is with the FFT function. The ripple display can be more complicated when several discontinuities are present. Use the FFT (fast Fourier transform) capability of some host spectrum analyzers to resolve these conditions.

1. Use FFT to measure the location of a cable fault.

   To measure the cable fault location, use the FFT function by following the steps below:

   - Retain the test setup in Figure 3-15.
   - Preset both the tracking source and the host spectrum analyzer.
   - For long cables, maximum RF output power from the HP 85645A tracking source is desirable.
2. Set the tracking source power level to maximum leveled output power.

To set the HP 85645A tracking source to maximum leveled output power, follow the steps below:

- Press (POWER LEVEL).
- Press (⇧) until the UNLVLD status indicator flashes.

3. On the portable spectrum analyzer, perform an FFT measurement.

   To perform an FFT measurement with an HP 8563A/E portable spectrum analyzer, follow the steps below:

   - On the HP 8563A/E portable spectrum analyzer, press (MEAS/USER).
   - Press FFT MEAS.

4. Use the marker to find the frequency component of interest.

   To use the HP 8563A/E portable spectrum analyzer marker function, (peak search identifies the dc term which is not meaningful) use the next-peak function to measure the largest trace-frequency component as explained in the procedure below:

   - Press PEAK SEARCH.
   - Press NEXT PEAK.
   - See Figure 3-18 for an example of the display.

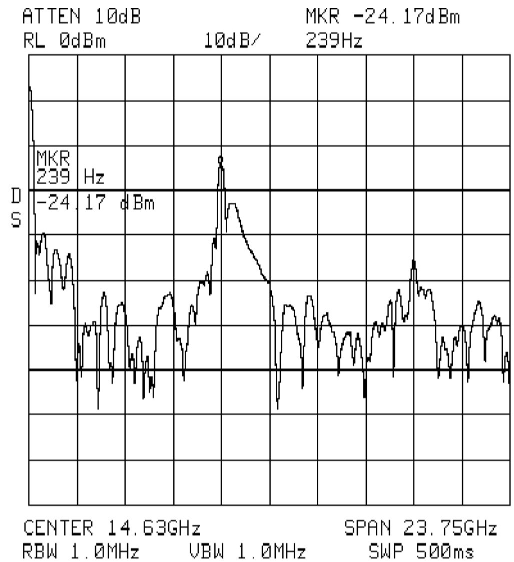


Figure 3-18. FFT Display of Fault-Location Measurement

5. Convert the results to the frequency domain.

   The large frequency component identified is the ripple frequency of the trace on the screen (assuming that the trace is in the time-domain where the FFT function is normally used).

   To convert the marker readings to frequency domain values, use the formula below:

   > [(1/post-FFT frequency)/sweep time] × frequency span = Δfrequency of one ripple period (which is equivalent to Δ Fmeas from previous measurement)

   The marker frequency in the example is 239 Hz and corresponds to a trace ripple-period of 4.2 ms. When the ripple period is compared to the frequency display parameters of 500 ms sweep and a 23.75 GHz span, it can be converted to a ripple period in terms of frequency (199 MHz).

6. Using the values from the measurement to satisfy the formula, then

   > [(1/239 Hz)/500 ms] × 23.75 GHz = 199 MHz

7. Use the results from this calculation to determine the fault location on the cable as shown in the following equation:

   Lmeas = Vp/(2 × Fmeas)

   Lmeas = $(3 \times 10^{10}$cm/s$) \times 0.66/(2 \times 199$ MHz$)$

   Lmeas = 50 cm

8. Return the spectrum analyzer to normal operation mode.

   To return the HP 8563A/E portable spectrum analyzer to normal operation, follow the steps below:

   - Press (SWEEP).
   - Press CONT .

9. Measure the return loss characteristics of the cable

   To measure the return loss characteristics of a cable, additional information is required. Refer to the recommendations below:

   - Calibrate the equipment for a return loss measurement by attaching a calibrated open or short to the end of the cable.
   - Read the amplitude of the resulting trace to determine the amplitude of a 0 dB return-loss ripple.

10. Calculate the residual mismatches in the system, and subtract them from the calibrated open/short measurement.

    To calculate the residual mismatches in the system, follow the recommendation below:

    - Add a 50 Ω load to the test connector on a power divider. The small amount of ripple is normalized out of the measurement trace.

Be aware

When there are multiple discontinuities in the cable being measured, then re-reflections occur. These appear as additional ripples and need to be correctly accounted for.

If you are attempting to measure the return loss of a discontinuity, then the signal loss due to cable attenuation or any previous discontinuities needs to be factored into the calculations.

If you are attempting to measure a dispersive transmission medium, such as a waveguide, then the data must be modified to compensate for the dispersion.

If any device in the cable system is adding phase shift to the measurement, it interferes with the results, unless the phase shift can be accurately accounted for.

A 5 GHz lowpass filter is the device tested in the following measurement examples. An HP 8563A/E portable spectrum analyzer is the host instrument paired with an HP 85645A tracking source.

Prepare for the filter roll-off measurement

Use the following procedure to make a calibrated measurement for lowpass filter frequency roll-off.

1. Prepare the equipment for the lowpass filter roll-off measurement.

   To prepare the equipment for the roll-off measurement, follow the steps below:

   - Press (PRESET) on the HP 85645A tracking source.
   - Preset the host spectrum analyzer.

2. Set the stop frequency of the HP 8563A/E portable spectrum analyzer.

   To set the stop frequency, select a value that includes the filter under test's upper frequency operating range. For this example, 5.8 GHz is used.

   - Press (FREQUENCY).
   - Press STOP FREQ .
   - Enter 5.8 GHz.

3. Connect a lowpass filter.

   To connect a lowpass filter, refer to Figure 3-19 for the measurement setup and follow the steps below:

   - Connect the lowpass filter between the host spectrum analyzer RF input connector and the tracking source RF OUTPUT connector.

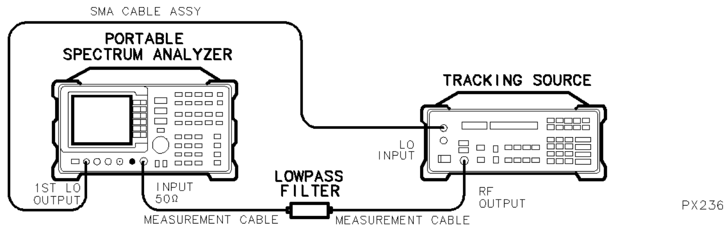


Figure 3-19. Connecting a Lowpass Filter for the Roll-off Measurement

- Turn the tracking source RF OUTPUT power on, if it is not already on. The RF OUTPUT status indicator should be lit.
- Observe the filter shape on the host spectrum analyzer display.

4. Measure a lowpass filter for its roll-off characteristics.

   To measure the lowpass filter roll-off characteristics with the portable spectrum analyzer, select a frequency span that includes the filter detail of interest. For this example, the start frequency is set to 2.75 GHz and the stop frequency is set to 4.25 GHz.

   Set the HP 8563A/E portable spectrum analyzer as indicated in the steps below:

   - Press (FREQUENCY).
   - Press START FREQ, and enter 2.75 GHz.
   - Press STOP FREQ, and enter 4.25 GHz.

5. Remove the filter from the system and calibrate the measurement setup as explained in Figure 3-2 at the beginning of this chapter.
6. Connect the lowpass filter between the HP 8563A/E portable spectrum analyzer INPUT 50 Ω connector and the HP 85645A tracking source RF OUTPUT connector, using the measurement cables.
7. Decrease the resolution bandwidth.

   To decrease the HP 8563A/E portable spectrum analyzer resolution bandwidth so that the filter roll-off is clearly displayed, follow the steps below:

   - Press (BW), then (⇩).

8. Increase the sweep speed if necessary.

   If the sweep speed is too slow, use stimulus response mode on the HP 8563A/E portable spectrum analyzer to decrease the measurement time.

   - Press (AUX CTRL), then TRACKING GENERATOR.
   - Press SWP CPL SR SA until SR is underlined.

9. Observe the filter roll-off. Refer to Figure 3-20 for an example of the measurement results.

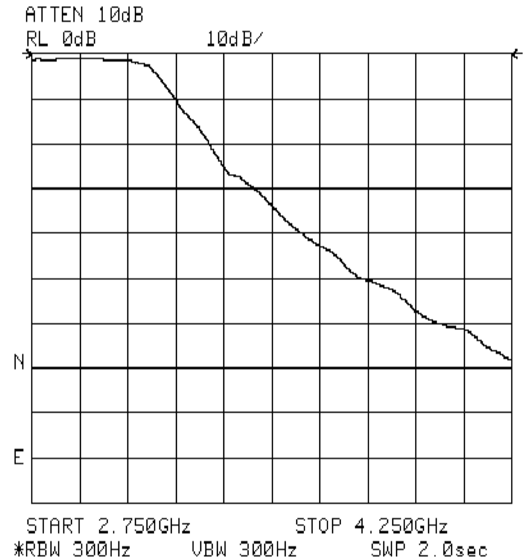


Figure 3-20. Lowpass Filter Roll-Off Measurement Results

The HP 8563A/E portable spectrum analyzer and HP 85645A tracking source system is limited to a 300 Hz, or greater, resolution bandwidth. This is due to the digital architecture of resolution bandwidths below 300 Hz in the HP 8563A/E portable spectrum analyzer.

With the resolution bandwidth of the HP 8563A/E portable spectrum analyzer reduced to 300 Hz, the maximum on-screen dynamic range can be displayed.

10. Increase the dynamic range of the measurement, if necessary.

    To increase the dynamic range of the measurement, do either or both of the following:

    - Increase the tracking source's output power level by pressing (POWER LEVEL) and entering a larger power level.
    - Decrease the input attenuation of the HP 8563A/E portable spectrum analyzer by pressing (AMPLITUDE) and ATTEN AUTO MAN until MAN is underlined. Decrease the attenuation value to obtain an optimum display of the filter's response.

The passband characteristics of a filter can be evaluated using the tracking source and host spectrum analyzer.

Prepare the system for the measurement

Use the procedure below to prepare for measuring a lowpass-filter for its passband response.

1. Prepare the system for making the passband measurement.

   To prepare the HP 85645A tracking source and HP 8563A/E portable spectrum analyzer system, follow the steps below:

   - Press PRESET on the tracking source.
   - Preset the portable spectrum analyzer.

2. Set the portable spectrum analyzer stop frequency.

   To set the HP 8563A/E portable spectrum analyzer stop frequency, select a value that includes the filter's passband range. For this example, 3.175 GHz is used.

   - Press FREQUENCY.
   - Press STOP FREQ .
   - Enter 3.175 GHz.

3. Connect the filter to the system.

   To connect the filter to the system, refer to Figure 3-21 for the measurement setup and follow the steps below:

   - Connect one side of the filter to the RF INPUT connector on the HP 8563A/E portable spectrum analyzer.
   - Connect the other side of the filter to the RF OUTPUT connector on the HP 85645A tracking source.

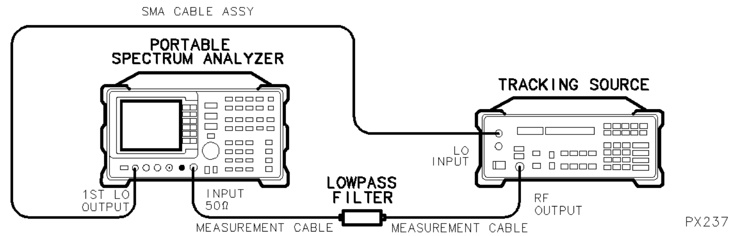


Figure 3-21. Connecting the Lowpass Filter for a Passband Measurement

4. Turn the RF OUTPUT power on, if it is not already on. The RF OUTPUT status indicator should be lit.
5. Observe the response shape of the filter displayed on the host spectrum analyzer to be sure the passband detail is included.

Measure the lowpass filter passband characteristics

Use the procedure below to measure a lowpass-filter for its passband response.

1. Set the start- and stop-frequencies on the host spectrum analyzer.

   To set start- and stop-frequencies on the HP 8563A/E portable spectrum analyzer, select frequencies that include the passband detail of interest. For this example, the start-frequency is set to 2.75 GHz and the stop-frequency is set to 3.175 GHz.

   - Press FREQUENCY
   - Press START, and enter 2.75 GHz.
   - Press STOP, and enter 3.175 GHz.

2. Set the host spectrum analyzer to 1 dB per div.

   To set the HP 8563A/E portable spectrum analyzer to 1 dB per division, follow the steps below:

- Press (AMPLITUDE).
- Press LOG dB/DIV.
- Enter 1 dB.

3. Calibrate the system for the measurement. Refer to "Calibrating the System for Making Measurements" at the beginning of this chapter.
4. Connect the lowpass filter to the system.

   To connect the lowpass filter to the system, follow the steps below:

   - Connect one end of the lowpass filter to the HP 8563A/E portable spectrum analyzer INPUT 50 Ω connector.
   - Connect the other end of the lowpass filter to the HP 85645A tracking source RF OUTPUT connector.
5. Observe the filter's passband response displayed on the spectrum analyzer. Refer to Figure 3-22 for an example of the measurement results.

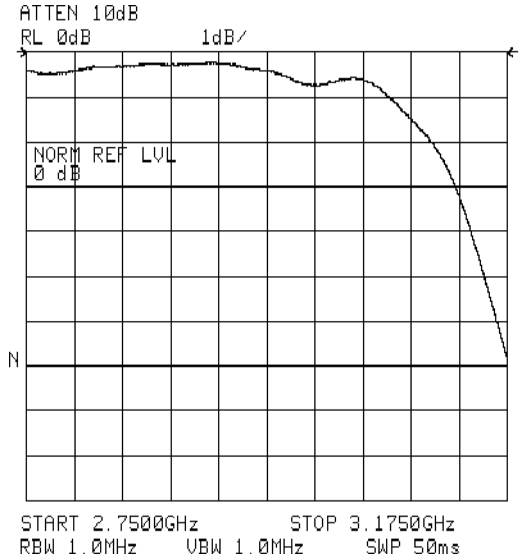


Figure 3-22. Lowpass Filter Passband Measurement Results

The measurement that follows, together with the previous passband measurement, demonstrates the excellent dynamic range measurement capability of the tracking source and spectrum analyzer combination.

Prepare the system for the filter stop-band measurement

Use the procedure below to prepare to measure the lowpass filter stop-band response.

1. Prepare the equipment for the measurement.

   To prepare the system for measuring lowpass filter stop-band characteristics, follow the steps below:

   - Press (PRESET) on the HP 85645A tracking source.
   - Preset the host spectrum analyzer.

2. Set the stop frequency on the spectrum analyzer.

   To set the stop frequency on the HP 8563A/E portable spectrum analyzer, select a value that includes the filter's stop-band range. For this example, 15 GHz is used.

   - Press (FREQUENCY).
   - Press STOP FREQ .
   - Enter 15 GHz.

3. Connect the lowpass filter to the system.

   To connect the lowpass filter to the system, refer to Figure 3-23 for the measurement setup and follow the steps below:

   - Connect one end of the lowpass filter to the RF INPUT connector on the HP 8563A/E portable spectrum analyzer.

- Connect the other end of the lowpass filter to the RF OUTPUT connector on the tracking source.

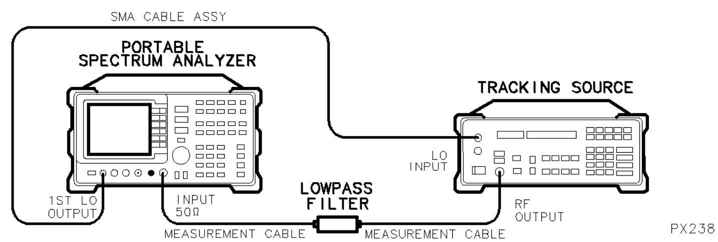


Figure 3-23. Connecting the Lowpass Filter for a Stop-band Measurement

4. Turn the RF OUTPUT power on, if it is not already on. The RF OUTPUT status indicator should be lit.
5. Observe the displayed response shape of the lowpass filter to be sure you are including the stop-band frequency area.

Make the lowpass filter stop-band measurement

Use the procedure below to measure a lowpass filter's stop-band characteristics.

1. Set the start- and stop-frequencies on the host spectrum analyzer.

   To set the start- and stop-frequencies on the HP 8563A/E portable spectrum analyzer, select values that include the pass-band detail of interest. For this example, the start-frequency is set to 6 GHz and stop-frequency is set to 15 GHz.

   - Press (FREQUENCY).
   - Press START, and enter 6 GHz.
   - Press STOP, and enter 15 GHz.

2. Adjust the display for the pass-band response.

   To adjust the HP 8563A/E portable spectrum analyzer to display the pass-band characteristics, follow the steps below:

   - Decrease the reference level with the knob or arrow keys until the stop-band response appears on the display.

3. Increase the tracking source output power.

   The RF output power needs to be increased just until the UNLVLD status indicator begins to light. To increase the HP 85645A tracking source RF output power, follow the steps below:

   - Press (POWER STEP) and (⇑) or (⇓) to select step increments of 1 dB, or use the data keys to enter a finer resolution.
   - Press (POWER LEVEL) and use the (⇑) or (⇓) keys to adjust the power level until the UNLVLD status indicator just begins to light.

4. Set the host spectrum analyzer attenuation to 0 dBm.

   To set the HP 8563A/E portable spectrum analyzer attenuation level, follow the steps below:

   - Press (AMPLITUDE).
   - Press ATTEN AUTO MAN and underline MAN.
   - Enter 0 dBm.

5. Measure the level of the filter stop-band characteristics.

CW-mode and swept-mode TOI measurements are possible by combining a host spectrum analyzer with two tracking sources. The TOI products of a device can be measured at a single frequency in CW signal mode, or over a range of frequencies in swept signal mode. In swept signal mode, a fixed frequency spacing is used for the two input signals.

The two tracking sources provide the pair of input signals to the device under test. The signals in this example are spaced 2 MHz apart and coupled through a power combiner. The power combiner output is connected to the device under test, (in this example an amplifier) then routed into the spectrum analyzer's INPUT 50 Ω connector.

Prepare to measure system TOI

Use the following procedure to prepare to measure the TOI (third-order-intermodulation or third-order-intercept) of a device in CW mode.

1. Prepare the equipment for the measurement.

   To prepare both of the HP 85645A tracking sources and the HP 8563A/E portable spectrum analyzer for the measurement, follow the steps below:

   - Press (PRESET) on both tracking sources.
   - Press preset on the host spectrum analyzer and connect the equipment as illustrated in Figure 3-24.

2. Connect the equipment for the measurement.

   To connect both tracking sources, the host spectrum analyzer, and the power combiner in a system, follow the steps below:

   - Connect the RF output signals from both tracking sources to the two input connectors on a power combiner.

- Connect the signal from the power combiner output to the HP 8563A/E portable spectrum analyzer INPUT 50 Ω connector.

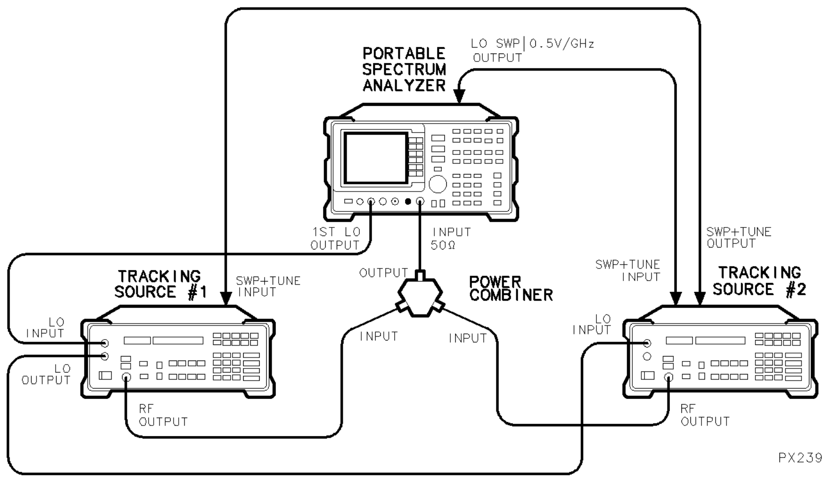


Figure 3-24. Connecting the System for the TOI Measurement

3. Set the CW frequencies for each tracking source.

   To set the tracking sources to CW signal mode, select a desirable signal spacing to use. For this example, 2 MHz spacing around a 300 MHz center frequency is used. Follow the steps below:

   - Press (CW) on tracking source number 1.

     Enter a frequency value that is 1 MHz below the center frequency of interest. For the example, a 299 MHz CW signal is used.

   - Press (CW) on tracking source number 2.

     Enter a frequency value that is 1 MHz above the center frequency of interest. For the example, 301 MHz CW signal is used.

Prepare the host spectrum analyzer to measure TOI

Two CW signals should be about 2 MHz apart on the spectrum analyzer display. Since the tracking sources are not synthesized when operating in CW mode, one or both of them may require frequency adjustments to obtain the desired output frequencies.

1. Set the spectrum analyzer center frequency, frequency span, and bandwidth settings.

   To set the HP 8563A/E portable spectrum analyzer settings so that the display of the measurement system's TOI products are optimized, follow the steps below:

   - Press (FREQUENCY).
   - Press CENTER FREQ. Enter a frequency value that falls at about the midpoint of the tracking source input signals. To center the signals in the example, 300 MHz is used.
   - Press (SPAN) and enter 10 MHz.
   - Press (BW).
   - Press RES BW AUTO MAN, and underline MAN. Enter a resolution bandwidth setting that shows all signals of interest. For the example, 100 kHz is used.
   - Press VIDEO BW AUTO MAN and underline MAN. Enter a video bandwidth setting that optimizes the display of the signals. For the example, 3 kHz is used.

2. Reduce unwanted system-distortion products.

   To reduce unwanted system-distortion products, press the following HP 8563A/E portable spectrum analyzer keys to add attenuation:

   - Press (AMPLITUDE).
   - Press ATTEN AUTO MAN, underline MAN. Enter an attenuation that reduces system TOI to the desired level. For the example, 20 dB is used.

3. If necessary, you can further improve the displayed TOI information.

To further reduce system noise, reduce the HP 8563A/E portable spectrum analyzer noise floor. This step is particularly helpful if much attenuation has been added to decrease spectrum analyzer TOI products. A reduced resolution bandwidth does, however, increase the sweep time. Follow the steps below:

- Press (BW).
- Press `RES BW`.
- Use the step keys, knob, or data keys to decrease the resolution bandwidth.

4. Store the system TOI products in trace B to use for comparison, if desired.

   To store the system TOI products in the HP 8563A/E portable spectrum analyzer, follow the steps below:

   - Press (TRACE)
   - Press `TRACE B`.
   - Press `CLEAR WRITE B`, then `VIEW B`.

Make the CW-mode TOI measurement

Use the procedure below the measure for TOI with the tracking sources in CW-signal mode.

1. Connect the device to test for TOI products.

   To connect the device to the system, retain the input signal connections from the tracking sources to the power combiner inputs. For the example, an amplifier is used. Refer to Figure 3-25 for the setup and follow the steps below:

   - Attach the power combiner output to the RF input connector of the amplifier.
   - Attach the RF output signal from the amplifier to the INPUT 50 Ω connector on the HP 8563A/E portable spectrum analyzer.

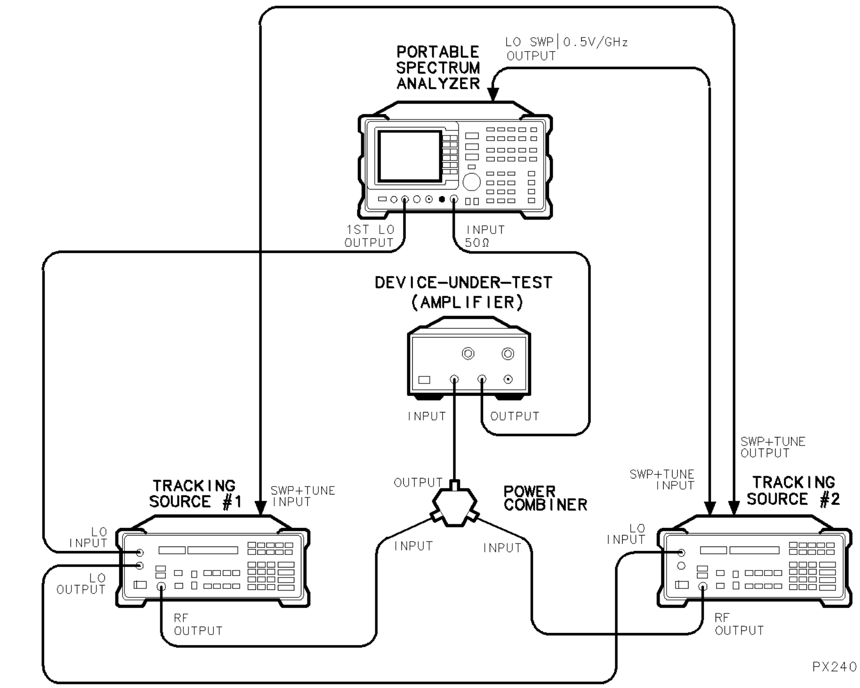


Figure 3-25. Connecting the Device for the TOI Measurement

2. View the TOI products on the spectrum analyzer display.

   To view the TOI products, follow the steps below:

   - If trace B is still visible, can compare the TOI products of the system with those of the device under test. Refer to Figure 3-26 for an example of the display with trace B present.

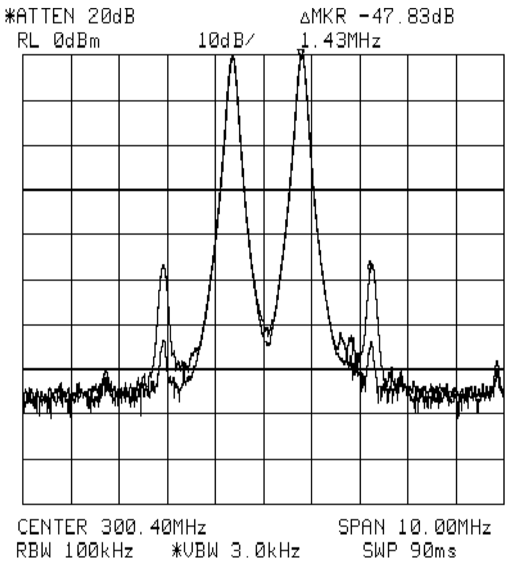


Figure 3-26. CW-Mode TOI With Tracking Source Signals Spaced 2 MHz Apart

3. Measure the peak of one tracking source CW signal on the display.

   To measure the amplitude of a tracking source signal peak displayed on the HP 8563A/E portable spectrum analyzer, follow the steps below:

   - Press (PEAK SEARCH).
   - Press MARKER DELTA.
   - Either press one of the "next-peak" keys or use the knob on the spectrum analyzer to locate the marker on one of the displayed TOI products.
   - Read the amplitude of the marker.
   - Calculate TOI according to the following formula:

     [amplitude of CW signal] +
     [|TOI signal relative amplitude|/2] = TOI

In this example, the CW signal amplitude measured equals 0 dBm the TOI signal amplitude measured is −47.83 dB.
The TOI product is then equal to the following:

[0 dBm] + [the absolute value of −47.83 dB/2] =
TOI of 23.92 dBm

Make a swept-mode TOI measurement

Use the procedure below the measure for TOI with the tracking sources in swept-signal mode.

1. Set the spectrum analyzer to desired start- and stop-frequencies.

   To set the HP 8563A/E portable spectrum analyzer to the start- and stop-frequencies of 1 MHz and 1.3 GHz used in this example, follow the steps below:

   - Press (FREQUENCY).
   - Press START FREQ and enter 0 MHz.
   - Press STOP FREQ and enter 1.3 GHz

2. Set the portable spectrum analyzer resolution bandwidth.

   To set the HP 8563A/E portable spectrum analyzer to 300 Hz used to display the swept TOI products in this example, follow the steps below:

   - Press (BW).
   - Press RES BW AUTO MAN, underline MAN
   - Enter 300 Hz.
   - On HP 8563A/E portable spectrum analyzers with the tracking generator feature, press (AUX CTRL).
   - Press TRACKING GENERATOR.
   - Press SWP CPL SR SA and underline SR for stimulus response mode.

3. If you prefer, save the swept display of the tracking source signal peak.

   To save the display of the swept-TOI product in the HP 8563A/E portable spectrum analyzer, follow the steps below:

   - Press (TRACE).
   - Press CLEAR WRITE B.
   - Press VIEW B.

Display the TOI products in swept mode

Use the procedure below to display the lower and upper TOI distortion products.

1. Generate signals to display the lower TOI product in swept mode.

   To set the tracking sources signals so that the upper TOI distortion products can be displayed, follow the steps below:

   - Press (OFFSET TRKG) on tracking source number 1.
   - Set the offset frequency to a value that equals the spacing of the input signals. For this example, 2 MHz is used.
   - Press (OFFSET TRKG) on tracking source number 2.
   - Set the offset frequency to a value that is two times the offset tracking frequency of tracking source number 1. For this example, 4 MHz is used.
   - View the spectrum analyzer display for the swept response of the lower TOI product. Refer to Figure 3-27 for an illustration of the display.

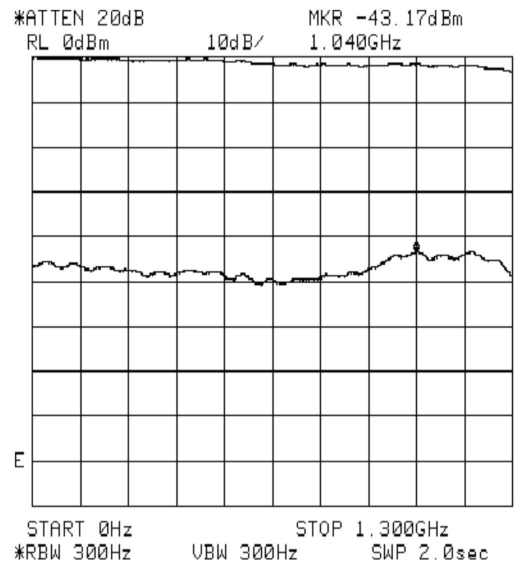


Figure 3-27. Swept-Mode TOI With Tracking Source Signals Spaced 2 MHz Apart

2. Generate signals to display the upper TOI product in swept mode.

   Modify the start- and stop-frequencies of the spectrum analyzer, if desired. In this example, the minimum input signal frequency of interest is 1 MHz, and the maximum offset frequency is −4 MHz. Therefore the spectrum analyzer start frequency is set to 5 MHz. (Tracking source number 2 will sweep from 1 MHz to 900 MHz, while the spectrum analyzer sweeps from 5 MHz to 1.3 GHz.)

   To set the tracking source signals so that the upper TOI distortion product is displayed, follow the steps below:

   - Press (OFFSET TRKG) on tracking source number 1.

     Enter a negative offset value that is equal to the spacing of the input signals. For this example, −2 MHz is used.

   - Press (OFFSET TRKG) on tracking source number 2.

     Enter a negative offset frequency that is two times the value of the offset tracking frequency of tracking source number 1. For this example, −4 MHz is used.

3. View the spectrum analyzer display for the swept distortion response of the lower intermodulation product.
4. Calculate the TOI distortion product with the following formula, or use the markers to determine TOI.

   [amplitude of CW signal] +
   [|TOI signal relative amplitude|/2] = TOI

4

Specifications and Characteristics

Specifications and Characteristics

What's in this chapter

This chapter contains specifications and characteristics for the HP 85644A and HP 85645A tracking source.

Amplitude	Amplitude-related specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Inputs and Outputs	Input and Output characteristics.
General	General specifications and requirements.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range −10 °C to +55 °C (unless otherwise noted). All specifications apply under the following conditions:
  - ☐ The instrument's temperature has been stabilized after 30 minutes of continuous operation (for ambient conditions).
  - ☐ The instrument's controls are autocoupled.
  - ☐ The instrument is ac coupled.
  - ☐ The instrument is on a 2-year calibration cycle.
  - ☐ The environmental requirements are met.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the instrument. Characteristics are specifically identified.
- Typical Performance, where listed, is not *warranted*, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

This section contains the amplitude-related specifications and characteristics.

Maximum Leveled Power Output

HP 85644A	band 0, 300 kHz to 1.8 GHz*: +10 dBm band 0, 1.8 to 2.9 GHz*: +4 dBm band 1, 2.0 to 6.5 GHz*: +5 dBm
HP 85645A	band 0, 300 kHz to 1.8 GHz*: +10 dBm band 0, 1.8 to 2.9 GHz*: +5 dBm band 1, 2.0 to 7.0 GHz*: +10 dBm band 2, 5.8 to 13.5 GHz*: +5 dBm band 3, 12.4 to 20.0 GHz*: +5 dBm band 4, 12.1 to 26.5 GHz*: −2 dBm

* Frequency ranges of the bands vary with the host instrument selected.

Minimum Leveled Power Output (characteristic)

HP 85644A	−80 dBm
HP 85645A	−70 dBm

Amplitude Resolution

0.01 dB

Vernier Range (characteristic)

Bands 0 to 3:	>16 dB
Band 4:	>10 dB

Dynamic Range (characteristic)

Dynamic range is a measure of the difference between the tracking source maximum power output and the spectrum analyzer displayed average noise level, with some system losses.

HP 85644A.

With HP 8566A/B:

Band 0, <1.8 GHz	141 dB
Band 0, <2.5 GHz	135 dB
Band 1, 2.0 to 5.8 GHz	134 dB

With HP 8562A Option 026

Band 0, <1.8 GHz	122 dB
Band 0, <2.9 GHz	116 dB
Band 1, 2.7 to 6.5 GHz	118 dB

With HP 8593A/E

Band 0, <1.8 GHz	119 dB
Band 0, <2.9 GHz	113 dB
Band 1, 2.7 to 6.4 GHz	116 dB

HP 85645A.

With HP 8566A/B

Band 0, <1.8 GHz	141 dB
Band 0, <2.5 GHz	136 dB
Band 1, 2.0 to 5.8 GHz	139 dB
Band 2, 5.8 to 12.5 GHz	127 dB
Band 3, 12.5 to 18.6 GHz	121 dB

Band 4, 18.6 to 23 GHz	109 dB

With HP 8562A Option 026

Band 0, <1.8 GHz	122 dB
Band 0, <2.9 GHz	117 dB
Band 1, 2.7 to 6.5 GHz	123 dB
Band 2, 5.9 to 13.0 GHz	117 dB
Band 3, 12.4 to 19.7 GHz	102 dB
Band 4, 19.1 to 26.5 GHz	90 dB

With HP 8593A/E

Band 0, <1.8 GHz	119 dB
Band 0, <2.9 GHz	114 dB
*Band 1, 2.7 to 6.4 GHz	121 dB
Band 2, 6.0 to 12.8 GHz	104 dB
Band 3, 12.4 to 19.4 GHz	100 dB
Band 4, 19.1 to 22.0 GHz	87 dB

*Band 1 in the HP 8593E is actually 2.75 to 6.5 GHz.

Amplitude Accuracy

The accuracy is measured with respect to −2 dBm, with the tracking source ac coupled and at room temperature (20 − 30°C). It is measured at 300 MHz in the low band and at 3 GHz for the high bands.

±1 dB

Output Signal Flatness

The output signal flatness is measured relative to −2 dBm at 300 MHz for the low band and at 3 GHz for the high bands.

HP 85644A	±2 dB
HP 85645A	
<10 MHz, dc coupled	±2 dB
≥10 MHz, ac coupled	±2 dB

Attenuator Range

HP 85644A	70 dB
HP 85645A	60 dB

Attenuator Accuracy (characteristic)

HP 85644A	1.2 dB maximum, over 70 dB
HP 85645A	1.9 dB maximum, over 60 dB

Power Sweep (characteristic)

Maximum Range (for 0 to 10 V)	band 0 to 3: > 16 dB band 4: > 10 dB
Slope	0 to 3 dB/V

Harmonics (characteristic)

HP 85644A	band 0, > 5 MHz: −25 dBc band 1: −15 dBc
HP 85645A	band 0, > 5 MHz: −25 dBc band 1 to 4: −30 dBc

Maximum Sweep Speed

250 MHz/ms

External AM (characteristic)

Logarithmic amplitude modulation may be generated by applying an external modulation source to the SWEEP IN connector on the rear panel.

AM rates: >1 kHz, up to 50 kHz available in some settings

This section contains the frequency-related specifications and characteristics. In this section, N equals the harmonic number.

Frequency Range

HP 85644A	300 kHz to 6.5 GHz
HP 85645A	dc coupled, 300 kHz to 26.5 GHz ac coupled, 10 MHz to 26.5 GHz

CW Frequency (characteristic)

Accuracy	± 5 MHz $\times$ N
Resolution	250 kHz

The frequency accuracy in the tracking mode is dependent on the host being used.

Offset Frequency Tracking Range

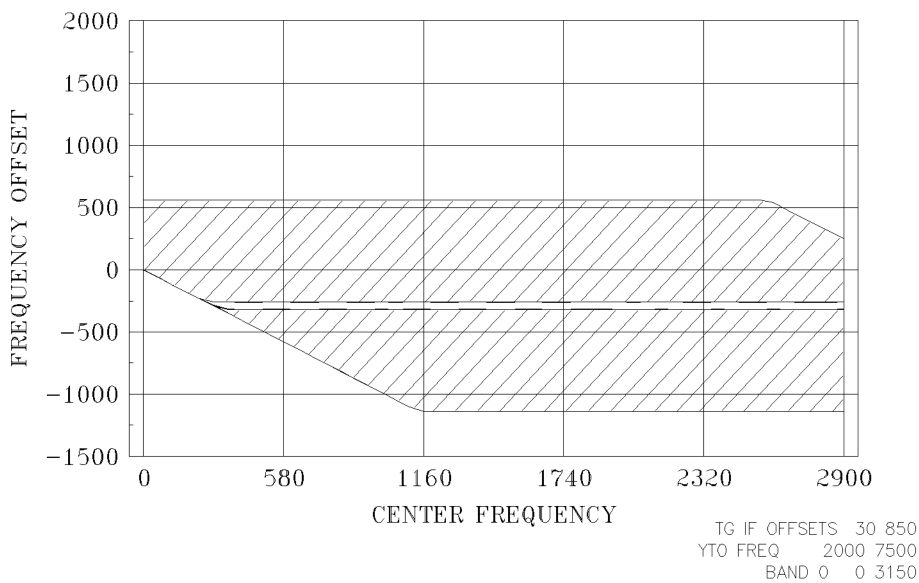
Maximum offset available with spectrum analyzer hosts	± 200 MHz
Resolution	10 Hz $\times$ N

The typical maximum offset available varies with the frequency and host selected. Refer to the following graphs for details.

Available Offset Frequencies for the HP 8560 Series Portable Spectrum Analyzer (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8560 Series Available Offset Tracking Range, Band 0

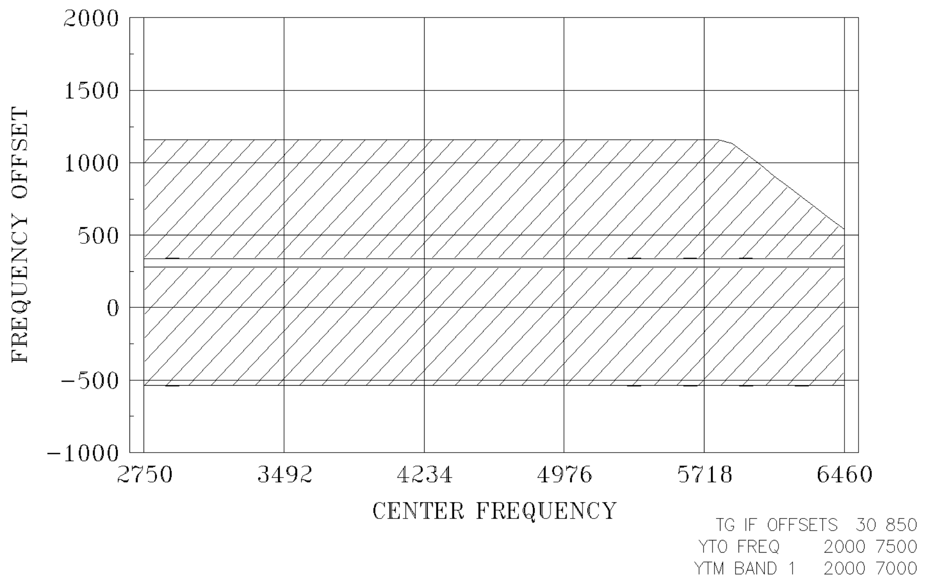


HP 8560 Series Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−316 MHz
Band 0, maximum	−262 MHz

HP 8560 Series Available Offset Tracking Range, Band 1

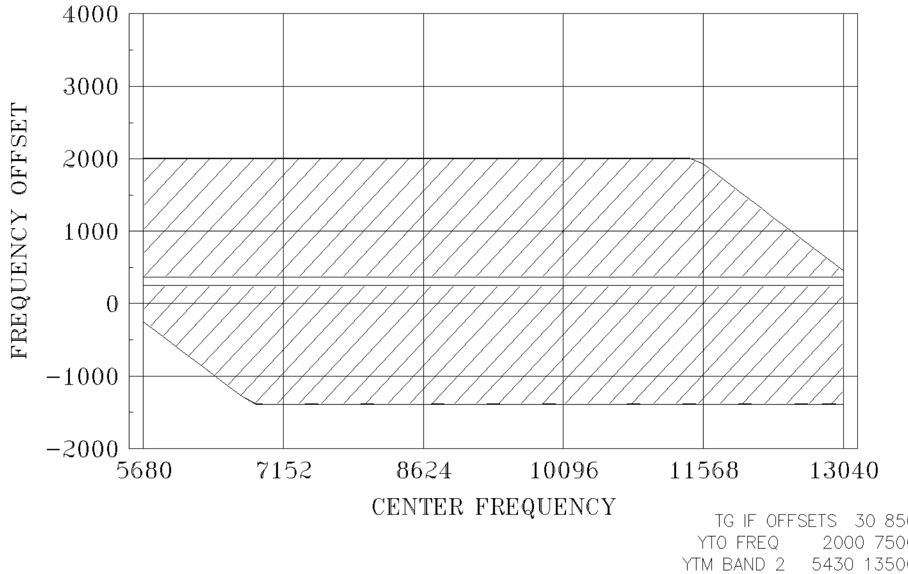


HP 8560 Series Band 1 (characteristic)

Unavailable Offset Range

Band 1, minimum	284 MHz
Band 1, maximum	338 MHz

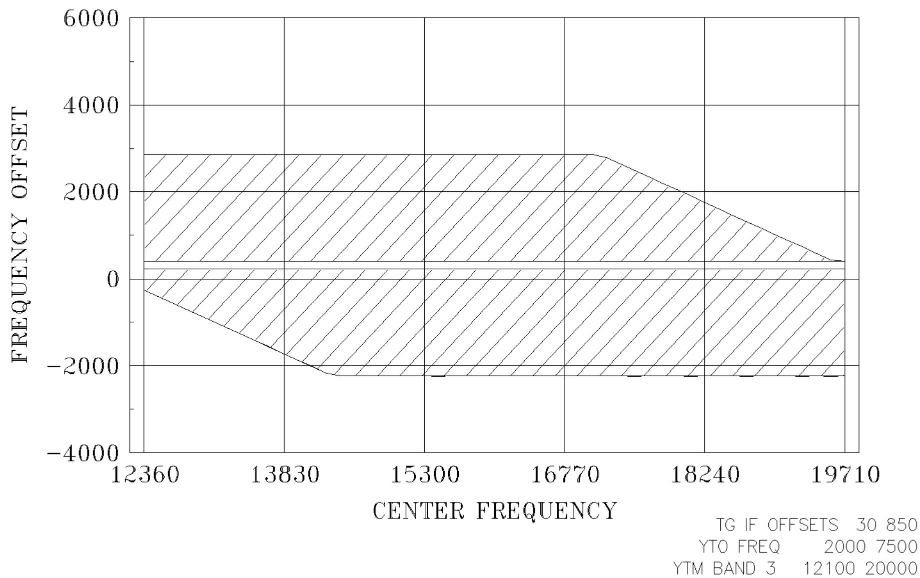
HP 8560 Series Available Offset Tracking Range, Band 2



HP 8560 Series Band 2 (characteristic)

Unavailable Offset Range		
	Band 2, minimum	257 MHz
	Band 2, maximum	365 MHz

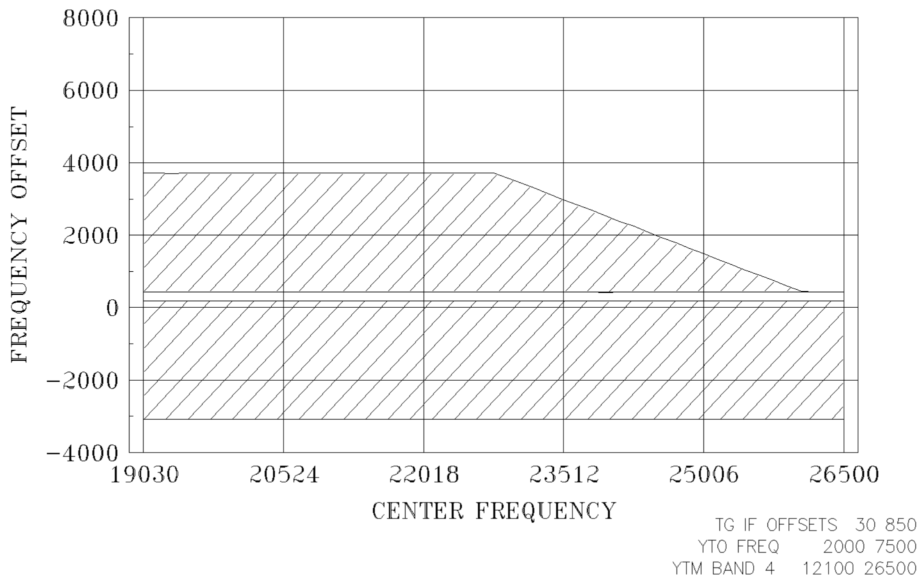
HP 8560 Series Available Offset Tracking Range, Band 3



HP 8560 Series Band 3 (characteristic)

Unavailable Offset Range	Band 3, minimum	230 MHz
	Band 3, maximum	392 MHz

HP 8560 Series Available Offset Tracking Range, Band 4



HP 8560 Series Band 4 (characteristic)

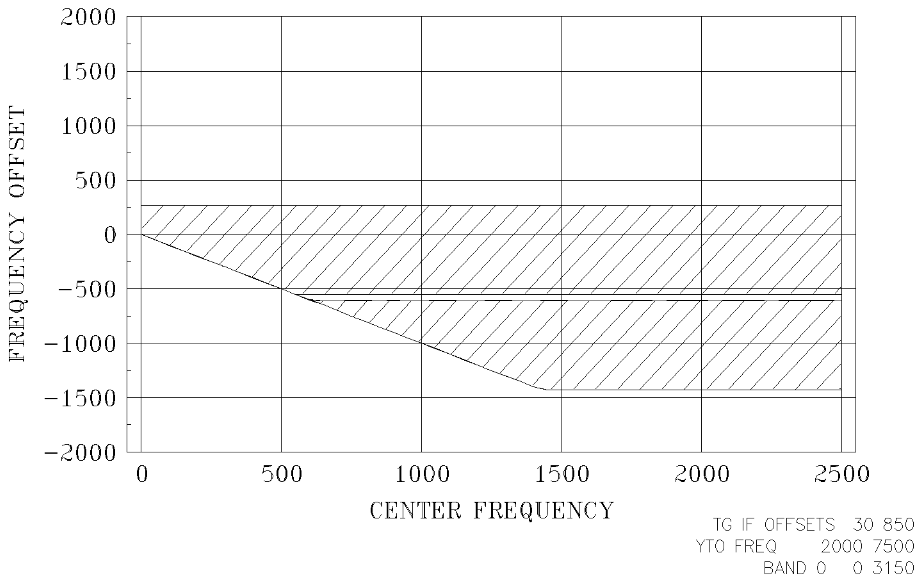
Unavailable Offset Range

Band 4, minimum	203 MHz
Band 4, maximum	419 MHz

Available Offset Frequencies for the HP 8566A/B Spectrum Analyzer (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8566A/B Available Offset Tracking Range, Band 0

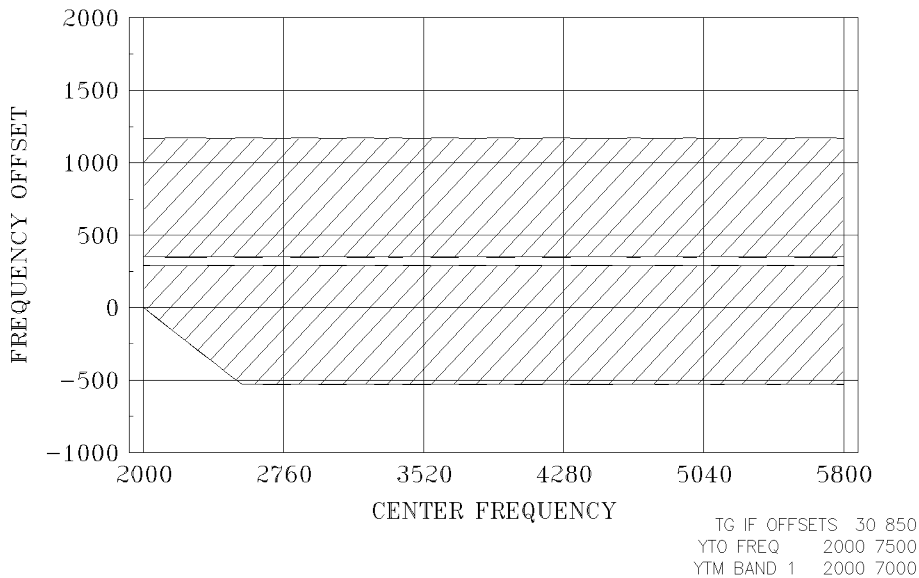


HP 8566A/B Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−606 MHz
Band 0, maximum	−552 MHz

HP 8566A/B Available Offset Tracking Range, Band 1

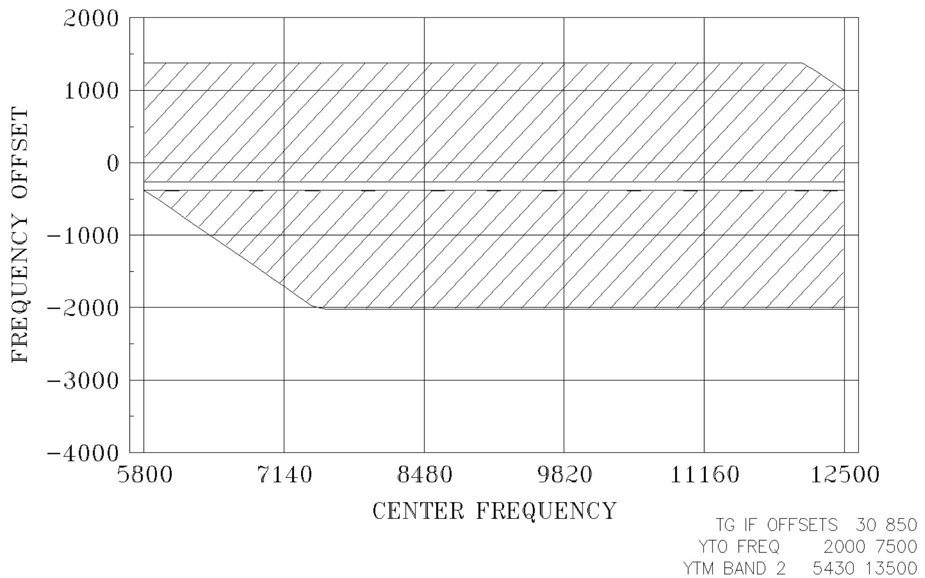


HP 8566A/B Band 1 (characteristic)

Unavailable Offset Range

Band 1, minimum	294 MHz
Band 1, maximum	348 MHz

HP 8566A/B Available Offset Tracking Range, Band 2

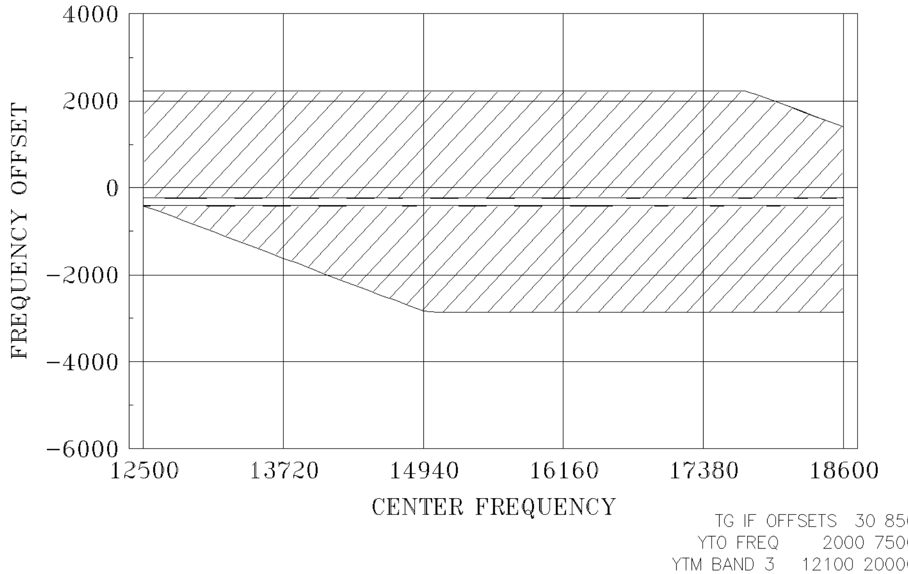


HP 8566A/B Band 2 (characteristic)

Unavailable Offset Range

Band 2, minimum	−267 MHz
Band 2, maximum	−375 MHz

HP 8566A/B Available Offset Tracking Range, Band 3

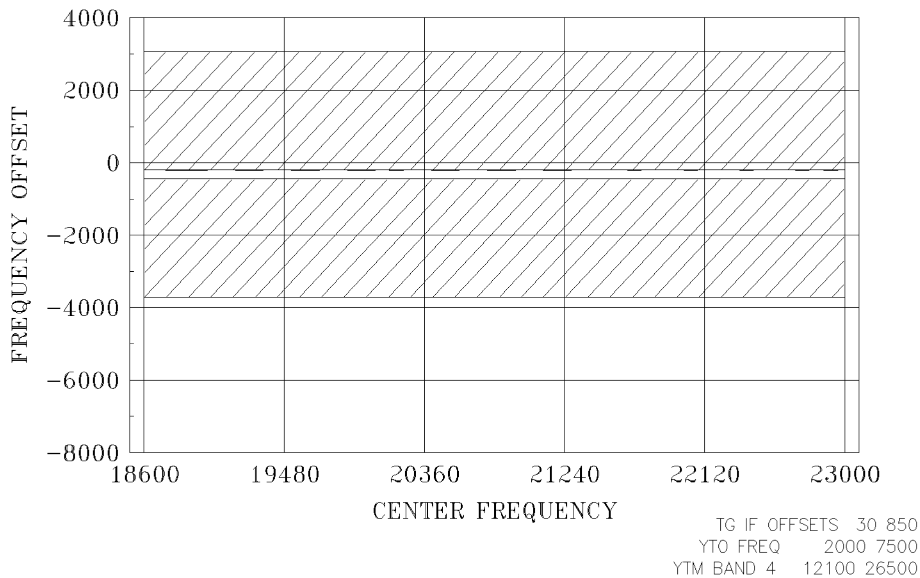


HP 8566A/B Band 3 (characteristic)

Unavailable Offset Range

Band 3, minimum	−240 MHz
Band 3, maximum	−402 MHz

HP 8566A/B Available Offset Tracking Range, Band 4



HP 8566A/B Band 4 (characteristic)

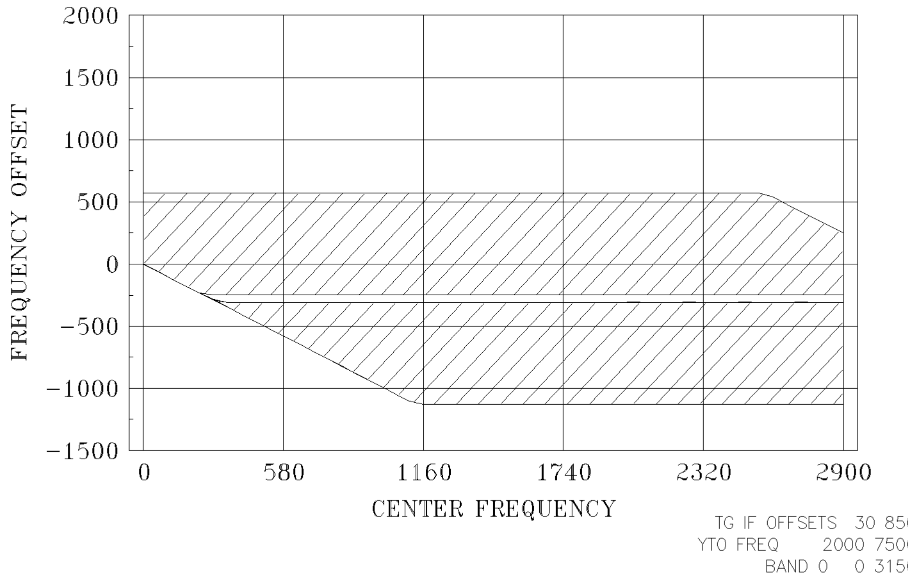
Unavailable Offset Range

Band 4, minimum	−213 MHz
Band 4, maximum	−429 MHz

Available Offset Frequencies for the HP 8590 Series Portable Spectrum Analyzer (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8590 Series Available Offset Tracking Range, Band 0

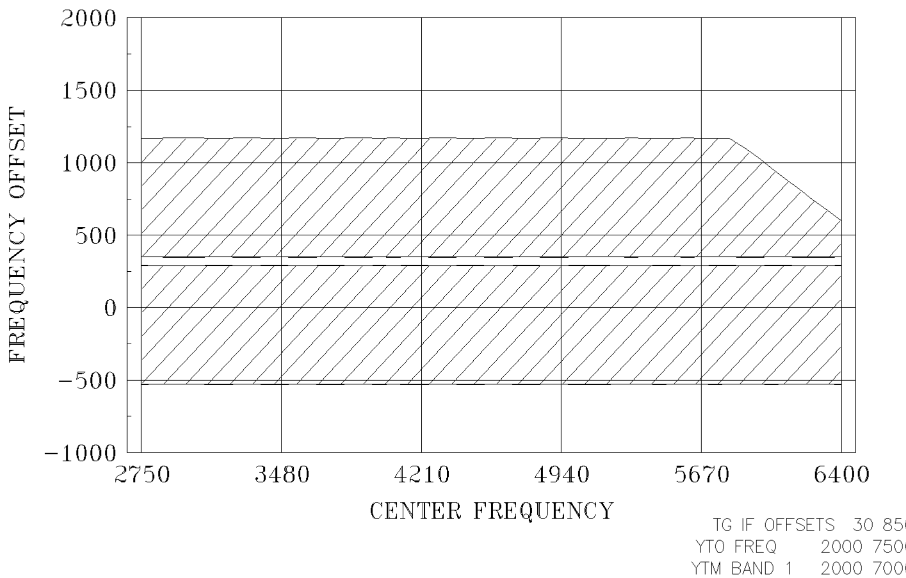


HP 8590 Series Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−306 MHz
Band 0, maximum	−252 MHz

HP 8590 Series Available Offset Tracking Range, Band 1

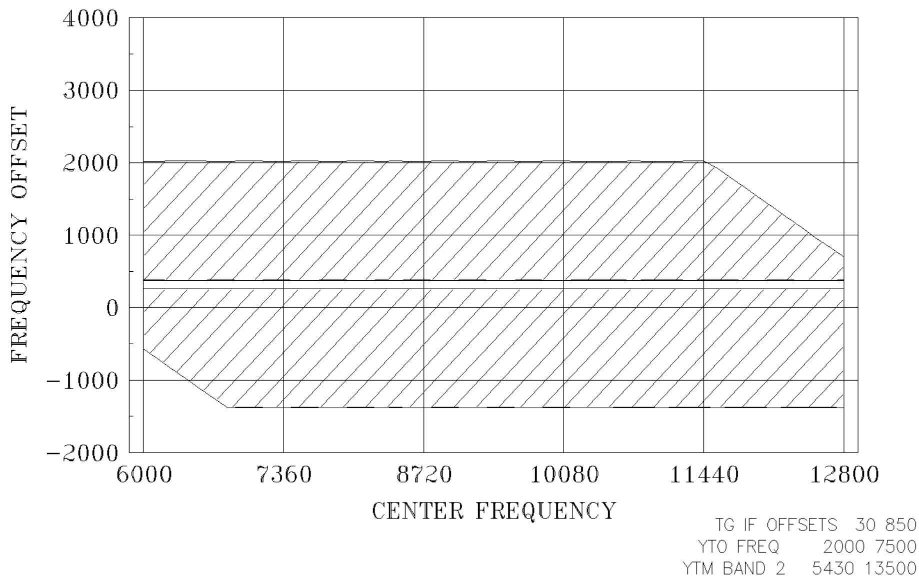


HP 8590 Series Band 1 (characteristic)

Unavailable Offset Range

Band 1, minimum	295 MHz
Band 1, maximum	349 MHz

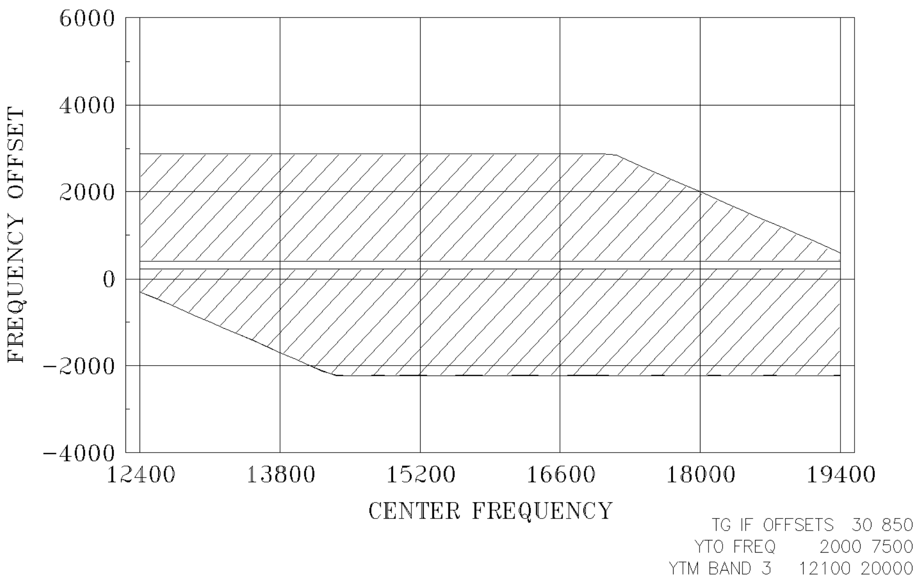
HP 8590 Series Available Offset Tracking Range, Band 2



HP 8590 Series Band 2 (characteristic)

Unavailable Offset Range	Band 2, minimum	267 MHz
	Band 2, maximum	375 MHz

HP 8590 Series Available Offset Tracking Range, Band 3

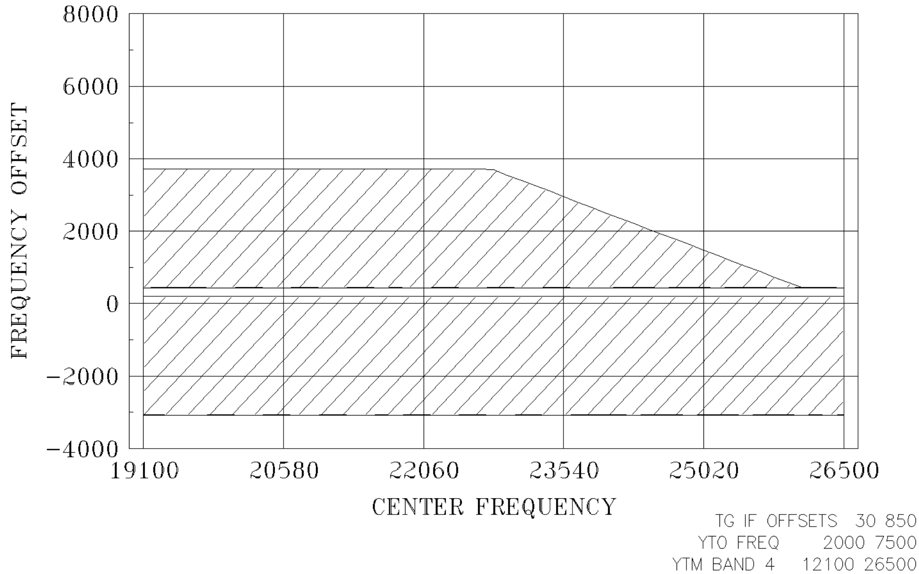


HP 8590 Series Band 3 (characteristic)

Unavailable Offset Range

Band 3, minimum	240 MHz
Band 3, maximum	402 MHz

HP 8590 Series Available Offset Tracking Range, Band 4



HP 8590 Series Band 4 (characteristic)

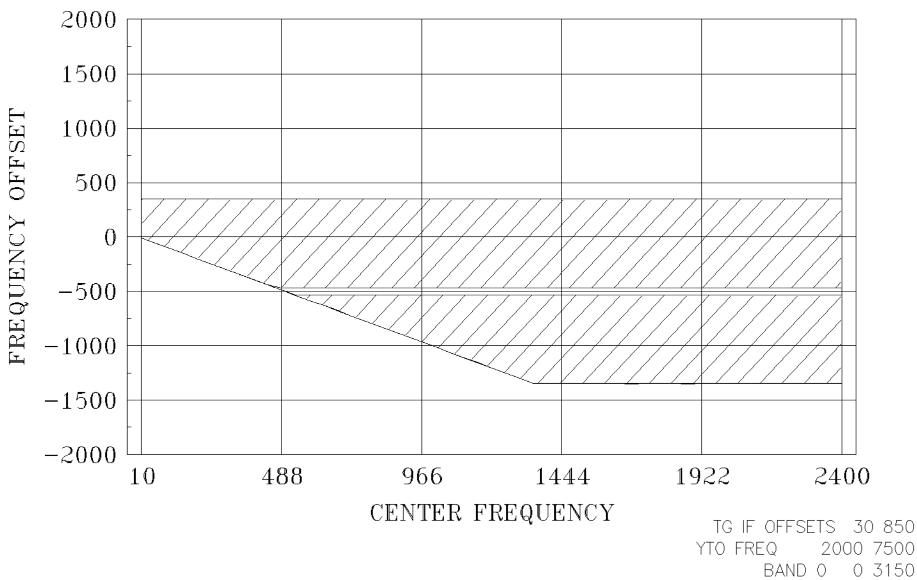
Unavailable Offset Range

Band 4, minimum	213 MHz
Band 4, maximum	429 MHz

Available Offset Frequencies for the HP 8340A/B Synthesized Sweeper (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8340A/B Available Offset Tracking Range, Band 0

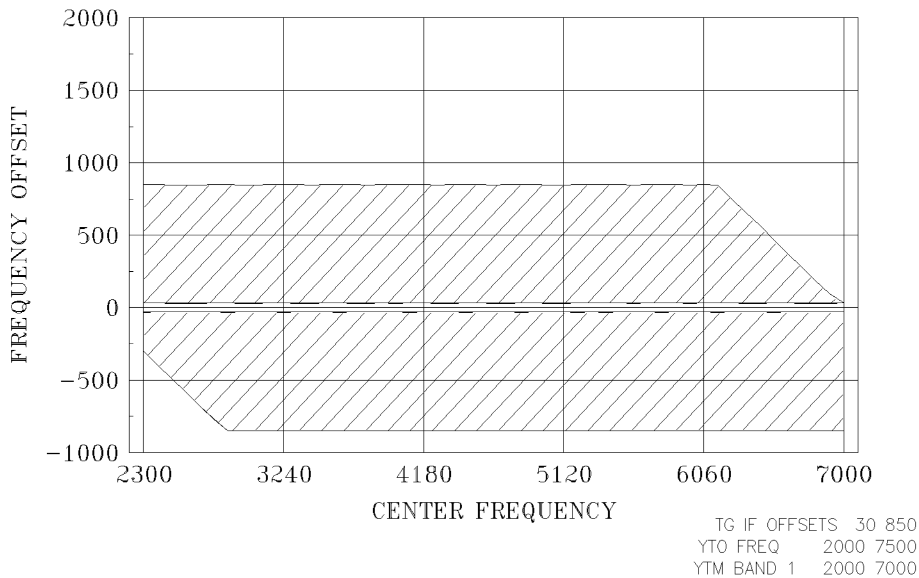


HP 8340A/B Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−527 MHz
Band 0, maximum	−473 MHz

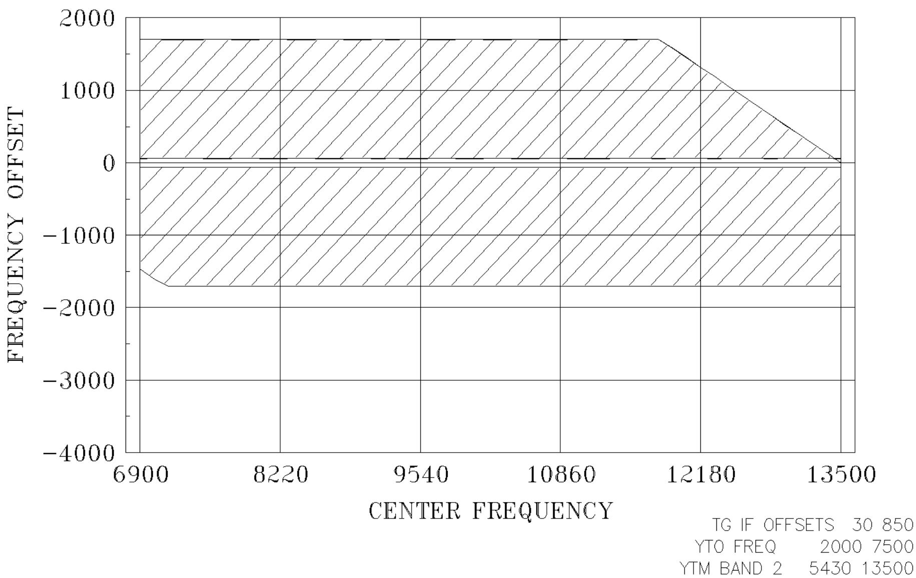
HP 8340A/B Available Offset Tracking Range, Band 1



HP 8340A/B Band 1 (characteristic)

Unavailable Offset Range	Band 1, minimum	−27 MHz
	Band 1, maximum	27 MHz

HP 8340A/B Available Offset Tracking Range, Band 2

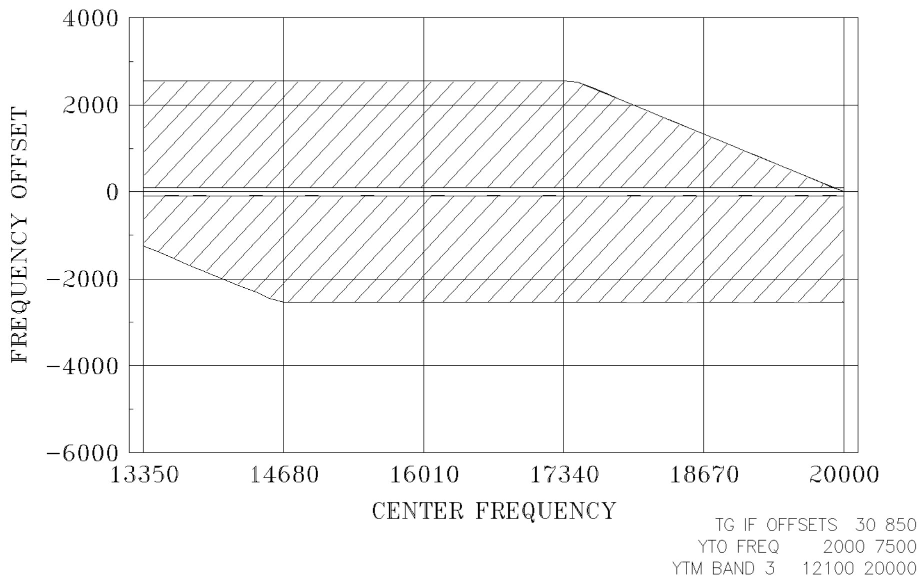


HP 8340A/B Band 2 (characteristic)

Unavailable Offset Range

Band 2, minimum	−54 MHz
Band 2, maximum	54 MHz

HP 8340A/B Available Offset Tracking Range, Band 3

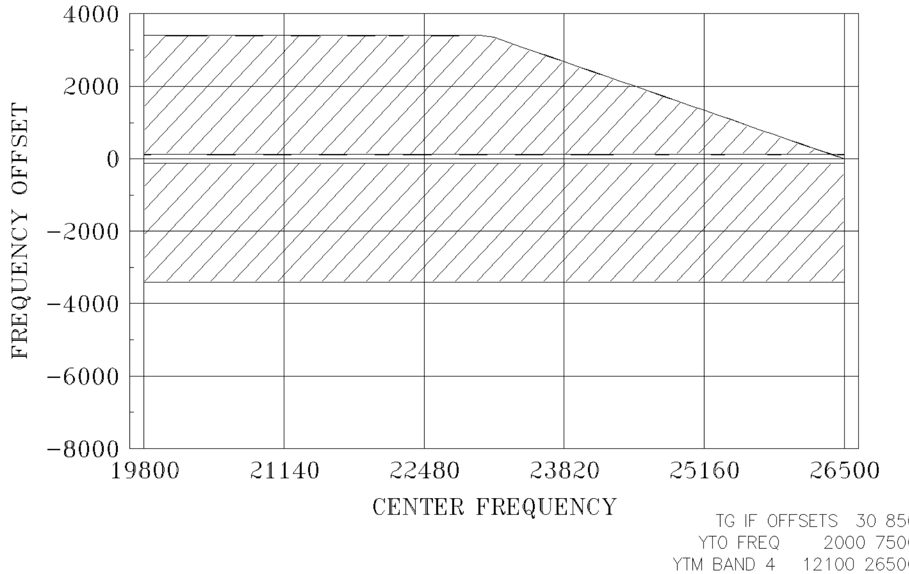


HP 8340A/B Band 3 (characteristic)

Unavailable Offset Range

Band 3, minimum	−81 MHz
Band 3, maximum	81 MHz

HP 8340A/B Available Offset Tracking Range, Band 4



HP 8340A/B Band 4 (characteristic)

Unavailable Offset Range

Band 4, minimum	−108 MHz
Band 4, maximum	108 MHz

o

This section contains the input and output characteristics.

Front Panel (characteristic)

RF Output HP 85644A	Type N (f)
VSWR (internally leveled only),	
0 dB attenuation	
300 kHz to 2.9 GHz:	1.8:1
2.9 GHz to 6.5 GHz:	1.6:1
RF Output HP 85645A	SMA (f)
VSWR (internally leveled only),	
0 dB attenuation	
300 kHz to 2.9 GHz:	1.5:1
2.9 GHz to 18 GHz:	1.6:1
18 GHz to 26.5 GHz:	2.0:1
LO Input	SMA (f), >−10 dBm, required for tracking
LO Output	SMA (f), >+7 dBm, used for tracking with second tracking source

Rear Panel (characteristic)

10 MHz Input	BNC (f), >−10 dBm, required for tracking in narrower resolution bandwidths and for the low frequency band (band 0)
SWP + TUNE IN	BNC (f), required for tracking
SWP + TUNE OUT	BNC (f), required for tracking with a second HP 85644A or HP 85645A tracking source
HI SWEEP IN/OUT	BNC (f), required for tracking with some hosts (HP 8590 Series spectrum analyzers)
BLANK IN	BNC (f), used to blank unleveled indicator during retrace
SWEEP IN	BNC (f), 0 to 10 V, used to control power sweep or to generate AM
EXT ALC	BNC (f), used with negative or positive detector for external leveling
AUX	9-pin, D-type connector, for future expanded capabilities

This section contains the general specifications and requirements.

Warmup

30 minutes, starting from ambient temperature

Calibration Interval

2 years

Environmental Specifications

Type tested to MIL-T-28800D, Type III, Class 5 environmental conditions as listed below:

Temperature (Operating)	−10°C to 55°C
Temperature (Non-operating)	−51°C to 71°C
Humidity	Type tested at 95% relative humidity and 40°C for 5 days
Altitude (Operating)	15,000 feet
Altitude (Non-operating)	50,000 feet
Vibration 5 to 15 Hz	0.059 inch peak-to-peak excursion

Vibration 15 to 25 Hz	0.039 inch peak-to-peak excursion
Vibration 25 to 55 Hz	0.020 inch peak-to-peak excursion
Pulse Shock	Half Sine at 40 g's for 11 ms duration
Transit Drop	8 inch drop on six faces and eight corners
Electromagnetic Compatibility	Conducted and radiated interference is in compliance with CISPR publication II (1985) and FTZ 526/527/79. meets MIL-STD-461B, Part 7 REO2 and CEO3 (narrowband, full limits; broadband, 20 dB relaxation 15 kHz to 100 kHz).

Power Requirements 115 V ac Operation

Voltage	110 V ±10% 120 V ±10%
Current (HP 85644A)	1.6 A rms maximum
Current (HP 85645A)	2.0 A rms maximum
Frequency	47 to 66 Hz, 400 Hz

Power Requirements 230 V ac Operation

Voltage	220 V ±10% 240 V ±10%
Current (HP 85644A)	0.8 A rms maximum
Current (HP 85645A)	1.0 A rms maximum
Frequency	47 to 66 Hz

Power Dissipation (nominal)

HP 85644A	< 150 VA, < 80 W
HP 85645A	< 200 VA, < 110 W

Weight (nominal)

HP 85644A	10 kg (22 lb)
HP 85645A	12 kg (26 lb)

Dimensions (nominal)

HP 85644A/HP 85645A Standard.

Height:	138 mm (5.5 in)
Width:	337 mm (13.5 in)
Depth:	461 mm (18.3 in)

HP 85644A/HP 85645A Option 919.

Height:*	133 mm (5.25 in)
Width:	457 mm (18 in)
Depth:	559 mm (22 in)

* not including feet

5

If You Have a Problem

If You Have a Problem

What's in this chapter

This chapter contains information that is aimed toward helping you when you have a problem with the tracking source.

The sections of information in this chapter are listed below:

Calling HP Sales and Service Offices	Refer to this section for information about contacting an HP sales and service office.
Returning Your Tracking Source for Service	Refer to this section for information about returning your tracking source for service.
General Tracking Source Operation Problems	Refer to this section for information about some typical problems that may occur while you are using an HP 85644A or HP 85645A tracking source.
General Problems when Using Any Host Spectrum Analyzer	Refer to this section for information about a problem that may occur while you are using a tracking source with one of the host spectrum analyzers.
Problems Specific to Using HP 8560 Series Portable Spectrum Analyzers	Refer to this section for information about a problem that may occur while you are using an HP 8560 Series portable spectrum analyzer with a tracking source.
Problems Specific to Using HP 8566A/B Spectrum Analyzers	Refer to this section for information about a problem that may occur while you are using an HP 8566A/B spectrum analyzer with a tracking source.
Problems Specific to Using HP 8590 Series Spectrum Analyzers	Refer to this section for information about a problem that may occur while you are using an HP 8590 Series portable spectrum analyzer with a tracking source.
General Problems when Using Any Host Signal Source	Refer to this section for information about a problem that may occur while you are using a signal source, such as a synthesized signal generator or synthesized sweeper, with a tracking source.

Problems Specific to Using HP 8340/8341 Series Synthesized Sources	Refer to this section for information about a problem that may occur while you are using an HP 8340/8341 synthesized source with a tracking source.
Specific Tracking Source and HP 8350 Series Sweep Oscillator Problems	Refer to this section for information about a problem that may occur while you are using an HP 8350 Series sweep oscillator with a tracking source.

P O

Use the information in this section to obtain Hewlett-Packard sales and service offices information. Sales and service offices are located around the world to provide complete support for your tracking source. To obtain servicing information or to order replacement parts, contact the nearest Hewlett-Packard Sales and Service office listed in Table 5-1. In any correspondence or telephone conversations, refer to the tracking source by its model number and full serial number. With this information, the HP representative can quickly determine whether your unit is still within its warranty period.

Before calling Hewlett-Packard

Before calling Hewlett-Packard or returning the tracking source for service, please make the checks listed in “Check the basics”. If you still have a problem please read the warranty printed at the front of this guide. If your tracking source is covered by a separate maintenance agreement, please be familiar with its terms.

Hewlett-Packard offers several maintenance plans to service your tracking source after warranty expiration. Call your HP Sales and Service Office for full details.

If you want to service the tracking source yourself after warranty expiration, contact your HP Sales and Service Office to obtain the most current test and maintenance information.

Check the basics

Often problems may be solved by repeating what was being done when the problem occurred. A few minutes spent in performing these simple checks may eliminate time spent waiting for instrument repair.

- ☐ Check that the tracking source is plugged into the proper ac power source.
- ☐ Check that the line socket has power.
- ☐ Check that the rear-panel voltage selector switch is set correctly.
- ☐ Check that the line fuse is good.
- ☐ Check that the tracking source is turned on.
- ☐ Check that the other equipment, cables, and connectors are connected properly and operating correctly.
- ☐ Check the equipment settings in the procedure that was being used when the problem occurred.
- ☐ Check that the test being performed and the expected results are within the specifications and capabilities of the tracking source. Refer to Chapter 4.
- ☐ Check the tracking source display for error messages. Refer to Chapter 7.
- ☐ Check operation by performing the verification procedures in Chapter 2. Record all results in the Performance Test record.
- ☐ Check for problems similar to those described in "General Tracking Source Operation Problems" of this chapter.

Use the information in this section if you need to return the tracking source to the factory.

Package the tracking source for shipment

Use the following steps to package the tracking source for shipment to Hewlett-Packard for service:

1. Fill in a service tag (available at the end of this chapter) and attach it to the instrument. Please be as specific as possible about the nature of the problem. Send a copy of any or all of the following information:
   - Any error messages that appeared on the tracking source display.
   - A completed Performance Test record.
   - Any other specific data on the performance of the tracking source.

CAUTION

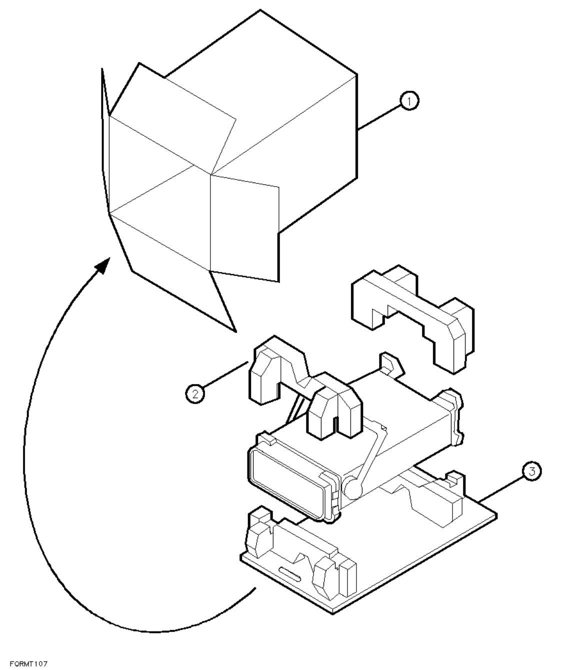
Tracking source damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the instrument or prevent it from shifting in the carton. Styrene pellets cause equipment damage by generating static electricity and by lodging in the tracking source fan.

2. Use the original packaging materials (see Figure 5-1) or a strong shipping container that is made of double-walled, corrugated cardboard with 159 kg (350 lb) bursting strength. The carton must be both large enough and strong enough to accommodate the tracking source and allow at least 3 to 4 inches on all sides of the tracking source for packing material.
3. Surround the instrument with at least 3 to 4 inches of packing material, or enough to prevent the instrument from moving in the carton. If packing foam is not available, the best alternative is SD-240 Air Cap™ from Sealed Air Corporation (Commerce, CA 90001). Air Cap looks like a plastic sheet covered with 1-1/4 inch air-filled bubbles. Use the pink Air Cap to reduce static electricity. Wrap the instrument several times in the material to both protect the instrument and prevent it from moving in the carton.

4. Seal the shipping container securely with strong nylon adhesive tape.
5. Mark the shipping container “FRAGILE, HANDLE WITH CARE” to ensure careful handling.
6. Retain copies of all shipping papers.

Packaging materials to use

Use the following illustration and table to help you package a tracking source for shipment.



Item	Description	HP part number
1	Outer Carton	9211-6348
2	Inner Foam Pad Set	9220-4734
3	Bottom Skid Tray	9220-4733

Figure 5-1. HP 85644A/85645A Tracking Source Packaging Materials

Use the information in this section to help identify and resolve problems that may occur while you are using the tracking source.

The information in this section is organized by symptom. Refer to a side-heading or illustration (if available) that most closely relates to or resembles the problem you are having.

If there are signal drop-outs and spikes

Signal drop-outs and spikes that appear on the display may be caused by hardware configuration problems. Some of these include a missing LO input or sweep + tune signal, or an incorrect host instrument configuration. Figure 5-2 shows an example of a signal display when the LO input signal is missing.

Symptoms if the LO signal is missing

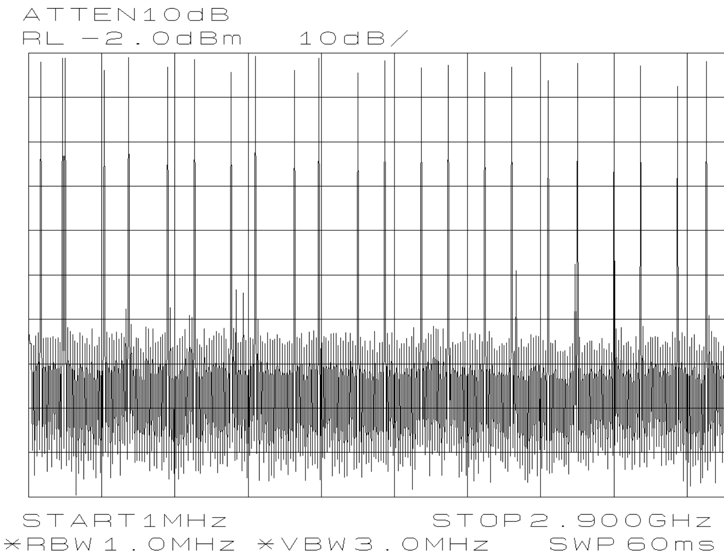


Figure 5-2. Display Example if the LO Input Signal is Missing

There are spikes on the display. If the host instrument is a spectrum analyzer, the display shows spikes that are approximately evenly spaced. These spikes may exhibit horizontal shifting.

To resolve the problem, try these suggestions:

- Make sure that the LO connection to the tracking source is connected to the front panel LO INPUT connector (not LO OUTPUT).
- Make sure that the connection to the host is to the proper LO signal connector.
- Verify that the measurement cable is working properly.

If signal tracking exhibits spikes after 100 MHz

A missing sweep + tune input signal can cause the tracking source signal to stop tracking anywhere from about 100 MHz to 300 MHz.

Symptoms when the sweep + tune signal is missing

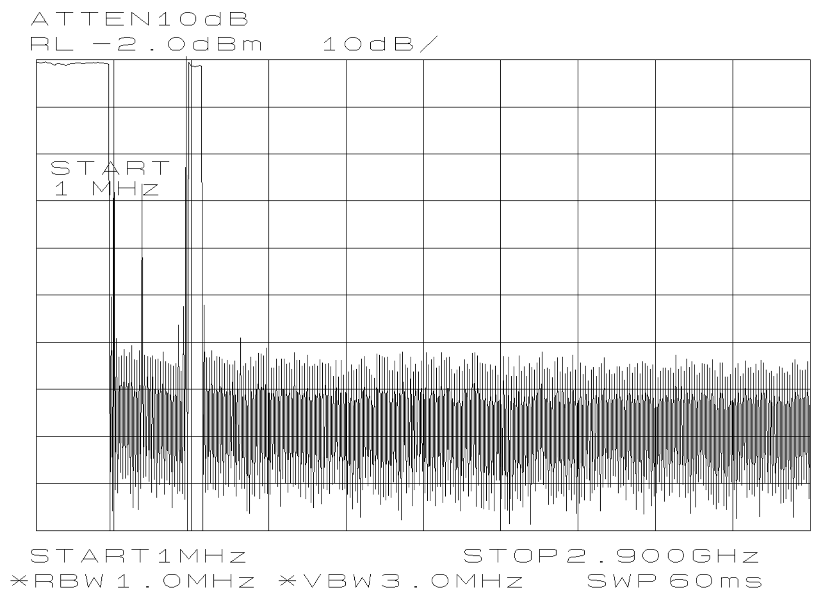


Figure 5-3. No Sweep + Tune Input Signal to the Tracking Source Display Example

The trace disappears or exhibits random spikes. There is a tracking problem. The tracking source may track a signal properly from 1 MHz to between 100 MHz and 300 MHz. After 300 MHz, either the signal disappears or there are spikes.

To resolve the problem, try these suggestions:

- Check that the sweep + tune cable is connected properly to the tracking source and the host instrument.
- Check that the measurement cable is working properly.

If the signal frequency appears unstable

An incorrect host instrument configuration can cause the displayed signal frequency to appear unstable.

Symptoms when host configuration is incorrect

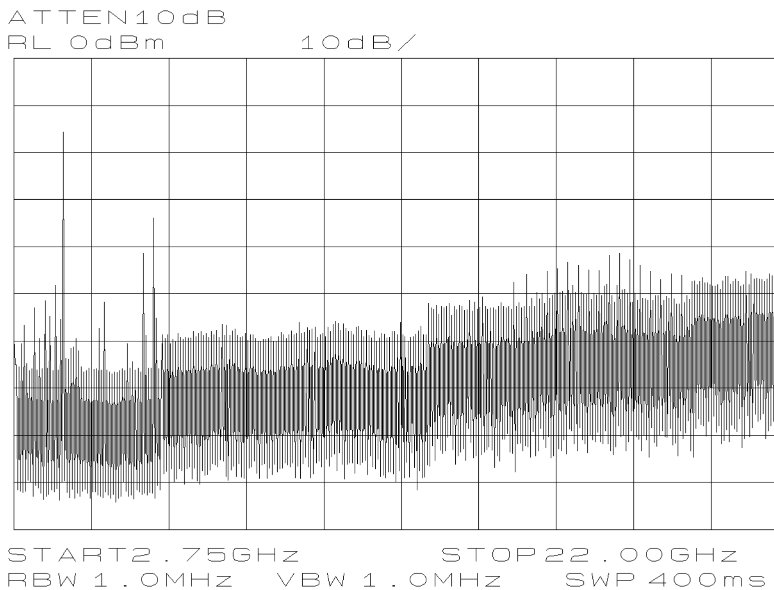


Figure 5-4. Incorrect Host Instrument Configuration Display Example

The output frequency is unstable. The output signal appears to be at the wrong frequency and is unstable. This may occur at all frequencies or in just a few of the frequency bands.

The particular symptoms displayed depend on the host instrument used and the host instrument configuration selected in the tracking source menu.

To resolve the problem, try these suggestions:

- Check the host instrument configuration selection under the (CONFIG) key.
- Make sure the configuration menu setting matches the actual host instrument model number.

If the tracking source RF output power is low

Several things can cause the tracking source output power to appear lower than expected. Low output power can occur if the RF output power is turned off, the offset frequencies are out of the tracking source's operating range, or the attenuator is set to manual mode. For the HP 85645A tracking source, low output power can also occur if ac coupling is selected when dc coupling is needed.

Symptoms of low output power when ac coupling is set and dc coupling is needed

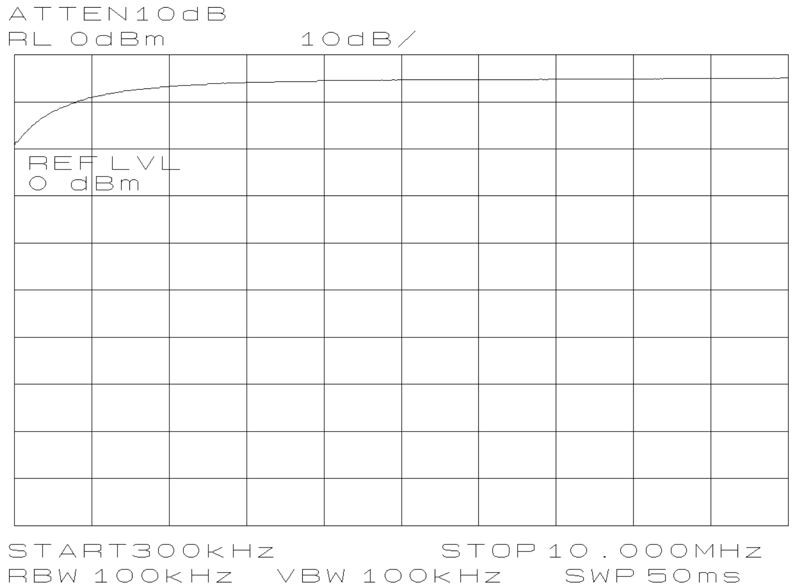


Figure 5-5. Low Tracking Source Output Power due to AC Coupled Setting

Output power is low. At frequencies below about 10 MHz, the tracking source output power becomes low. The power level becomes lower as the frequency becomes is reduced.

When you are measuring power on a host spectrum analyzer, the level may appear low if signal tracking is not precise. This problem is most pronounced with host instruments without synthesized frequencies.

To resolve the problem, try these suggestions:

- Make sure the RF output power is turned on.
- Make sure the output frequency settings are within the range of the tracking source.
- Adjust signal tracking with the tracking source's front-panel tracking adjust. For more severe conditions, use the offset-tracking mode and enter an offset value equal in frequency to the frequency error value.
- If the RF output power is turned on and the frequency settings are within tracking source ranges, the cause is probably hardware related. Refer to Table 5-1 for an HP sales and service office to contact.
- On the HP 85645A tracking source, change the front-panel RF output setting to dc coupled.

If the RF output power is not present

Make sure the tracking source is turned on and the RF output power switch is turned on. The status indicators for both of these switches should be lit.

Symptoms when RF output is turned off

There is no output power from the tracking source.

To resolve the problem, try these suggestions:

- Make sure the tracking source is turned on. The power switch status indicator should be lit.
- Turn the RF output power on by pressing the tracking source's front-panel RF OUTPUT (ON/OFF) key. The RF OUTPUT status indicator next to the RF output connector should be lit.

If the output signal is unstable or incorrect

An incorrect offset frequency setting can cause an unstable or incorrect output signal.

Symptoms when an out-of-range offset is being used

The output power appears low.

The output frequency is incorrect.

The output frequency is unstable.

To resolve the problem, try these suggestions:

- Verify that the offset frequency is within the operating range for your measurement setup. Refer to Chapter 4, “Specifications and Characteristics,” for operating frequency ranges.
- If the host instrument is a signal source, the offset frequency *must* be at least 30 MHz times the harmonic of the host instrument for frequency bands other than band 0.

If the output power cannot be decreased

The attenuator set to manual mode can prevent you from setting the output power as low as specifications indicate. In manual mode, the attenuator no longer automatically changes with power level changes. Refer to the specifications chapter in this manual for output power levels.

Symptom when attenuator manual mode is set

The RF output power cannot be decreased.

To resolve the problem, try this suggestion:

- Press (AUX FCTN) and check the `ATTEN MODE` setting. Make sure it is set to `AUTO`.

Use the information in this section if you are using a tracking source with a spectrum analyzer as a host instrument.

Problems can be caused by improper host preselector tracking, host LO feedthrough signal interference, or inadequate tracking adjustment.

The information in this section is organized by the symptoms that might be displayed when these problems occur.

If the output signal flatness looks wrong

A host instrument preselector that needs peaking can cause problems with the output signal flatness. The flatness problem may appear in the form of unexplained amplitude variations, or amplitude "glitches."

Symptoms when host preselector is tracking

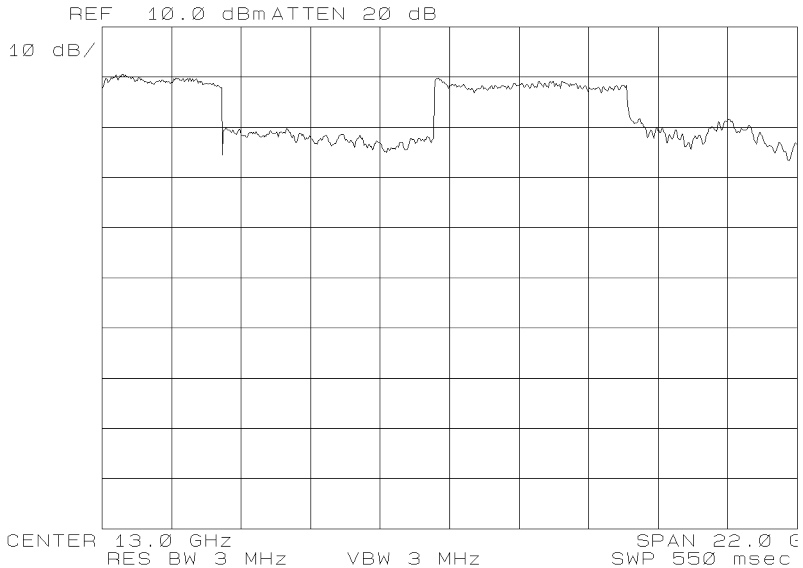


Figure 5-6. Host Preselector Tracking Display Example

The flatness looks wrong. The amplitude display of the output from the tracking source does not appear as flat as expected in all host frequency bands except low band. Low band frequencies are usually above 3 GHz.

The signal level rises or falls. The signal level may rise or fall several dB from band to band (of the host instrument).

There is an abrupt variation in amplitude (glitch). There may be a "glitch" for a few dB at the beginning of one or more of the frequency bands.

The flatness of the displayed signal is a function of both the output flatness of the tracking source and the flatness of the host spectrum analyzer. The latter is highly dependent on how closely the host instrument's input preselector filter tracks the actual frequency of the host spectrum analyzer.

To resolve the problem, try these suggestions:

- Adjust the preselector tracking from the spectrum analyzer's front panel.
- Check the spectrum analyzer's operating manual to find out how to adjust preselector peaking.
- Decrease the spectrum analyzer sweep speed. Sometimes, a slower sweep speed helps resolve to this problem.

If the output signal appears distorted

If the host instrument LO signal is feeding through to the output signal from the tracking source, distortion may appear along the displayed trace.

Symptoms of host LO feedthrough combining with tracking source output

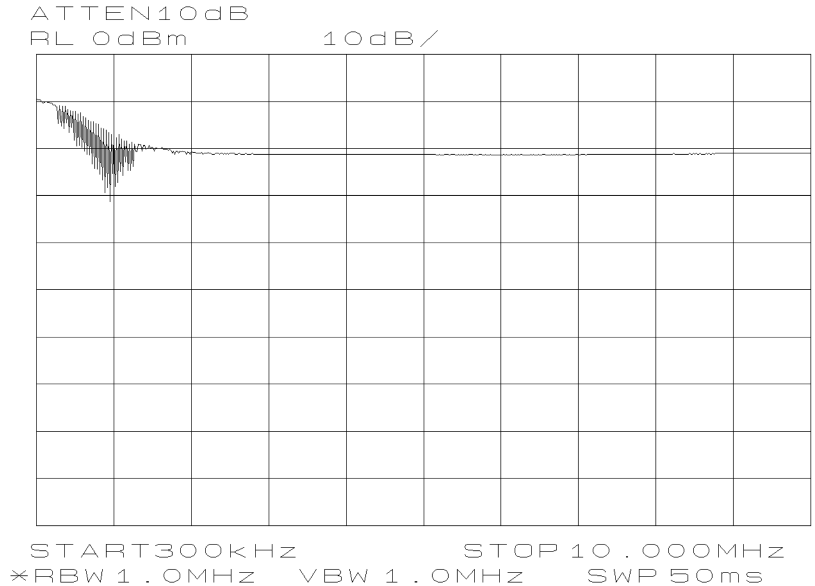


Figure 5-7. Wide Span Display Example of Host LO Feedthrough Interference

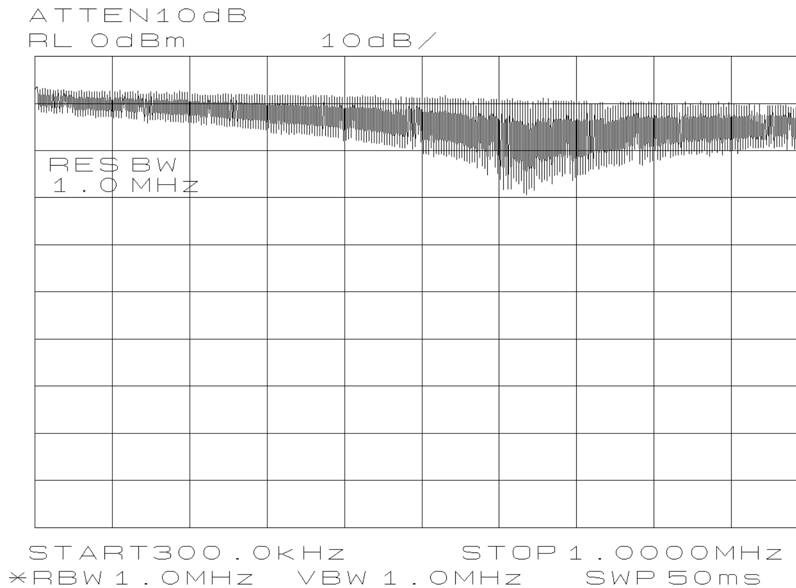


Figure 5-8. Narrow Span Display Example of Host LO Feedthrough Interference

There is "fuzz" on the signal. There appears to be "fuzz" displayed on the signal for a range of frequencies between 300 kHz and about 2 to 4 MHz.

The amplitude increases. The amplitude may increase below 1 MHz.

There is a signal, but no input. A signal is displayed at 0 Hz when no input signal is connected to the host spectrum analyzer. This is called LO feedthrough and has a shape that corresponds to the current resolution bandwidth filter.

If the tracking source RF output is connected to the host spectrum analyzer, the RF output signal from the tracking source can combine with the LO feedthrough signal from the spectrum analyzer and cause erroneous results. The results may appear as a widened trace, an amplitude increase, as ringing, or as other types of trace distortion.

To resolve the problem, try these suggestions:

- To reduce the distortion, try narrowing the resolution bandwidth of the host spectrum analyzer.

- Try adjusting both the output power level of the tracking source and the reference level of the host spectrum analyzer. These adjustments combined can have an effect on the interference.

If there is an unexplained decrease in tracking source output power

Any difference in frequency between the host spectrum analyzer signal and the tracking source output signal can appear as a decrease in amplitude.

A tracking adjustment may be needed. This adjustment is especially important when you are using the tracking source's internal 10 MHz reference, narrow host instrument resolution bandwidths, or low-band operation (band 0).

Without an external 10 MHz reference signal connected to the tracking source and to the host instrument, an offset due to the inaccuracy of the tracking source's internal 10 MHz reference translates to an amplitude error in narrow resolution bandwidths. The error appears most severely in low band (band 0).

Symptoms when tracking adjust is needed

The RF output power is low. The tracking source output power is lower than the front-panel setting indicates.

Any decrease in displayed trace amplitude can be due to a difference in frequency between the host spectrum analyzer signal and the tracking source output signal.

In narrow resolution bandwidths (those less than about 1 kHz), the center frequency of the host spectrum analyzer's resolution bandwidth filters may not be centered at exactly the IF frequency. This difference may show up as a tracking error and appear as a constant amplitude error in all bands. The error increases as the bandwidth is decreased.

To resolve the problem, try these suggestions:

- Make sure that the tracking source and the host instrument are using a common, sufficiently high powered, 10 MHz reference signal. A common reference signal guarantees that the tracking source uses the same reference frequency as the host spectrum analyzer.
    - □ If a reliable external 10 MHz reference signal is available from the host instrument, connect it to the tracking source 10 MHz reference input connector.

- ☐ If a reference signal from the host spectrum analyzer is not available, connect a 10 MHz reference from a separate source. Note that this may make the tracking source's frequency accurate, but it does not guarantee the host spectrum analyzer's frequency accuracy.

- If a reference is not available at all, set the host spectrum analyzer to the widest resolution bandwidth that still allows the measurement to be made.
- Adjust signal tracking with the (TRKG ADJUST) key. If the tracking adjust range is not adequate, press (OFFSET TRKG) to change to offset tracking mode. Adjust the offset for maximum, output power.
- In narrower resolution bandwidths, press (TRKG ADJUST) and adjust the tracking source until the problem goes away.

P

Use the information in this section if your host spectrum analyzer is an HP 8560, HP 8561, HP 8562, or an HP 8563 portable spectrum analyzer.

This section contains information about conditions that can be caused by the following things:

- The 0.5 V/GHz setting is not selected.
- Spectrum analyzer flatness correction routine being performed.
- The start frequency setting is less than 0 Hz.
- Digital resolution bandwidths (below 300 Hz) are being used.

The information in this section is organized by the symptoms that might be displayed when these problems occur.

If signal tracking stops before a full-sweep completes

If the proper sweep voltage is not selected, signal tracking stops before a full sweep is completed.

The rear-panel sweep output on the portable spectrum analyzer has two settings. These are the LO sweep and 0.5 V per GHz settings. The tracking source needs the 0.5 V per GHz setting.

Symptoms when 0.5 V/GHz is not selected

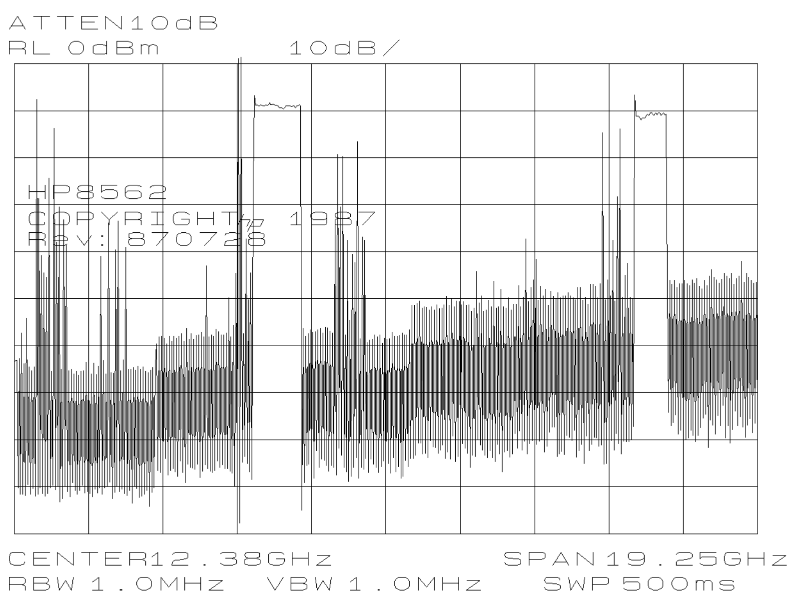


Figure 5-9. Display Example when 0.5 V/GHz is Not Selected

The tracking source stops tracking. The tracking source output only tracks the host instrument for small portions of the total span range. This symptom may be especially obvious after pressing the preset key on the spectrum analyzer because the preset state is LO sweep.

The sweep + tune output connector on these host instruments is also used for the 0 to 10 V LO sweep output. A menu key selects between 0.5 V/GHz and 0 to 10 V, LO sweep output.

To resolve the problem, try these suggestions:

- Select the 0.5V/GHz setting.
- Store the preset state with the 0.5 V/GHz setting as the power-on state. Press the following keys on the HP 8561A or HP 8562A/B portable spectrum analyzer:
  1. Press (PRESET).
  2. Press (SWEEP).
  3. Press REAR PANEL OUTPUT.
  4. press .5V/GHz (FAV).
  5. press (SAVE), then PWR ON STATE.
  6. To invoke the setting after pressing (PRESET), recall the power-on state.
- Press the following keys on an HP 8560A/E, HP 8561B/E, or HP 8563A/E portable spectrum analyzer:
  1. Press (PRESET).
  2. Press (AUX CTRL).
  3. Press REAR PANEL.
  4. Press .5V/GHz (FAV).
  5. Press (SAVE), then PWR ON STATE.
  6. To invoke the setting after pressing (PRESET), recall the power-on state.

If small steps in amplitude appear on the output signal

Small amplitude steps may appear on the output signal when the HP 8560 Series spectrum analyzer is running a flatness-correction self adjustment. The amplitude steps are most obvious in a 1 dB per division setting. This self adjustment is normal operation for the portable spectrum analyzer.

Symptoms when flatness correction is needed

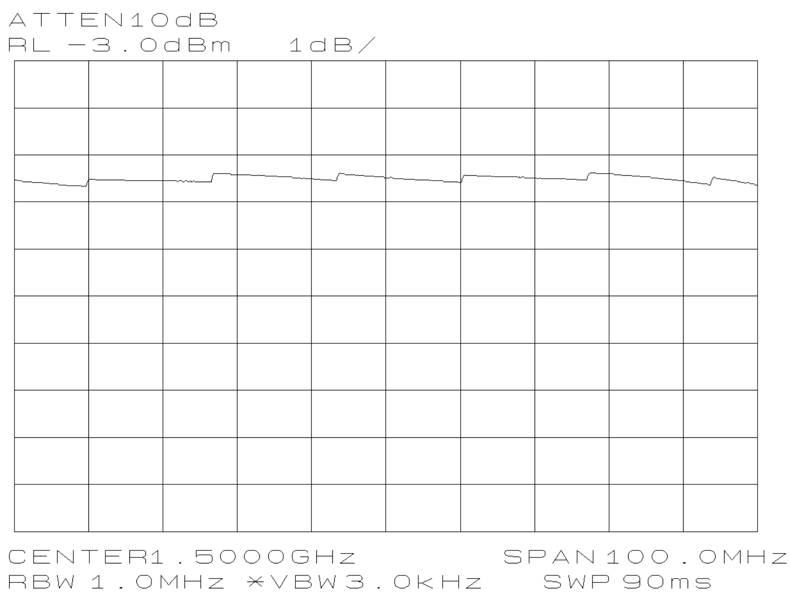


Figure 5-10. Flatness Correction Affects Display Example

Small steps in amplitude appear. Small steps of amplitude (a few tenths of a dB) appear in an otherwise smooth trace. The steps are usually about 15 MHz or more apart.

Portable spectrum analyzers improve flatness by internally adjusting gain at specific frequencies during a sweep. The results of the adjustment often appear on the display, especially in a 1 dB per division setting.

This self adjustment is normal operation for portable spectrum analyzers.

If there are signal drop-outs along the trace

If the start-frequency setting of the host instrument is less than 0 Hz, an error occurs in the sweep + tune output signal.

Symptoms when a negative start frequency is used

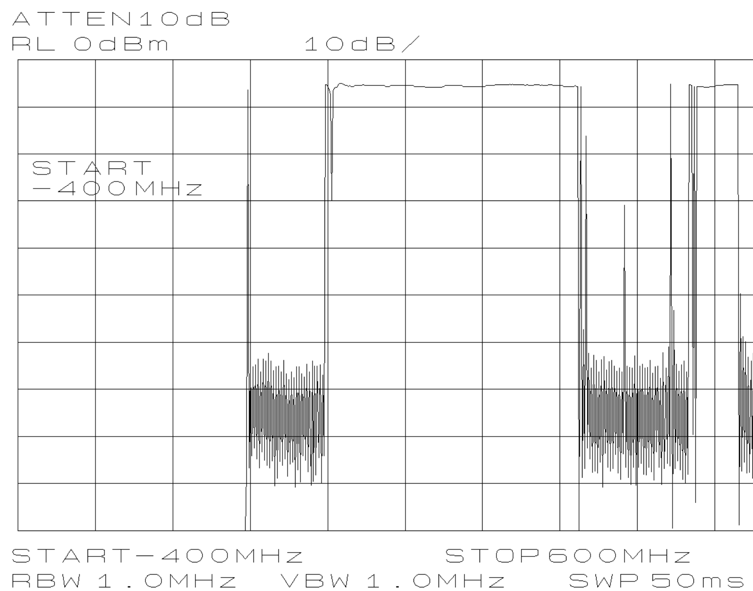


Figure 5-11. Negative Start Frequency Display Example

There are drop-outs in the signal trace. Signal drop-outs appear in the displayed output.

On some models of portable spectrum analyzers, an error in the sweep + tune output occurs whenever the start frequency is less than 0 Hz.

To resolve the problem, try the following suggestion:

- Set the start frequency of the host spectrum analyzer to a value greater than 0 Hz.

If there are repeating patterns on the trace

If resolution bandwidths less than 300 Hz are selected on the host spectrum analyzer, there may be spikes displayed along the output trace.

Some portable spectrum analyzer models generate narrow resolution bandwidths (below 300 Hz) digitally. Digital resolution bandwidths are incompatible with the tracking source. Refer to the host spectrum analyzer operating manual for information about these bandwidths.

Symptoms when digital resolution bandwidths are used

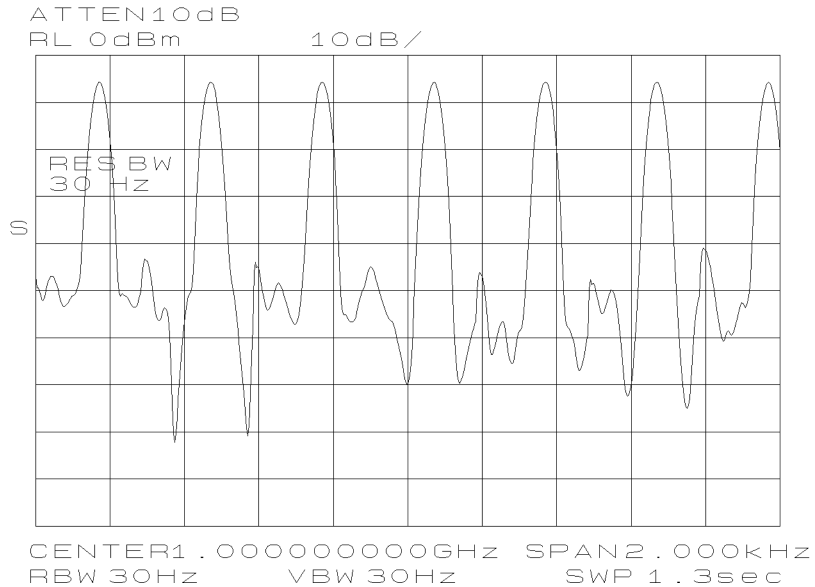


Figure 5-12. Using Digital Resolution Bandwidth Less than 300 Hz

There is a repeating pattern on the trace. A repeating pattern of broad, rounded spikes appears across the display when resolution bandwidths below 300 Hz are used. The spacing between the spikes changes when span width changes.

To resolve the problem, try the following suggestion:

- Set the resolution bandwidth of the host spectrum analyzer to at least 300 Hz.

Use the information in this section if your host instrument is an HP 8566A/B spectrum analyzer.

The primary problem that may occur with this host instrument is that the HP 8566A/B spectrum analyzer may need preselector peaking. Refer to the illustration and information below.

If there are amplitude glitches in the output signal

If the host spectrum analyzer preselector is not peaked, amplitude shifts or abrupt variations in amplitude ("glitches") may appear on the displayed signal.

Symptoms when host preselector peaking needed

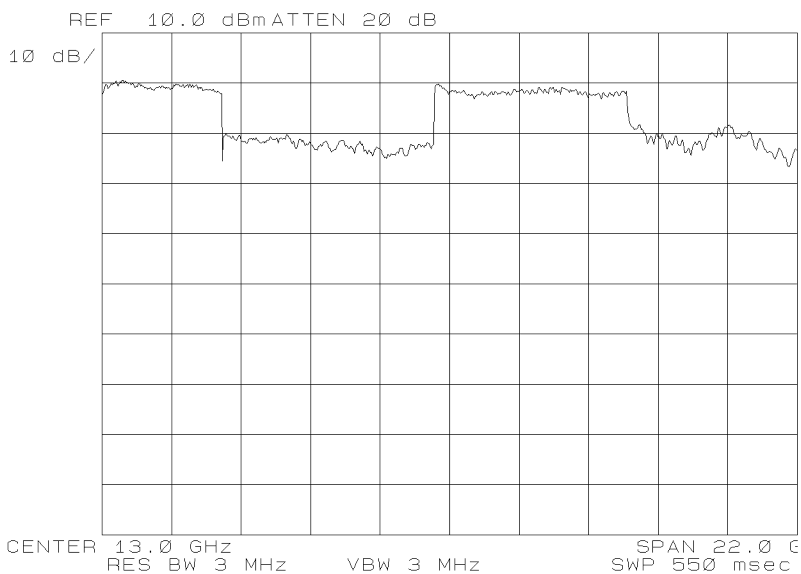


Figure 5-13. Example of Need for Host Spectrum Analyzer Preselector Peaking

There are abrupt variations in amplitude (glitches). Either amplitude glitches appear at the beginning of one or more of the frequency bands and above 2 GHz, or an amplitude-level shift appears during an entire band.

To resolve the problem, try the following suggestions:

- Adjust the host spectrum analyzer preselector for each band, as needed.
- Perform the host spectrum analyzer preselector adjustment from its front panel. If the preselector peaking adjustment has drifted over time, it may not be apparent until a tracking source is connected.
- Adjust the preselector DAC in the spectrum analyzer. For any frequency band, place a marker anywhere within the band. Press (SHIFT) (blue key) then the (CONT) key in the SWEEP keys block to activate the preselector DAC. Use the step keys, knob, or data keys to adjust the preselector DAC.

P

Use the information in this section if you are using an HP 8590 Series spectrum analyzer as the host instrument.

This section contains information about conditions that can be caused by the following item:

- The HP 8590 Series portable spectrum analyzer HI SWEEP signal is not connected. Refer to the illustration and information below.

If there are signal drop-outs

The tracking source needs to have the high-sweep signal connected from the host instrument. If it is missing, there will be signal drop-outs in the output signal.

Symptoms when the high-sweep signal is missing

There are signal drop-outs at the beginning of the sweep. Drop-outs appear at the beginning of the sweep in certain spans and center frequencies.

To resolve the problem, try these suggestions:

- Check that the HP 8590 Series spectrum analyzer high-sweep output signal is connected to the HI SWEEP connector on the tracking source.
- Check that the measurement cable is working properly.
- Check that the tracking source is configured to operate with the host model number you are using. Press (CONFIG) and review the `HOST SELECT` menu choice.

Use the information in this section if your host instrument is a signal source.

Some of the common problems include an incorrect frequency offset, a missing stop-sweep signal, or a misadjustment of tracking due to measurement cable length.

The information in this section is organized by the symptoms that might occur when these problems are encountered.

If the frequency and amplitude appear wrong

The tracking source offset tracking mode must be used whenever the host signal source frequency is in any band other than the lowest band. If the mode is not properly set, the signal frequency, and possibly the amplitude, appear wrong.

Symptoms when frequency offset is wrong

There are frequency and amplitude errors. The output frequency, and possibly the displayed amplitude, are incorrect. The offset frequency of the tracking source needs to be greater than N×30 MHz in bands 1, 2, 3, and 4.

Unless a host signal source is set to the lowest band, which generally includes frequencies below 2 GHz, the tracking source *must* be set for offset tracking.

Refer to the signal source's operating manual for band numbers and harmonic numbers. To resolve the problem, try the following suggestion:

- Set the tracking source offset frequency to a value greater than N×30 MHz. N is the harmonic number of the band being used. Refer to the operation manual of the host instrument you are using for the harmonic number of the frequency bands.

If there are signal drop-outs at the start of the signal

The tracking source needs a stop-sweep signal connected to its rear panel. If this signal is not connected, the start of the trace may exhibit drop-outs.

Symptoms when stop-sweep signal is missing

The frequency may be incorrect.

There may be signal drop-outs. Signal drop-outs may appear at the beginning of a sweep.

Try the following suggestion to resolve the problem:

- Make sure the host signal source stop-sweep signal is connected to the HI SWEEP input on the tracking source.

If the tracking frequency is off

The frequency of the tracking source signal needs to be the same as the host instrument signal. The tracking frequency can be off if the cable length creates a delay.

Symptoms when cable length causes need for tracking adjust

The tracking frequency is off. Tracking frequency is off by a few kHz when fast sweep rates are used, especially when measurement cables in the setup are 1 meter long or more.

Cable length can create enough of a delay to cause a tracking offset, especially when fast sweep rates are used. The proper solution for this problem depends largely on the test setup.

To resolve the problem, try these suggestions:

- Try adding a length of cable in parallel with the path of the long cable.
- Try widening the resolution bandwidth setting used to display the measurement results. Make the resolution bandwidth wide enough to include the offset.

- Change the tracking adjust setting such that it eliminates the problem. The setting, however, is valid only as long as the sweep rate of the host signal source (GHz/s setting) is not changed.
- Try decreasing the sweep rate (increasing the sweep time) of the host instrument.

Use the information in this section if you are using an HP 8340/8341 Series synthesized source.

The primary problem that may occur is a signal tracking problem caused by the synthesized source V/GHz value.

If signal tracking stops after about 19 GHz

The synthesized source has a 1 V per GHz output. This output needs to be 0.5 V per GHz to operate with the tracking sources.

Symptoms when a 1 V/GHz setting limits signal tracking

Tracking stops after about 19 GHz. The tracking source works correctly up to about 19 GHz. Above 19 GHz, tracking stops.

The default sweep + tune sensitivity for these hosts is 1 V/GHz. The signal output, however, is limited to about 19 V. As a result, the sweep + tune signal is invalid above about 19 GHz.

To resolve the problem, try this suggestion:

- Modify the two internal jumpers in the synthesized source to change the sensitivity to 0.5 V/GHz. Refer to the HP 8340/8341 Series synthesized source documentation for instructions. This change allows the full range of the host signal source to be tracked by the tracking source.

If signal tracking works only for a limited range

The sweep + tune sensitivity setting on the synthesized source may need to be changed. This is a hardware change and cannot be done from the front-panel.

Symptoms when the 1 V/GHz setting needs to be 0.5 V/GHz setting

Signal tracking works over limited range. Signal tracking works only for a limited range of frequency, near the beginning of the first band (usually near about 10 MHz).

Tracking source output becomes unstable. Above the frequency range of the first band, the tracking source output frequency becomes unstable.

To resolve the problem, try these suggestions:

- Check that the proper synthesized source is selected in the tracking source configuration menu.
- Verify the sensitivity of the source. If the 0.5 V/GHz jumper modification to the synthesized source has been made, the source's sensitivity may not be the same as the rear-panel label indicates. Tune it to 10 GHz. Select CW mode and measure the signal at the 1V/GHz OUTPUT with a voltmeter.
  - If the voltage measures near 10 volts, the sensitivity is 1 V/GHz.
  - If the voltage measures near 5 volts, the sensitivity is 0.5 V/GHz.

If there are signal drop-outs at the end of a sweep

If the sweep speeds of the synthesized source and the spectrum analyzer used as the display are different, signal drop-outs may appear at the right-hand side of the display.

Symptoms when sweep times are unsynchronized

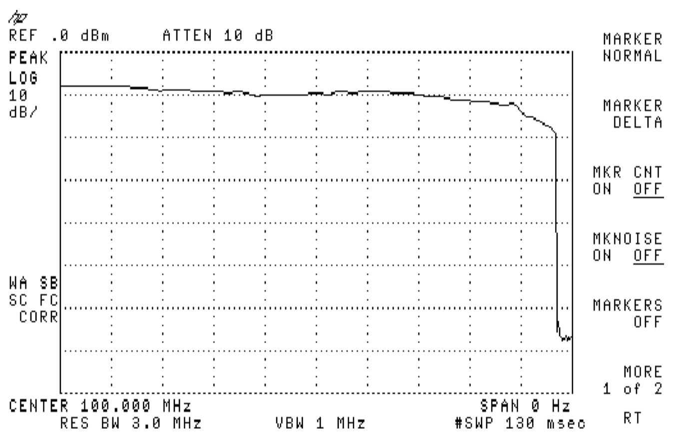


Figure 5-14. Display Example of Non-synchronized Sweep Times

Signal drop-outs appear on the right-hand side of the display. The signal trace displayed on a spectrum analyzer drops out at the right-hand side of the display. This symptom may appear if the displayed signal is a combination of a signal from the host source and the tracking source, combined through a device such as a mixer. The spectrum analyzer displaying the trace is in zero span. Its sweep is externally triggered by the host source, and its center frequency equals the tracking offset setting of the tracking source.

This problem is due to the difference in sweep times between the host source and the spectrum analyzer. Although both instruments may display the same sweep time values, there is some inaccuracy caused by internal hardware tolerances.

To resolve the problem, try the following:

- Adjust the sweep time of the synthesized source or of the spectrum analyzer. Use the data keys, if necessary, to change the sweep times and make the numeric values equal. Make small changes with the knob until the drop-out just disappears from the screen.

P U P 8350 O

Use the information in this section when you encounter problems while you are using an HP 8350 Series sweep oscillator as the host instrument.

A common problem that may occur when using this host instrument is related to tracking adjust. The tracking error is due to the frequency inaccuracy of the internal downconverter oscillator in the sweep oscillator.

If the signal amplitude decreases

If the tracking source signal tracking needs adjustment, the output signal amplitude may decrease.

Symptoms when tracking adjust is needed

There is a frequency offset. The output frequency of the tracking source tracks with an offset of up to several MHz in the lowest frequency band.

There is a decrease in amplitude. The symptom may manifest itself as an amplitude decrease if the display device you are using can detect the amplitude change.

Low band (band 0) in sweepers usually includes frequencies below 2 GHz. These frequencies are generated with an additional downconverter oscillator. The additional oscillator is free running (not phase locked).

As a result the downconverter oscillator frequency can vary several MHz from the desired value, causing an unpredictable frequency offset at the RF output. This condition only occurs when low-band frequencies are being used.

To resolve the problem, try these suggestions:

- Try adjusting the tracking source by pressing the front-panel (TRKG ADJUST) key. Generally, however, the front-panel tracking adjust does not have the range needed to resolve the problem.

- If the tracking adjust range is too limited, use the offset tracking mode and adjust the offset frequency to compensate for the host frequency inaccuracy.

Service tags. Insert Service Tag card here. Throw this page away.

6

Error Messages

Error Messages

What's in This Chapter?

Tracking Source Error Messages	Refer to this information for the error messages that may occur when you are using the tracking source.

The SCPI (standard commands for programmable instruments) system is used as the standard error code set.

Error messages that begin with a negative (−) sign are generated by SCPI command errors. A brief description about the cause of the error and possible solutions are provided in the error message descriptions. For more thorough information about command-related error messages, refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document.

SCPI command related error messages (those preceded with the negative sign) are purged from instrument memory after they are reviewed. Non-negative error messages are retained in instrument memory until you delete them with a command or preset the tracking source. Refer to the list below for error-message categories:

Error Range	Error Category
−100 to −199	SCPI Command Language Errors
−200 to −299	SCPI Command Execution Errors
−300 to −399	SCPI Related Device-Specific Errors
−400 to −499	SCPI Command Query Errors
100 to 199	Tracking Source Controller-Board Device Errors
200 to 299	Tracking Source Frequency Errors
300 to 399	Reserved
400 to 499	HP-IB Remote Errors
500 to 599	Reserved
600 to 699	Tracking Source Calibration Errors
700 to 799	Math Errors
800 t0 899	Tracking Source Self-Diagnostics Test Errors

SCPI Command Language Errors

SCPI command language errors can occur during remote command execution.

ERR −100

`COMMAND ERROR.` General SCPI command error. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −101

`INVALID CHARACTER.` General SCPI command error related to the syntax used. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −102

`SYNTAX ERROR.` An unrecognized SCPI command or data type was encountered. As an example, a string was received, but string data is not accepted by the destination device. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −103

`INVALID SEPARATOR.` The parser expected a separator, but encountered an illegal character. As an example, a colon was omitted in a SCPI command string as shown below:

```
OUTPUT 703;"SYSTem ERRor"
```

versus

```
OUTPUT 703;"SYSTem:ERRor"
```

ERR −104

`DATA TYPE ERROR.` The parser received data elements that are not allowed. This error may occur if string or numeric data is expected, but block data is received.

ERR −105

`GET NOT ALLOWED.` A GET (group execute trigger) is received within a command string. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −106

`BAND DATA NOT ALLOWED.` The `SOURCE:SWEEP:HOST:A:BAND` command was sent before the `SOURCE:SWEEP:HOST:A` command was sent.

ERR −107

`CUSTOM HOST NOT LOADED.` No previous data was loaded and the custom host was selected using the `SOURCE:SWEEP:RSEL` command.

ERR −108

`PARAMETER NOT ALLOWED.` There were more parameters received than expected for the header. As an example, sending `CALibration:TRACk:ADJust 128,255` can cause the error. `CALibration:TRACk:ADJust` can only accept one parameter.

ERR −109

`MISSING PARAMETER.` Fewer parameters were received than required for the header. As an example, sending `DISPlay:BRIGhtness` can cause this error. `DISPlay:BRIGhtness` requires a numeric parameter.

ERR −112

`PROGRAM MNEMONIC TOO LONG.` Your program header contains more than 12 characters. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −113

`UNDEFINED HEADER.` You used a header that was undefined for the receiving device. The syntax is correct. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −121

`INVALID CHARACTER IN NUMBER.` Your command included a data character that is invalid. As an example, you entered a "9" in octal data, or an alpha in decimal data. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −123

`NUMERIC OVERFLOW.` The exponent is too large. The magnitude of the exponent cannot exceed 32000.

ERR −124

TOO MANY DIGITS. The mantissa of your decimal numeric data element contained more than 255 digits, excluding leading zeros. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −128

NUMERIC DATA NOT ALLOWED. Your data contained valid numeric data, but numeric data is not allowed for this operation. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −131

INVALID SUFFIX. Your command suffix does not follow the syntax described in the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document. Refer to this document for information.

ERR −138

SUFFIX NOT ALLOWED. A suffix was encountered after a numeric element that does not allow suffixes.

ERR −141

INVALID CHARACTER DATA. There is invalid character data in your command. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −144

CHARACTER DATA TOO LONG. There are more than 12 characters in your character data element. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −148

CHARACTER DATA NOT ALLOWED. Your data contained valid character data, but character data is not allowed for this operation. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −150

STRING DATA ERROR. Your string data contains an error. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −151

`INVALID STRING DATA.` There is invalid string data in your command. As an example, an END message may have been received before the terminal quote character. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −158

`STRING DATA NOT ALLOWED.` Your data contained valid string data, but string data is not allowed for this operation. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −160

`BLOCK DATA ERROR.` Your block data contains an error. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −161

`INVALID BLOCK DATA.` There is invalid block data in your command. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −168

`BLOCK DATA NOT ALLOWED.` Your data contained valid block data, but block data is not allowed for this operation. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −170

`EXPRESSION ERROR.` Your expression data contains an error. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −171

`INVALID EXPRESSION.` There is invalid expression data in your command. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −178

`EXPRESSION DATA NOT ALLOWED.` Your data contained valid expression data, but expression data is not allowed for this operation. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

SCPI Command Execution Errors

SCPI command execution errors can occur during remote command operations. Errors from −200 to −299 occur if an error is detected in the instrument's execution control block. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information. The error may be due to the following causes:

- A <PROGRAM DATA> element following a header appears to be outside of its legal input range, or is otherwise inconsistent with the operation's capabilities.
- A valid command sequence could not be completed due to an instrument problem.

ERR −200

EXECUTION ERROR. Your command contains a parameter error and could not be executed. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −222

DATA OUT OF RANGE. Your program data is valid, but is outside the legal range defined for this operation. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −223

TOO MUCH DATA. Your program contains legal block, expression, or string data, but more than the operation could manage due to memory or related operation-specific requirements. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −276

MACRO RECURSION ERROR. Your program contains syntactically legal macro-program data, but could not be executed because it appears to be recursive. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

ERR −277

`MACRO REDEFINITION NOT ALLOWED.` Your program contains syntactically legal macro label in the *DMC command, but it could not be executed because it matches a previously defined macro label. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

SCPI Related Device-Specific Errors

SCPI related device-specific errors may occur during remote operation. Errors from −300 to −399 occur when the instrument detects an error that is not a command error, query error, or execution error. Some device operation may not have completed due to hardware trouble. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information. The offending hardware may be among the following types:

- Storage media related devices, for example EEROMs or EPROMs.
- Any instrument components used during SCPI command execution.

`ERR −310`

`SYSTEM ERROR.` Some problem has occurred at the system level. Check all cable connections and configuration settings.

`ERR −350`

`QUEUE OVERFLOW.` More errors occurred than were recorded by the instrument.

SCPI Command Query Errors

SCPI command query request or response errors may occur during remote operation. Errors from −400 to −499 occur if an error is detected that is related to the query response operation. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information. The error may be due to the following causes:

- An attempt was made to read data from the query response when no data was available.
- The query data has been lost.

`ERR −400`

`QUERY ERROR.` This error indicates that there is an error condition in the query command or in the query process. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

`ERR −410`

`QUERY INTERRUPTED.` This error indicates that the query operation has been interrupted by an unknown condition. For example, a query followed by DAB or GET before the query response was completely sent. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

`ERR −420`

`QUERY UNTERMINATED.` This error indicates that the query operation was unterminated. For example, an operation required the instrument to talk, but the request string contained incomplete or wrong data. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

`ERR −430`

`QUERY DEADLOCKED.` This error indicates that the query operation is frozen. For example, both input buffer and output buffer are full, and the operation cannot continue. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

`ERR -440`

`QUERY UNTERMINATED after indefinite response.` This error indicates that the query was received within the same command sequence that requested an indefinite response. Refer to the *IEEE 488.2 Standard Codes, Formats, Protocols and Common Commands* document for information.

Tracking Source Controller-Board Device Errors

The tracking source may exhibit device-related errors that occur during use.

ERR 101

BATTERY LOW. The battery (BT1 on the controller board) power is low. Typical battery life is about 20 years from installation. Worst case battery life is about 1 year from installation. This message occurs at power up. It is best to replace the battery at the first occurrence of this error message.

ERR 102

EEROM CHK SUM 1. The stored calibration data is corrupt and the instrument needs service. The EEROM is probably defective and needs to be replaced. Once the EEROM is replaced the instrument needs to be recalibrated, and the calibration data restored in the EEROM.

ERR 103

ERROM CHK SUM 2. The stored calibration data is corrupt and the instrument needs service. The EEROM is probably defective and needs to be replaced. Once the EEROM is replaced the instrument needs to be recalibrated, and the calibration data restored in the EEROM.

ERR 104

EEROM CHK SUM 3. The stored calibration data is corrupt and the instrument needs service. The EEROM is probably defective and needs to be replaced. Once the EEROM is replaced the instrument needs to be recalibrated, and the calibration data restored in the EEROM.

ERR 107

MODEL ??. The EEROM is probably defective, return the instrument for service. Refer to Chapter 5 of this manual for the HP sales and service offices table.

ERR 108

CANNOT PROGRM EE. Your calibration data is not getting stored in the EEROM. There may be a controller board hardware problem. The instrument needs service.

ERR 109

DATA BUS FAILURE. There seems to be an internal instrument-bus related problem. The error is probably caused by hardware problems; the instrument needs to be serviced.

ERR 110

ADC FAILURE. There seems to be a controller board ADC problem. The instrument needs to be serviced.

Tracking Source Frequency Errors

The tracking source may exhibit frequency-related errors during use.

`ERR 200`

`LO UNLOCK.` There seems to be a problem with the RF board in the instrument. The instrument needs to be serviced.

HP-IB Errors

There may be HP-IB related errors that occur during use. The user is not responsible for these errors. They are instrument-bus related problems.

ERR 401

`HPIB OPEN STATUS.` Instrument HP-IB problem. Contact service personnel. Refer to Chapter 5, "If You Have Problems" for sales and service office information.

ERR 402

`HPIB OPEN STREAM.` Instrument HP-IB problem. Contact service personnel. Refer to Chapter 5, "If You Have Problems" of this manual for sales and service office information.

Tracking Source Calibration Errors

There may be errors that occur during self-calibration routines.

ERR 601

ALC HIBAND. This error may occur if an incorrect (non-monotonic) power value is entered during the ALC high-band adjustment.

ERR 602

ALC LOBAND. This error may occur if an incorrect (non-monotonic) power value is entered during the ALC low-band adjustment.

ERR 604

ALC LOOP. This error may occur during the Amplitude Peak adjustment (ADJ #1) if the instrument is unable to properly adjust the power level.

ERR 605

MOD AMP LOW PWR. This error may occur during the Amplitude Peak adjustment (ADJ #1) if the instrument detects that the MOD AMP output power is below test limit.

ERR 606

2ND LVL AMP ADJ. This error may occur if the host instrument sweep + tune voltage is not at the correct level. This could be due to an incorrect host frequency setting, a bad external cable, or an internal discriminator failure.

ERR 608

SWP+TUNE CAL. This error may occur if the host instrument sweep + tune voltage is not at the correct level. This could be due to an incorrect host frequency setting or to a bad connection between the host instrument and the tracking source sweep + tune connector.

ERR 609

ALC EXTERNAL. This error may occur if an incorrect (non-monotonic) power level is entered during the ALC External adjustment.

ERR 610

YTM PEAK FAIL. This error may occur during the Amplitude Peak adjustment (ADJ #1) if the instrument is unable to complete the peaking algorithm due to broken hardware.

Math Errors

Math errors may occur during tracking source operation. These errors are not user generated; they occur only if a firmware problem exists.

ERR 750

DIVIDE BY ZERO. Firmware problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 751

FLOATING UNDERFLOW. Firmware problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 752

FLOATING OVERFLOW. Firmware problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 753

ILLEGAL OPERAND. Firmware problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 754

DETECT NaN. Firmware problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 755

LOSS OF PRECISION. Firmware problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 756

INEXACT RESULT. Firmware problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

Tracking Source Self-Diagnostic Test Errors

Self-diagnostic test errors may occur during tracking source operation.

For most of the following errors, refer to the *HP 85644A/85645A Tracking Source Service Guide* for service information.

ERR 801

MOTHER BUS. Mother-bus interface problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 802

FNT PANEL BUS. Front panel interface problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 803

INT BUS FAILURE. Internal bus interface problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 804

ADC GND INPUT. Analog-to-digital converter ground-input problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 805

ADC VERF INPUT. Analog-to-digital converter voltage reference input problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 806

CNTRL REVISION?. The A2 controller assembly revision is unknown. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 807

ADC 24V INPUT. Analog to digital 24V-input problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 808

ADC/MOD 7V INPUT. Analog to digital converter 7V-input problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 809

`ADC/MOD −3V INPT.` Analog to digital converter MOD-amplifier −3V-input problem. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 810

`HIGH BAND SWITCH.` High band switch operation does not meet test limits. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 811

`LOW BAND SWITCH.` Low band switch operation does not meet test limits. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 812

`LOW BAND PWR OFF.` Unable to reduce low band power to specified level. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 813

`LOW BAND PWR ON.` Unable to increase low band power to specified level. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 814

`RF ASSY REV?.` The A3 RF assembly revision is unknown. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 815

`ADC/RF GND INPUT.` Analog-to-digital converter RF ground input value does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 816

`ADC/RF VERF INPT.` Analog-to-digital converter reference input does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 817

`SWPTUNE OFF FINE.` Sweep + tune OFFSET FINE DAC does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 818

`SWPTUNE OFF COAR.` Sweep + tune OFFSET COARSE DAC does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 819

`SWPTUNE GAIN CW.` Sweep + tune GAIN CW switch operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 820

`UNLOCK SRCH NEG.` Unlock detector and search-down circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 821

`UNLOCK SRCH POS.` Unlock detector and search-up circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 822

`CW UNLOCK SRCH.` Unlock detector and CW-search circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 823

`MAIN COIL SUMAMP.` Main coil summing amplifier operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 824

`MAIN COIL BND SW.` Main coil band-switch circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 825

`MAIN COIL DVR.` Main coil driver operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 826

`FM DVR.` FM coil driver operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 827

PLL1 INTEGRATOR. Phase locked loop 1 integrator operation does not meet test limits. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 828

PLL2 INTEGRATOR. Phase locked loop 2 integrator operation does not meet test limits. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 829

PLL3 INTEGRATOR. Phase locked loop 3 integrator operation does not meet test limits. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 830

YTO INTEGRATOR. YTO loop integrator operation does not meet test limits. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 831

ALC PREAMP. ALC preamplifier circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 832

ALC COARSE DAC. ALC coarse level DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 833

ALC FINE DAC. ALC fine level DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 834

ALC SLOPE DAC. ALC slope DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 835

YTO LEVELING. YTO level voltage does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 836

`ALC LOOP INTGR.` ALC loop integrator operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 837

`SWP_T_BUFFER.` Sweep + tune buffer operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 838

`YTM GAIN DAC.` YTM gain DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 839

`YTM BP 3 DAC.` YTM breakpoint-3 DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 840

`YTM BP4 FREQ DAC.` YTM breakpoint-4 frequency DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 841

`YTM BP4 DAC.` YTM breakpoint-4 DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 842

`YTM OFFSET DAC.` YTM offset DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 843

`YTM BP1 DAC.` YTM breakpoint-1 DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 844

`YTM BP2 DAC.` YTM breakpoint-2 DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 845

`YTM DRIVE.` YTM drive circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 846

`BIAS BAND OFFSET.` Bias band offset DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 847

`BIAS OFFSET DAC.` Bias offset DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 848

`BIAS GAIN DAC.` Bias gain DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 849

`PWR LEVEL DAC.` Power level adjust DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 850

`SYTM BIAS DAC.` SYTM bias DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 851

`LEVEL AMP DAC.` Leveling amplifier driver DAC operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 852

`260 MHz OSC.` The 260 MHz oscillator circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

ERR 853

`4.2 GHz OSC.` The 4.2 GHz oscillator circuit operation does not meet test limit. Contact service personnel. Refer to Chapter 5 for sales and service office information.

7

Front-Panel Operation

Front-Panel Operation

What's in This Chapter?

This chapter contains the following information:

Front- and Rear-Panel Features	This is an overview of the tracking source's connectors and status indicators. The information in this section is not alphabetized.
Tracking Source Preset Conditions	This section contains two tables, one lists the instrument's preset states and the other lists the menu selections' preset states.
Front-Panel Key and Menu Selection Descriptions	This is an alphabetically organized reference section that describes the operation of the tracking source front-panel keys and menu selections.

The following information describes the tracking source's front- and rear-panel connectors as well as the status indicators. Unless stated otherwise, this information applies to both tracking source models.

Front-Panel Features

This section contains illustrations and descriptions of the front panel of both the HP 85644A and HP 85645A tracking sources.

Figure 7-1 identifies the front panel features of the HP 85644A tracking source. Figure 7-2 identifies the front panel features of the HP 85645A tracking source.

The descriptive text is organized by following the front-panel features in a clockwise direction, starting at the LINE switch.

Front- and Rear-Panel Features

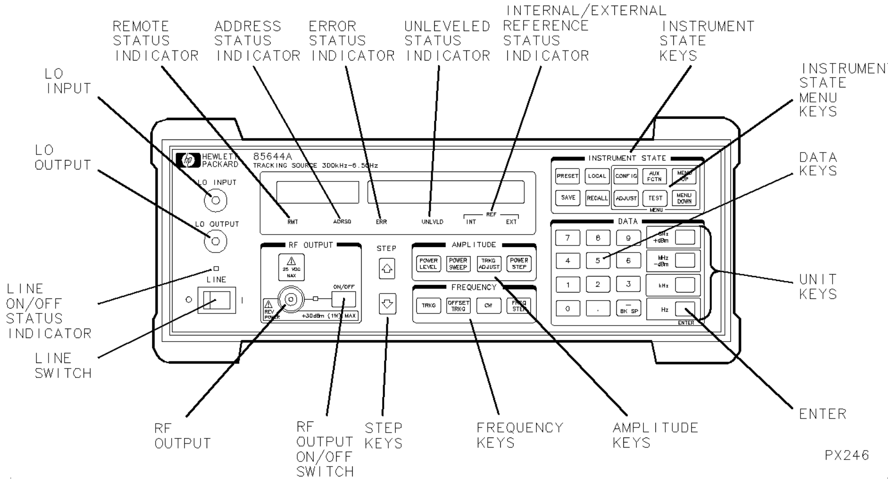


Figure 7-1. HP 85644A Tracking Source Front-Panel Features

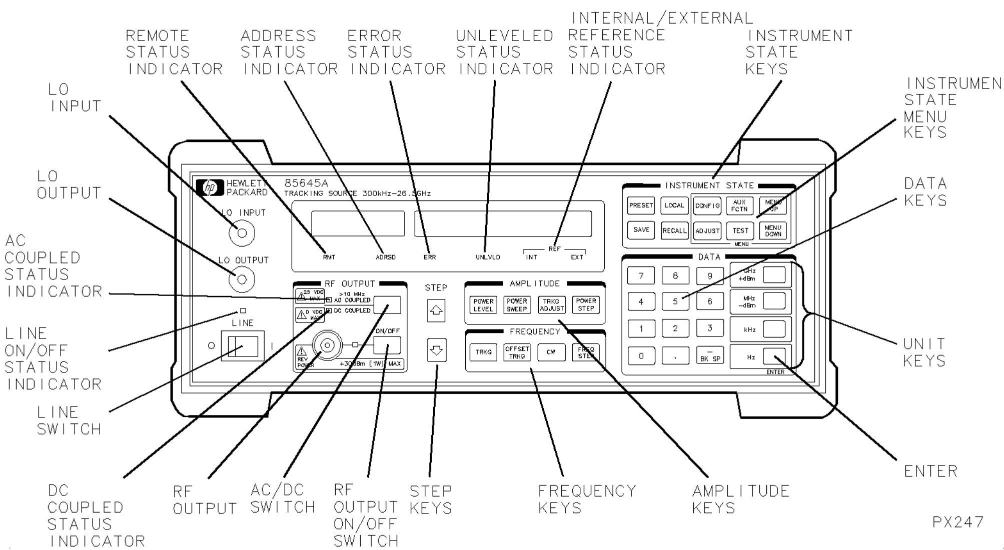


Figure 7-2. HP 85645A Tracking Source Front-Panel Features

LINE 0 1	This is the instrument on or off switch. The numbers 0 and 1 indicate off and on, respectively.
LINE	This is the on or off status indicator. This status indicator lights when the instrument is turned on. The indicator goes off when the instrument is turned off.
AC COUPLED	This is the ac coupling status indicator (available with the HP 85645A tracking source only). When the RF output is ac coupled, the AC COUPLED status indicator lights.
LO OUTPUT	This connector provides an LO output signal that matches the input frequency. The frequency range is 2 GHz to 7 GHz and the output power range is nominally +7 dBm.
LO INPUT	This connector accepts a frequency range of 2 GHz to 7 GHz. An LO input signal is required for tracking and offset tracking operations. An input power of more than −10 dBm is required for proper operation.
RMT	This is the remote operation status indicator. This status indicator lights when the tracking source is in remote operation mode. The (PRESET) and (LOCAL) keys are the only front-panel keys that are usable when the RMT status indicator is lit.
ADRSD	This is the addressed status indicator. This status indicator lights when the tracking source has received a remote command. The front-panel keys and controls remain functional if only the ADRSD status indicator is lit. Turn the status indicator off by pressing the (LOCAL) front-panel key.
ERR	This is the error status indicator. This status indicator lights when there is an internal error condition in the tracking source. The internal error may be caused by tracking source software or hardware, or it may be related to a remote-operation problem. You can press the (TEST) key, then scroll through the errors when this indicator is lit. Refer to the description of the (TEST) key in the alphabetical reference in this chapter.

UNLVLD

This is the unleveled-power status indicator. This status indicator lights when the RF output power is unleveled. The flashing that might occur during retrace can be suppressed when using HP 8566A/B spectrum analyzer or HP 8560 Series portable spectrum analyzer hosts by properly connecting the BLANKING or PEN LIFT connector to the tracking source BLANK IN connector. On HP 8590 Series portable spectrum analyzer hosts, connect the HIGH SWEEP IN/OUT connector to achieve the same result. Refer to Table 7-2 for a list of supported host instruments. Typically, this indicator lights (or flashes) due to either of the following events:

- When your requested output power exceeds the capability of the tracking source.
- During host retrace if the tracking source BLANK IN signal is not connected to the host instrument's BLANKING or PEN LIFT connector.

  In some instances, the unleveled indicator does not have enough time to light during an unleveled state.

REF

The reference status indicator labeled INT is for the internal 10 MHz reference. This status indicator lights when the tracking source is using its internal 10 MHz reference oscillator. Use of an external 10 MHz reference is recommended, especially for CW mode or at lower frequencies (in band 0) and narrow resolution bandwidth measurement conditions.

The status indicator labeled EXT is for the external 10 MHz reference. This status indicator lights when you use an external 10 MHz reference. The 10 MHz external reference input connector is located on the tracking source's rear panel. When an appropriate input signal with correct frequency and power is detected at this connector, this reference signal is automatically used by the tracking source.

INSTRUMENT STATE

The (PRESET), (LOCAL), (SAVE), and (RECALL) keys control instrument related states. Refer to the key descriptions in this chapter for information.

INSTRUMENT STATE MENU	The (CONFIG), (AUX FCTN), (MENU UP), (ADJUST), (TEST), and (MENU DOWN) keys access the instrument operation menus. Refer to the key descriptions in this chapter for information.
DATA	The data keys are used to enter values during operation.
Units Keys	The keys in this group allow you to terminate data entry with the appropriate units.
ENTER	This key allows you to complete an operation that requires termination. This key also allows you to select a menu key operation. Refer to the descriptions of front-panel keys and menu keys for more information.
AMPLITUDE	The (POWER LEVEL), (POWER SWEEP), (TRKG ADJUST), and (POWER STEP) keys, control the amplitude function of the tracking source. Refer to the key descriptions in this chapter for information.
FREQUENCY	The (TRGK), (OFFSET TRKG), (CW), and (FREQ STEP) keys control the frequency function of the tracking source. Refer to the key descriptions in this chapter for information.
STEP	The (⇧) and (⇩) keys control the step function. The step keys perform two major functions. One of them is to control data values. The size of the step can be changed for your measurement requirements. The second major function is to toggle or scroll through items available in menu selections. Refer to the STEP key descriptions in this chapter for information.
RF OUTPUT ON/OFF	This is the on or off switch for the tracking source RF output power. When RF output is turned on, the status indicator lights. The indicator turns off when the RF output power is turned off.
AC/DC Switch	This is the switch to use to select either ac or dc coupling on an HP 85645A tracking source.
RF OUTPUT	This connector provides the RF tracking output signal or a signal that can be used as a CW source. Refer to Chapter 5 for information about the RF output.

DC COUPLED	This is the dc coupling status indicator (available with the HP 85645A tracking source only). When the RF output is dc coupled, the DC COUPLED status indicator lights.

Rear-Panel Connectors and Features

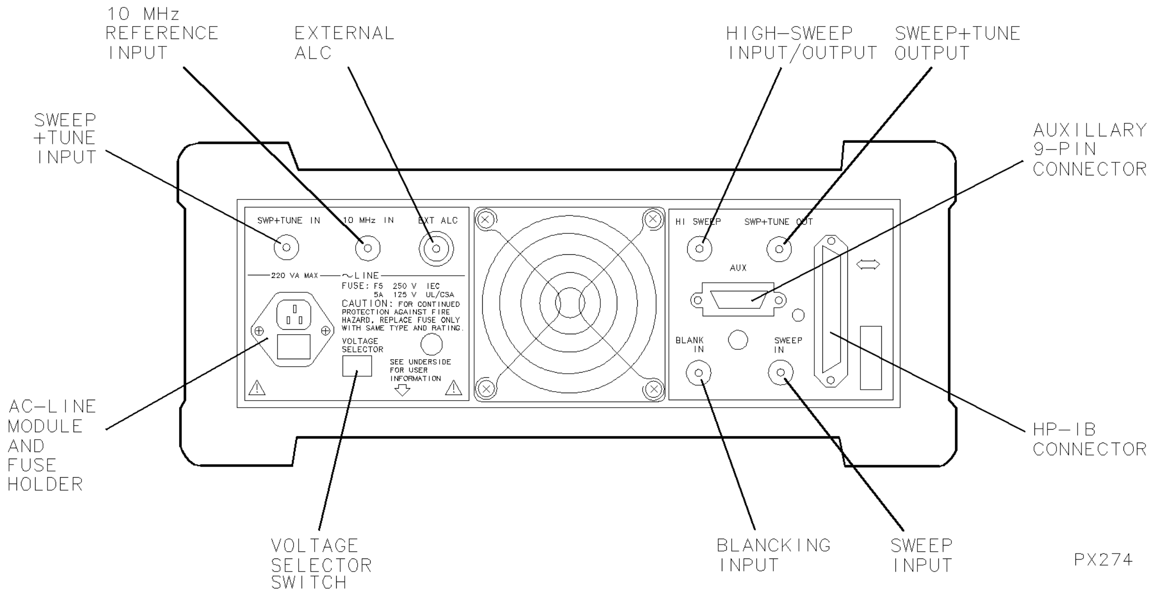


Figure 7-3. Tracking Source Rear-Panel Features

SWP + TUNE IN — An input signal is required at this connector for tracking or offset tracking operation. SWP + TUNE IN is the input connector for the sweep signal from the host instrument (the instrument whose signal is being tracked).

10 MHz IN — This is the 10 MHz reference input. The tracking source automatically detects and uses this input, rather than the 10 MHz internal reference, when an adequate 10 MHz external signal is present. Refer to the specifications chapter for information about the 10 MHz input requirements. Using an external 10 MHz reference is recommended.

EXT ALC	This input allows you to use crystal detectors (such as the HP 33334C) to provide the leveling voltage. External crystal detectors can be calibrated at any desired frequency.
LINE	This is the ac-power connector module. Within the ac-power module is the fuse. Refer to Chapter 1 for fuse part numbers.
VOLTAGE SELECTOR	This is the ac-power voltage selector switch. Set the voltage selector switch to the correct value for the area where the tracking source is being used.
HI SWEEP	This is a bi-directional signal connector that monitors the start-sweep status. If either the tracking source or the host instrument are not ready to start sweeping, neither instrument is allowed to sweep. When the proper input signal is present, the front-panel unleveled status indicator is turned off during retrace.
SWP+TUNE OUT	This output provides a sweep + tune voltage source. The output voltage is equivalent to the sweep + tune input and is buffered. This connector can be used as an additional output when you are making daisy-chain connections from other instruments to the tracking source.
AUX	This is the 9-pin connector designed for future, auxiliary control expansion. This feature is not currently implemented.
HP-IB	This is the HP-IB interface connector. The tracking source is a programmable instrument.
BLANK IN	The input signal applied to this connector is used to blank the unleveled status indicator during host instrument signal retrace. Although an input signal is not required at this connector for tracking source operation, the unleveled status indications are invalid without it. BLANK IN connects to BLANKING OUTPUT on HP 8560 Series spectrum analyzers, or to PEN LIFT on HP 8566 Series spectrum analyzers.
SWEEP IN	The input signal applied to this connector is used to control the power sweep of the tracking source.

The input signal must be from 0 to 10 V for proper power-sweep operation. The SWEEP IN signal can be supplied by the spectrum analyzer's sweep-output signal.

HP 8560 Series portable spectrum analyzers have only one connector available for the SWP + TUNE and SWEEP OUT signals. As a result, sweep out for power sweep is available only in CW mode.

Option 005 Portable Spectrum Analyzers

Standard HP 8560 Series portable spectrum analyzers share a single connector for SWEEP + TUNE and SWEEP OUT signals. You can choose the output signal state you want. As a result, the tracking source power sweep function is possible only by setting the tracking source to CW mode with the spectrum analyzer output signal set to SWEEP OUT.

HP 8560 Series portable spectrum analyzers offer Option 005 which adds an alternate SWEEP OUT connector. Portable spectrum analyzers with this option have full (synthesized) power sweep capability.

The following tables are intended to be quick overviews of the tracking source's preset states. The preset states are instrument states that exist when the tracking source (PRESET) key is pressed. The states can be manually or remotely changed.

Pressing the (PRESET) key restores many of the tracking source settings to their initial states. Custom settings should be stored in one of the tracking source's memory registers. Conditions that are unchanged by instrument preset are labeled "existing" or "user-selected" in the Preset State column. Those that have no preset state are identified with dashes (−−) in the Preset State column.

Tracking Source Front-Panel Key Preset States

Table 7-1 lists the preset states of each tracking source front-panel key. There are menu selections beneath some of the instrument state keys. Refer to "Tracking Source Menu Maps" for illustrations of the preset conditions of the menu states.

Table 7-1. Tracking Source Preset States

Function or Key	Preset State	Settings Range	Resolution
Amplitude Keys			
(POWER LEVEL)	0 dBm	HP 85644A only:	
		−80 dBm to +30 dBm	0.01 dB
		HP 85645A only:	
		−70 dBm to +30 dBm	0.01 dB
		Manual attenuator mode: (refer to the (POWER LEVEL) key description)	
(POWER STEP)	1.00 dB	0.01 dB to +100 dB	0.01 dB
(POWER SWEEP)	0 dB	0 to +30 dB (at 10 V sweep)	0.01 dB
(TRKG ADJUST)	0 counts	±5000 counts	1 count
Frequency Keys			
(CW)	CW mode, OFF; (3 GHz when selected after preset)	HP 85644A: 0 to 6.5 GHz; HP 85645A: 0 to 26.5 GHz	1 Hz
(FREQ STEP)	10 kHz for offset tracking with CW mode off	1 Hz to 4 GHz	1 Hz
	50 MHz (if CW mode is activated)	HP 85644A: 250 kHz to 6.5 GHz; HP 85645A: 250 kHz to 26.5 GHz	1 Hz
(OFFSET TRKG)	Offset tracking OFF, default is 0 Hz when selected after preset	±4 GHz	1 Hz
(TRKG)	ON	Tracking ON or OFF	−−
RF Output Keys			
Output Coupling Mode	ac coupled	ac or dc coupled (HP 85645A only)	−−
RF OUTPUT (ON/OFF)	output ON	RF output ON or OFF	−−
Instrument State Keys			
(LOCAL)	Local	Local or remote	−−
(PRESET)	−−	−−	−−
(RECALL)	−−	0 to 9 (10 states)	1
(SAVE)	−−	0 to 9 (10 states)	1

M M M

This section contains information about how to use the front-panel keys to access menu choices. The menu maps of the tracking source are also included here.

Tracking Source Menu Control

The INSTRUMENT STATE block on the front panel of the tracking source contains menu keys.

The menu keys are used to access choices beneath them. The menu choices are displayed in the tracking source's 24-character display windows.

Front-panel keys are used to control the menu choices. These keys include MENU UP, MENU DOWN, data, ⇑, and ⇓.

The MENU UP and MENU DOWN keys display the different choices beneath each INSTRUMENT STATE menu key. An INSTRUMENT STATE menu key must be pressed first, then pressing the MENU UP and MENU DOWN keys displays the choices.

The ENTER key in the data-keys group selects the menu choice that is displayed.

The ⇑, and ⇓ keys change settings in the menu operation.

1. Enter a menu item directly.

   To enter a menu-item directly, follow the steps below:

   - Press the desired INSTRUMENT STATE menu key.
   - Enter the menu-item number. Refer to the individual menus in "Tracking Source Menu Maps" in this section for the menu-item numbers.
   - Press ENTER to display the menu item.

2. Enter a menu item with the menu-control keys.

To access menu items with the front-panel menu control keys, follow the steps below:

- Press an (INSTRUMENT STATE) key.
- Press (MENU UP) or (MENU DOWN) to display the desired menu choice.
- Press (ENTER) to display the menu item.

3. Change menu choice parameters.

To change menu-choice parameters with front-panel keys, follow the steps below:

- Use the data keys, (⇧), or (⇩) to change the menu choice's selectable parameters or values.
- Terminate the data entry or parameter setting by pressing an appropriate data key. Refer to specific menu-item descriptions for more information about these parameters.
- Press (MENU UP) or (MENU DOWN) to return to the initial menu item level.

Tracking Source Menu Maps

The (ADJUST), (AUX FCTN), (CONFIG), and (TEST) instrument state menu keys provide menu selections. Most of these selections have parameters or features that can be set for measurement requirements. Refer to the menu maps below for the menu structures.

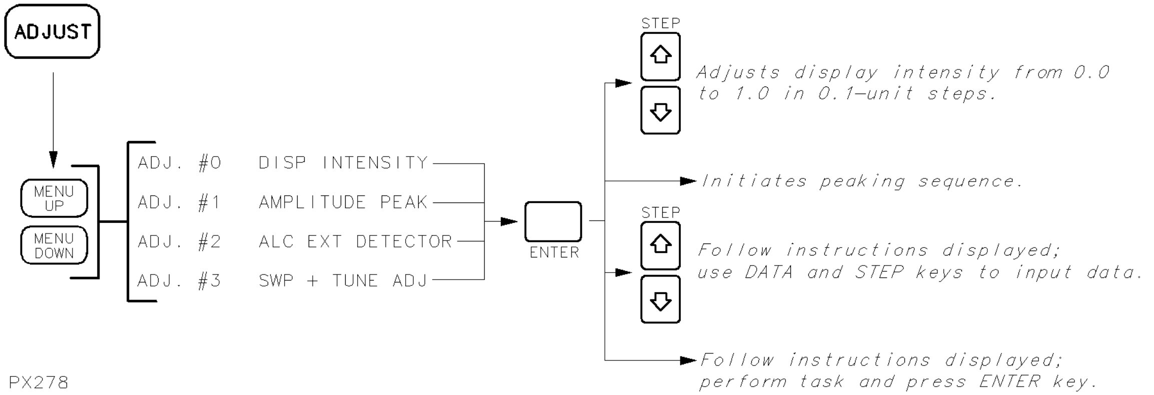


Figure 7-4. The (ADJUST) Key Menu Map

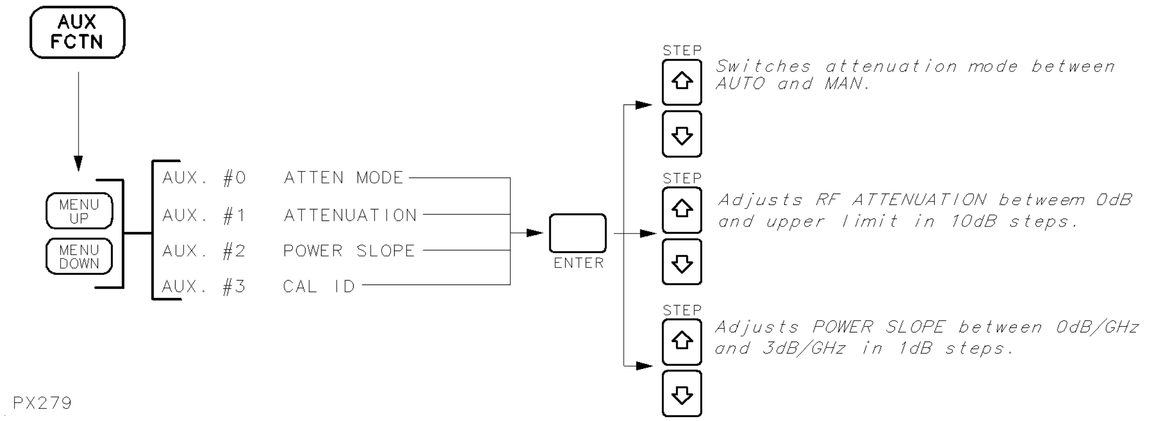


Figure 7-5. The AUX FCTN Key Menu Map

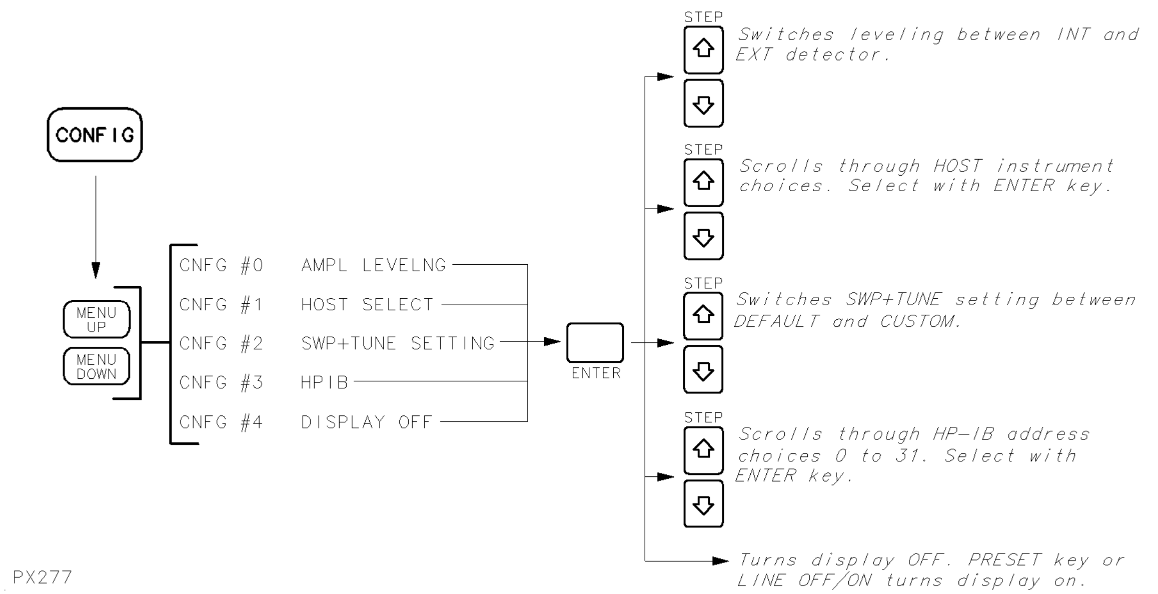


Figure 7-6. The CONFIG Key Menu Map

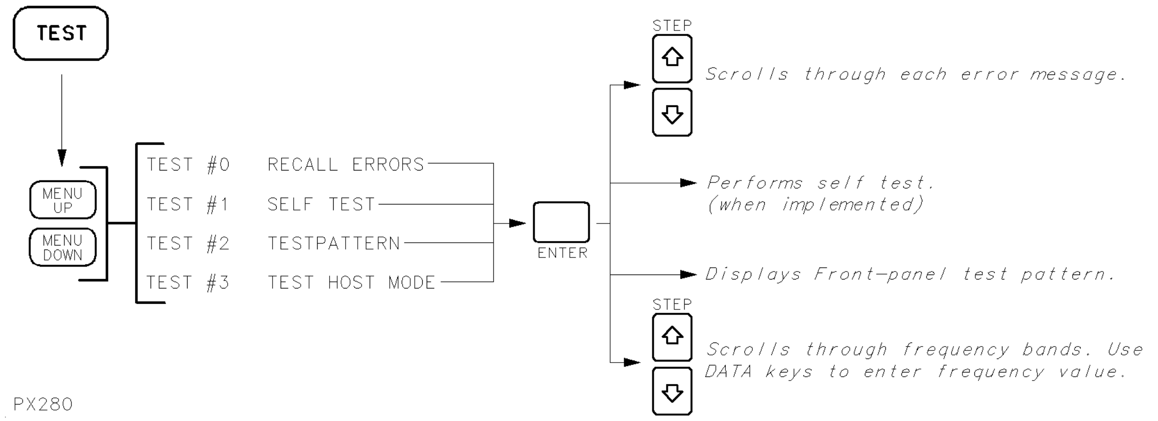


Figure 7-7. The TEST Key Menu Map

The tracking source front-panel keys are alphabetically arranged in this reference section. Refer to the illustrations in Figure 7-1 and Figure 7-2 or to the menu maps in “Tracking Source Menu Maps” for locations of the keys and menu items.

(AC COUPLED) Press this key *(available on the HP 85645A only)* to turn on or off output power ac coupling. When ac-coupling mode is selected, the AC COUPLED status indicator lights. In ac-coupling mode, the dc-blocking capacitor is placed in the tracking source's RF output signal path. Although low frequency response is degraded with ac coupling turned on, the tracking source RF output gains some protection from any dc signal potential.

(ADJUST) Press this key to access the tracking source's Adjustments menu. There are four adjustments available. The adjustment number (such as ADJ #0) appears in the left-hand display window. The name of the adjustment (such as DISP INTENSITY) appears in the right-hand display window. Refer to the list below for the menu selections available under this key. The menu selections available under the (ADJUST) key are listed below. Refer to the descriptions of these selections in this alphabetical listing.

ADJ #0	DISP INTENSITY
ADJ #1	AMPLITUDE PEAK
ADJ #2	ALC EXT DETECTOR
ADJ #3	SWP + TUNE ADJ

ALC EXT DETECTOR Press this key to access the external-detector calibration routine. Press (ADJUST), then press (MENU DOWN) until ADJ #2, ALC EXT DETECTOR appears in the display windows. Press (ENTER) to display ENTER DET FREQ.

Enter the frequency value (within the range of the tracking source) at which you want to calibrate the external detector. Press a frequency-units key to terminate data entry.

The numbers that appear in the right-hand display window represent a DAC number and a previously existing power level. The power level displayed may or may not be accurate for your detector.

The adjustment routine prompts you for actual output power values at each DAC setting. Actual output power values can be accurately determined by using a power meter with a power sensor. The power sensor is placed at the point where leveling is desired. Enter the measured power value and terminate the entry with an appropriate power units key. Notice that the DAC number changes after each entry. Continue entering power meter readings associated with the DAC numbers until the message ENTER TO STORE appears. Press (ENTER). The message PROGRAMMING appears in the display window as the instrument stores the power values in memory. When the message ENTER TO UNDO appears, either press (ENTER) to start over, or press any other front-panel key to exit the adjustment. During the calibration routine, press (⇧) and (⇩) to check or edit data entries. Because the tracking source has no way of knowing where the minimum and maximum detector voltages are, the adjustment begins at the center of the tracking source's DAC numbers, which is at number 128, then decrements. The count of the DAC number decreases until the external detector voltage is as small as possible for the tracking source's hardware to operate. At that point, the count returns to the next DAC number just above the mid-point and begins incrementing until the detector voltage stops changing (reaches a peak output capability). The detector is now calibrated and the power values you entered are stored until you need to calibrate another detector. Anytime the calibrated detector is used in external leveling mode, the output power selected with the tracking source's (POWER LEVEL) key is accurately calibrated for your measurement.

AMPLITUDE PEAK Select this adjustment *(available on the HP 85645A only)* to run the automatic amplitude peaking routine. It is recommended that you press (PRESET) before selecting this adjustment. During the adjustment, avoid pressing any front-panel keys.

Make sure the RF output power is on. The ON/OFF status indicator should be lit.

Press (ADJUST), then press (MENU DOWN) until **ADJ #1, AMPLITUDE PEAK** appears in the display windows. Press (ENTER) and the automatic amplitude peaking routine begins. After a moment, the message **YTM PEAK DONE** is displayed. This adjustment optimizes the peak output power in bands 1 through 4 of the HP 85645A tracking source. The amplitude peak adjustment routine is especially valuable when you are using the tracking source in environments with temperature extremes, or when peak power is critical to a measurement. During the amplitude peaking routine, the following errors may occur. Regardless of the error, however, previous YTM calibration data is restored:

- If error **604 ALC LOOP BROKEN** is displayed, the routine was unable to properly adjust the signal amplitude. There is possibly a problem with the ALC loop in the instrument that needs service.
- If error **605 MOD AMP PWR LOW** is displayed, the output power from the modulation amplifier is low. The cause may be related to the modulation amplifier, the power detector (which is part of the modulation amplifier), or to the gain circuitry on the controller board assembly. Service the instrument to determine the cause.
- If error **610 YTM CAL FAIL** is displayed, the amplitude peak routine failed to complete. This error appears, usually along with the errors listed above, if there is a problem with the YTM driver on the controller board assembly, or to the YTM itself. Service the instrument to determine the cause.

AMPL LEVELNG Select this configuration operation to display or change the amplitude leveling mode. Press (CONFIG). Then **CNFG**

#0, AMPL LEVELNG appears in the display windows. Press (ENTER) to display AMPL LEVELNG INT or AMPL LEVELNG EXT. Use the (⇑) and (⇓) keys to toggle the setting. Use the AMPL LEVELNG EXT selection when you plan to use an external detector.

ATTEN MODE Select this auxiliary function to choose either manual or automatic attenuator coupling. Press (AUX FCTN). Then AUX #0, ATTEN MODE appears in the display windows. Press (ENTER) to display the current attenuation mode. Use the (⇑) and (⇓) keys to toggle between AUTO and MAN (automatic or manual attenuation).

When AUTO is selected, the entire amplitude range of the tracking source is available at the RF output when you are changing the power level. When MAN is selected, the attenuator remains at the selected setting until you enter a new value. The power level range is limited to the attenuator vernier range.

The attenuator mode function is not available if external detector leveling is activated on the tracking source. The attenuator remains fixed at 0 dB.

ATTENUATION Select this auxiliary function to display or change the current attenuation setting. Press (AUX), then press (MENU DOWN) until AUX #1, ATTENUATION appears in the display windows. Press (ENTER) to display the current attenuator setting. Entering a new attenuation value by using the (⇑) and (⇓) keys or data keys automatically changes the attenuation mode to manual.

(AUX FCTN)

Press this key to access the tracking source's auxiliary function menu selections. There are four auxiliary functions available. The auxiliary function number (such as AUX #0) appears in the left-hand display window. The name of the auxiliary function (such as ATTEN MODE) appears in the right-hand display window. The menu selections available under the (AUX FCTN) key are listed below. Refer to the descriptions of these selections in this alphabetical listing.

AUX #0	ATTEN MODE
AUX #1	ATTENUATION
AUX #2	POWER SLOPE
AUX #3	CAL ID (Firmware revisions B and later)

CAL ID	Select this axiliary function to display a checksum of the calibration constants stored in EEROM. Press (AUX), then press (MENU DOWN) until **AUX #3, CAL ID** appears in the display windows. Press (ENTER) to display the checksum of the calibration constants. The user can compare this checksum signature with the checksum signature obtained after the last calibration. If the checksum signature has changed, someone has performed a partial calibration since the last full calibration.
(CONFIG)	Press this key to access the tracking source's Configuration operation menu selections. There are five selections available. The operation number (such as **CNFG #0**) appears in the left-hand display window. The name of the configuration operation (such as **HOST SELECT**) appears in the right-hand display window. The menu selections available under the (CONFIG) key are listed below. Refer to the descriptions of these selections in this alphabetical listing. CNFG #0 — AMPL LEVELNG CNFG #1 — HOST SELECT CNFG #2 — SWP+TUNE SETTING CNFG #3 — HPIB CNFG #4 — DISPLAY OFF
(CW)	Press this key to immediately place the tracking source in continuous-wave mode. The right-hand display window indicates the current CW frequency setting and allows you to change the setting. Display resolution for CW mode settings may not be representative of the actual CW signal. Refer to the specifications in this manual for CW mode frequency accuracy.
(DC COUPLED)	Press this key *(available on the HP 85645A only)* to turn dc coupling on. When dc coupling is on, the DC COUPLED status indicator lights. In dc-coupling mode, the dc-blocking capacitor is bypassed in the tracking source's RF output signal path.

CAUTION Use dc coupling only for RF output signals below 10 MHz, and only when you are confident that no dc power will be present at the RF output on the HP 85645A.

DISP INTENSITY Select this adjustment to change the intensity level of the display windows. Press (ADJUST). Then **ADJ #0, DISP INTENSITY** appears in the display windows. Press (ENTER) to display the current intensity setting. Change the value with the (⇧) and (⇩) keys or enter a value between 0 and 1 with the data keys. A value of 0 reduces the display intensity to its minimum level. A value of 1 increases the display intensity to its maximum level.

DISPLAY OFF Select this item to turn the display windows off. Be aware that either pressing the (PRESET) key or switching the instrument off, then on again, are the only ways to restore the display. Press (CONFIG), then press (MENU DOWN) until **CNFG #4, DISPLAY OFF** appears in the display windows. Press (ENTER) to immediately turn the display windows off. Press (LINE) or (PRESET) to return the display windows to normal operation.

(FREQ STEP) Press this key to view or change the frequency step increment. **STP** <number> appears in the display window. The number indicates the current step-increment size.

Use the data keys to enter specific increment sizes. Use the (⇧) and (⇩) keys to enter 1-2-5 step increments. In CW mode, the default frequency step size is 50 MHz. The step-size range is 250 kHz to 6.5 GHz for the HP 85644A tracking source and 250 kHz to 26.5 GHz for the HP 85645A.

In offset tracking mode, the default frequency step size is 10 kHz and the range for both instruments is 1 Hz to 4.0 GHz. Use the data keys to enter specific step-size increments. Use the (⇧) and (⇩) keys to enter 1-2-5 step increments.

HOST SELECT Select this configuration operation to identify which host instrument model is to be used with the tracking source.

Press (CONFIG), then (MENU DOWN) until CNFG #1, HOST SELECT appears in the display windows. Press (ENTER) to display the currently selected host model number. Use the (⇑) and (⇓) keys to scroll through the list of host instruments. Press (ENTER) to select the host appearing in the display window. An arrow indicates which host instrument is selected.

For each host model listed, many host-specific parameters are selected automatically.

HPIB — Select this configuration operation to display the HP-IB address of the tracking source. Press (CONFIG), then (MENU DOWN) until CNFG #3 HPIB is displayed. Press (ENTER) to display the tracking source's HP-IB address. You can change the address by pressing the (⇑) and (⇓) keys or data keys. Terminate data entry with the (ENTER) key. Store the HP-IB address in the tracking source EEROM by following the subsequent prompts that appear in the display windows.

(LINE) — Press this switch to turn the tracking source on or off. When the power is turned on, the instrument initially displays the model number and firmware version. The status indicator turns on when the power is on.

(LOCAL) — Press this key to return the tracking source from remote to local operation. Pressing this key when the RMT status indicator is lit turns it off and restores the keyboard to normal operation. Refer to "Front- and Rear-Panel Features" at the beginning of this chapter for information about the status indicators.

(OFFSET TRKG) — Press this key to display the current offset tracking value in the right-hand display window. If the value is zero, offset tracking is turned off. Enter a non-zero value that is within the limits of the tracking source to activate offset tracking. The limits of the offset tracking operation are determined by the host instrument and the frequency band of interest.

(ON/OFF) — Press this key to turn RF output power on or off. Turning the RF output power on or off does not change the display window information, but does turn the corresponding status indicator on or off. Refer to "Front- and Rear-Panel Features" at the beginning of this chapter for information about the status indicators.

(POWER LEVEL) Press this key to display the current output power level or to enter an output power level.

Entering a power level that exceeds the hardware limits of the tracking source causes the UNLVLD status indicator to light. The HP 85644A tracking source power settings can be between −80 dBm and +30 dBm, however, the actual power may not achieve +30 dBm. The HP 85645A tracking source operating power can be set between −70 dBm and +30 dBm.

In manual attenuation mode, the tracking source cannot automatically change the attenuator setting to allow for the difference in power output. The power limits of either tracking source when operating in manual attenuation mode is equal to the sum of the following formula:

[−internal attenuation setting +
(−10.99 to +30 dBm)]

As an example, if the attenuation value is 30 dB, then the operating power range is between −40.99 dB and 0.0 dB.

`POWER SLOPE` Select this auxiliary function to display or enter a power slope for the tracking source output. Press (AUX), then (MENU DOWN) until `AUX #3, POWER SLOPE` appears in the display windows. Press (ENTER) to display the current power slope value (`PWRSLP 0.00dB/Gz`).

If you select the power-slope function when the host instrument is in low-band mode, you can enter a power slope between 0.00 dB per GHz and 3.00 dB per GHz. If the host instrument is in high-band mode when you select power slope, you can enter a power slope between 0.00 dB per GHz and 1.00 dB per GHz. Toggling from low-band mode to high-band mode does not change the tracking source power slope settings ranges. The range is dependent on the initial state of the host instrument.

Use the ⇧ and ⇩ keys or data keys to change the power slope value. The power capability of the tracking source may actually limit the operating power-slope range. Terminate data entry with any units key.

The power slope function is generally used to compensate for cable losses. At the high frequency end of a sweep, a higher power output than the tracking source display indicates is required. As a result, the true output power at this high-end frequency is the product of span and slope.

POWER STEP — Press this key to change the size of the step-key increment. The increment selected controls the step-size when the ⇧ and ⇩ keys are used to change the power level, power sweep, or power slope values. `PWR STP <number> dB` appears in the display window. The number indicates the current step-size increment. Use the ⇧ and ⇩ keys to change the current value by increments of 1, 2, or 5, or use the data entry keys to change the step size to a specific value.

POWER SWEEP — Press this key to enter the power range over which the RF output power is to sweep. Disable power sweep either by entering a value of 0 dB or by pressing PRESET. This operation requires a 0 to 10 V signal present at the tracking source's rear- panel SWEEP IN connector. The operation uses only the internal amplitude vernier (modulator) to attempt to satisfy the desired range of output power requested. As a result, the UNLVLD status indicator may light at high power levels. To use the power sweep function on an HP 8560 Series portable spectrum analyzer (non-Option 005 ALT SWEEP OUTPUT), move the cable on the tracking source from the SWEEP + TUNE INPUT connector to the SWEEP INPUT connector. Set the tracking source to CW mode at a frequency of interest. Use the spectrum analyzer host in a wide resolution bandwidth. A wide resolution bandwidth is at least 1 MHz or more. Also refer to the POWER SWEEP and POWER LEVEL key descriptions for information about setting these parameters.

(PRESET) Press this key to return the tracking source to a known state. The states are described in Table 7-1, "Tracking Source Preset States." Pressing (PRESET) clears errors and displays the tracking source model number and revision number. (PRESET) does not change the host model number selection.

(RECALL) Press this key to initiate the tracking source's recall-state function. You can retrieve any of the 10 states saved in the tracking source memory. Press (RECALL). When the message **RECALL?** appears, enter a number from 0 to 9 and press (ENTER). The recalled state is then activated. The display indicates whether the recalled state is in CW mode, offset tracking, or non-offset tracking mode when the state is activated.

RECALL ERRORS Select this test to identify the errors that have occurred. The ERR status indicator lights when there are errors. Press (TEST), then **TEST #0, RECALL ERRORS** appears in the display windows. Press (ENTER) to display the first error number and message. Use the (⇧) and (⇩) keys to scroll through the list of errors. The message **LAST ERROR** appears momentarily when you reach the end of the list; **FIRST ERROR** when you reach the top of the list. Exit this operation by pressing any front-panel key, other than data keys, or the (⇧) and (⇩) keys. Press (PRESET) to clear the errors.

(SAVE) Press this key to initiate the tracking source's save-state function. You can save up to 10 states in the tracking source memory. Press (SAVE). When the message **SAVE?** appears, enter a number from 0 to 9, and press (ENTER) to save the state in that register number. The operating mode (CW, offset tracking, or non-offset tracking) is also saved in the register.

SELF TEST This feature is not implemented for firmware revision 062391. The firmware revision can be read in the tracking source windows when the power is turned on. When implemented, select this test to have the tracking source perform its own self-test. Press (TEST), then press (MENU DOWN) until `TEST #1, SELF TEST` appears in the display windows. Press (ENTER) and the self-test process begins. The instrument sets itself to several known states, then checks various points in the circuitry for proper levels of operation. If a point does not meet defined limits, the self-test stops and a message about the failure is displayed. If the self test passes, the message `TEST #1 SELF TEST PASSED` is displayed.

`SELF TEST` can also be accessed remotely by using the command `DIAG:TEST?` which returns a "1" if the test passes, or "0" if the test fails. The `DIAG:TEST?` command will not work with instruments that have firmware revision A.

`SWP+TUNE ADJ` Select this adjustment to run the interactive routine that corrects for variations in the host SWP + TUNE OUTPUT connector signal. Use this adjustment only if the tracking source has difficulty remaining locked to the host (generally this is only the case with HP 8590 Series spectrum analyzers). The results of this adjustment are invoked by selecting (CONFIG), then `SWP+TUNE SETTING` and selecting the `CUSTOM` option. They are not activated at the end of the adjustment. For host instruments other than the HP 8590 Series spectrum analyzers, the factory defined default values are acceptable. Press (ADJUST), then press (MENU DOWN) until `ADJ #3, SWP+TUNE ADJ` appears in the display windows. Make sure the SWP + TUNE OUTPUT signal from the host is connected to the tracking source, then press (ENTER) to display `Set SA to 0 SPAN`. Set the host to 0 span. Set the host to the various frequency settings as prompted by the tracking source, pressing (ENTER) on the tracking source after each entry.

Refer to Table 7-2 for the frequency settings required by the tracking source for the different host instruments. The tracking source stores the SWP + TUNE voltages detected at the various frequencies, then uses these voltages for self-adjustment to improve its tracking operation.

Table 7-2. Host Instrument Sweep + Tune Adjustment Frequency Settings

Host Instrument	Band	Adjustment Start Frequency	Adjustment End Frequency
HP 8560A/E spectrum analyzer	0	150 MHz	2900 MHz
HP 8561A/B/E spectrum analyzer	0	150 MHz	2400 MHz
	1	3600 MHz	6460 MHz
HP 8562A spectrum analyzer, HP 8562A (old) spectrum analyzer (serial number 2350A or earlier), and HP 8563A/E spectrum analyzer	0	150 MHz	2400 MHz
	1	3600 MHz	5500 MHz
	2	6700 MHz	1190 MHz
	3	13600 MHz	18400 MHz
	4	19810 MHz	26500 MHz
HP 8566A/B spectrum analyzer	0	0 MHz	1900 MHz
	1	2700 MHz	5500 MHz
	2	6100 MHz	12100 MHz
	3	12700 MHz	18100 MHz
	4	18900 MHz	24000 MHz
HP 8593A/E spectrum analyzer	0	300 MHz	2550 MHz
	1	3400 MHz	5900 MHz
	2	6600 MHz	12100 MHz
	3	13100 MHz	18800 MHz
	4	19500 MHz	26500 MHz
HP 8594A/E spectrum analyzer	0	300 MHz	2900 MHz
HP 8595A/E spectrum analyzer	0	300 MHz	2550 MHz
	1	3400 MHz	6400 MHz
HP 8596E spectrum analyzer	0	300 MHz	2550 MHz
	1	3400 MHz	5900 MHz
	2	6600 MHz	12100 MHz
HP 70909A spectrum analyzer	0	0 MHz	2900 MHz
	1	2700 MHz	6300 MHz
	2	5700 MHz	12800 MHz
	3	12600 MHz	26500 MHz
HP 70910A spectrum analyzer	0	0 MHz	2900 MHz
	1	2700 MHz	6300 MHz
	2	5700 MHz	12800 MHz
	3	12600 MHz	26500 MHz

**Table 7-2.
Host Instrument Sweep + Tune Adjustment Frequency Settings (continued)**

Host Instrument	Band	Adjustment Start Frequency	Adjustment End Frequency
HP 8340A synthesized sweeper	0	10 MHz	2200 MHz
	1	2500 MHz	6800 MHz
	2	7100 MHz	13250 MHz
	3	13600 MHz	19700 MHz
	4	20100 MHz	26500 MHz
HP 83590A RF plug-in	0	2000 MHz	6800 MHz
	1	7100 MHz	13300 MHz
	2	13600 MHz	20000 MHz
HP 83592A/B/C RF plug-in	0	25 MHz	2200 MHz
	1	2500 MHz	6800 MHz
	2	7100 MHz	13300 MHz
	3	13600 MHz	20000 MHz
HP 83594A RF plug-in	0	2000 MHz	6800 MHz
	1	7100 MHz	13300 MHz
	2	13600 MHz	19900 MHz
	3	20100 MHz	26500 MHz
HP 83595A RF plug-in	0	25 MHz	2200 MHz
	1	2500 MHz	6800 MHz
	2	7100 MHz	13300 MHz
	3	13600 MHz	20100 MHz
	4	20100 MHz	26500 MHz

SWP+TUNE SETTING	Select this configuration operation to display or change the correction factor status. Press (CONFIG). Press (MENU DOWN) to display CNFG #2, SWP + TUNE SETTING. Press (ENTER) to display the correction factor status for the host model selected. You can only toggle the setting between CUSTOM and DEFAULT. When CUSTOM is displayed, correction factors are host-specific and are entered by you (via the (ADJUST) menu key) for a particular host instrument model. When DEFAULT is displayed, correction factors used are the predefined values stored by the tracking source. For HP 8590 Series spectrum analyzer hosts, the CUSTOM setting is recommended. To change the correction factor values for the HP 8590 Series spectrum analyzer host instrument, press (ADJ), then (MENU DOWN) to display ADJ #3 SWP+TUNE ADJ. Refer to SWP+TUNE ADJ in this alphabetical listing for information about changing the values. Also refer to Chapter 1 for further information.
(TEST)	Press this key to access the tracking source's Test selections. There are four tests available. The test number (such as TEST #0) appears in the left-hand display window. The name of the test (such as RECALL ERRORS) appears in the right-hand display window. The menu selections available under the (TEST) key are listed below. Refer to the descriptions of these selections in this alphabetical listing.

TEST #0	RECALL ERRORS
TEST #1	SELF TEST
TEST #2	TESTPATTERN
TEST #3	TEST HOST MODE

`TEST HOST MODE` Select this test to use an external signal source (such as the HP 8340A synthesized sweeper) to provide the local oscillator input to the tracking source. The HP 8340A synthesized sweeper can be used to exercise the full frequency range of the tracking source.

Press (TEST), then press (MENU DOWN) until `TEST #3, TEST HOST MODE` appears in the display windows. Press (ENTER). The left-hand display window indicates `BAND #0`, and the right-hand display window indicates the CW frequency of the band activated.

Use the (⇧) and (⇩) keys to change the band and display the corresponding CW frequency. Change the CW frequency with the data entry keys, terminate data entry with the (ENTER) key. A reference frequency is required to lock to the LO input signal. In test-host mode, this frequency is defined internally as 3.9 GHz in band 0 and as 300 MHz in bands 1 through 4. The external source CW frequency, therefore, must be set 300 MHz below (or, in band 0, 3900 MHz above) the frequency setting of the tracking source. The actual output frequency of the tracking source is dependent on the frequency of the external source, not the tracking source's CW frequency.

To set the output frequency of the synthesized sweeper, refer to the following formula:

For band 0:

> [desired tracking source frequency + 3900 MHz] = synthesized sweeper frequency setting

For bands 1 through 4:

> [desired tracking source frequency/band number] − 300 MHz = synthesized sweeper frequency setting

Table 7-3. Frequency Ranges and Band Numbers for Test #3, Test Host Mode

Band Number	Frequency Range	Synthesized Sweeper Frequency
0	0.00 to 3100 GHz	3900 to 7000 MHz
1	2000 to 7500 GHz	1700 to 7200 MHz
For HP 85645A Tracking Source Only		
2	4000 to 15000 GHz	refer to preceding formula
3	6000 to 22500 GHz	refer to preceding formula
4	8000 to 26500 GHz	refer to preceding formula

TESTPATTERN

Select this test to verify the operation of the front-panel status indicators and the display windows. Press (TEST), then press (MENU DOWN) until TEST #2, TESTPATTERN appears in the display windows. Press (ENTER) and the test pattern is displayed. The status indicators labeled RMT, ERR, AC COUPLING, DC COUPLING, and RF OUTPUT ON should all light. Unless an external reference signal is present, the INT reference status indicator should light. If an external reference signal is present, the EXT reference status indicator lights.

The UNLVLD and REF INT or EXT status indicator states are not changed during this test.

Exit the test pattern menu by pressing any front-panel key, except the (⇧) and (⇩) keys, data keys, or any of the keys corresponding with one of the status indicators.

(TRKG)

Press this key to initiate the tracking sources' primary function: tracking the host instrument's signal without offsets. The tracking source's preset state is non-offset tracking. Press (PRESET) or (TRKG) to return the tracking source to normal tracking-mode from offset tracking or CW mode. Pressing (TRKG) deactivates the (⇧) and (⇩) keys and data entry keys.

(TRKG ADJUST)

Press this key to adjust the tracking source for optimum signal tracking. Use the (⇧) and (⇩) keys to change the DAC number displayed by 1, or the data keys to enter a specific value between ±5000. Press (ENTER) to store the setting.

8

Programming Reference

Programming Reference

This chapter contains information about the IEEE 488.2 common commands and SCPI command language used with the HP 85644A or HP 85645A tracking sources.

Command Language Overview	This section describes IEEE 488.2 common commands and SCPI (standard commands for programmable instruments). Information about command-usage rules and parameter types accepted is also included.
Using the Command Reference	This section contains explanations about proper command structure and how to read the syntax statements. Syntax diagrams are not used in this command reference.
Alphabetized Command Reference	This is the alphabetical command reference. The IEEE 488.2 common commands are separately alphabetized from the SCPI commands.
IEEE 488.2 Common Command Reference	This section contains the common commands. Common commands include the asterisk character (*). They are alphabetized together at the beginning of the "Alphabetized Command Reference" section. The IEEE 488.2 command mnemonic is spelled out in the descriptive text for each command.
SCPI Command Reference	This section is the SCPI command reference. SCPI commands are alphabetized by the subsystem name. The commands within a subsystem are alphabetized. A subsystem name is the command mnemonic (keyword) that appears first in each program message. Within each subsystem are the related commands and parameters.

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Information about IEEE 488.2 common commands and SCPI command usage rules and restrictions are provided in the following pages. Both IEEE 488.2 common commands and SCPI commands operate over HPIB.

Refer to the glossary for terminology definitions.

The following topics are covered in this section:

IEEE 488.2 Common Commands Description	This section contains general information about IEEE 488.2 common commands used with the tracking source. The IEEE 488.2 common command summary is located here.
SCPI Commands Description	This section contains general information about distinguishing standard SCPI commands from new product-specific SCPI commands.
SCPI Subsystem Command Descriptions	This section lists the subsystem names that are available with the tracking sources. Brief descriptions about each subsystem is provided.
SCPI Command Parameters	This section lists the parameter types (numeric, block, discrete and so forth) that are allowed with the SCPI language.
SCPI Conformance Information	This section contains information about SCPI command parameters, range, and status. Table 8-3 lists the status (new or standard) of each SCPI command and each command's appropriate parameters.
Programming Rules	This section contains information about proper SCPI syntax usage. Table 8-2 identifies the different types of SCPI parameters.

IEEE 488.2 Common Commands Description

The common commands that can be used with the tracking source conform to the requirements of the *ANSI/IEEE Std 488.2-1987 IEEE Standard Codes, Formats, Protocols and Common Commands* document.

These requirements are described below:

- IEEE 488.2 common commands are designated with an asterisk (*).
- The intent of IEEE 488.2 common commands is to perform non-instrument specific functions, such as reset, self-tests, and status byte query. These commands are designed to remotely control any programmable instrument, regardless of model number or manufacturer.
- The commands are usually only four or five characters long and are preceded with an asterisk (*). They may include parameters, and use "white space" to separate the command mnemonic from the parameter. Refer to Figure 8-1 for an illustration of an IEEE 488.2 common command.

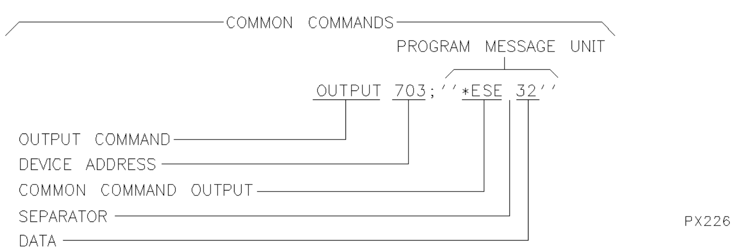

Figure 8-1. IEEE 488.2 Common Command Format

IEEE 488.2 Command Summary

The 488.2 common commands available with the tracking source are as follows:

Table 8-1. IEEE 488.2 Common Commands Summary

Mnemonic	Mnemonic Description	Parameter and Range
*CLS	Use this command to clear the status data structures.	——
*ESE	Use this command to set the Standard Event Status Enable Register bits.	integer number, 0 through 255
*ESE?	Use this command to query the Standard Event Status Enable Register.	——
*ESR?	Use this command to query the standard event status register.	——
*IDN?	Use this command to obtain instrument identification information.	——
*OPC	Use this command to allow a device to generate an operation complete message in the ESR when all pending, selected device operations are completed.	——
*OPC?	Use this command to query the operation complete flag setting.	——
*RST	Use this command to perform a device reset.	——
*SRE	Use this command to enable the Service Request Enable register bits.	integer number, 0 through 255
*SRE?	Use this command to query the Service Request Enable Register.	——
*STB?	Use this command to read the status byte register.	——
*TST?	Use this command to execute the self test and obtain results.	——
*WAI	Use this command to cause the device to wait for a process to complete before continuing with other instructions.	——

SCPI Commands Description

SCPI commands are designed to perform instrument-specific functions. These include making instrument setups, making measurements, querying instrument states, and retrieving data. Tracking source SCPI commands follow version 1990.0 syntax rules of the *Standard Commands for Programmable Instruments Manual*. Figure 8-2 indicates the structure of a typical SCPI command.

Some commands in this chapter are not listed in the SCPI document. They are created to meet the need of a particular operation for this instrument. They do syntactically conform to the rules of the *Standard Commands for Programmable Instruments Manual*. SCPI commands are hierarchically structured into program messages. The first command mnemonic is the **subsystem** name and is the highest-level command. The next command mnemonic is more specific to the task.

The remaining command mnemonics complete the program message syntax with the most specific parameter (such as ON or OFF, or a numeric value) at the end of the program message.

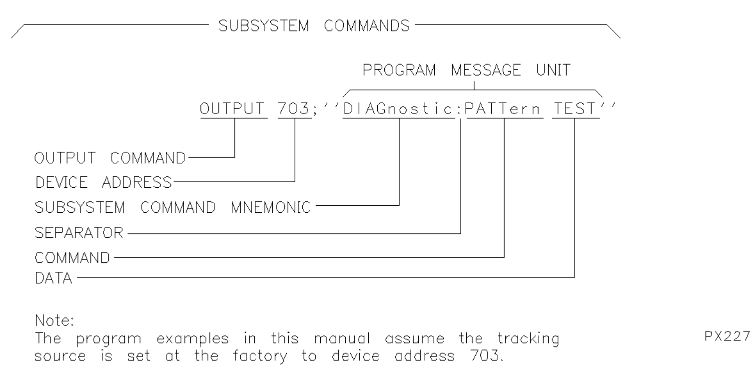

Figure 8-2. SCPI Command Format

SCPI Subsystem Command Descriptions

The following alphabetical list identifies SCPI subsystem commands that are available with the tracking source. Refer to the alphabetical command reference for complete descriptions of the commands contained in each subsystem, their parameters and query responses.

CALibration	Use the commands in this subsystem to adjust (peak) the tracking source output power or to adjust its tracking signal with respect to the host instrument.
DIAGnostic	Use the commands in this subsystem to select the test host mode and identify the test host frequency setting, identify power leveling state, or to verify selected front-panel status indicator and display window operations.
DISPlay	Use the commands in this subsystem to control the display window intensity or on and off state.
OUTPut	Use the commands in this subsystem to control the ac or dc RF output coupling state.
SOURce	Use the commands in this subsystem to control the tracking source's output power level, attenuation setting, frequency settings, and to control host instrument assignments.
STATus	Use the commands in this subsystem to control and evaluate the status registers of the tracking source.
SYSTem	Use the commands in this subsystem to preset the tracking source or to review errors.

SCPI Command Parameters

SCPI commands accept Boolean, block, discrete, and numeric parameters. The parameter is separated from the command mnemonics by white-space. Refer to the following table for examples of, and restrictions about, these parameters.

Table 8-2. SCPI Parameter Types

Parameter Type	Description and Example
Boolean	Represents a single binary condition that is either true or false. When Boolean is specified, any mantissa value gets rounded to either 1 or 0. 1 represents ON 0 represents OFF
Block	Definite block program data format as specified in IEEE 488.2 *IEEE Standard Codes, Formats, Protocols, and Common Commands*.
Discrete	Selects from a finite number of values. These parameters use mnemonics to represent each valid setting. As an example, the SOURce:POWer:ATTenuation:<*value*> command can use either a numeric value within the specified range, or the mnemonics UP or DOWN for <*value*>.

Table 8-2. SCPI Parameter Types (continued)

Parameter Type	Description and Example
Numeric	Indicated in syntax as either <real number> or <integer>. This parameter accepts all commonly used decimal representations of numbers, including optional signs, decimal points for real numbers, and scientific notation. For example: 123 or 1.23E2 −123 or −1.23E2 0.123 or 1.23E−1 or 1.23000E−01 Accepts all commonly used suffixes with decimal representations of numbers including optional signs and decimal points. As an example: 0.123S or 123MS and 1234OHM or 1.234KOHM Voltage: UV for E−6 MV for E−3 V for E0 KV for E3 Percent: PCT Ohms: OHM KOHM for E3 MOHM for E6 Frequency Units: HZ for E0, or hertz KHZ for E3, or kilohertz MHZ for E6, or megahertz GHZ for E9, or gigahertz Time: PS for E−12 NS for E−9 US for E−6 MS for E−3 S for E0

SCPI Conformance Information

Table 8-3 contains SCPI conformance information, the parameter type allowed, and acceptable parameter range. Each command mnemonic for the tracking source is identified as new (*NEW*) or standard (*STD*). Both new and standard commands conform to SCPI guidelines. Table 8-3 lists each of the SCPI commands that can be used with the tracking source. These commands conform to the following SCPI requirements:

- Standard and new SCPI commands must meet the criteria of SCPI rules as documented in version 1990.0 of the *Standard Commands for Programmable Instruments Manual*.
- Standard commands must match a previously confirmed SCPI mnemonic in syntax and operation. These commands are identified as "*STD*" in Table 8-3.
- New commands, which are created for the specific purpose of tracking source remote operation, must conform to SCPI guidelines. These commands are identified as "*NEW*" in Table 8-3 and may not yet appear in the *Standard Commands for Programmable Instruments Manual*.

Table 8-3. SCPI Command, Parameter, and Status Summary

Subsystem	Command	Parameter Type	Range	SCPI Status
CALibration				
	:ALC:EXTernal	——	activates function	*NEW*
	:ALC:EXTernal:Freq	real number GHz	same as frequency range of instrument	*NEW*
	:ALC:EXTernal:[ADJust]	real number dBm	same as power range of instrument	*NEW*
	:PEAKing[:EXECute]	——	——	*NEW*
	:SWEeptune:SETTing	string	character string "Custom" or "Default"	*NEW*
	:TRACk:ADJ	numeric	Integer from −5000 to +5000	*NEW*
	:TRACk:ADJ?	——	returns integer from −5000 to +5000	*NEW*
DIAGnostic				
	:PATTern	discrete	TEST	*NEW*
	:TEST?	——	if return is 1, indicates pass; if return is 0, indicates fail	*NEW*
	:THMode	——	——	*NEW*
	:THMode?	——	if return is 1, indicates mode on; if return is 0, indicates mode off	*NEW*
	:THFReq	numeric	band number, integer 0 to 4 and real number in frequency units (see command description for range)	*NEW*
	:THFReq?	——	returns a band number between 0 and 4, and CW frequency setting (see command for range)	*NEW*
	:UNLeveled?	——	if return is 1, indicates unleveled state; if return is 0, indicates leveled state	*NEW*
DISPlay				
	:BRIGhtness	numeric	real number from 0.0 to 1.0	*STD*
	:BRIGhtness?	——	returns a real number between 0.0 to 1.0	*STD*
	[:STATe]	discrete or Boolean	ON | OFF | 1 | 0	*STD*
	[:STATe]?	——	if return is 1, indicates state on; if return is 0, indicates state off	*STD*

Table 8-3. SCPI Command, Parameter, and Status Summary (continued)

Subsystem	Command	Parameter Type	Range	SCPI Status
OUTPut				
	:COUPling	discrete	AC | DC	*STD*
	:COUPling?	——	returns AC or DC	*STD*
	[:STATe]	discrete or Boolean	ON | OFF | 1 | 0	*STD*
	[:STATe]?	——	if return is 1, indicates state on; if return is 0, indicates state off	*STD*
SOURce				
	:POWer:ATTenuation	discrete or numeric	UP | DOWN | real number range: for HP 85645A 0 to 60 dB; for HP 85644A 0 to 70 dB	*STD*
	:POWer:ATTenuation?	——	returns a numeric value [DB]	*STD*
	:POWer:ATTenuation:AUTO	discrete or Boolean	ON | OFF | 1 | 0	*STD*
	:POWer:ATTenuation:AUTO?	——	if return is 1, indicates on; if return is 0, indicates off	*STD*
	:POWer:ALC[:STATe]	discrete or Boolean	ON | OFF | 1 | 0	*STD*
	:POWer:ALC[:STATe]?	——	if return is 1, indicates on; if return is 0, indicates off	*STD*
	:POWer:ALC:SOURce	discrete	INTernal | DIODe	*STD*
	:POWer:ALC:SOURce?	——	returns INT or DIODE	*STD*
	:POWer:CENTer	numeric	UP | DOWN |real number range: for HP 85645A −70 dBm to +30 dBm; for HP 85644A −80 dBm to +30 dBm	*STD*
	:POWer:CENTer?	——	returns a real number in [DBm]	*STD*
	:POWer[:LEVel][:IMMediate][:AMPLitude]	discrete or numeric	UP | DOWN |real number range: for HP 85645A −70 dBm to +30 dBm; for HP 85644A −80 dBm to +30 dBm	*STD*
	:POWer[:LEVel][:IMMediate][:AMPLitude]?	——	returns a real number in [DBM]	*STD*
	:POWer:MODE	discrete	FIXed | SWEep	*STD*
	:POWer:MODE?	——	returns FIXED or SWEEP	*STD*

Table 8-3. SCPI Command, Parameter, and Status Summary (continued)

Subsystem	Command	Parameter Type	Range	SCPI Status
SOURce (continued)				
	:POWer:SLOPe	discrete or numeric	UP | DOWN | real number range: for band 0, 0 to 3 dB/GHz; for bands 1 to 4, 0 to 1 dB/GHz	*NEW*
	:POWer:SLOPe?	——	returns a real number in [DB/GHz]	*NEW*
	:POWer:SPAN	discrete or numeric	UP | DOWN | real number range is band specific (see command for range)	*NEW*
	:POWer:SPAN?	——	returns a real number in [DB]	*NEW*
	:POWer:STEP:AUTO	discrete or Boolean	ON | OFF | 1 | 0	*NEW*
	:POWer:STEP:AUTO?	——	if return is 1, indicates on; if return is 0, indicates off	*NEW*
	:POWer:STEP[:INCRement]	discrete or numeric	UP | DOWN | a real number from 0.01 dB to 100 dB	*NEW*
	:POWer:STEP[:INCRement]?	numeric	returns a real number in [DB]	*NEW*
	:FREQuency[:CW | FIXed]	discrete or numeric	UP | DOWN | real number range: for HP 85644A is 0.0 GHz to 6.5 GHz; for HP 85645A is 0.0 GHz to 26.5 GHz	*NEW*
	:FREQuency[:CW | :FIXed]?	——	returns a real number in <frequency unit>	*NEW*
	:FREQuency:STEP:AUTO	discrete or Boolean	ON | OFF | 1 | 0	*NEW*
	:FREQuency:STEP:AUTO?	——	if return is 1, indicates on; if return is 0, indicates off	*NEW*
	:FREQuency:STEP[:INCRement]	discrete or numeric	UP | DOWN | real number range; for HP 85644A is 250 kHz to 6.5 GHz; for HP 85645A is 250 kHz to 26.5 GHz	*NEW*
	:FREQuency:STEP[:INCRement]?	——	UP | DOWN | real number range; for HP 85644A is 0.0 GHz to 6.5 GHz; for HP 85645A is 0.0 GHz to 26.5 GHz	*NEW*

Table 8-3. SCPI Command, Parameter, and Status Summary (continued)

Subsystem	Command	Parameter Type	Range	SCPI Status
SOURce (continued)				
	:FREQuency:MODE	discrete	CW | FIXed | SWEep	*NEW*
	:FREQuency:MODE?	——	returns CW or SWEEP	
	:FREQuency:OFFSet	discrete or numeric	UP | DOWN |real number range from −4.0 GHz to 4.0 GHz	*NEW*
	:FREQuency:OFFSet?	numeric	returns a real number [Hz]	*NEW*
	:FREQuency:OFFSet:STEP:AUTO	discrete or Boolean	ON | OFF | 1 | 0	*NEW*
	:FREQuency:OFFSet:STEP:AUTO?	——	if return is 1, indicates on; if return is 0, indicates off	*NEW*
	:FREQuency:OFFSet:STEP[:INCRement]	discrete or numeric	UP | DOWN | real number <frequency unit>	*NEW*
	:FREQuency:OFFSet:STEP[:INCRement]?	——	returns a real number in <frequency unit>. Range is 1 Hz to 4.0 GHz	*NEW*
	:ROSCillator:SOURce?	——	if return is 1, indicates using external reference oscillator; if return is 0, indicates using internal reference oscillator	*STD*
	:SWEep:RSELect	discrete	host instrument model number (see command reference section for model numbers)	*NEW*
	:SWEep:RSELect?	——	returns selected host instrument model number	*NEW*
STATus				
	:OPERation[:EVENt]?	——	returns an integer from 0 to 32767	*STD*
	:OPERation:CONDition?	——	returns an integer from 0 to 32767	*STD*
	:OPERation:ENABle	numeric	an integer from 0 to 32767	*STD*
	:OPERation:ENABle?	——	returns an integer from 0 to 32767	*STD*
	:OPERation:PTRansition	numeric	an integer from 0 to 32767	*STD*
	:OPERation:PTRansition?	——	returns an integer from 0 to 32767	*STD*

Table 8-3. SCPI Command, Parameter, and Status Summary (continued)

Subsystem	Command	Parameter Type	Range	SCPI Status
STATus (continued)				
	:OPERation:NTRansition	numeric	an integer from 0 to 32767	*STD*
	:OPERation:NTRansition?	——	returns an integer from 0 to 32767	*STD*
	:QUEStionable[:EVENt]?	——	returns an integer from 0 to 32767	*STD*
	:QUEStionable:CONDition?	——	returns an integer from 0 to 32767	*STD*
	:QUEStionable:ENABle	numeric	an integer from 0 to 32767	*STD*
	:QUEStionable:ENABLe?	——	returns an integer from 0 to 32767	*STD*
	:QUEStionable:PTRansition	numeric	an integer from 0 to 32767	*STD*
	:QUEStionable:PTRansition?	——	returns an integer from 0 to 32767	*STD*
	:QUEStionable:NTRansition	numeric	an integer from 0 to 32767	*STD*
	:QUEStionable:NTRansition?	——	returns an integer from 0 to 32767	*STD*
	:PRESet	—	returns the status registers to known states	*STD*
SYSTem				
	:ERRor?	——	returns error number and discrete (or string data)	*NEW*
	:PRESet	——	Sets the tracking source to known conditions	*NEW*

Programming Usage Rules

The tracking source command language follows specific guidelines that are in conformance with defined standards. Refer to the IEEE 488.2 documentation previously identified, or to the beginners guide for SCPI (HP part number H2325-90001).

Linking SCPI with IEEE 488.2 Commands Semicolons link sequential IEEE 488.2 common commands. Semicolons also link IEEE 488.2 common commands with SCPI commands in a program message as shown in "Example of IEEE 488.2 and SCPI Command Combination".

Using colons Always use colons to separate command mnemonics, and use white-space to separate commands from parameters as illustrated in "Example of IEEE 488.2 and SCPI Command Combination".

Example of IEEE 488.2 and SCPI Command Combination

`*CLS;*RST;DIAGnostic:TEST?`	*Clear the status data structures, reset the system, run the SCPI diagnostics test, and return the status of the test result.*
`SYSTem:PRESet;*OPC?;`	*Preset the instrument and return an ASCII 1 at the completion of all measurements.*
`SOURce:FREQuency:MODE SWEep`	*Set the source to sweep mode. Notice that subsequent commands are separated with colons (:) and parameters are separated from the last command with white-space.*

Using Uppercase or Lowercase Letters Any portion of a command mnemonic appearing in uppercase letters indicates the minimum characters that must be entered in the program message. Entering the remaining lowercase letters is optional. However, all of the lowercase letters must be entered if any are entered. Otherwise an error occurs. *Command messages are not case sensitive.* You can enter any combination of uppercase or lowercase letters.

Using PMT

PMTs (program message terminators), such as <new line>, <^END> (or both terminators combined) returns the command path to the root (subsystem command mnemonic). The <^END> terminator means that EOI is asserted on the HPIB interface at the same time the preceding data byte is sent. Refer to Figure 8-3 in this section, for an example of a PMT.

Using Different Parameter Types

The four types of parameters used with the SCPI command language are numeric, Boolean, block, and discrete. Refer to Table 8-2, "SCPI Command Parameters," in the following section.

Example Syntax of a Program Message Terminator

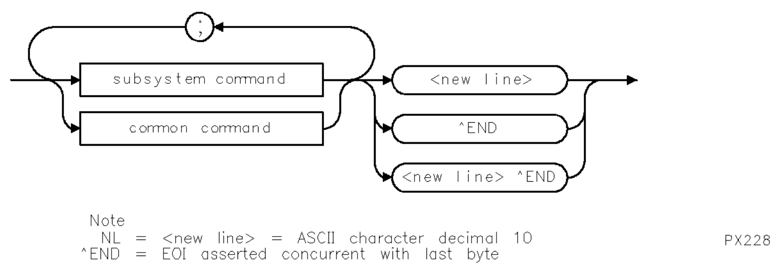

Figure 8-3. Simplified PMT Syntax

Refer to the following information for details about using the command reference.

Mnemonics in Examples

IEEE 488.2 commands require that the asterisk (*) character be entered into the command line.

SCPI command mnemonics in the examples in this reference are completely spelled out with the abbreviated uppercase letters and the optional complete spelling in lowercase letters.

You may enter just the abbreviated (uppercase) letters in your actual commands, or you can enter the entire mnemonic, completely spelled out in uppercase or lowercase letters. Neither the abbreviated nor the fully spelled mnemonic are case sensitive.

Syntax in Examples

Syntax diagrams are not used in this command reference.

Syntax statements that appear at the top of each command description indicate proper syntax.

Optional syntax characters, such as semi-colons (;) that can be entered at the end of a program message, are omitted. Optional command mnemonics and parameter units, (parameter units such as power and frequency units) are included in syntax statements. The optional commands are represented in the syntax statement as mnemonics within brackets ([ ]).

Never enter the brackets as part of the program message. Entering any mnemonic into a program message that is enclosed within brackets is strictly optional.

Separate the command mnemonics from argument syntax or values with space. The minimum space allowed is one space. You decide the amount of maximum space to use in your program messages. Parameter arguments are separated with a vertical-bar character |. Read the vertical bar as “or”.

Syntax Statements

Use the syntax statement to create a program message. Refer to the procedure below for creating a program message from a documented syntax statement:

1. Enter the subsystem command mnemonic. The subsystem mnemonic appears first in the syntax statement. Recall the uppercase and lowercase lettering rules.
2. Enter the colon (:) and subsequent command mnemonics with colons as appropriate.
3. Insert a blank space between the last command mnemonic and an argument where indicated in the syntax statement. Do not insert a space between the command mnemonic and a question mark (?).
4. Enter the argument syntax into the program message. Allowable argument choices are divided with the vertical-bar (|) character. Read the vertical-bar character as “or.”

The program message is ready to be executed.

The first alphabetized group of commands are IEEE 488.2 commands. For complete information about these commands, refer to the *ANSI/IEEE Std 488.2-1987 IEEE Standard Codes, Formats, Protocols and Common Commands* reference document.

The second alphabetized group of commands are SCPI commands. SCPI commands are alphabetized by the subsystem name. Each subsystem contains commands. The commands within the subsystem are alphabetized. Any related parameters are stated in the textual command syntax.

Use the commands in this section to control non-instrument specific operations. Refer to command summary in Table 8-1 in this chapter.

*CLS

Syntax

*CLS<terminator>

Description

Use this command to clear status data structures and the request-for-operation-complete flag (refer to the *OPC command).

After a SYSTem:PRESet or *RST command, bit 7 of the Standard Event Status Register (ESR) is set to 1.

Example

`OUTPUT 703;"*CLS;"` *Clear the instrument's status registers.*

*ESE

Syntax

*ESE <mask><terminator>
*ESE?

Description

Use this command to set the standard event status register bits. The query allows you to determine the current contents of the Standard Event Status Enable Register.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 through 255
query	?	0 through 255

Example

`OUTPUT 703;"*ESE 32;"` *Enable bit 5 of the Standard Event Status Register, to be read by the Status Byte Register.*

*ESR

Syntax

*ESR?<terminator>

Description

Use this command to query the contents of the standard event status register. This command purges the contents of the standard event status register after it is read.

After a SYSTem:PRESet command, bit 7 (power on) of the Standard Event Status Register is set to 1.

Refer to Table 8-4 for definitions of the ESR bits.

Table 8-4. ESR Bit Definitions

<table>
<tr><th>Bit Number</th><th>Title</th><th>IEEE 488.2 Reference Section</th></tr>
<tr><td>Bit 7 (MSB)</td><td>power on|11.5.1.1.2</td><td></td></tr>
<tr><td>Bit 6</td><td>user request|11.5.1.1.3 (N/A)</td><td></td></tr>
<tr><td>Bit 5</td><td>command error|11.5.1.1.4</td><td></td></tr>
<tr><td>Bit 4</td><td>execution error|11.5.1.1.5</td><td></td></tr>
<tr><td>Bit 3</td><td>device specific error |11.5.1.1.6</td><td></td></tr>
<tr><td>Bit 2</td><td>query error |11.5.1.1.7</td><td></td></tr>
<tr><td>Bit 1</td><td>request control|11.5.1.1.8 (N/A)</td><td></td></tr>
<tr><td>Bit 0</td><td>operation complete</td><td>11.5.1.1.9</td></tr>
</table>

Example

`OUTPUT 703;"*ESR?;"` *Returns the contents of the standard event status register, then clears the register.*

*IDN

Syntax

*IDN?<terminator>

Description

Use this query to obtain instrument-related identification information. The four fields of the response are separated by commas. The first field is the manufacturer's name. The second field is the instrument model number. The third field is the serial number, or an ASCII 0 if the serial number is unavailable. The fourth field is the firmware date-code, or an ASCII 0 if the date- code is unavailable. Refer to the example of a response below:

Example

`OUTPUT 703;"*IDN?;"`	*Return the manufacturer, instrument model number, the serial number, and the firmware date-code (in the yymmdd format). As an example, HEWLETT-PACKARD,85645A,2411A00092,910408 for an HP 85645A might be returned.*

*OPC

Syntax

*OPC<terminator>

*OPC?<terminator>

Description

Use this command to set the operation-complete-flag request bit. Once all pending device operations are completed, the OPC bit in the standard event status register is set. When the operations are completed, the query places an ASCII character 1 in the output queue.

In the following example, the Standard Event Status Enable Register and the standard status register enable must be set to allow a serial poll to read the event.

The following SCPI or IEEE 488.2 commands are compatible with the *OPC or the *OPC? command:

CALibration:PEAK

DIAGnostic:TEST?

SYSTem:PRESet

*RST

*TST

Example

`OUTPUT 703;"*CLS;"`	*Clear the Status Registers.*
`OUTPUT 703;"*ESE 1;"`	*Enable bit 1 of the Standard Event Status Register.*
`OUTPUT 703;"*SRE 32;"`	*Enable bit 5 of the Service Request Register.*
`OUTPUT 703;"*CAL:PEAK;*OPC;"`	*Peak the tracking source then set the operation complete flag when completed.*

```
J=0
REPEAT
     J=J+1
     IF J>10000 THEN
```

```
            OUTPUT 703"*RST;"   If the loop continues past 10000
                                passes, reset the system.
            DISP "ABORTED"      Print aborted on the display.
            STOP
        END IF
UNTIL BIT(SPOLL(703),6)=1
END
```

Query Example

In the following example, the parser is held off until the CAL:PEAK operation is completed.

```
OUTPUT 703;"*CAL:PEAK;*OPC?;"   Peak the tracking source then re-
                                turn the operation complete flag
                                when completed.
ENTER 703;A$                    Find the operation complete flag.
```

*RST

Syntax

*RST<terminator>

Description

Use this command to perform a device reset and the following events:

- Set device-dependent functions to known states, independent of the past-use history of the device.
- Abort the pending operations.
- Clear the output queue.
- Clear the request for the operation-complete flag.

The reset command does not do any of the following:

- Affect the IEEE 488.1 (HPIB) interface state.
- Modify the standard status register enable (SRE) setting.
- Modify the standard event status enable (ESE) setting.
- Modify the power-on-clear flag.
- Modify the calibration data.

Example

`OUTPUT 703;"*RST;"` *Reset the device.*

*SRE

Syntax

*SRE <mask><terminator>
*SRE?<terminator>

Description

Use this command to set the service request enable register bits. The query returns the contents of the service request enable register.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 through 255
query	?	0 through 255

Example

`OUTPUT 703;"*SRE 32;"`	*Enable bit 5 of the Service Request Register.*
`OUTPUT 703;"*SRE?;"`	*What is the enable-bit setting for the service request register.*
`ENTER 703;Enable_bits`	*Get the current Service Request Enable Register setting.*

*STB

Syntax

*STB<terminator>

Description

Use this command to read the status byte register and the master summary status bit setting.

Example

```
OUTPUT 703;"*STB?;"
ENTER 703;Status_byte
```

Get the status of the instrument's status byte registers.

*TST

Syntax

*TST?<terminator>

Description

This command is not yet implemented.

Once implemented, use this command to execute an internal self-test and place the pass/fail status code in the output queue. If the self-test passes, the result is an ASCII 0. If the self-test failed, the result is an ASCII 1. Use the SCPI command ERR to identify the error conditions.

Example

`OUTPUT 703;"*TST?;"`	*Execute the device's internal self-test.*
`ENTER 703;Fail`	*Get the self-test status, pass or fail.*

```
IF Fail = 0 THEN
     PRINT "Self-test passed."
ELSE
     PRINT "Self-test failed."
END IF
```

*WAI

Syntax

*WAI<terminator>

Description

Use this command to prevent the device from executing further commands or queries until the no-operation-pending flag is true.

The *WAI command does not set the operation complete bit in the standard event status register.

Example

`OUTPUT 703;"CAL:PEAK; *WAI;"` *Peak the tracking source and wait until the operation is finished before executing any further commands.*

The SCPI commands are used to control measurement operations or instrument-specific functions.

Command syntax is represented as a syntax statement. Syntax diagrams are not used.

Refer to the table preceding each subsystem to learn which commands are available and the how they are alphabetized within the subsystem.

Calibration subsystem commands control the tracking source peaking operation and monitor the tracking signal with respect to the host instrument signal. Table 8-5 lists the CALibration subsystem commands in alphabetical order.

Table 8-5. CALibration Subsystem Commands Descriptions

SCPI Command and Syntax	Description	Related Front-Panel Operation
CALibration:ALC:EXTernal	Perform ALC calibration for EXTernal ALC mode	(ADJUST) ADJ #2 ALC EXT Detector
CALibration:ALC:EXTernal:Freq <real num>GHz	Perform ALC calibration for EXTernal ALC mode	(ADJUST) ADJ #2 ALC EXT Detector
CALibration:ALC:EXTernal <real num>dBm	Perform ALC calibration for EXTernal ALC mode	(ADJUST) ADJ #2 ALC EXT Detector
CALibration:PEAKing[:EXECute]	Adjusts the YTM (yig-tuned-multiplier) offset and gain circuitry for peak output power.	(ADJUST), **ADJ #1 AMPLITUDE PEAK**
CALibration:SWEeptune:SETTing	Selects custom calibration settings or factory settings relating to host SWP+TUNE voltage	(CONFIG) CNFG #3 Swp+ Tune setting
CALibration:TRACk:ADJ	Adjusts tracking with respect to the host instrument signal.	(TRACK ADJ)
CALibration:TRACk:ADJ?	Query returns the current tracking number.	(TRACK ADJ)

:ALC:EXTernal

Syntax

CALibration:ALC:EXTernal
CALibration:ALC:EXTernal:FREQuency <real number>GHz
CALibration:ALC:EXTernal <real number>dBm

Description

Use this command to remotely adjust the ALC for external modes of ALC detection. The first time that the command CALibration:ALC:EXTernal <real number>dBm is used, it must be preceeded by the other two CALibration:ALC:EXTernal commands.

Example

`OUTPUT 703;"CAL:ALC:EXTernal;*OPC;"`	**OPC will alert the user when the sequence has ended. *OPC? is NOT meant to be used with this command and will hang the bus if it is used.*
`OUTPUT 703;"CAL:ALC:EXT:FREQ 1.0GHz;"`	*Sets the frequency point where the ALC is to be adjusted.*
`REPEAT`	
`OUTPUT 703;"CAL:ALC:EXT <power meter reading in dBm>;"`	*Reads power meter, allowing appropriate settling time.*
`WAIT (.250)`	
`UNTIL BIT (SPOLL(703),6)=1`	*The "repeat-until loop" is executed until OPC=1, which triggers bit 6 of the status byte register to equal 1.*
`DIAG:STOREE`	*This command stores the table to EEPROM.*

:PEAKing

Syntax

CALibration:PEAKing[:EXECute]

Description

Use this command to obtain optimum peak-amplitude response. The PEAKing command automatically adjusts the tracking source's YTM (yig-tuned-multiplier) offset and gain circuitry to give peak amplitude response.

The new gain and offset settings for each band are determined, then saved in the tracking source's memory.

Example

`OUTPUT 703;"CALibration:PEAKing:EXECute"`	*Execute the peak-amplitude routine. Notice that the optional command [:EXECute] is included for this example.*

:SWEeptune:SETTing

Syntax

CALibration:SWEeptune:SETTing

Description

Use this command to select custom or factory sweep-plus-tune calibration seetings relating to the host's sweep-plus-tune voltage

Example

```
OUTPUT 703;"CALibration:SWEeptune:
           SETTing CUSTOM;"
```

Select the custom calibration settings obtained by performing ADJ #3 SWP+TUNE ADJ under the (ADJUST) *menu.*

:TRACk

Syntax

CALibration:TRACk:ADJust <integer>| UP | DOWN
CALibration:TRACk:ADJust?

Description

Use this command to query or make tracking-source tracking signal adjustments, with respect to the host instrument. This adjustment is typically made with the host instrument set to a narrow resolution bandwidth. Tracking is adjusted until the displayed response is at its maximum (peak) level.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	increment = 1
numeric	integer	−5000 to +5000
query	?	integer between −5000 and +5000

Example

```
OUTPUT 703;"CALibration:TRACk:ADJust 1294"
```
Set the tracking source DAC number to 1,294.

```
OUTPUT 703;"CALibration:TRACk:ADJust UP"
```
Adjust the tracking source up 1 unit from its current position.

```
OUTPUT 703;"CALibration:TRACk:ADJust DOWN"
```
Adjust the tracking source down 1 unit from its current position.

Query Example

```
OUTPUT 703;"CALibration:TRACking:ADJust?"
```
What is the current tracking adjust DAC set to?

```
ENTER 703;Track
```
Get the current DAC number.

```
PRINT "The tracking adjustment DAC
       is set to",Track
```
Print or display the current DAC number.

These subsystem commands can be used to evaluate tracking source operation, to determine which test host instrument is selected, or to monitor RF output power leveling. You can also test front-panel status indicators for proper operation. Table 8-6 lists the DIAGnostic subsystem commands in alphabetical order.

Table 8-6. DIAGnostic Subsystem Commands Descriptions

SCPI Command and Syntax	Description	Related Front-Panel Operation
DIAGnostic:TEST?	Query returns self-test pass (1) or fail (0) status	(TEST), TEST #1 SELF TEST
DIAGnostic:THMode	Allows you to select a synthesized sweeper for the 1st LO input signal to the tracking source.	(TEST), TEST #4 TEST HOST MODE
DIAGnostic:THMode?	Query returns current test-host mode.	(TEST), TEST #4 TEST HOST MODE
DIAGnostic:THFReq	Allows you to send the test host band number and CW frequency value to the tracking source.	(TEST), TEST #4 TEST HOST MODE
DIAGnostic:THFReq?	Query returns the current test-host band number and CW frequency setting.	(TEST), TEST #4 TEST HOST MODE
DIAGnostic:UNLeveled?	Query returns Boolean 1 if state is unleveled; 0 if state is leveled. The query resets the value to 0.	UNLVLD status indicator
DIAGnostic:PATTern TEST	Displays a front-panel test pattern.	(TEST), TEST #2 TESPATTERN

:TEST?

Syntax

DIAGnostic:TEST?

Description

This query command starts a self-test routine that verifies certain tracking source hardware operations. The command sets the instrument hardware to various known states. Then, appropriate points in the circuitry are measured with an internal ADC. The name of the diagnostic test being run flashes across the tracking source display window as it occurs. If the measured value does not meet defined limits, then **SELF TEST FAILED** appears. Any further testing is halted.

If the self-test completes and passes, a "0" is returned to the controller, a "1" is returned if the test failed.

Review error messages remotely by using the SYSTem:ERRor? command. Any programming errors are cleared from the tracking source's memory after they are reviewed. Hardware errors are retained in memory after they are reviewed.

Parameter Type	Parameter Allowed	Range
query	?	Boolean, 1 if test failed 0 if test passed

Example

```
OUTPUT 703;"DIAGnostic:TEST?"     Did the test pass or fail?
ENTER 703;Fail                    Find the test status.
PRINT "If Test fail print 1"      Return 1 if the test has failed.
PRINT  Fail                       Print or display the result.
```

:THMode

Syntax

DIAGnostic:THMode
DIAGnostic:THMode?

Description

Use this command to select an HP 8340A synthesized sweeper as the 1st LO input to the tracking source. The frequency range of the synthesized sweeper eliminates the need for multiple spectrum analyzers when testing the tracking source's YTO. Select the frequency with the THFReq command.

Parameter Type	Parameter Allowed	Range
query	?	Boolean, 1 if test-host mode is on 0 if test-host mode is off

Example

```
OUTPUT 703;"DIAGnostic:THMode"
```
Place the tracking source in test host mode.

Query Example

```
OUTPUT 703;"DIAGnostic:THMode?"
```
What is the current test-host mode setting?

```
ENTER  703;Thost
```
Find the current test-host mode setting.

```
PRINT  "The Test Host mode is ",
        Thost;BOOLEAN
```
Print or display a 1 if test host mode is on; a 0 if it is off.

:THFReq

Syntax

DIAGnostic:THFReq <integer> <real number><frequency unit>
DIAGnostic:THFReq?

Description

Use this command to enter or query the tracking source band number and frequency setting when test host mode is enabled.

Set the synthesized sweeper frequency 300 MHz (specific to the each tracking source band) below the tracking source's CW frequency. As an example, if the tracking source is set to 2.5 GHz, then the synthesized sweeper must be set to 2.2 GHz. Refer to Table 8-7 below for synthesized sweeper settings.

For band 0:

[desired tracking source frequency + 3900 MHz] = synthesized sweeper frequency setting

For bands 1 through 4:

[desired tracking source frequency / band number]
− 300 MHz = synthesized sweeper frequency setting

Table 8-7. Band Number and Frequency Ranges

Band Number	Frequency Range	Synthesized Sweeper Frequency
0	0.00 to 3100 GHz	3900 to 7000 MHz
1	2000 to 7500 GHz	1700 to 7200 MHz
For HP 85645A Tracking Source Only		
2	4000 to 15000 GHz	refer to preceding formula
3	6000 to 22500 GHz	refer to preceding formula
4	8000 to 26500 GHz	refer to preceding formula

Parameter Type	Parameter Allowed	Range
numeric	integer	0 or 1 for HP 85644A; 0 through 4 for HP 85645A
numeric	real number	0 to 6.5 GHz for HP 85644A; 0 to 26.5 GHz for HP 85645A
<frequency unit>	See Table 8-2.	
query	?	band number: 0, 1, 2, 3, or 4 depending on the tracking source model and frequency setting frequency value: 0 to 6.5 GHz for HP 85644A; 0 to 26.5 GHz for HP 85645A

Example

`OUTPUT 703;"DIAGnostic:THFReq 0 1.25 GHZ;"`	*Select tracking source band 0, and set the frequency to 1.25 GHz.*

Query Example

`OUTPUT 703;"DIAGnostic:THFReq?;"`	*What are the current test-host mode band number and frequency settings?*
`ENTER 703;Band,Freq`	*Get the band number and frequency setting.*
`PRINT "The test host band is ",Band, "and frequency is",Freq`	*Print or display the band number and frequency settings.*

:UNLeveled?

Syntax

DIAGnostic:UNLeveled?

Description

Use this query command to determine whether or not the tracking source output power is leveled. If a Boolean 1 is returned, the output power is unleveled. If a Boolean 0 is returned, the output power is leveled.

The UNLeveled? query command resets the Boolean value to 0. If an unleveled condition occurs at anytime during a sweep, the value is set to 1 and remains at 1 until the query is executed.

Parameter Type	Parameter Allowed	Range
query	?	Boolean, 1 if output power is unleveled 0 if output power is leveled

Example

`OUTPUT 703;"DIAGnostic:UNLeveled?"`	*What is the current output power leveling state?*
`ENTER 703;Level`	*Determine what the current leveling status is.*
`PRINT 703;"The output power is ", Level;BOOLEAN`	*Return a Boolean 1 if output power is unleveled, a 0 if it is leveled.*

:PATTern

Syntax

DIAGnostic:PATTern TEST

Description

Use this command to display the tracking source front-panel test pattern. Certain status indicator also light simultaneously. The command causes a predetermined pattern to appear in the display windows and to light a certain combination of the status indicators.

The following status indicators should light simultaneously:

- ADRSD
- RMT
- ERR
- AC COUPLING (HP 85645A only)
- DC COUPLING (HP 85645A only)
- RF ON

The following display pattern should appear. There should be and alternating pattern of 4 LEDs on and 4 LEDs off across the 24-character display windows.

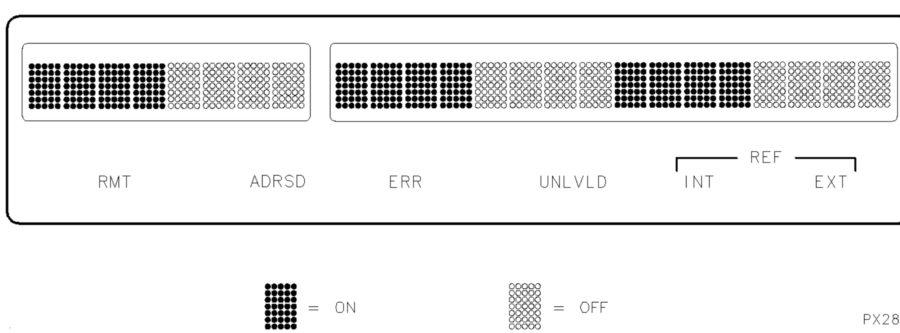

Figure 8-4. Display Pattern of "DIAGnostic:PATTern TEST" Command

Parameter Type	Parameter Allowed	Range
discrete	TEST	——

Example

`OUTPUT 703;"DIAGnostic:PATTern TEST"`	*Start the front-panel display and status indicator test routine.*

These subsystem commands can be used to control the intensity and on or off state of the tracking source's 24-character display windows. Table 8-8 lists the DISPlay subsystem commands in alphabetical order.

Table 8-8. DISPlay Subsystem Commands Descriptions

SCPI Command and Syntax	Description	Related Front-Panel Operation
DISPlay:BRIGhtness	Allows you to adjust the display window's brightness, or intensity.	(ADJUST), ADJ #0 DISP INTENSITY
DISPlay:BRIGhtness?	Query returns current display intensity setting.	(ADJUST), ADJ #0 DISP INTENSITY
DISPlay[:STATe]	Allows toggling display windows on (1) or off (0).	
DISPlay[:STATe]?	Query returns Boolean 1 if display is turned on, 0 if off.	(CONFIG), CNFG #4 DISPLAY OFF

:BRIGhtness

Syntax

DISPlay:BRIGhtness <real number>
DISPlay:BRIGhtness?

Description

Use this command to change or query the display window intensity setting.

Parameter Type	Parameter Allowed	Range
numeric	real number	0.0 is minimum intensity; 1.0 is maximum intensity
query	?	real number from 0.0 to 1.0

Example

```
OUTPUT 703;"DISPlay:BRIGhtness 0.8"
```

Set the display windows to a 0.8 level of intensity.

Query Example

```
OUTPUT 703;"DISPlay:BRIGhtness?"
```

What is the current display window intensity setting?

```
ENTER 703;Value
```

Get the intensity setting.

```
PRINT "The display intensity
       setting is ",Value
```

Print or display the current setting value.

[:STATe]

Syntax

DISPlay[:STATe] ON | OFF | 1 | 0
DISPlay[:STATe]?

Description

Use this command to toggle or query the state of the 24-character display windows. Notice that [:STATe] is an assumed command which can be entered optionally.

Parameter Type	Parameter Allowed	Range
discrete	ON or OFF	——
numeric	Boolean	1 turns the display on; 0 turns the display off
query	?	Boolean, 1 if the display is on; 0 if the display is off

Example

`OUTPUT 703;"DISPlay:STATe OFF"`	*Turn the 24-character display windows off. The [:STATe] command is optionally entered.*
`OUTPUT 703;"DISPlay ON"`	*The display is turned on. The [:STATe] command is assumed here.*

Query Example

`OUTPUT 703;"DISPlay:STATe?"`	*What is the 24-character display state, on or off?*
`ENTER 703;Disp` `PRINT "The display state is ",Disp`	*Return a Boolean 1 is if the state is on;* *a 0 if the state is of.*

These subsystem commands can be used to toggle the HP 85645A tracking source's RF output between ac or dc. They can also be used for both instruments to control the RF output state. Table 8-9 lists the OUTPut subsystem commands in alphabetical order.

Table 8-9. OUTPut Subsystem Commands Descriptions

SCPI Command and Syntax	Description	Related Front-Panel Operation
OUTPut:COUPling	Allows selection of AC or DC RF output power coupling on HP 85645A only.	(AC COUPLING) or (DC COUPLING) toggle key
OUTPut:COUPling?	Query returns AC or DC coupling status	Either the AC or DC status indicator is lit.
OUTPut[:STATe]	Allows turning RF output on (1) or off (0)	RF OUTPUT (ON/OFF) toggle key. A lit RF OUTPUT status indicator means state is on.
OUTPut[:STATe]?	Query returns Boolean 1 if RF output is on, 0 if off.	A lit RF OUTPUT status indicator means RF output is on.

:COUPling

Syntax

OUTPut:COUPling AC | DC
OUTPut:COUPling?

Description

Use this command on the HP 85645A to select either ac or dc RF output coupling.

When ac coupling is selected, the AC COUPLED status indicator lights and the dc-blocking capacitor is included in the RF output path.

When dc is selected, the DC COUPLED status indicator lights and the dc-blocking capacitor is bypassed in the RF output path.

Parameter Type	Parameter Allowed	Range
discrete	AC or DC	AC on or off DC on or off
query	?	AC or DC

Example

```
OUTPUT 703;"OUTPut:COUPling AC"
OUTPUT 703;"OUTPut:COUPling DC"
```

`OUTPUT 703;"OUTPut:COUPling AC"`	*Select ac coupling.*
`OUTPUT 703;"OUTPut:COUPling DC"`	*Select dc coupling.*

Query Example

`OUTPUT 703;"OUTPut:COUPling?"`	*What is the current HP 85645A RF output coupling state?*
`ENTER 703;In$`	*Get the RF output state setting.*
`PRINT "The RF output is "&In$&" coupled."`	*Print or display the output coupling state.*

[:STATe]

Syntax

OUTPut[:STATe] ON | OFF | 1 | 0
OUTPut[:STATe]?

Description

Use this command to remotely turn the RF output state on or off. Entering the [:STATe] command is optional.

Parameter Type	Parameter Allowed	Range
discrete	ON or OFF	——
numeric	Boolean	1 turns RF output on; 0 turns RF output off
query	?	Boolean, 1 indicates automatic attenuation is on; 0 indicates automatic attenuation is off

Example

`OUTPUT 703;"OUTPut:STATe ON"`	*Turn the RF output on. The [:STATe] command is optionally entered.*
`OUTPUT 703;"OUTPut OFF"`	*Turn the RF output off. Notice that the [:STATe] command is assumed.*

Query Example

`OUTPUT 703;"OUTPut:STATe?"`	*What is the current RF output status, ON or OFF?*
`ENTER 703; Rfstate`	*Get the current RF output state.*
`PRINT "The RF output state is ",Rfstate`	*Return a Boolean 1 if the RF output state is on and 0 if it is off.*

Use the commands in this subsystem to control the tracking source's operating and measurement parameters. These parameters include commands for power level, attenuation, frequency settings, offset tracking, and slope. You can also verify the presence of a 10 MHz external reference, and verify or select the host instrument model number. Table 8-10 lists the SOURce subsystem commands in alphabetical order.

Table 8-10. SOURce Subsystem Commands Descriptions

SCPI Command and Syntax	Description	Related Front-Panel Operation
SOURce:POWer:ATTenuation	Allows entry of tracking source's internal attenuation value	(AUX), AUX #1 ATTENUATION
SOURce:POWer:ATTenuation?	Query returns the tracking source's internal attenuation setting.	(AUX), AUX #1 ATTENUATION
SOURce:POWer:ATTenuation:AUTO	Allows toggling automatic attenuation mode on (1) or off (0)	(AUX), AUX #0 ATTEN MODE
SOURce:POWer:ATTenuation:AUTO?	Query returns Boolean 1 if automatic attenuator mode is on, 0 if off.	(AUX), AUX #0 ATTEN MODE
SOURce:POWer:ALC[:STATe]	Allows entry of ALC state on (1) or off (0)	
SOURce:POWer:ALC [:STATe]?	Query returns Boolean 1 if ALC state is on, 0 if off	
SOURce:POWer:ALC:SOURce	Allows selection of internal (INTernal) or external (DIODe) amplitude leveling.	(CONFIG), CNFG #0 AMPL LEVELNG
SOURce:POWer:ALC:SOURce?	Query returns current amplitude leveling state (DIODE or INT).	(CONFIG), CNFG #0 AMPL LEVELNG

Table 8-10. SOURce Subsystem Commands Descriptions (continued)

SCPI Command and Syntax	Description	Related Front-Panel Operation
SOURce Subsystem (continued)		
SOURce:POWer:CENTer	Allows entry of center-reference power point for power sweep function	(POWER LEVEL)
SOURce:POWer:CENTer?	Query returns current setting of center-reference power point for power sweep function	(POWER LEVEL)
SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]	Allows entry of tracking source RF output power level	(POWER LEVEL)
SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]?	Query returns the current RF output power level setting	(POWER LEVEL)
SOURce:POWer:MODE	Allows selection of either sweep (SWEep) or fixed (FIXed) power sweep mode	(POWER SWEEP)
SOURce:POWer:MODE?	Query returns current power sweep mode, SWEEP or FIXED	(POWER SWEEP)
SOURce:POWer:SLOPe	Allows selection of power-slope constant used for amplitude slope compensation.	(AUX FCTN), AUX #2 POWER SLOPE
SOURce:POWer:SLOPe?	Query returns the current power-slope constant value	(AUX FCTN), AUX #2 POWER SLOPE
SOURce:POWer:SPAN	Allows selection of power range about the center-reference power point for power sweep function	(POWER SWEEP)
SOURce:POWer:SPAN?	Query returns the current range from center-reference power point	(POWER SWEEP)
SOURce:POWer:STEP:AUTO	Allows toggling the automatic power step-increment function on (1) or off (0)	——
SOURce:POWer:STEP:AUTO?	Query returns Boolean 1 if automatic power-step is on, 0 if off	

Table 8-10. SOURce Subsystem Commands Descriptions (continued)

SCPI Command and Syntax	Description	Related Front-Panel Operation
SOURce Subsystem (continued)		
SOURce:POWer:STEP[:INCRement]	Allows selection of power step increment to use with UP or DOWN command	(POWER STEP)
SOURce:POWer:STEP[:INCRement]?	Query returns the current power step increment for power step function	(POWER STEP)
SOURce:FREQuency[:CW | :FIXed]	Allows selection of a CW, or fixed, RF output signal frequency value (CW and FIXed are identical commands) and entry of a CW value	(CW)
SOURce:FREQuency[:CW | :FIXed]?	Returns the current CW frequency of tracking source RF output signal	——
SOURce:FREQuency:STEP[:INCRement]	Allows selection of a frequency step increment for UP or DOWN command	(FREQ STEP)
SOURce:FREQuency:STEP[:INCRement]?	Query returns the current frequency step increment to function with UP or DOWN command	(FREQ STEP)
SOURce:FREQuency:STEP:AUTO	Allows toggling automatic frequency step increment on (1) or off (0)	——
SOURce:FREQuency:STEP:AUTO?	Query returns Boolean 1 if automatic frequency step is on, 0 if off	——
SOURce:FREQuency:MODE	Allows selection of either CW (CW) or swept (SWEep) frequency mode	(CW) or (TRKG)
SOURce:FREQuency:MODE?	Query returns the current frequency mode selection	——
SOURce:FREQuency:OFFSet	Allows selection of offset tracking mode and entry of an offset-frequency value	(OFFSET TRKG)
SOURce:FREQuency:OFFSet?	Query returns the current value of the offset tracking frequency	——

Table 8-10. SOURce Subsystem Commands Descriptions (continued)

SCPI Command and Syntax	Description	Related Front-Panel Operation
SOURce Subsystem (continued)		
SOURce:FREQuency:OFFSet:STEP:AUTO	Allows toggling automatic offset step mode on (1) or off (0)	——
SOURce:FREQuency:OFFSet:STEP:AUTO?	Returns Boolean 1 if automatic offset step mode is on, 0 if off	——
SOURce:FREQuency:OFFSet:STEP[:INCRement]	Allows entry of a frequency offset-step increment to use with UP or DOWN command	(FREQ STEP)
SOURce:FREQuency:OFFSet:STEP[:INCRement]?	Query returns the current frequency offset-step increment used with UP or DOWN command	(FREQ STEP)
SOURce:ROSCillator:SOURce?	Query returns Boolean 1 if tracking source is in external reference oscillator mode, or 0 if in internal mode	——
SOURce:SWEep:RSELect	Allows selection of a supported host model number (see command in reference section for host model numbers)	(CONFIG), CNFG #1 HOST SELECT
SOURce:SWEep:RSELect?	Query returns the currently selected host model number	(CONFIG), CNFG #1 HOST SELECT

:POWer:ALC:SOURce

Syntax

SOURce:POWer:ALC:SOURce INTernal | DIODe
SOURce:POWer:ALC:SOURce?

Description

Use this command to select or query the amplitude-leveling mode. You can select either external (diode) or internal amplitude leveling mode.

Parameter Type	Parameter Allowed	Range
discrete	INTernal or DIODe	——
query	?	INT or DIODE

Example

```
OUTPUT 703;"SOURce:POWer:ALC:SOURce INTernal"
```

Set the tracking source's amplitude leveling mode to internal.

Query Example

```
OUTPUT 703;"SOURce:POWer:ALC:SOURce?"
```

What is the current amplitude leveling source?

```
ENTER 703;Source$
```

Get the current amplitude leveling state.

```
PRINT "The ALC loop is ",Source$,"leveled."
```

Print or display the source, internal or diode (external). The response is either DIODE for external leveling or INT for internal amplitude leveling.

:POWer:ATTenuation:AUTO

Syntax

SOURce:POWer:ATTenuation:AUTO ON | OFF | 1 | 0
SOURce:POWer:ATTenuation:AUTO?

Description

Use this command to set the tracking source's internal output attenuator to automatic or manual operation.

Programming a specific output attenuation level turns the automatic attenuation function off, regardless of the :ATTenuation:AUTO command setting.

Parameter Type	Parameter Allowed	Range
discrete	ON or OFF	--
numeric	Boolean	1 turns automatic attenuation on; 0 turns manual attenuation on
query	?	Boolean, indicates automatic attenuation is on; 0 indicates automatic attenuation is off

Example

```
OUTPUT 703;"POWer:ATTenuation:AUTO ON"
```
Turn on the tracking source's automatic attenuation feature.

Query Example

```
OUTPUT 703;"SOURce:POWer:ATTenuation:AUTO?"
```
Is the output attenuator mode set to automatic or manual?

```
ENTER 703;Att_mode
```
Get the attenuator mode setting.

```
PRINT "The automatic-attenuation mode is ",
        Att_mode
```
Print or display the mode (response is Boolean). If 1 is returned, the automatic attenuation mode is on. If 0 is returned, the manual mode is on.

:POWer:ATTenuation

Syntax

SOURce:POWer:ATTenuation <integer>[DB] UP | DOWN
SOURce:POWer:ATTenuation?

Description

Use this command to set the tracking source's internal attenuation level. The attenuation setting is coupled to the power level setting. Increasing internal attenuation by 10 dB causes the RF output signal power level to decrease by 10 dB.

Programming a specific attenuation level turns the automatic attenuation off. As a result, the power level range is limited to the ALC range. The ALC range is dependent on frequency.

Parameter Type	**Parameter Allowed**	**Range**
discrete	UP or DOWN	10 dB
numeric	integer	0 to 70 dB for HP 85644A 0 to 60 dB for HP 85645A
query	?	integer from 0 to 70 dB for HP 85644A; 0 to 60 dB for HP 85645A

Example

```
OUTPUT 703;"SOURce:POWer:ATTenuation 20DB"
```

Set the tracking source internal attenuation to 20 dB.

Query Example

```
OUTPUT 703;"SOURce:POWer:ATTenuation?"
ENTER 703;Att
PRINT "The output attenuator is set to ",Att
```

What is the tracking source's internal attenuation setting?
Get the current attenuation setting.
Print or display the internal attenuator setting.

:POWer:ALC[:STATe]

Syntax

SOURce:POWer:ALC[:STATe] ON | OFF | 1 | 0
SOURce:POWer:ALC[:STATe]?

Description

Use this command to activate or deactivate the tracking source's ALC-loop function. When the ALC loop is activated, the unleveled power condition is monitored by the tracking source. When ALC is set to off, unleveled power conditions can occur, regardless of the internal or external (diode) reference mode. This command is useful for diagnostic purposes. Notice that [:STATe] is an assumed command which can be entered optionally.

Parameter Type	Parameter Allowed	Range
discrete	ON or OFF	——
numeric	Boolean	1 turns ALC-loop function on; 0 turns ALC-loop function off
query	?	Boolean, 1 indicates ALC-loop function is on; 0 indicates ALC-loop function is off

Example

`OUTPUT 703;"SOURce:POWer:ALC:STATe OFF"`	*Turn the ALC loop function off. The optional command [:STATe] is included.*

Query Example

`OUTPUT 703;"SOURce:POWer:ALC:STATe?"`	*What is the current ALC loop state, on or off?*
`ENTER 703;Alcstate`	*Get the current ALC loop function state.*
`PRINT "The ALC state is set to ",Alcstate`	*A Boolean 1 is returned if the ALC-loop state is activated and a 0 if it is deactivated.*

:POWer:CENTer

Syntax

SOURce:POWer:CENTer <real number>[DBM] | UP | DOWN
SOURce:POWer:CENTer?

Description

Use this command to set a power-span center-reference point for use with the power sweep operation. From this reference point, the SOURce:POWer:SPAN setting has a center point of reference about which to pivot.

Valid center-power values are directly affected by the power-level setting of the instrument. The power range of the HP 85644A is 0 to −80 dBm, and for the HP 85645A is 0 to −70 dBm.

Refer to the SOURce:POWer:SPAN and SOURce:POWer:MODE commands which are also part of the SOURce subsystem.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	The increment is controlled by the power step command. Refer to the :POWer:STEP[:INCRement] command.
numeric	real number	corresponds to the power level setting
query	?	value of center, reference-power setting

Example

`OUTPUT 703;"SOURce:POWer:CENTer −20 DBM"`	*Set the power-span center reference-point to −20 dBm.*
`OUTPUT 703;"SOURce:POWer:CENTer UP"`	*Increment the power-span center reference point. The size of the step is controlled by the :POWer:STEP[:INCRement] setting.*

Query Example

`OUTPUT 703;"SOURce:POWer:CENTer?"`	*What is the current power-span center reference-point setting?*

`ENTER 703;Level`	*Get the current power-span center reference-point value.*
`PRINT "The center reference power of the sweep is ",Level`	*A power point between −70 or −80 dBm and +30 is returned.*

:POWer[:LEVel][:IMMediate][:AMPLitude]

Syntax

SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]
<real number>[DBM] | UP | DOWN
SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]?

Description

Use this command to set the tracking source's RF output power level. The output power range is different for the two tracking source models. Refer to the parameter table below.

The actual output power is limited by hardware capability. Although leveled output power is specified to be 0 dBm, the actual leveled output power above 0 dBm is not quantified by the instrument during operation.

If you request a power value that exceeds the range of the ALC output power compensation circuitry, the UNLVLD status indicator lights. Recall that the bracketed ([ ]) mnemonics are assumed commands and can be entered optionally.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	The increment is controlled by the power step command. Refer to the :POWer:STEP[:INCRement] command.
numeric	real number	−70 to +30 dBm for HP 85644A −80 to +30 dBm for HP 85645A
query	?	The value of the power level.

Example

```
OUTPUT 703;"SOURce:POWer:LEVel
      :IMMediate:AMPLitude -20 DBM"
```

Set the power level to −20 dBm. Recall that the bracketed, optional command mnemonics, are all included.

Query Example

`OUTPUT 703;"SOURce:POWer:LEVel :IMMediate:AMPLitude?"`	*What is the current power level setting?*
`ENTER 703;Level`	*Get the current power level setting.*
`PRINT "The power level is ",Level`	*Print or display the tracking source's RF output power setting.*

:POWer:MODE

Syntax

SOURce:POWer:MODE SWEep | FIXed
SOURce:POWer:MODE?

Description

Use this command to select or query the power sweep mode. If power span is set to 0 dB, the SWEep command does not activate power sweep. Selecting FIXed, however, does turn power sweep off and sets the power span to 0 dB.

Parameter Type	Parameter Allowed	Range
discrete	SWEep or FIXed	——
query	?	SWEEP or FIXED

Example

`OUTPUT 703;"SOURce:POWer:MODE SWEep"`	*Turn on the tracking source's power-sweep mode (useful only if SOURce:POWer:SPAN is not set to 0 dB).*
`OUTPUT 703;"SOURce:POWer:MODE FIXed"`	*Turn off power-sweep mode and set the span to 0 dB.*

Query Example

`OUTPUT 703;"SOURce:POWer:MODE?"`	*What is the current power-sweep mode?*
`ENTER 703;Mode$`	*Get the current power-sweep mode setting.*
`PRINT "The power-sweep mode is set to ", Mode$"`	*Print or display the mode, SWEEP or FIXED.*

:POWer:SLOPe

Syntax

SOURce:POWer:SLOPe <real number>[DB/GHZ] | UP | DOWN
SOURce:POWer:SLOPe?

Description

Use this command to set the incremental value of change in power the tracking source is to use as it tracks the host instrument signal. This command allows you to adjust the tracking source output power for tracking accuracy.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	The increment is controlled by the power step command. See the :POWer:STEP[:INCRement] command.
numeric	real number	0 to 3.00 dB/GHz (band 0); 0 to 1.0 dB/GHz (bands 1 through 4)
query	?	0 to 3.00 DB/GHZ

Example

```
OUTPUT 703;"SOURce:POWer:SLOPe 0.5"
```
Set the power-slope increment to 0.5 dB/GHz.

Query Example

```
OUTPUT 703;"SOURce:POWer:SLOPe?"
```
What is the current power-slope increment setting?

```
ENTER 703;Slope
```
Get the current power-slope increment setting.

```
PRINT "The power-slope increment
      is set to ",Slope," dB/GHz."
```
Print or display the power- slope value.

:POWer:SPAN

Syntax

SOURce:POWer:SPAN <real number>[DB] | UP | DOWN
SOURce:POWer:SPAN?

Description

Use this command to set the tracking source's power-span width for power-sweep measurements. The actual power-sweep range is frequency dependent.

For the low-band frequencies of the tracking source, the range is typically 30 dB, if the start power point is −10 dBm. For the fourth-band frequencies, the range is 10 dB if the start power point is −10 dB.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	The increment is controlled by the power step command. See the :POWer:STEP[:INCRement] command.
numeric	real number	0 to +30 dB
query	?	0 to +30 DB

Example

```
OUTPUT 703;"SOURce:POWer:SPAN 20DB"      Set power-span to 20 dB.
OUTPUT 703;"SOURce:POWer:SPAN DOWN"      Decrease the power-span range
                                          by the step-size increment con-
                                          trolled by the
                                          :POWer:STEP[:INCRement] comman
```

Query Example

```
OUTPUT 703;"SOURce:POWer:SPAN?"          What is the current power-span
                                          range?
ENTER 703;Span                            Get the current power-span setting.
PRINT "The power-span range               Print or display the power-span
      is set to ",Span," dB."             value.
```

:POWer:STEP:AUTO

Syntax

SOURce:POWer:STEP:AUTO ON | OFF | 1 | 0
SOURce:POWer:STEP:AUTO

Description

Use this command to activate or deactivate automatic power-step mode. When automatic power-step is activated, the step-increment value defaults to 1 dB. When UP or DOWN parameters are used with the SOURce:POWer commands, the increment of change is 1 dB.

When automatic power-step is deactivated, the step-increment value equals the SOURce:POWer:STEP[:INCRement] command setting.

Parameter Type	Parameter Allowed	Range
discrete	ON	1 dB
discrete	OFF	––
numeric	Boolean	1 turns automatic mode on; 0 turns automatic mode off
query	?	Boolean, 1 if automatic mode is on; 0 if automatic mode is off

Example

`OUTPUT 703;"SOURce:POWer:STEP:AUTO ON"`	*Activate automatic power-step. Step-increments default to 1 dB.*

Query Example

`OUTPUT 703;"SOURce:POWer:STEP:AUTO?"`	*What is the current automatic power-step mode?*
`ENTER 703;Auto`	*Get the current power-step mode.*
`PRINT "Is step-mode set to automatic?",Auto`	*Print or display the step-mode setting. Return is Boolean 1 if automatic-mode is on or 0 if automatic-mode is off.*

:POWer:STEP[:INCRement]

Syntax

SOURce:POWer:STEP[:INCRement] <real number>[DB] | UP | DOWN
SOURce:POWer:STEP[:INCRement]?

Description

Use this command to select a power-step increment value. This increment controls the size of change that occurs when automatic power-step is off, and UP or DOWN is used in SOURce:POWer commands.

When the automatic power-step mode is activated, the power-step increment defaults to 1 dB. When automatic-mode is deactivated, the power step size becomes the value entered via this command. To deactivate automatic power-step mode, enter this command along with a desired numeric value for the step increment.

Notice that [:INCRement] is an assumed command which can be entered optionally.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	Increment change in 1, 2, 5 sequence
numeric	real number	0.01 dB to 100 dB
query	?	0.01 to 100 DB

Example

`OUTPUT 703;"SOURce:POWer:STEP :INCRement 1.25 DB"`	*Set power-step size to 1.25 dB increments. Entering the [:INCRement] command is optional.*
`OUTPUT 703;"SOURce:POWer:STEP :INCRement UP"`	*Step the power level up 1.25 dB from its current setting.*

Query Example

`OUTPUT 703;"SOURce:POWer:STEP :INCRement?"`	*What is the current power-step increment setting?*

`ENTER 703;Stepinc`	*Get the current power-step increment setting.*
`PRINT "The power-step is set to ", Stepinc," dB."`	*Print or display the power-step increment value.*

:FREQuency [:CW | :FIXed]

Syntax

SOURce:FREQuency[:CW | :FIXed]
<real number><frequency unit> | UP | DOWN
SOURce:FREQuency[:CW | :FIXed]?

Description

Use this command to turn the tracking source into a CW signal source. For this mode, enter a continuous wave or fixed frequency value that is used while CW or fixed mode is active. The :CW and :FIXed commands provide identical signal conditions and are optionally entered in the command line. Enter whichever command you prefer, or enter neither command, the effect is the same.

If you activate the CW or fixed signal mode with the SOURce:FREQuency:MODE CW command, the frequency value is unknown. Use the command SOURce:FREQuency[:CW | :FIXed] <frequency value> to activate CW or fixed frequency mode at a known frequency setting.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	The increment is controlled by the frequency step command. See the :FREQuency:STEP[:INCREMENT] command.
numeric	real number	For HP 85644A, 0 Hz to 6.5 GHz For HP 85645A, 0 Hz to 26.5 GHz
query	?	0 Hz to 6.5 GHz for HP 85644A; 0 Hz to 26.5 GHz for HP 85645A

Example

```
OUTPUT 703;"SOURce:FREQuency:CW 5.25124 GHZ"
```

Set and activate the tracking source continuous wave signal at 5.25124 GHZ. Notice that the [:CW] command is optionally entered. The :FIXed command would deliver the same signal condition.

Query Example

`OUTPUT 703;"SOURce:FREQuency:FIXed?"`	*What is the current fixed mode frequency setting?*
`ENTER 703;Freq`	*Get the current fixed-mode frequency setting.*
`PRINT "The fixed frequency setting is ",Freq," Hz."`	*Print or display the fixed frequency value.*

:FREQuency:STEP:AUTO

Syntax

SOURce:FREQuency:STEP:AUTO ON | OFF | 0 | 1
SOURce:FREQuency:STEP:AUTO?

Description

Use this command to activate or deactivate automatic frequency-step mode. When automatic frequency-step is activated, the step-increment value defaults to 50 MHz. When UP or DOWN parameters are used with the SOURce:FREQuency commands, the increment of change is 50 MHz.

When automatic frequency-step is deactivated, the step-increment value equals the SOURce:FREQuency:STEP[:INCRement] command setting.

Parameter Type	Parameter Allowed	Range
discrete	ON	50 MHz
discrete	OFF	– –
numeric	Boolean	1 turns automatic mode on 0 turns automatic mode off
query	?	Boolean, 1 if automatic mode is on; 0 if automatic mode is off

Example

```
OUTPUT 703;"SOURce:FREQuency
            :STEP:AUTO ON"
```

Activate automatic frequency-step mode. The step-size defaults to 50 MHz increments.

Query Example

```
OUTPUT 703;"SOURce:FREQuency
           :STEP:AUTO?"
```

What is the current automatic frequency- step mode?

```
ENTER 703;Auto
```

Get the current frequency-step mode setting.

```
PRINT "Is step-mode set
       to automatic?",Auto
```

Print or display the step-mode setting. Return is Boolean 1 if automatic-mode is on or 0 if automatic-mode is off.

:FREQuency:STEP[:INCRement]

Syntax

SOURce:FREQuency:STEP[:INCRement]
<real number><frequency unit> | UP | DOWN
SOURce:FREQuency:STEP[:INCRement]?

Description

Use this command to select or query the frequency-step increment value. This frequency-step increment value controls the size of change that occurs when the UP and DOWN commands are used with the SOURce:FREQuency commands.

When the automatic frequency-step mode is activated, the step size defaults to 50 MHz. When automatic-mode is deactivated, the frequency-step size becomes the value entered with the SOURce:FREQuency:STEP command. Entering a value with the SOURce:FREQuency:STEP command turns automatic mode off.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	Increments change in 1, 2, 5 sequence.
numeric	real number	For HP 85644A, 1 Hz to 6.5 GHz For HP 85645A, 1 Hz to 26.5 GHz
query	?	1 Hz to 6.5 GHz for HP 85644A; 1 Hz to 26.5 GHz for HP 85645A,

Example

```
OUTPUT 703;"SOURce:FREQuency:STEP
            :INCRement 100.25 MHZ"
```

Set frequency-step size increment to 100.25 MHz. Notice that the [:INCRement] command is optionally entered.

```
OUTPUT 703;"SOURce:FREQuency:STEP UP"
```

Increase the frequency 100.25 MHz from its current setting.

Query Example

`OUTPUT 703;"SOURce:FREQuency:STEP :INCRement?"`	*What is the current frequency-step increment setting? Notice that the [:INCRement] command is optionally entered.*
`ENTER 703;Step`	*Get the current frequency-step increment setting.*
`PRINT "The frequency-step size is ",Step," Hz."`	*Print or display the frequency-step increment value.*

:FREQuency:MODE

Syntax

SOURce:FREQuency:MODE CW | SWEep
SOURce:FREQuency:MODE?

Description

Use this command to activate either the tracking source's swept- or CW-signal mode of operation. The major function of the tracking source is to track a host instrument at no offset to the host's input frequency.

Parameter Type	Parameter Allowed	Range
discrete	CW or SWEep	——
query	?	CW or SWEEP

Example

`OUTPUT 703;"SOURce:FREQuency :MODE SWEep"`	*Activate the tracking source's swept-frequency mode for host instrument tracking.*
`OUTPUT 703;"SOURce:FREQuency :MODE CW"`	*Activate the tracking source's CW-frequency mode for host instrument tracking.*

Query Example

`OUTPUT 703;"SOURce:FREQuency:MODE?"`	*What is the tracking source tracking-signal mode?*
`ENTER 703;Mode$`	*Get the current frequency-tracking mode setting.*
`PRINT "The frequency mode is ",Mode$`	*Print or display the frequency-tracking mode setting. The return is either CW or SWEEP.*

:FREQuency:OFFSet

Syntax

SOURce:FREQuency:OFFSet
<real number><frequency unit> | UP | DOWN
SOURce:FREQuency:OFFSet?

Description

Use this command to select an offset frequency for offset tracking operations.

Offset limits are dependent upon the host instrument hardware. You can, however, enter offset values within the tracking source range at anytime.

The preset condition is non-offset tracking.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	When automatic-step mode is off, the increment is controlled by the offset frequency-step size.
numeric	real number	—4.00 GHz to 4.00 GHz
query	?	—4.00 GHZ to 4.00 GHZ

Example

```
OUTPUT 703;"SOURce:FREQuency
            :OFFSet 21.4 MHz"
```
Set the offset tracking value to 21.4 MHz.

Query Example

```
OUTPUT 703;"SOURce:FREQuency:OFFSet?"
```
What is the current offset-tracking frequency setting?

```
ENTER 703;Offset
```
Get the current offset-tracking frequency setting.

```
PRINT "The frequency offset setting
       is ",Offset,"Hz"
```
Print or display the frequency setting for offset-tracking.

:FREQuency:OFFSet:STEP:AUTO

Syntax

SOURce:FREQuency:OFFSet:STEP:AUTO ON | OFF | 1 | 0
SOURce:FREQuency:OFFSet:STEP:AUTO?

Description

Use this command to activate or deactivate automatic offset-tracking frequency-step mode. When the automatic mode is activated, the step-increment value defaults to 10 kHz. When the UP or DOWN commands are used with the SOURce:FREQuency:OFFSet commands, the increment of change is 10 kHz.

When the automatic mode is deactivated, the step-increment value equals the SOURce:FREQuency:OFFSet:STEP[:INCRement] command setting.

Parameter Type	Parameter Allowed	Range
discrete	ON	10 kHz
discrete	OFF	––
numeric	Boolean	0 turns automatic mode off; 1 turns automatic mode on
query	?	Boolean, 1 if automatic mode is on; 0 if automatic mode is off

Example

```
OUTPUT 703;"SOURce:FREQuency:STEP:AUTO ON"
```
Activate automatic offset-tracking frequency-step mode.

Query Example

```
OUTPUT 703;"SOURce:FREQuency:STEP:AUTO?"
ENTER 703;Auto
PRINT "Is step-mode set to automatic?",Auto
```
What is the current step mode?
Get the step mode setting.
Print or display the step-mode setting. Return is Boolean 1 if automatic-mode is on or 0 if automatic-mode is off.

:FREQuency:OFFSet:STEP[:INCRement]

Syntax

SOURce:FREQuency:OFFSet:STEP[:INCRement]
<real number> <frequency unit> | UP | DOWN
SOURce:FREQuency:OFFSet:STEP[:INCRement]?

Description

Use this command to select an offset tracking frequency-step increment. This increment controls the size of change that occurs when the UP or DOWN commands are used with the SOURce:FREQuency:OFFSet commands. When automatic step-mode is activated, the step size defaults to 10 kHz. In manual mode, the value entered with this command is in effect. Entering a value with the :FREQuency:OFFSet:STEP[:INCRement] command deactivates automatic frequency offset-step mode. Notice that the [:INCRement] mnemonic is an assumed command.

Parameter Type	Parameter Allowed	Range
discrete	UP or DOWN	Increments change in 1, 2, 5 sequence. If automatic step mode is on, default increment is 10 kHz.
numeric	real number	—4.00 GHz to 4.00 GHz
query	?	—4.00 GHZ to 4.00 GHZ

Example

```
OUTPUT 703;"SOURce:FREQuency:OFFSet
            :STEP:INCRement 21.4 MHz"
```

Set the offset tracking step-incremen value to 21.4 MHz. The :INCRement command is optionally entered.

Query Example

```
OUTPUT 703;"SOURce:FREQuency:OFFSet
            :STEP:INCRement?"
ENTER 703;Offset
```

What is the current offset-tracking frequency step-increment setting?
Get the current offset-tracking frequency step- increment setting.

`PRINT "The tracking offset setting is ",Offset,"Hz"`	*Print or display the offset-tracking frequency step-increment setting.*

:ROSCillator:SOURce?

Syntax

SOURce:ROSCillator:SOURce?

Description

Use this query command to determine the presence of a 10 MHz external reference. The external reference is attached to the rear-panel 10 MHz connector on the tracking source.

Parameter Type	Parameter Allowed	Range
query	?	Boolean, 1 when an external reference is connected; 0 when no external reference connected

Query Example

```
OUTPUT 703;"SOURce:ROSCillator:SOURce?"
```
Is there a 10 MHz external reference connected to the tracking source?.

```
ENTER 703;Ext_ref
```
Get the current external reference setting.

```
PRINT "The status of a 10 MHz external
      reference is ",Ext_ref"
```
Print or display the status, Boolean 1 if an external reference is attached; Boolean 0 if not.

:SWEPt:RSELect

Syntax

SOURce:SWEep:RSELect <host model number>
SOURce:SWEep:RSELect?

Description

Use this command to select the host-instrument model for the tracking source to track. Refer to Table 8-11 below for the list of valid host-instrument model numbers.

Parameter Type	Parameter Allowed	Range
discrete	See Table 8-11	one model number
query	?	Host instrument model number as indicated in Table 8-11

Table 8-11. Supported Host Instruments

Parameter Allowed	Model Number	Instrument Type	Restrictions
HP8560	HP 8560A/E	portable spectrum analyzers	——
HP8561	HP 8561A/B/E	portable spectrum analyzers	
HP8562	HP 8562A/B	portable spectrum analyzers	——
HP8562OLD	HP 8562A/B	portable spectrum analyzer	For those serial prefixes 2350A and below
HP8563	HP 8563A/E	portable spectrum analyzers	
HP8566	HP 8566A/B	spectrum analyzer	——
HP8593	HP 8593A/E	portable spectrum analyzer	Option 009
HP8594	HP 8594A/E	portable spectrum analyzer	Option 009
HP8595	HP 8595A/E	portable spectrum analyzer	Option 009
HP8596	HP 8596E	portable spectrum analyzer	Option 009 *
HP8340_5	HP 8340A/B (0.5 V/GHz)	synthesized sweeper	*
HP8340_1	HP 8340A/B (1.0 V/GHz)	synthesized sweeper	*
HP8341_5	HP 8341A (0.5 V/GHz)	synthesized sweeper	*
HP8341_1	HP 8341A (1.0 V/GHz)	synthesized sweeper	*
HP70909	HP 70909A	spectrum analyzer	——
HP70910	HP 70910A	spectrum analyzer	——
HP83590_5	HP 83590A (0.5 V/GHz)	RF plug-in	*
HP83590_1	HP 83590A (1.0 V/GHz)	RF plug-in	*
HP83592_5	HP 83592A/B/C (0.5 V/GHz)	RF plug-in	*
HP83592_1	HP 83592A/B/C (1.0 V/GHz)	RF plug-in	*
HP83594_5	HP 83594A (0.5 V/GHz)	RF plug-in	*
HP83594_1	HP 83594A (1.0 V/GHz)	RF plug-in	*
HP83595_5	HP 83595A (0.5 V/GHz)	RF plug-in	*
HP83595_1	HP 83595A (1.0 V/GHz)	RF plug-in	*

* Requires HP 85644A/45A firmware later than revision A. For firmware revision A, the |Parameter Allowed| does not include "_5" or "_1", only the basic HP model number.

Example

`OUTPUT 703;"SOURce:SWEep:RSELect HP8563"`	*Select the HP 8563A/E spectrum analyzer as the host instrument for the tracking source to track.*

Query Example

`OUTPUT 703;"SOURce:SWEep:RSELect?"`	*What is the current host-instrument model number?*
`ENTER 703;Host$`	*Get the current host-instrument model number.*
`PRINT "The host-instrument is ",Host$`	*Print or display the host-instrument model number.*

Use the commands in this subsystem to evaluate the status registers of the tracking source.

These commands access non-IEEE 488.2 status structures. The additional structures supported are identified in the following tables. Table 8-12 lists the STATus subsystem commands in alphabetical order.

Table 8-12. STATus Subsystem Commands Descriptions

SCPI Command and Syntax	Description	Related Front-Panel Operation
STATus:OPERation:CONDition?	Query returns the current status of the Standard Operation Status Condition register	——
STATus:OPERation:ENABle	Determines which bits of Standard Operation Status Event register will set bit 7 in the Status Byte register	——
STATus:OPERation:ENABle?	Query returns the current state of the Enable register	——
STATus:OPERation[:EVENt]?	Query returns current status of Standard Operation Status Event register	——
STATus:OPERation:PTRansition	Determines which bits of Standard Operation Status Condition register sets corresponding Standard Operation Status Event register with positive transition	——
STATus:OPERation:PTRansition?	Query returns current state of positive transition (PTR) filter	——
STATus:OPERation:NTRansition	Determines which bits of Standard Operation Status Condition register sets corresponding Standard Operation Status Event register with negative transition	——
STATus:OPERation:NTRansition?	Query returns current state of negative transition (NTR) filter	——
STATus:QUEStionable:CONDition?	Query returns current status of the Standard Questionable Status Condition register	——

Table 8-12. STATus Subsystem Commands Descriptions (continued)

SCPI Command and Syntax	Description	Related Front-Panel Operation
STATus Subsystem (continued)		
STATus:QUEStionable:ENABle	Determines which bits of Standard Questionable Status Event register will set bit 3 in Status Byte register	——
STATus:QUEStionable:ENABLe?	Query returns the current state of the Enable register	——
STATus:QUEStionable[:EVENt]?	Query returns current status of Standard Questionable Status Event register	——
STATus:QUEStionable:PTRansition	Determines which bits of Standard Questionable Status Event register sets corresponding Standard Operation Status Event register with positive transition	——
STATus:QUEStionable:PTRansition?	Query returns the current state of the positive transition (PTR) bit	——
STATus:QUEStionable:NTRansition	Determines which bits of Standard Questionable Status Event register sets corresponding Standard Operation Status Event register with negative transition	——
STATus:QUEStionable:NTRansition?	Query returns the current state of negative transition (NTR) bit	——
STATus:PRESet	Presets the Status subsystem to initial states: PTR bits to 1 NTR bits to 0 ENAB bits to 0 COND and EVEN registers to 0	——

STATus Subsystem Register States

The STATus subsystem standard operation status register bits and the standard questionable status register bits are set as indicated in Table 8-13 and Table 8-14.

Table 8-13. Standard Operation Status Register

Bit Number	Definition
0	calibrating, set at the start of the calibration, cleared at the end of the calibration
1	unused, defined as settling bit
2	unused, defined as ranging bit
3	unused, defined as sweeping bit
4	unused, defined as measuring bit
5	unused, defined as waiting for trigger bit
6	unused, defined as waiting for arm bit
7	unused, defined as correcting bit
8	unused, an instrument specific bit
9	unused, an instrument specific bit
10	self-test in progress, set at the start of the self-test, cleared at the end of the self-test.
11	unused, an instrument specific bit
12	unused, an instrument specific bit
13	unused, a reserved bit
14	unused, defined as user-defined program running bit
15	zero

Table 8-14. Standard Questionable Status Register

Bit Number	Definition
0	unused, defined as voltage summary bit
1	unused, defined as current summary bit
2	unused, defined as time summary bit
3	unleveled power, set if the tracking source output power goes unleveled and is cleared when power is leveled
4	unused, defined as temperature bit
5	frequency error, set if frequency error occurs in self test
6	unused, defined as phase summary bit
7	unused, defined as modulation summary bit
8	calibration error, set if error in calibration occurs, cleared when no error exists
9	self-test failed, set if the self-test failed, cleared if self- test passed
10	hardware fault, *unused*
11	unused, an instrument specific bit
12	unused, an instrument specific bit
13	unused, defined as instrument summary bit
14	unused, defined as unexpected parameter
15	unused, reserved bit

:OPERation:CONDition?

Syntax

STATus:OPERation:CONDition?<terminator>

Description

Use this query command to return the current status of the operation condition register.

Parameter Type	Parameter Allowed	Range
query	?	0 to 32767

Query Example

```
OUTPUT 703;"STATus:OPERation:CONDition?"
ENTER 703; Condition
```

What is the current status of the Standard Operation Status Condition register?

:OPERation:ENABle

Syntax

STATus:OPERation:ENABle <mask><terminator>
STATus:OPERation:ENABle?<terminator>

Description

Use this command to set the bit in the standard operation status register that enables a summary bit to occur (to set bit 7) in the status byte register. The query returns the current state (*or enable bit)* of the enable register.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 to 32767
query	?	0 to 32767

Example

```
OUTPUT 703;"STATus:OPERation:ENABle 1025"
```
Set the Standard Operation Status register to 1025.

Query Example

```
OUTPUT 703;"STATus:OPERation:ENABle?"
```
Which Standard Operation Status bits are set to enable a summary bit to occur in the Status Byte registers.

```
ENTER 703;Enable_mask
```
Get the current enable mask.

:OPERation[:EVENt]?

Syntax

STATus:OPERation:EVENt?<terminator>

Description

Use this query command to obtain the status of the standard operation status event register. The event register contains the positive- or negative-transition filtered contents of the condition register.

Destructive Read

This query command purges the contents of the event register.

Query Example

`OUTPUT 703;"STATus:OPERation[:EVENt]?"`	*What are the contents in the Standard Operation Status Event registers.*
`ENTER 703;Event`	*Get the contents of the Event registers.*
`PRINT 703;"The contents of the Standard Event register is ",Event`	*Print or display the contents. The response is an NR1 <NL (new line)> value.*

:OPERation:NTRansition

Syntax

STATus:OPERation:NTRansition <mask><terminator>
STATus:OPERation:NTRansition?<terminator>

Description

Use this command to control the NTR (negative-transition) filter bits. The transition filter bits determine which negative-going bits in the condition register will set corresponding bits in the event register. Transition filters are unaffected by *CLS (clear status) or queries.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 to 32767
query	?	0 to 32767

Example

`OUTPUT 703;"STATus:OPERation:NTRansition 1024"`	*Activate the self-test bit number 10.*
`OUTPUT 703;"STATus:OPERation:PTRansition 0"`	*Disable the positive transition filter.*
`OUTPUT 703;"STATus:OPERation:ENABle 1024"`	*Enable the self-test bit number 10.*
`OUTPUT 703;"*SRE 128"`	*Service Request Enable Register bit number 7.*
`OUTPUT 703;"*TST?"`	*The instrument asserts SRQ when the self-test is completed.*

```
J=0
REPEAT
     J=J+1
     IF J>10000 THEN
          OUTPUT 703;"*RST"
          DISPlay "ABORTED"
          STOP
     END IF
UNTIL BIT(SPOLL(703),6)=1
ENTER 703; Fail$
```

If the loop exceeds 10,000 rounds, reset the operation.

Print or display ABORTED.

The results of TST are sent to Fail$. If 1 is returned, the test failed; if 0 is returned, the test passed.

Query Example

`OUTPUT 703;"STATus:OPERation:NTRansition?"`	*What is the negative transition mask value?*
`ENTER 703; Negative_mask`	

:OPERation:PTRansition

Syntax

STATus:OPERation:PTRansition <mask><terminator>
STATus:OPERation:PTRansition?<terminator>

Description

Use this command to control the PTR (positive-transition) filter bits. The transition filter bits determine which positive-going bits in the condition register will set corresponding bits in the event register. Transition filters are unaffected by *CLS (clear status) or queries.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 to 32767
query	?	0 to 32767

Example

`OUTPUT 703;"STATus:OPERation:PTRansition 1"`	*Activate calibration bit number 1.*
`OUTPUT 703;"STATus:OPERation:NTRansition 0"`	*Disable the negative transition filter.*
`OUTPUT 703;"STATus:OPERation:ENABle 1"`	*Enable the calibration bit number 1.*
`OUTPUT 703;"*SRE 128"`	*Service Request Enable Register bit number 7.*
`OUTPUT 703;"*TST?"`	*The instrument asserts SRQ when the self-test is started.*
`J=0`	

```
REPEAT
     J=J+1
     IF J>10000 THEN
          OUTPUT 703;"*RST"
          DISPlay "ABORTED"
          STOP
     END IF
UNTIL BIT(SPOLL(703),6)=1
ENTER 703; Fail$
```

If the loop exceeds 10,000 rounds, reset the operation.

Print or display ABORTED.

The results of TST are sent to Fail$. If 1 is returned, the test failed; if 0 is returned, the test passed.

Query Example

```
OUTPUT 703;"STATus:OPERation:PTRansition?"
ENTER 703; Positive_mask
```

What is the positive transition mask value?

:PRESet

Syntax

STATus:PRESet

Description

Use this command to preset the tracking source' status registers. Presetting the status registers sets all PTRansition filter bits to 1, all NTRansition filter bits to 0, all ENABle bits to 0, and all CONDition registers to 0.

All used bits of the Questionable and Operation Status Registers (which includes the Condition, Event, Transition, and Enable registers) are set or cleared. However, bit number 15 (MSB) is not used, therefore, this bit is neither set nor cleared. As a result, the range is 0 to 32767, not 0 to 32768.

Example

`OUTPUT 703;"STATus:PRESet"`	*Preset the tracking source's status registers.*

:QUEStionable:CONDition?

Syntax

STATus:QUEStionable:CONDition?<terminator>

Description

Use this query command to return the current status of the questionable condition register.

Parameter Type	Parameter Allowed	Range
query	?	0 to 32767

Query Example

```
OUTPUT 703;"STATus:QUEStionable:CONDition?"
ENTER 703; Condition
```

What is the current status of the Standard Questionable Status Condition register?

:QUEStionable:ENABle

Syntax

STATus:QUEStionable:ENABle <mask><terminator>
STATus:QUEStionable:ENABle?<terminator>

Description

Use this command to set the bits in the standard questionable status register that enables a summary bit to occur (to set bit 3 in the status byte register). The query returns the current state of the enable register.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 to 32767
query	?	0 to 32767

Example

`OUTPUT 703;"STATus:QUEStionable:ENABle 8"`	*Set the Standard Questionable Status register to bit 3.*

Query Example

`OUTPUT 703;"STATus:QUEStionable:ENABle?"`	*Which Standard Questionable Status bits are set to enable a summary bit to occur in the status byte registers.*
`ENTER 703;Enable_mask`	*Get the current enable mask.*

:QUEStionable[:EVENt]?

Syntax

STATus:QUEStionable[:EVENt]?<terminator>

Description

Use this query command to obtain the status of the standard questionable status event register. The event register contains the positive- or negative-transition filtered contents of the condition register.

Destructive Read

This query command purges the contents of the event register.

Parameter Type	Parameter Allowed	Range
query	?	0 to 32767

Query Example

`OUTPUT 703;"STATus:QUEStionable:EVENt?"`	*What are the contents in the Standard Questionable Status Event register?*
`ENTER 703;Event`	*Get the contents of the Event register.*
`PRINT 703;"The contents of the Standard Event register is ",Event`	*Print or display the contents. The response is an NR1 <NL (newline)> value.*

:QUEStionable:NTRansition

Syntax

STATus:QUEStionable:NTRansition <mask><terminator>
STATus:QUEStionable:NTRansition?<terminator>

Description

Use this command to control the NTR (negative-transition) filter bits. The transition filter bits determine which negative-going bits in the condition register will set corresponding bits in the event register. Transition filters are unaffected by *CLS (clear status) or queries.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 to 32767
query	?	0 to 32767

Example

`OUTPUT 703;"STATus:QUEStionable:NTRansition 8"`	*Activate the unleveled-power bit number 3.*
`OUTPUT 703;"STATus:QUEStionable:PTRansition 0"`	*Disable the positive transition filter.*
`OUTPUT 703;"STATus:QUEStionable:ENABle"`	*Enable the unleveled- power bit number 3.*
`OUTPUT 703;"*SRE 8"`	*Service Request Enable Register bit number 7.*
`OUTPUT 703;"*TST?"`	*The instrument asserts SRQ when the power is leveled.*
`J=0` `REPEAT`	*If the loop exceeds 10,000 rounds, reset the operation.*

```
J=0
REPEAT
     J=J+1
     IF J>10000 THEN
          OUTPUT 703;"*RST"
          DISPlay "ABORTED"
```

Print or display `ABORTED`.

```
            STOP
        END IF
    UNTIL BIT(SPOLL(703),6)=1
    ENTER 703; Fail$
```

The results of TST are sent to Fail$. If 1 is returned, the test failed; if 0 is returned, the test passed.

Query Example

```
OUTPUT 703;"STATus:QUEStionable:NTRansition?"

ENTER 703; Negative_mask
```

What is the negative transition mask value?

:QUEStionable:PTRansition

Syntax

STATus:QUEStionable:PTRansition <mask><terminator>
STATus:QUEStionable:PTRansition?<terminator>

Description

Use this command to control the PTR (positive-transition) filter bits. The transition filter bits determine which positive-going bits in the condition register will set corresponding bits in the event register. Transition filters are unaffected by *CLS (clear status) or queries.

Parameter Type	Parameter Allowed	Range
numeric	integer	0 to 32767

Example

`OUTPUT 703;"STATus:QUEStionable:PTRansition 512"`	*Activate the self-test fail bit number 9.*
`OUTPUT 703;"STATus:QUEStionable:NTRansition 0"`	*Disable the negative going transition filter.*
`OUTPUT 703;"STATus:QUEStionable:ENABle 512"`	*Enable the self-test fail bit number 9.*
`OUTPUT 703;"*SRE 128"`	*Service Request Enable Register bit number 7.*
`OUTPUT 703;"*TST?"`	*The instrument asserts SRQ when the self-test is started.*
`J=0` `REPEAT`	*If the loop exceeds 10,000 rounds, reset the operation.*

```
J=0
REPEAT
     J=J+1
     IF J>10000 THEN
          OUTPUT 703;"*RST"
          DISPlay "ABORTED"
          STOP
     END IF
UNTIL BIT(SPOLL(703),6)=1
```

Print or display ABORTED.

Query Example

`OUTPUT 703;"STATus:QUEStionable:PTRansition?"`	*What is the positive transition mask value?*
`ENTER 703; Positive_mask`	*The results of TST are sent to Fail$. If 1 is returned, the test failed; if 0 is returned, the test passed.*
`ENTER 703; Fail$`	

Use the commands in this subsystem to remotely preset the tracking source or to review errors. Table 8-15 lists the SYSTem subsystem commands in alphabetical order.

Table 8-15. SYSTem Subsystem Commands Descriptions

SCPI Command and Syntax	Description	Related Front-Panel Operation
SYSTem:ERRor?	Query returns tracking source error. Repeat the command for each error.	(TEST), TEST #0 RECALL ERRORS
SYSTem:PRESet	Presets the tracking source to known states	(PRESET)

:ERRor?

Syntax

SYSTem:ERRor?

Description

Use this query command to review error messages. After reviewing an error that is related to remote programming, the error is erased from memory. After reviewing an error that is hardware related, the error is retained in memory.

Refer to the error messages in Chapter 6 of this manual for error message information.

Parameter Type	Parameter Allowed	Range
query	?	An error message as listed in Chapter 6 of this manual.

Example

`OUTPUT 703;"SYSTem:ERRor?"`	*What is the first error in the error-queue?*
`ENTER 703;Error$`	*Get the first error stored in the error-queue.*
`PRINT "The error is ",Error$"`	*Print or display the error number and message. Delete the error from memory if it is due to remote programming, retain the error if it is hardware related.*
`OUTPUT 703;"SYSTem:ERRor?"`	*What is the next error in the error-queue?*
`ENTER 703;Error$`	*Get the next (and so forth) error from the error-queue.*
`PRINT "The error is ",Error$"`	*Print or display the error number and message. Delete the error from memory if it is due to remote programming, retain the error if it is hardware related.*

:PRESet

Syntax

SYSTem:PRESet

Description

Use this command to return the tracking source to a known state. These states are listed in Table 7-1 and 7-2 of Chapter 7, “Operation Reference.”

Example

`OUTPUT 703;"SYSTem:PRESet"`	*Preset the tracking source and return it to its known preset state.*

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